

**THE IMPACT OF CORPORATIONS EXCESS SAVING BEHAVIOR AND
MACROECONOMIC POLICIES ON POVERTY INCIDENCE: EMPIRICAL
ANALYSIS OF INDONESIA, PHILIPPINES AND THAILAND**

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In Partial Fulfillment of the Requirements for the Degree of

Doctor of Philosophy

by

Nur Ain Shahrier

August 2012

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**THE IMPACT OF CORPORATIONS EXCESS SAVING BEHAVIOUR AND
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Nur Ain Shahrier, Ph.D.

Cornell University 2012

The period since the 1997 Asian Financial Crisis has witnessed many reforms in the economic structure and financial landscape in Asian economies that have increasingly influenced the global economy and financial discourse. The extents of these reforms not only involve macroeconomic policies but most importantly affect the behavior of economic agents and have challenged traditional economic assumptions and fundamentals.

The first chapter analyzes the issue of a savings glut that arose due to the claim that corporations hoard cash after the 1997 Asian Crisis. The savings behavior that the corporations exhibited went against the conventional economic theory that firms are supposed to invest in productive sectors to generate employment and increase labor force participation. This unfortunately wasn't the case because firms turned to alternative investments in financial markets that caused negative repercussions on social welfare especially by adversely affecting the incidence of poverty.

Based on these findings, we proceed with the second chapter using historical data and a financial computable general equilibrium (FCGE) model to examine the economy-wide impact of fiscal and monetary policies, and in particular, the impact on poverty and the income of the bottom 20% of the population in Thailand. The argument that expansionary policies will improve the income distribution is reconsidered and the model reveals that this is not necessarily the case.

Finally, the third chapter draws an example from a group of lower income households in the rural area of Lombok that have successfully and independently improved their financial conditions and welfare and were not adversely affected by the investment behavior of corporations or the economic policies of the government and central bank. Their sustainable growth for more than two decades provides hope and it shed lights on the possibility for the poor to survive and improve their well-being without depending on subsidies or external funding.

BIOGRAPHICAL SKETCH

Nur Ain Shahrier was born on 27th January 1980 in Penang, Malaysia. She obtained her Diploma in Actuarial Science from MARA University of Technology in 2001, Bachelor Degree (Honors) in triple majors: Actuarial Science, Economics and Mathematics from University of Iowa in 2004, Master in Engineering (MENG) with concentration in Financial Engineering in 2006, Master in Science (MSc.) in Regional Science in 2010 and a PhD degree in the field of Regional Science in 2012 at Cornell University. She was awarded the Central Bank of Malaysia Scholarship during her studies abroad in addition to being offered positions as teaching assistants for several graduate courses and a research assistant in the Regional Science Department. Her research concentrates on economic behavior and macroeconomic policies and their impact on poverty line and income distribution in an economy. Aside from numerous conferences that she has participated, she is currently working towards publications of her working papers and obtaining her Associate in Actuarial Science from the Society of Actuaries.

In addition to her career life, she is blessed with a wonderful husband, Adnan and her four children: Adam (4 years old), Aidan (3 years old), Arissa (18 months) and Ariana (1 month). The juggling responsibilities mainly as a wife, a mother, a PhD student, and a teaching assistant are the main motivation for her to continuously strive to achieve improvement in life especially using research as a tool in the quest of greater knowledge out of human curiosity. Her principle in life is to share and to give back her blessings through her skills and expertise to the people that needed it most as part of the duty of successful person.

*To my beloved family: Mum, Dad, Hubby and the greatest joy in my life, my children, Adam, Aidan,
Arissa and Ariana*

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The journey towards the completion of my PhD has had many best and worst moments in my life. Aside from the efforts, strength and never ending prayers and motivational quotations that kept me going for the past five years, this success was made possible largely due to the encouragement, guidelines and support from many people. Hence, I am taking this opportunity to express my highest gratitude to those who have been instrumental in this completion and making my doctoral journey a magnificent experience.

First and foremost, my debt of gratitude goes to my adviser, Prof. Iwan Azis for his unflagging encouragement, immeasurable guidance, sincerest attention, genuine caring and concern that are necessary for my survivorship in the doctoral program and subsequently in the completion of my PhD. His approach and faith in his students has taught me humility, selfless attitude, how to care and understand others' needs that I would carry along in my life. He has his own unique way in motivating the students to prioritize what matters in our life and not only acts as an adviser but 'fatherly figure' that serves as an important role model. Admittedly, the opportunities that he has provided to me from acceptance into the PhD program to working with him as Teaching Assistants, conducting field work research in rural area of Indonesia and many others have contributed immensely to my personal and academic life at Cornell. I would never have developed the confidence that I have and achieve these milestones without his guidance. Thank you very much, Professor Azis.

Next, I would also like to give heartfelt and special thanks to Professor Timothy Mount, my chair whose insight and input into analytical analysis has stimulated and enhanced my analytical capabilities. His relaxed demeanor, flexibility in scheduling and gentle advice never failed to make me motivated and encouraged after each meeting. His knowledge and guidance in

approaching analytical analysis would constantly provide constructive challenge to my thinking in understanding the results that I have obtained and shed lights on any ambiguity that sometimes a ‘black box’ model produce. I was certain that the moment he agreed to be my chair, I could see the lights and the hope of materializing my PhD successfully. Thank you very much, Professor Mount.

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My gratitude is also extended to Professor Kieran Donaghy for his continuous support and encouragement along with the funding sources that the department has provided which made it possible for me to raise three children and survived my PhD. It has been a great privilege to spend my five years in the Regional Science Department and its staffs and faculties will always remain dear to me.

In addition, my special thanks and debt of gratitude is dedicated especially to Nattapong Puttanapong for his endless generosity in providing the data and materials that are pertinent to my research. Furthermore, his continuous advice, guidance and prompt response to my questions serve as an example of valuable attitude of sharing and selflessness among colleagues. Furthermore, I would also like to gratefully acknowledge my friends and groups that have made

my stay at Cornell a pleasant and memorable experience. It is impossible to name each one of them, but rest assured that they leave a memorable footprint in my heart.

Finally and yet most importantly, I am highly indebted to my husband, Tengku Adnan for his supports all these years and his patient in helping me to pull through my PhD with four children. The ups and downs that we have shared for the past five years especially in managing the little ones have made us appreciative of each other and admittedly it hasn't been an easy path for us. I would also like to dedicate my gratitude and sincerest appreciation to my beloved parents, Shahrier Pawanchik and Rosni Md. Yusuff and sisters, Atiqah, Adilah and Arifah, for their unconditional loves, blessings and help in every possible way to ensure that I could complete my PhD. Last but not least, to my four angels, Adam, Aidan, Arissa and Ariana for the joy and blessings that they have brought into my life. Their smiles, laughter, hugs, stories and sense of humor are remedies that keep me going with determination each day.

TABLE OF CONTENTS

BIOGRAPHICAL SKETCH	iii
DEDICATION	iv
ACKNOWLEDGEMENTS	v
TABLE OF FIGURES	xiv
LIST OF TABLES	xx

CHAPTER 1: What Drives Corporate Saving Glut Post-97 Asian Financial Crisis? The Empirical Evidence of Indonesia, Philippines and Thailand

1. Introduction and Overview of Excess Saving	1
1.1. Motivation 1: Corporate Saving	1
1.2. Objective	10
2. Global Imbalance	11
2.1. What is Global Imbalances?	11
2.2. What are the Causes of Global Imbalances?	12
2.3. What are the Consequences of Global imbalances?	15
3. Literature Review	16
3.1. Theoretical Review	16
3.2. Empirical Review	18
4. Data and Methodology	21
4.1. Data Description	21
4.1.1 Flow-of-Funds (FoFs)	22
4.1.2. Overview on Thailand FoFs Accounts	24

4.1.3. Overview on Philippines FoFs Accounts	26
4.1.4. Overview on Indonesia FoFs Accounts	28
4.2. Relevant Variables as Regressors	29
4.2.1. Macroeconomic Indicators	30
4.2.2. Banks Specific Indicators	37
4.2.3. Corporations Specific Indicators	37
4.3. Estimation Methodology	38
5. Results and Analysis	46
5.1. Gross Saving versus Gross Capital Formation in Asean-3	46
5.1.1. The Evidence of Positive Excess Saving in Thailand?	49
5.1.2. The Evidence of Positive Excess Saving in Philippines?	54
5.1.3. The Evidence of Positive Excess Saving in Indonesia?	59
5.2. The Estimation Results	64
5.2.1. Feldstein-Horioka Regression Result	64
5.2.2. Determinants of Corporate Saving Regression Result	65
5.3. The Evidence of an Increase in Financial Market Investment Post-97 AFC by Corporate Sector	79
6. Conclusion	86
6.1. Concluding Remarks	86
APPENDIX	91
REFERENCES	120

CHAPTER 2: The Impact of Macroeconomic Policies on Poverty Incidence Using Financial Computable General Equilibrium Method: Case Evidence of Thailand

1. Introduction	124
1.1. Problem Statement/Hypothesis	127
2. Literature Review	128
3. Data and Methodology 1	131
3.1. Construction of Quadrant - 1: Aggregate Demand and Aggregate Supply Curves	131
3.1.1. Blanchard and Quah Decomposition in this Framework	133
3.1.2. Construction of Quadrant - 2: CPI and Poverty Line	136
3.1.3. Construction of Quadrant – 3: Poverty Line and Average Income of the Poor	139
3.1.4. Construction of Quadrant – 4: GDP and Average Income of the Poor	140
4. Results and Analysis I	140
4.1. Results for General Economy in Thailand using GDP, CPI, Poverty Line and Average Income of the Poor	140
4.2. Results for Quadrant – 1: Aggregate Demand and Aggregate Supply Curves	143
4.3. Results for Quadrant – 2: CPI and Poverty Line	150
4.4. Results for Quadrant – 4: GDP and Average Income of the Poor	152
4.5. Results for Quadrant - 3: Poverty Line and Average Income of the Poor	154
5. Data and Methodology II	158
5.1. A 2004 Social Accounting Matrix (SAM) of Thailand	158
5.2. A 2004 Flow-of-Funds (FoF) Accounts of Thailand	161

5.3. A 2004 Financial Social Accounting Matrix (FSAM) of Thailand	164
5.4. A 2004 Financial Computable General Equilibrium Model (FCGE) of Thailand	166
5.5. Core Module of FCGE	167
5.5.1. Price Block	167
5.5.2. Production Block	168
5.5.3. Income Block	169
5.5.4. Expenditure Block	170
5.5.5. System Constraints Block	171
5.6. Financial Module of FCGE	172
5.6.1. Households' Behavioral Specifications	175
5.6.2. Enterprise's Behavioral Specifications	176
5.6.3. Banks' Behavioral Specifications	176
5.6.4. Government's Behavioral Specifications	177
5.6.5. Bank of Thailand's Behavioral Specifications	178
5.6.6. Rest of the World's Behavioral Specifications	178
5.6.7. System Constraints Specifications	179
5.6.7. Poverty Block Specifications	179
6. Results and Analysis II	180
6.1. Shock 1: Increase in Government Expenditure	181
6.2. Shock 2: Decrease in Government Expenditure	188
6.3. Shock 3: Increase in Interest Rate	194

6.4. Shock 4: Decrease in Interest Rate	201
6.5. Shock 5: Increase in Reserve Requirement	206
6.6. Shock 6: Decrease in Reserve Requirement	212
7. Conclusion	218
7.1. Concluding Remarks	218
APPENDIX	224
REFERENCES	254

CHAPTER 3: The Economics of Group Lending: Its Impact, Sustainability and Growth: Case Study of KWPGBM in Lombok, Indonesia.

1. Introduction	257
1.1. Problem Statement and Hypothesis	258
1.2. Literature Review	260
2. Overview of KWPGBM	266
2.1. Lending Mechanism of KWPGBM	267
3. Data & Methodology	273
3.1. Analytical Hierarchy Process in General	273
3.2. Analytical Hierarchy Process in KWPGBM Framework	292
4. Results and Analysis	295
4.1. Results for hypothesis 1: KWPGBM improves the wellbeing of its borrowers	295

4.2. Results for hypothesis 2: KWPGBM is a sustainable institution in the long run	303
4.3. Results for hypothesis 3: KWPGBM should not grow or outreach under certain circumstances due to possibility of failures	305
5. Conclusion	312
5.1. Concluding Remark	312
APPENDIX	316
REFERENCES	329

TABLE OF FIGURES

Figure 1.1: Saving vs Investment by Economic Sectors: Thailand (millions of bath)	2
Figure 1.2: Saving vs Investment by Economic Sectors: Philippines (millions of pesos)	3
Figure 1.3: Saving vs Investment by Economic Sectors: Indonesia (in percent of GDP)	3
Figure 1.4: Corporation Gross Saving in Asean – 3 (in percent of GDP)	4
Figure 1.5: Emerging Asean – 3: Unemployment Rate (in percent)	6
Figure 1.6: Size of LCY Bond Market for Corporations in Asean – 3 (in USD billions)	8
Figure 1.7: The Volatility of Bond Yield in Asia	9
Figure 1.8: The Sizable Current Account Balances of the US and Others	15
Figure 1.9: Domestic Gross Saving over Gross Investment in Asean- 3 (in percent of GDP)	47
Figure 1.10: Domestic Gross Saving in Asean- 3 (in percent of GDP)	48
Figure 1.11: Corporation Gross Saving in Asean- 3 (in percent of GDP)	48
Figure 1.12: Domestic Gross Saving and Gross Capital Formation - Thailand (in percent of GDP)	51
Figure 1.13: Saving-Investment Balance -Thailand (in percent of GDP)	52
Figure 1.14: Saving vs Investment by Economic Sectors -Thailand (Millions of Bath)	52
Figure 1.15: Excess Saving Pre-97 AFC -Thailand (in percent of GDP)	53
Figure 1.16: Excess Saving Post-97 AFC- Thailand (in percent of GDP)	53
Figure 1.17: Domestic Gross Saving and Gross Capital Formation – Philippines (in percent of GDP)	55
Figure 1.18: Saving-Investment Balance -Philippines (in percent of GDP)	56
Figure 1.19: Saving vs Investment by Economic Sectors -Philippines (Millions of Pesos)	57

Figure 1.20: Excess Saving Post-97 AFC - Philippines (in percent of GDP)	58
Figure 1.21: Domestic Gross Saving and Gross Capital Formation – Indonesia (in percent of GDP)	60
Figure 1.22: Saving-Investment Balance - Indonesia (in percent of GDP)	61
Figure 1.23: Saving vs Investment by Economic Sectors -Indonesia (Billions of Rupiahs)	62
Figure 1.24: Excess Saving Pre and Post 97 AFC: Indonesia (in percent of GDP)	63
Figure 1.25: Non-Financial Corporations Used of Financial Instruments – Thailand (Millions of Bath)	80
Figure 1.26: Non-Financial Corporations Used of Non-Financial Instruments – Thailand (Millions of Bath)	80
Figure 1.27: Financial Corporations Issuance of Loans - Thailand (Millions of Bath)	81
Figure 1.28: Non-Financial Corporations Used of Financial Instruments - Philippines (Millions of Pesos)	82
Figure 1.29: Non-Financial Corporations Used of Non-Financial Instruments – Philippines (Millions of Pesos)	83
Figure 1.30: Financial Corporations Issuance of Loans - Philippines (Millions of Pesos)	83
Figure 1.31: Non-Financial Corporations Used of Financial Instruments - Indonesia (Billions of Rupiahs)	84
Figure 1.32: Non-Financial Corporations Used of Non-Financial Instruments – Indonesia (Billions of Rupiahs)	86

Figure 1.33: Financial Corporations Issuance of Loans - Indonesia (Billions of Rupiahs)	86
Figure 2.1: The Impact of Aggregate Demand Shock on Poverty Line and Income of the Poor	125
Figure 2.2: The Impact of Negative Aggregate Demand Shock on Poverty Line and Income of the Poor	126
Figure 2.3: Thailand's Inflation (%)	141
Figure 2.4: Thailand's GDP Growth (%)	141
Figure 2.5: Thailand's Official Poverty Line	142
Figure 2.6: Thailand's Average Income of the Poor (%)	143
Figure 2.7: CPI versus GDP – Thailand (1981 – 2009)	144
Figure 2.8: Impulse Response of Output Growth and Price to Demand Shock (left hand side) and Supply Shock (right hand side)	145
Figure 2.9: Aggregate Supply Curve – Thailand (1985-2009)	146
Figure 2.10: Aggregate Demand Curve – Thailand (1985-2009)	147
Figure 2.11: Thailand Dynamic Slopes (1991 – 2009)	147
Figure 2.12: Response of Price to Demand and Supply Shocks – Thailand (1985-2009)	149
Figure 2.13: Response of GDP Output to Demand and Supply Shocks – Thailand (1985 -2009)	149
Figure 2.14: Consumer Price Index against the Poverty Line – Thailand (1988 -2002)	150
Figure 2.15: VAR (2) for Thailand Poverty Line and CPI	151

Figure 2.16: Average Income of the Poor against GDP – Thailand	152
Figure 2.17: VAR (1) for Thailand GDP and Average Income of the Poor	154
Figure 2.18: Relation of Aggregate Demand and Aggregate Supply with Poverty Line and Average Income of the Poor (3 Quadrants) – Thailand	156
Figure 2.19: Relation of Aggregate Demand and Aggregate Supply with Poverty Line and Average Income of the Poor (4 Quadrants) – Thailand	157
Figure 2.20: Connecting Core CGE Module and Financial Module	173
Figure 2.21: Income Distribution of a Population	180
Figure 2.22: Level of Poverty Line (Index) in Thailand	181
Figure 2.23: Income Distribution of the Bottom 20% of the Population to the Top 20% of the Population - Thailand (%)	182
Figure 2.24: Income of the Bottom 20% of the Population – Thailand (billions of bath)	183
Figure 2.25: The Level of RGDP as the Government Increases its Spending – Thailand (billions of bath)	183
Figure 2.26: Price Index across the RGDP – Thailand	184
Figure 2.27(Construction of Quadrant – 2) Price Index across the Poverty Line – Thailand	185
Figure 2.28: (Construction of Quadrant – 4) Income of the Bottom 20% of the Population across RGDP - Thailand (billions of bath)	185
Figure 2.29: Level of Poverty Line (Index) in Thailand	188
Figure 2.30: Income Distribution of the Bottom 20% of the Population to the Top 20% of the Population - Thailand (%)	189

Figure 2.31: Income of the Bottom 20% of the Population - Thailand (billions of bath)	190
Figure 2.32: Price Index across the RGDP – Thailand	191
Figure 2.33: (Construction of Quadrant – 2) Price Index across the Poverty Line – Thailand	191
Figure 2.34: (Construction of Quadrant – 4) Income of the Bottom 20% of the Population across RGDP - Thailand (billions of bath)	192
Figure 2.35: Level of Poverty Line (Index) in Thailand	195
Figure 2.36: Income Distribution of the Bottom 20% of the Population to the Top 20% of the Population - Thailand (%)	196
Figure 2.37: Income of the Bottom 20% of the Population - Thailand (billions of bath)	196
Figure 2.38: Price Index across the RGDP – Thailand	198
Figure 2.39: (Construction of Quadrant – 2) Price Index across the Poverty Line – Thailand	198
Figure 2.40: (Construction of Quadrant – 4) Income of the Bottom 20% of the Population across RGDP - Thailand (billions of bath)	199
Figure 2.41: Level of Poverty Line (Index) in Thailand	201
Figure 2.42: Income Distribution of the Bottom 20% of the Population to the Top 20% of the Population - Thailand (%)	202
Figure 2.43: Income of the Bottom 20% of the Population - Thailand (billions of bath)	202
Figure 2.44: Price Index across the RGDP – Thailand	203
Figure 2.45: (Construction of Quadrant – 2) Price Index across the Poverty Line – Thailand	204

Figure 2.46: (Construction of Quadrant – 4) Income of the Bottom 20% of the Population across RGDP - Thailand (billions of bath)	204
Figure 2.47: Level of Poverty Line (Index) in Thailand	207
Figure 2.48: Income Distribution of the Bottom 20% of the Population to the Top 20% of the Population - Thailand (%)	208
Figure 2.49: Income of the Bottom 20% of the Population - Thailand (billions of bath)	208
Figure 2.50: Price Index across the RGDP – Thailand	209
Figure 2.51: (Construction of Quadrant – 2) Price Index across the Poverty Line – Thailand	210
Figure 2.52: (Construction of Quadrant – 4) Income of the Bottom 20% of the Population across RGDP - Thailand (billions of bath)	210
Figure 2.53: Level of Poverty Line (Index) in Thailand	213
Figure 2.54: Income Distribution of the Bottom 20% of the Population to the Top 20% of the Population - Thailand (%)	213
Figure 2.55: Income of the Bottom 20% of the Population - Thailand (billions of bath)	214
Figure 2.56: Price Index across the RGDP – Thailand	215
Figure 2.57: (Construction of Quadrant – 2) Price Index across the Poverty Line – Thailand	215
Figure 2.58: (Construction of Quadrant – 4) Income of the Bottom 20% of the Population across RGDP - Thailand (billions of bath)	216
Figure 3.1: Besley and Coate Repayment Game Model	264
Figure 3.2: Besley and Coate Repayment Game (With Social Sanction)	265
Figure 3.3: A General Structure of AHP	273

Figure 3.4: AHP Framework for Questionnaire 3	276
Figure 3.5: The Positive Impact and Benefits of KWPGBM on its Borrowers (Questionnaire 1)	295
Figure 3.6: The Negative Impact and Costs of KWPGBM on its Borrowers (Questionnaire 2)	296
Figure 3.7: The Sustainability of KWPGBM in the Long Run (Questionnaire 3)	303
Figure 3.8: The Benefits and the Costs across the Number of Borrowers in a Group	310
Figure 3.9: The Benefits Cost Ratio across the Number of Borrowers in KWPGBM (2006 – 2008)	311

LIST OF TABLES

Table 1.1: Correlations between Corporation Saving and Unemployment	7
Table 1.2: Correlation Matrix of Corporate Savings and its Determinant Variables	94
Table 1.3: Pairwise Granger – Causality Test	98
Table 1.4: Results of Unit Root Tests Using Augmented Dickey Fuller Statistic	100
Table 1.5: Determinants of Corporate Investment/GDP (F-H Regression)	101
Table 1.6: Ordinary Least Square Full-Form Model of Corporate Saving/GDP	102
Table 1.7: Ordinary Least Square Reduced-Form Model of Corporate Saving/GDP	105
Table 1.8: Autoregressive of Order (1) Model of Corporate Saving/GDP	108
Table 1.9: Expected and Actual Sign of the AR (1) Regression Coefficients	111
Table 1.10: Categories of Variables in our AR (1) Model	112
Table 1.11: Adjusted R-Square Results from Variable Exclusion	113
Table 2.1: Thailand’s Social Accounting Matrix in 2004 (billions of bath)	159
Table 2.2: Flow-of-Funds Account of Thailand in 2004	163
Table 2.3: Structure of Financial SAM (FSAM)	169
Table 2.4: Financial Module Equations	174
Table 3.1: Loan Characteristics versus Growth	277
Table 3.2: Comparison of Characteristics with respect to Sustainability node in Growth Cluster	279
Table 3.3: Random Consistency Index Table (RI)	281
Table 3.4: Comparison with respect to Sustainability node in Loan Character Cluster	282
Table 3.5: Inconsistency Index with respect to Loan Characteristics	283
Table 3.6: Comparison with respect to KWBGGM’s Management of its Sustainability	284

Table 3.7: Inconsistency Index with respect to KWPGBM’s Management	285
Table 3.8: Comparison with respect to KWBGGM’s Deposit Facility on its Sustainability	285
Table 3.9: Inconsistency Index with respect to KWPGBM’s Management	286
Table 3.10: Comparison with respect to KWBGGM’s Marketing Facility on its Sustainability	286
Table 3.11: Inconsistency Index with respect to KWPGBM’s Marketing Facility	287
Table 3.12: Comparison with respect to KWBGGM’s Loan Duration on its Sustainability	287
Table 3.13: Inconsistency Index with respect to KWPGBM’s Loan Duration	288
Table 3.14: Comparison with respect to KWBGGM’s Loan Interest Rate on its Sustainability	288
Table 3.15: Inconsistency Index with respect to KWPGBM’s Loan Interest Rate	289
Table 3.16: Comparison with respect to KWBGGM’s Loan Procedure on its Sustainability	289
Table 3.17: Inconsistency Index with respect to KWPGBM’s Loan Procedure	290
Table 3.18: Comparison with respect to KWBGGM’s Loan Size on its Sustainability	291
Table 3.19: Inconsistency Index with respect to KWPGBM’s Loan Interest Rate	291

CHAPTER 1

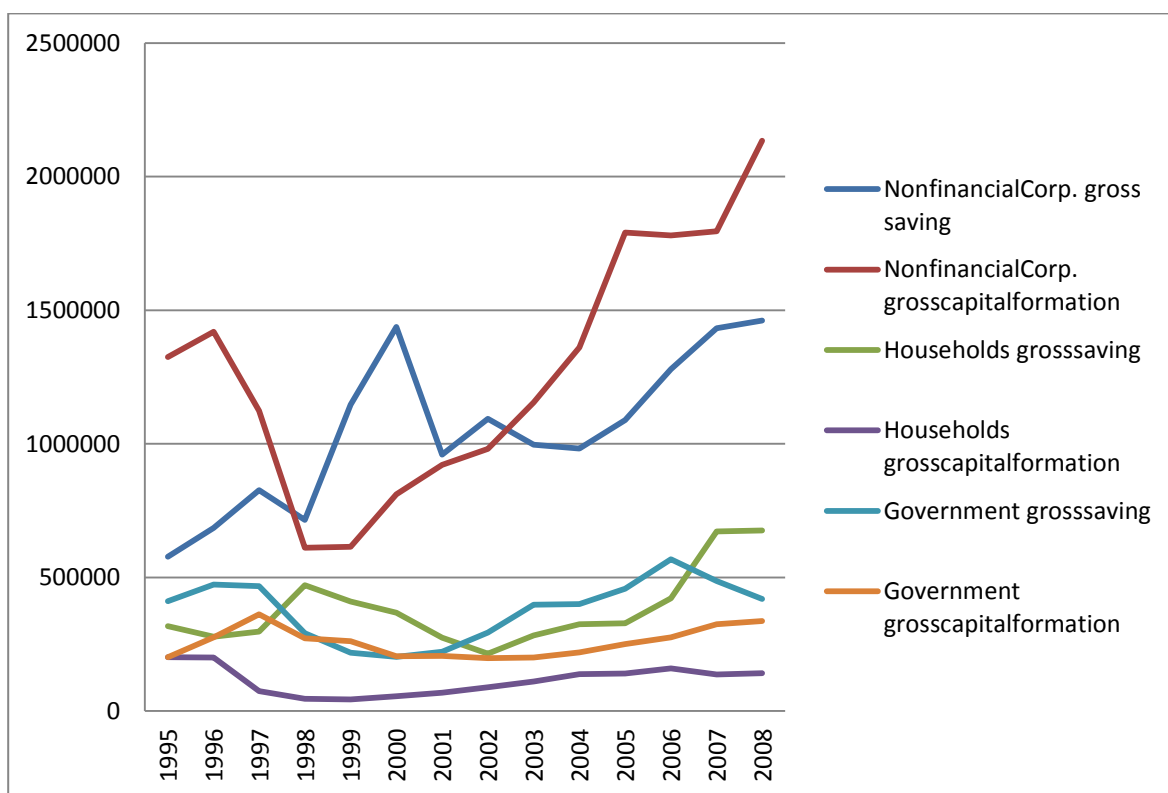
WHAT DRIVES CORPORATE SAVING GLUT POST-97 ASIAN FINANCIAL CRISIS? THE EMPIRICAL EVIDENCE OF INDONESIA, PHILIPPINES AND THAILAND

1. Introduction and Overview of Excess Saving

1.1. Motivation 1: Corporate Saving

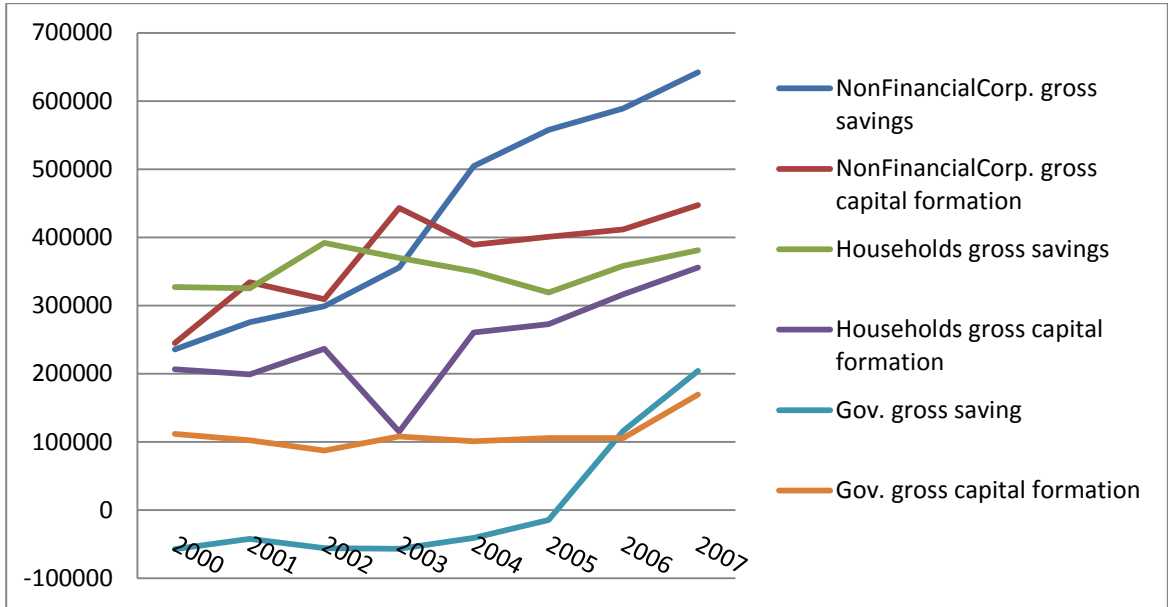
One of the main focuses in this paper is on corporate saving, that is to validate the widely claim across the news about the rise of corporate saving that have attracted considerable attention in the past years. “Corporations awash with cash eschew corporate bonds” (*Financial Times*, June 29th, 2010), “Hoarding Not Hiring – Corporations Stockpile Mountain of Cash” (*ABC News*, April 1st, 2010), “Companies pile up cash but remain hesitant to add jobs” (*Washington Post*, July 15th, 2010), “Savings by Companies – The Corporate Savings Glut” (*The Economist*, 7th July, 2005). We find that these saving scenarios odd because theoretically companies are net borrowers, investing for future output and incomes while households are the net savers that provide them with capital through banks. The switch in companies dissaving to net saving is global spanning from North America, Europe and Asia. In Emerging East Asia, the surge of corporate saving for unusually many years after the 1997 AFC warrant a thorough research on the possible determinants that have led to such behaviors. The following three figures showed the trend of savings by sectors in Asean-3 and it is apparent that the highest saver in the economy is the corporate sectors as compared to household sectors, government sectors and financial sectors. In

Figure 1.1 for Thailand, we can conclude that non-financial corporations have the highest saving and the highest investment in the real sector relative to other economic players such as households and government. In Figure 1.2 for Philippines, the non-financial corporations become the leading sector for gross saving and gross capital formation starting in 2003 in which prior to that, the households' savings were the highest. In Figure 1.3 for Indonesia, both the non-financial corporations and the households sectors are the leading savers and investors in the economy relative to the government sector.



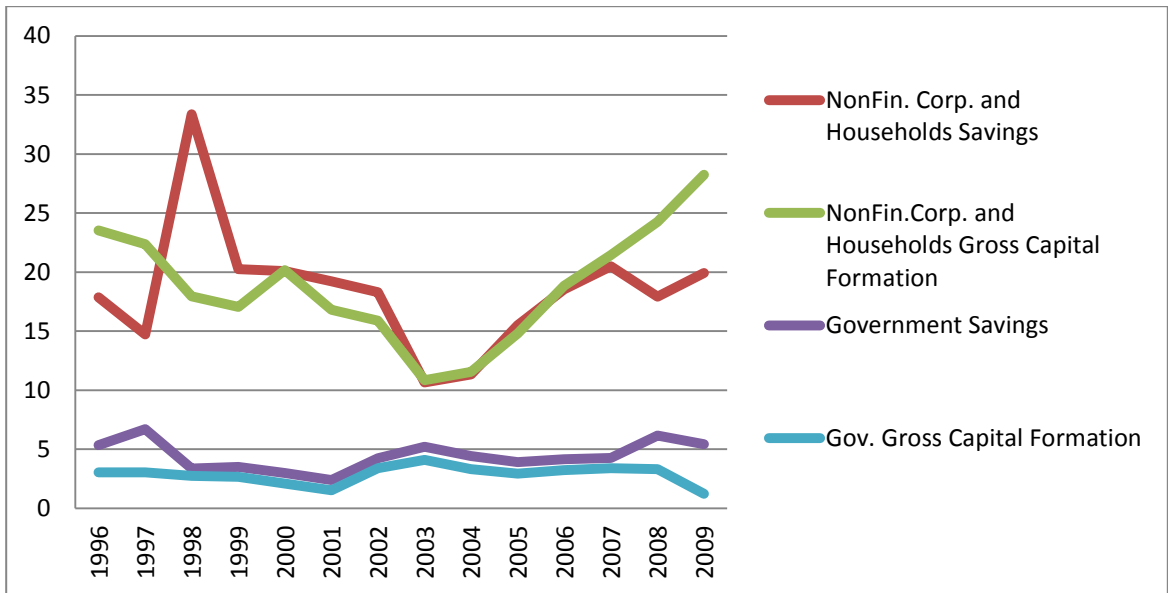
Source: Flow-of-Funds Accounts of Thailand

Figure 1.1: Saving vs Investment by Economic Sectors: Thailand (millions of bath)



Source: Flow-of-Funds Accounts of Philippines

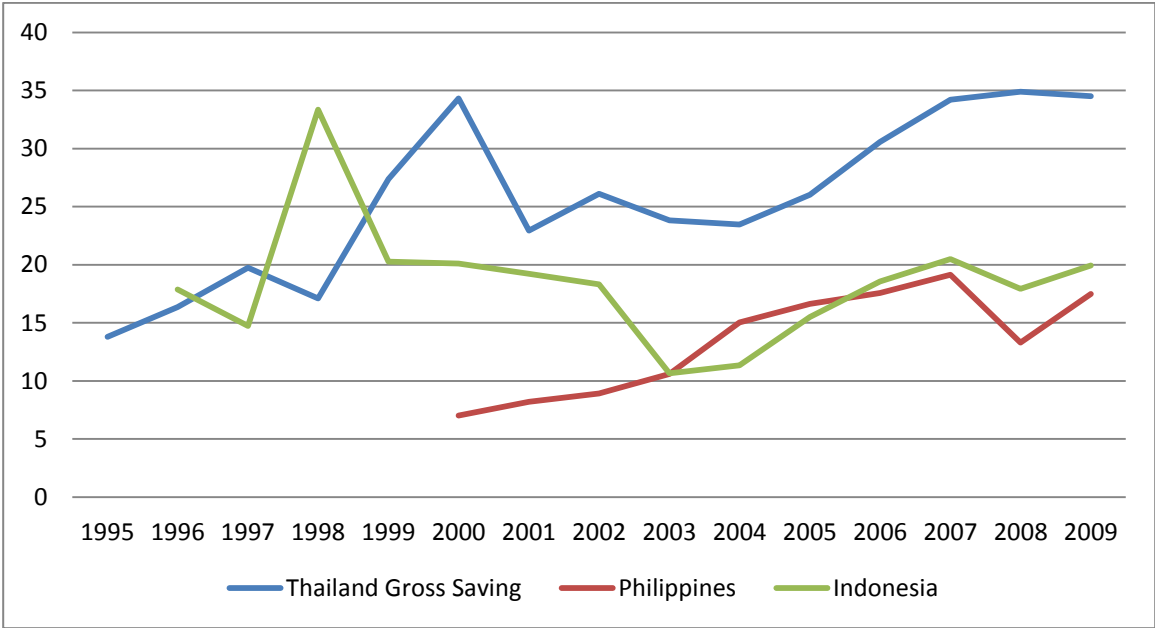
Figure 1.2: Saving vs Investment by Economic Sectors: Philippines (millions of pesos)



Source: Flow-of-Funds Accounts of Indonesia

Figure 1.3: Saving vs Investment by Economic Sectors: Indonesia (in percent of GDP)

Furthermore, in Figure 1.4, we can see that there is an upward trend in the corporation gross saving of Asean-3 whereby in 2009 it reaches about 35% of GDP in Thailand and 20% of GDP in both Indonesia and Philippines. Economists expect that this upward trend would continue for years to come unless the factors that drive this behavior are tackled.



Source: Flow-of-Funds Accounts

Figure 1.4: Corporation Gross Saving in Asean – 3 (in percent of GDP)

Since the companies in aggregate are becoming net savers on a huge scale across the globe, the repercussion of such hoarding behavior is not only to the individual country's domestic economy but significantly affecting at global level as well. It is arguably among mainstream economists and medias that the excess saving is the cause of prolonged low bond yields around the world, tight credit spread, the strengthening of dollars, the equities do not rally, the rise in unemployment and the widening of

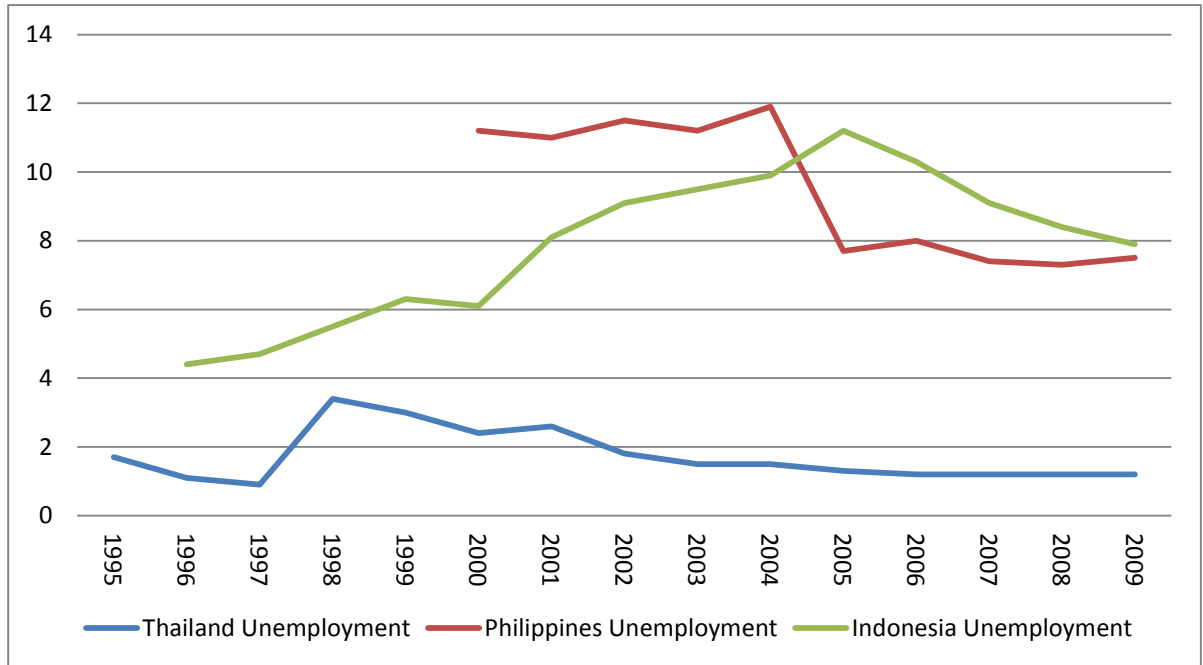
income distribution between the rich and the poor in a country. We explain briefly here how the corporation excess saving¹ mechanism has brought about the rise in unemployment rate and low bond yields although a thorough research is needed to validate these claims which are not the main focus of our paper.

-Rise in unemployment²: A rise in the saving would shift the IS curve to the left and downward, lowering the interest rate and reducing the output. As described in the textbook, a decline in output produced would lead corporations to cut back on its factor of productions including labor and this will lead to a rise in unemployment (unless the shift of the IS curve is accompanied with the shift in the LM curve downward and to the right, possibly due to monetary easing by the government, which would still lower the interest rate but raise the output). In Figure 1.5 below, we see that Thailand's unemployment rate was highest in 1998 to 2002, coinciding with the period of corporation's positive excess saving there (Figure 1.17). Similarly in Indonesia, the **rise** in the unemployment rate from 1998 to 2005 corresponded positively to the period of corporations' positive excess saving (Figure 1.25). However, this was not the case in Philippines whereby the **fall** in the unemployment rate from 2004 and beyond corresponded to the corporations' positive excess saving (Figure 1.21). Table 1.1 shows the correlations between excess saving and the unemployment rate. The degree of correlation is very strong in Thailand (0.7573), but shows very weak linear relationship in Indonesia (0.0125) and Philippines (0.0127).

¹ We defined excess saving as gross saving minus gross investment. A positive excess saving indicates gross saving greater than gross investment and vice versa for negative excess saving.

² Unemployment data is taken from World Bank Database and is defined as the number of unemployed as % of labor force.

The correlations across all these countries are positive (0.3667) implying that there might exist spillover effect between them.



Source: EIU Database

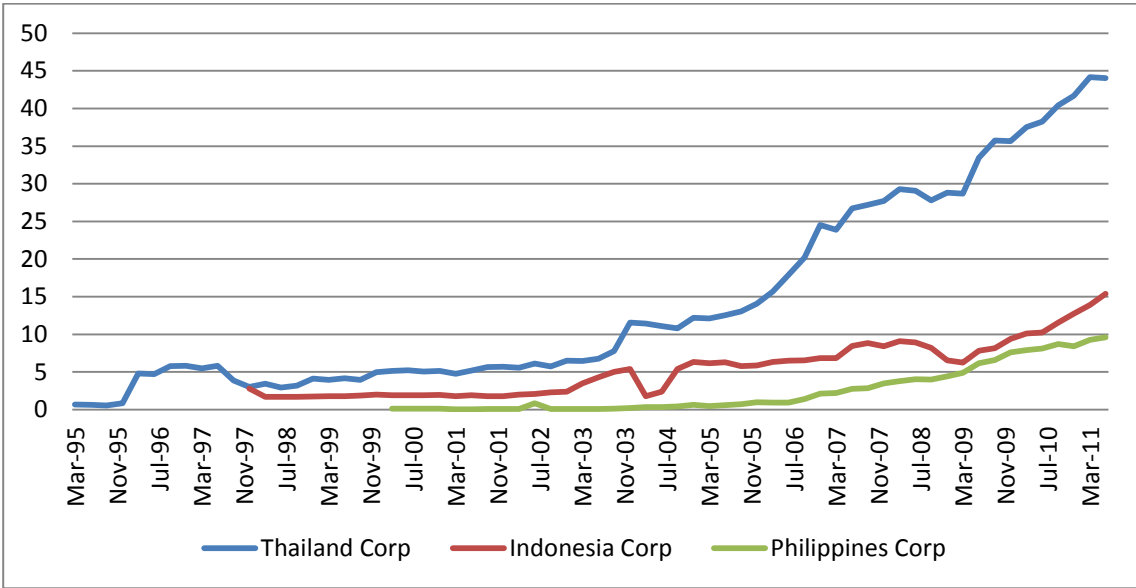
Figure 1.5: Emerging Asean – 3: Unemployment Rate (in percent)

Table 1.1: Correlations between Corporation Saving and Unemployment

Correlations between Corporation Saving and Unemployment				
	Corporation Gross Saving Across Countries	Thailand Corporation Gross Saving	Indonesia Corporation Gross Saving	Philippines Corporation Gross Saving
Unemployment Across Countries	0.3667			
Unemployment (Thailand)		0.7573		
Unemployment (Indonesia)			0.0125	
Unemployment (Philippines)				0.0127

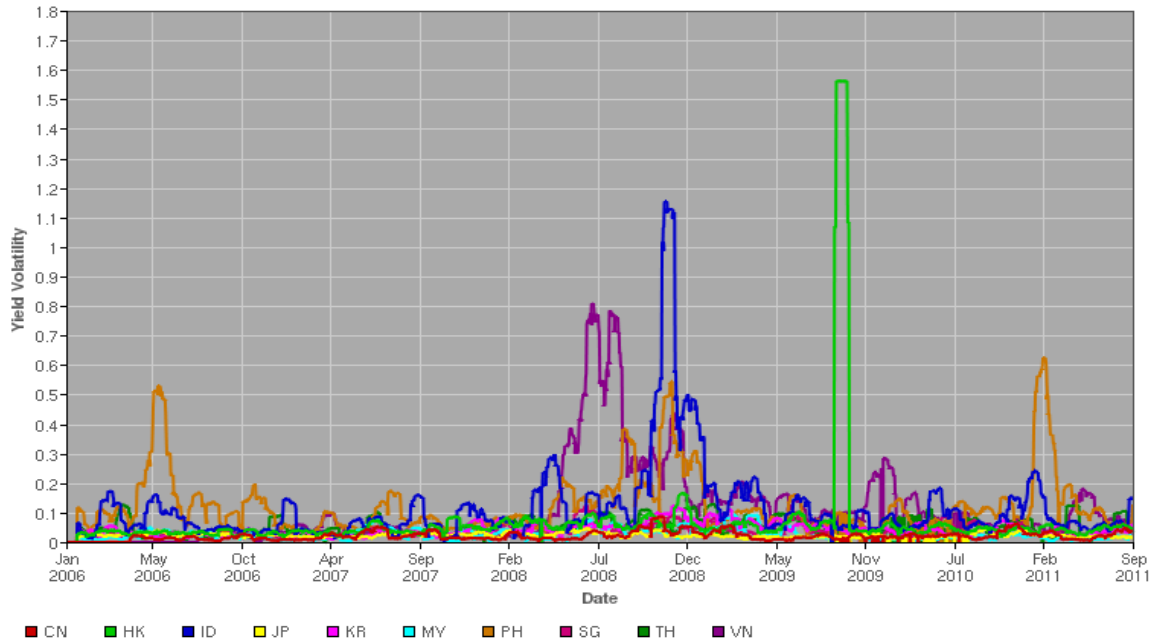
-Low Bond Yields: When the corporations have excess saving, their extra cash need to be put somewhere: they could continue to hold them as cash and currency or invest in the bonds market or in the equity market. Lately, the investors are flooding the bond markets especially the Emerging East Asia market that is perceived as safe haven given the benign financial market conditions in the Euro Zone and in the US. The high demand for bonds in East Asia region dampens its yield and increases its prices. Some might argue that this is due to excess liquidity and not excess saving. While these two concepts, “excess liquidity” and “excess saving” are not mutually exclusive, the mechanism that channels the shocks from excess liquidity or excess saving to the bond yield is not clear and empirical work on these is limited due to the difficulty in identifying the underlying structural shocks (Bracke and Fidora, 2008). Figure 1.6 below shows the upward rising in the size of local currency bond market for corporations in Asean-3, with Thailand reaching about USD45 billion in Dec. 2010.

Figure 1.7 shows the volatility of bond yield in Asia with highest spike for Thailand in November, 2009 and in October, 2008 for Indonesia. Overall, the data shows less volatile yield for bond market in Asia.



Source: EIU Database

Figure 1.6: Size of LCY Bond Market for Corporations in Asean – 3 (in USD billions)



Source: Asian Development Bank³

Figure 1.7: The Volatility of Bond Yield in Asia

³ Yield volatility is the standard deviation of the change in daily yields of LCY benchmark 10-year government bond over the last 21 trading days. The yield volatility near zero implies that the daily yield are clustered around the average yield while the high volatility implies less predictability of in the daily change over the covered period.

1.2. Objective

Hence, the purpose of this paper is fivefold. First, we will review briefly the causes and the consequences of global imbalances from the existing literatures. Second, we will extend the issue surrounding global imbalances discussed above to the saving-investment behaviors of economic agents⁴ in Emerging East Asia countries notably Thailand, Indonesia and Philippines (ASEAN-3). In other words, we will examine the agents' preferences to save and to invest prior and post 1997 AFC and prior to 2008 GFC. Then we will focus solely on corporation gross saving and gross capital formation graphical evidence to support the corporation savings glut. Third, we will relate this finding to a greater research of Felstein-Horioka regression in order to determine the component of savings that affect the corporation investment decision. In other words, we are looking at the effect of corporation saving, household saving and government saving that could potentially influence the decision to invest or to save by corporate sector. Forth, using empirical approach, we will look at the driving forces behind the rise in the corporate sectors saving that are claimed to drive this global saving glut (Loeys and Mackie, 2005). Our regression variables would consist of not only the standard macroeconomic variables that are commonly used in the existing literatures on private saving but include both the business and the firms' specific variables as well. Finally, we will analyze the claim on the rise in the financial market instruments post 1997 AFC by corporate sector. The purpose of these is to see whether the decline in the corporation investment in the real sector is supplemented by an increase in the corporation investment in the financial market.

⁴ Economic agents here refer to household sector, government and non-financial corporations.

2. Global Imbalances

2.1. What is Global Imbalances?

According to Adams and Park (2009), the recent phenomena of global imbalances or global current account imbalance referred to the large current account surpluses or deficits that started to emerge since the last 10 years in the world economy. They added that most of these imbalances were heavily concentrated on certain regions and countries. Callabero (2009) also referred 'global imbalances' to massive, large and persistence current account deficits of the US that were financed by emerging countries (peripheries). Azis (2009) clearly mentioned that the US current account deficit stood at 7% of GDP which was far above the dangerous threshold of 4-5% of a country's GDP. This being translated into an annual rate of more than \$800 billion and constitute about 70% of the global current account deficits. On the other hand, about half of global current account surpluses came from East Asia which means that US deficits have been financed by countries from these regions – emerging economy countries. As of the first half of 2010, China ran up a \$119 billion of trade surplus, which will likely exceed last year's total of \$227 billion. Bernanke (2007) referred 'the large increase in the net financial capital or net desired saving (desired saving less desired investment) from outside industrial countries' as global saving glut.

Balance of Payment

Current Account

Trade Balance = Export (X) – Import (M)

Current Account Balance = Trade Balance + Net Factor Income

GDP = Consumption(C) + Investment (I) + Government Spending (G) + (Export (X) –
Import (M))

GNI = Consumption(C) + Investment (I) + Government Spending (G) + (Export(X) –
Import (M)) + Net Factor Income

$Y = C + I + G + \text{Current Account Balance}$

$(Y - C - G) - I = \text{Current Account Balance}$

$S - I = \text{Current Account Balance} \quad (1)$

Hence if $S - I < 0 \Rightarrow$ Current Account Deficit and if $S - I > 0 \Rightarrow$ Current Account Surplus

Since Current Account Balance is the difference of saving and investment, it makes conceptually more useful to analyze the global imbalances phenomena from saving and investment of countries or regions.

2.2. What are the Causes of Global Imbalances?

There are many different perspectives on the causes and the effects of global imbalances. These include the perspectives from India, Europe, US and developing Asia countries including China. Azis (2009) investigated the cause of global imbalances from two sides: the emerging economy countries and the industrialized countries. He stated that from emerging markets' perspectives, the declined in investment was caused by the “super cautious attitude among the governments and investors” (Azis, 2009, pg. 9) following the 1997 Asian financial

crisis. This implies that $S - I > 0$ (under investment) since I is declining. On the other hand, in the industrial countries like the US, the Fed accommodative fiscal and monetary policies have led to over consumption and credit booms. The US over consumption at the expense of borrowing from abroad had caused especially the households to suffer from *dual-gap problem: investment-saving gap* (low saving due to low interest rate in the US as a result of accommodative policies $\Rightarrow S - I < 0$ since S is declining and I is increasing) and *trade gap* (the US has been borrowing from abroad resulting in capital account surplus or widening current account deficit). Adams and Park (2009) provided three main arguments on the causes of global imbalances from the developed Asia perspectives⁵. In their arguments, they stated three main reasons for Asia current account surplus: too much saving that surge since 2003 especially in PRC due to rapid economic growth, too little investments in the real estate sector since 1997 AFC and Bretton Woods II that is the role of highly competitive exchange rate to boost exports and rapid growth. From the US perspectives, Bernanke (2007) argued that the origin of the global saving glut from 1996-2004 was the result of transformation of emerging market economies notably East Asian economies and oil producing countries. However, according to Bernanke (2007) the increase in saving or the decline in investment patterns varies by countries with China for instance experiencing higher saving rate than investment rate while other developing Asia countries showed more a decline in investment. In the US, there was a decline in domestic saving while investment remained unchanged during the period of 1996-2004. From the Indian perspectives, Reddy⁶ (2006) stated that emerging market economies (EME) especially Asia have come to rely heavily on external demand in

⁵ Developed Asia countries included the newly industrialized economies of Hong Kong, China, Republic of Korea, Singapore, Taipei, China as well as other developing Asian economies as defined by the IMF.

⁶ Dr.Y.V.Reddy is the Governor of Reserve Bank of India.

the late 1990s that lead to these countries' currencies being undervalued in order to maintain the external price competitiveness. This, along with sharp rise in US consumption demand that can be met through imports led to the US large current account deficits and Asia large current account surplus. He added that India has experienced current account surplus from 2000-2004 due to business cycles and current account deficit from 2004-2006 when the business cycle unwind. Furthermore, for India, capital flows is more important in the accumulation of reserves as opposed to current account surplus and hence Indian policies do not attribute to the widening of global imbalances. Similarly, the Europe with their close-to-zero current account balances when taken as aggregate does not contribute to current global imbalances as well (Lane and Ferretti, 2007). Although the oil-producing countries do attribute to global current account surplus as a result of a surge in oil price, more attention is on the emerging market economies especially Asia, particularly because of Lucas Paradox. Figure 1.8 below shows that oil producing countries have been experiencing relatively stable current account surplus while emerging Asia shows a gradual increase in current account surplus since the late 1990s that eventually surpassed the oil exporters' countries current account balance.

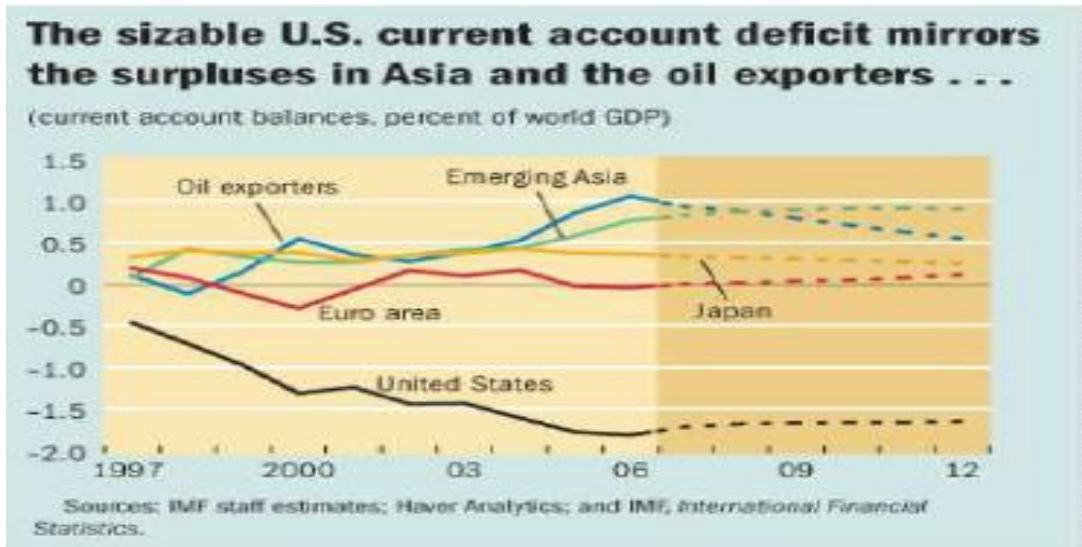


Figure 1.8: The Sizable Current Account Balances of the US and Others

2.3. What are the Consequences of Global Imbalances?

There are many consequences of current global imbalances on most countries in the world although the particular country may not have attributed to the widening current account deficit or surplus. Azis (2009) had argued that global imbalances could create “several types of conflict ranging from trade disputes, conflicts between multi-nationals and domestic companies, and internal conflicts sparked by contradictory interpretations of law within a country (pg. 8)”. Furthermore, these unattended imbalances could create global recession and financial crisis just as the current 2007/2008 financial crisis. Although the global imbalances may seem to have negative impact on the current deficit countries, Azis (2010) stated that current account surplus countries also experienced the negative consequences such as a decline in the employment growth rates as a result of a decline in real sectors’ investment and worsen income disparity as a result of increase in financial sector investment. However, Azis (2010) did caution not to single out this saving-investment pattern as the only cause for the

negative consequences. Adams and Park (2009) on the other hand argued that since global imbalances underlie global financial crisis, Asia's main strategy of export-oriented industrialization as a key factor for economic growth may not be sustainable in the future. Moreover, they mentioned on the welfare costs due to over saving, under investment, excessive foreign exchange reserves and current financial crisis. Although India as mentioned earlier is not one of the countries that attributed to global imbalances, there is the potential of spill-over effect from global developments on the domestic interest rate and fiscal policies. Reddy (2006) outlined the effects on India's corporate sectors, banks and households whereby these institutions are more susceptible to shocks from variable interest rates and foreign currency exchange rate. Despite these potential adverse effect, the Federal Reserve of India have taken regulatory actions in ensuring that corporate sectors and banks are hedged against interest rate and currency risks and have put a cap/ceiling on these institutions' exposure.

3. Literature Review

3.1. Theoretical Review

Adams and Park (2009) showed that developing Asia including China, the Middle East and Russia experienced global current account surplus sharply after 1997-1998 while the US has experienced current account deficit starting from 1991. Although they have shown in general the pattern of current account surpluses for Thailand, Indonesia and Philippines since 1980s, they didn't show the source for these surpluses. Instead, they argued the possible explanations for post crisis current account surpluses were too much saving, too little investment and Bretton Woods II with emphasis mainly on China. Serven and Nguyen (2010) have also shown that the US was in current account deficit from 1992 and exceed 1% of the world GDP

in 1999. The US counterparts during this period was Japan and emerging Asian countries excluding China but after 2000, while the US current account continues to be in large deficit relative to the world GDP⁷, its counterparts now are those of China and oil exporting countries⁸. Furthermore, they have taken one step further in showing the components of saving and investment (% of GDP) for selected countries from 1990-2008. For China, EU, Japan, and Asia (including Japan), the saving is always higher than the investment but it was reversed for the US since 1990.

Some economists have used flow-of-funds as one of the methodologies in analyzing the macroeconomic conditions of a country although it is not a very popular way. Bezermer (2009) had claimed that if economists had analyzed the investment pattern in US using FoFs prior to 2007, they might have seen the sign of bubble in the financial markets and the bust that had happened. He further added that FoFs could potentially be one way forward in anticipating the financed-induced recession. Dawson (2004) had used Thailand FoFs (1996-1997) in analyzing the financial vulnerability of Thailand's economy during the Asian crisis. Azis (2010) had used the FoFs for the saving-investment analysis that underlied the current global imbalances. He has shown that Asean-4⁹ saving less investment (% of GDP) became tremendously positive after the 1997 AFC, reached its peak in 1999 and surpassed China, Japan, and NIE before gradually decreasing (but still positive) until 2004. However, the investment in real sector (% of GDP) of Asean-4 dropped from 40% (1997) to 15% (1999) and remained at 20% to 25% until 2004.

⁷ The US large current account deficit reached its peak in 2005 and 2006 at more than 1.5% of the world GDP.

⁸ In 2007-2008, the deficit with China accounted for about 40% of the US overall current account deficit.

⁹ Asean-4 refers to Thailand, Indonesia, Philippines and Malaysia.

In this paper, we are contributing to the existing literature of using the FoFs in analyzing the saving-investment pattern of Asean-3 during the period of pre and post 1997 AFC which is an extension of Azis (2010) coverage. However, instead of looking at aggregate gross saving and aggregate gross capital formation, we will look only at corporate saving and the composition of its financial funds since 1990s¹⁰.

3.2. Empirical Review

As an extension to the FoF analysis on saving-investment behaviors of economic players in the economy, we will determine the macroeconomic and financial factors that drive the hoarding behavior of corporate sectors. As we have mentioned earlier, they have been much talk on the corporate sectors hoarding behavior around the world and economists are perplexed that even in a tight economy with financial landscape that supposedly induced lower savings, we are witnessing the opposite behavior among the corporations.

In looking at factors that influence the private savings, several empirical studies that cover various data for different sample periods and countries have been done. In addition, most of these papers differ in terms of model specifications, estimation techniques and econometric procedure. Due to this, the estimated signs and the reported significance levels of a number of factors that are relevant to private saving decision appear to vary.

Boileau and Moyen (2009) have shown that precautionary motive and liquidity motive are the two mechanisms that increased idiosyncratic risk that lead to higher cash holdings although the liquidity motive through large increase in the volatility of cash flows (net income) best explains the rise in North American firms' cash holding.

¹⁰ With exception to Philippines since its flow-of-funds are only available since 2000.

Loaza et al. (1999) has shown the determinant factors that drive the private saving (household saving and corporate saving) for 150 countries from 1965 to 1994 as part of their research project for World Bank Database. They have used the evidence from their empirical finding using cross section Ordinary Least Square (OLS) estimates and Generalized Method of Moments (GMM) system estimator to provide support on the policy making variables and to interplay its connection with other variables that are affecting saving. Their finding using the preferred method of GMM system estimators have shown that real per capita GPDI, real growth rate of per capita GPDI, real interest rate, terms of trade, urbanization ratio, age dependency ratio, public saving, private credit flow per GPDI and inflation rate have significant effect on the private saving across these countries. Furthermore, they have highlighted that one of the potential problems that could arise in the empirical study on saving rate is the joint endogeneity problem, the joint determinants between the explanatory variables and the dependent variable e.g. the real interest rate and the real income growth. Another problem is the presence of “unobserved country-specific effects” that are correlated with the regressors. Due to this, Louza et al (1990) based their empirical analysis on GMM estimators applied to dynamic model using panel data.

Earlier study by Edwards (1995) was on the determinants of private saving and public saving using panel data across 36 countries from 1970-1992. In his study, he has found that per capita growth, political economy, foreign savings reflected by the current account balance and financial development are among the statistically significant determinants of private and public savings. Among the empirical problems that he has raised are the lacked of data on the relevant independent variables, measurement error and endogeneity that leads to causality.

Hence, he has employed instrumental variables estimation methods using lagged values of endogenous variables as the instruments.

Another recent empirical study was by Nair (2006) that looked instead at the household saving in India and its relation to the continuous time series financial sector liberalization index (FLI). Using general OLS model, he found that FLI has negative significant impact on the household saving whereas the absolute income is the major significant and positive determinant of the household savings.

In line to these main researches on driven factors of saving rate, we will look specifically at corporate saving¹¹ in Asean-3 and the potential macroeconomics and financial variables that have caused such hoarding behavior, if it exists. The mentioned studies above provide an impetus of potential determinant variables of the corporate saving to use in our estimation model. We will investigate 38 variables that in our opinion could potentially affect such behavior and employ the appropriate regression technique to make our conclusion. The uniqueness of our research is the fact that we are looking at corporate saving data obtained from each country's Flow-of-Funds Accounts and to the best of our knowledge; this is the first paper that will investigate the relation of corporate saving in Asean-3 incorporating not only the tangible macroeconomics variables but also the intangible financial variables such as business confidence, firms' net worth and banks' net worth. Additionally, we would relate our finding to Feldstein-Horioka (1977) saving-investment puzzle that is, under the perfect capital mobility across the world, the domestic saving should not be relevant to the decision of

¹¹ Not private saving which commonly would include household saving and corporate saving.

corporate sector to invest. In other words, there shouldn't be any differences for corporate sectors in raising capital domestically or from abroad.

4. Data and Methodology

4.1. Data Description

We will use Flow-of-Funds (FoFs) Accounts of Thailand (1995-2009), Indonesia (1996-2009) and Philippines (2000-2009) in investigating the existence of excess saving in these countries.

The FoFs provide the data on sectoral saving and investments in both the production and financial markets in addition to tracing the sources and the used of these funds in an economy.

Next, in examining the possible factors that drive the rise in corporate saving, we will first collect the data on relevant variables from various sources mainly CEIC, IFS, World Bank Database, Trading Economics and EIU. It should be noted that the data available are for small number of years leading to regression analysis that are possible but only in parsimonious forms. For example, the corporate saving in Philippines are observed only for the years of 2000 - 2009 and the data for construction of financial liberalization index such as prudential regulations are available even for shorter period of time. In addition, note that these panel data sets are unbalanced with the number of observations varying considerably across Asean-3.

Section 4.2 provides a detailed description of the variables chosen and their relations (expected signs) to corporate saving. These saving determinant variables are identified not only from the existing literatures but are relevant to the context of current scenarios in which intangible elements such as banks' networth, business confidence, firms' networth and other behavioral factors are included.

4.1.1. Flow-of-Funds (FoF)

As we have mentioned earlier, our data source for institutional savings and investments were taken from the FoF accounts for each country. These FoF accounts are constructed in accordance to the definitions, coverage and concepts of the System of National Accounts (SNA) set forth by the United Nations. The information is classified based on the economic institutional sectors and their transactions respectively. In general, the economic institutional sectors typically would include government sector, financial sector, non-financial sector, household sector and rest of the world. We will describe in further detail the definition of these sectors for Asean-3 countries in the next following section. The transaction activities in the FoF are categorized into two types: *non-financial transaction* and *financial transaction*.

-Non-Financial Transaction shows saving and investment activities of each economic sector during the period using the data obtained from National Income¹². The major non-financial transactions are:

1. *Gross Saving* - the saving of each economic sector during the period of one year.

$$\text{Gross Saving}_i = \text{Income}_i - \text{Consumption}_i \text{ (excluding depreciation expense)} + \text{Net Transfer}_i / \text{Subsidy}_i$$
 where i = each economic sector

It is important to note that in the System of Flow-of-Funds Account, the financial assets hold by each of this economic sector is not part of gross saving. Instead, the financial assets are

¹² The information is obtained publicly from System of the Flow-of-Funds Account of Thailand document. https://docs.google.com/a/cornell.edu/viewer?a=v&q=cache:qCM-wxoPSi4J:www.nesdb.go.th/Portals/0/eco_datas/account/ff/ff2001-2006/32.Definition.pdf+gross+saving+in+flow+of+funds+thailand&hl=en&gl=us&pid=bl&srcid=ADGEESh9wuxUM4S9sYK78M65Ltlq_-ES0AyXz83r3BLJbzhdaDzvCY9zHGLR2flK7PGtyukqs0CK_8vDbKnhxG8RM69tUh-iwDu-t94XxB-PJpoIHhGhSVWl65FVi5CJP9CTkZj7Ow01&sig=AHIEtbQqVNeE3xrdntBmgS38HqeWJhYUcQ&pli=1

classified under the financial transaction type that shows the usage of the savings surplus or funding of the saving-investment deficit through the financial instruments. For instance, if a corporation has positive excess saving, it can use this extra additional saving to acquire financial instruments such as bonds, equities, loans, or even keep them in a form of cash, the most liquid instrument. In addition, we have to distinguish between saving and liquidity. An economic sector could have high saving due to the liquidity requirements. Most dictionaries would define liquidity as the ability to convert an asset to cash quickly or having enough cash on hand to meet financial obligations without needing to sell off the fixed assets. The concept of excess saving and excess liquidity is not mutually exclusive. In fact, excess saving could be the source of excess liquidity and excess liquidity is often refers to narrow money (M1), broad money (M2) or credit given out in the economy.

As quoted in Ruffer and Stracca (2006), *“While the concept of excess liquidity sounds intuitive, its measurement is fraught with difficulties. What exactly is liquidity, and how do we determine whether it is excessive or not? I usually define excess liquidity as the ratio of a monetary aggregate to nominal GDP, a.k.a. the ‘Marshallian K’, which is equivalent to the inverse of the ‘velocity of money’.”*

2. Gross Capital Formation – Expenses incurred in acquiring fixed assets such machineries, equipments and buildings in addition to changes in inventories. The values for the capital goods refer to the values of new assets purchased while the values of changes in inventories are the values of inventory at the end of the period less the value of inventory at the beginning of the period (net value)
3. Purchase of Land – Recorded as net value of changes in land homeownership among the economic agents that could affect their financial transactions.

4. Transfers – the transfer of assets or wealth among economic agents that do not affect the production of goods and services.

-Financial Transaction – shows the usage of financial instruments from the saving investment surplus or the source of financial instruments in funding the saving investment deficits for each economic sector. These data are typically obtained from the balance sheet and financial statements of all the institutions involved and its classification varies depending on its liquidity and popularity. The description of financial transactions involved in Asean – 3 are described in the next section.

4.1.2. Overview on Thailand FoFs Accounts

In this FoFs framework, there are five economic sectors:

1. Non-Financial Corporation Sectors

- businesses owned and controlled by corporation and quasi corporation
- businesses entity owned by government or enterprise (Corporate Business).

2. Financial Corporation Sectors

- Central Bank is the Bank of Thailand
- Other Depository Corporations such as Commercial Banks, Finance Companies, Saving Co-operatives, Special Purpose Financial Institutions (Government Saving Bank, Government Housing Bank, Bank for Agricultural and Agricultural Co-operatives, Export-Import Bank for Thailand, Small and Medium Enterprise Development Bank for Thailand and Islamic Bank of Thailand
- Other Financial Corporations such as stock exchange of Thailand, pawnshops, Financial Institutions Development Fund, Life and Non Life Insurance Companies,

Provident Fund and Government Pension Fund, Securities Companies and Asset Management Companies, Credit Foncier Companies, Agricultural Co-operatives, Small Industry Credit Guarantee Corporation, Asset Management Corporation, Secondary Mortgage Corporation, Thai Asset Management Corporation.

3. *General Government Sector*

- Central Government
- Local Government
- Public State Enterprise

4. *Rest of the World (ROW)*

5. *Households and Non-Profit Institutions Serving Household Sectors*

The financial instruments used in Thailand FoFs framework are:

1. *Monetary Gold and Special Drawing Right (SDR)*

- Gold and international reserve assets form by International Monetary Fund (IMF).

2. *Currency and Deposit*

- Currency is the banknotes and coins circulating in the economy
- Transferable deposit is the deposits that can be changed into check and payable order
- Other deposits refer to all claims that are represented by evidence of deposits other than transferable deposits

3. *Securities Other than Shares*

- Short term and long term of private and public securities such as bills, bonds, certificate of deposits, commercial paper, debentures and similar instruments normally traded in the financial market.

4. *Loans*

- Short term loans in which the maturity is less than one year
- Long term loans in which the maturity is more than one year

5. *Shares and Other Equity*

- Common stocks and preferred stocks whose owner has the right to ownership of the company and its capital

6. *Insurance Technical Reserves*

- Reserves for insurance claims of insurance companies, provident funds and pension funds

7. *Other Account Receivables or Payable*

- Receivables and payables from purchasing and selling of goods and services
- Any remaining transactions in the balance sheet that cannot be categorized in any of the 1-6 financial instruments above.

4.1.3. Overview on Philippines FoFs Accounts¹³

In these FoFs framework, we have six economic players:

1. *Non-Financial Corporation Sectors*

- Corporations and quasi corporations engaged in the production of goods and non-financial services such as agricultural, manufacturing, construction, utilities, trade, transport and communications, hotels and restaurants, education, health, business, real estate and personal services.

¹³ Source: Revised Technical Notes on the Philippines Flow of Funds - <http://www.bsp.gov.ph/statistics/fof/FOFTechnotes.pdf>

- Government owned and controlled corporations (GOCCs) engaged in the mentioned activities are also included.

2. *Financial Corporation Sectors*

- Bangko Sentral ng Pilipinas (BSP)
- Corporations and quasi-corporations engaged in financial intermediation and in auxiliary financial services such as Commercial Banks, Thrift Banks, Rural Banks, Insurance and Pension Fund Companies.
- Other Financial Corporations such as Financing Companies, Lending Investors and Stock Dealers and Brokers.
- Government Financial Institutions (GFIs)

3. *General Government Sector*

- National Government (NG)
- Local Government Units (LGUs)
- Social Security Agencies (SSAs)
- Central Bank Board of Liquidators (CB-BOL)

4. *Rest of the World (ROW)*

5. *Household Sectors*

- Entrepreneurial activities of households, all other unaccounted transactions in the domestic economy and non-profit institutions serving households (NPISH).
- All resident households and household operated activities.

6. *Domestic Economy*

- Sum of the domestic sectors' transactions among themselves and with the rest of the world (ROW) such as purchase and sale of land.

The financial instruments used in Philippines FoFs framework are:

1. *Monetary Gold and Special Drawing Rights (SDR)*
2. *Currency and Deposits*
 - Currency and bank notes
 - Transferable deposits and other deposits by national and foreign currency
3. *Securities Other than Shares*
4. *Loans*
 - Bank and other institutions loans in local and foreign currency
5. *Shares and Other Equity*
6. *Insurance Technical Reserve*
 - Life insurance and pension reserve
7. *Accounts Receivable or Payable*
 - Trade credits and advances
 - Interbank claims

4.1.4. Overview on Indonesia FoFs Accounts

In these FoFs framework, we have five economic players:

1. *Financial Corporation Sector*
 - Central Bank of Indonesia
 - Deposit Money Banks
2. *General Government Sector*
3. *Other Domestic Sector*

- non-financial sector (businesses)
- household sectors

4. *Rest of the World*

The financial instruments used in Indonesia FoFs framework are:

1. *Monetary Gold and SDRs*

2. *Currency and Deposits*

- Currency and bank notes such as Rupiah and foreign exchange currency
- Transferable deposits and other deposits by national and foreign currency, time deposits, saving deposits, demand deposits, postal Giro deposits and cooperation

3. *Credit*

- Securities other than shares such as bonds and bills.
- Loans - bank and other institutions loans in Rupiah and foreign currency

4. *Shares and Other Equity*

5. *Others*

- Trade credits and advances
- Interbank transactions
- Insurance technical reserve

4.2. *Relevant Variables as Regressors*

In general, there are two channels that can affect saving rate: income effect or substitution effect. Income effect refers to changes in lifetime income while substitution effect refers to substituting between current and future consumption (Aghevli et.al, 1990). When a factor that

induces higher discounted present value of future income leads to a rise in current consumption but a fall in saving, then this is the income effect. On the other hand, if current consumption declines and saving rises (in favor of future consumption), this is the negative substitution effect.

4.2.1. Macroeconomic Indicators

1. Government (public) saving/GDP (%): There are several views on the relationship between government saving (fiscal policy) and private saving. Aghevli et al (1990) mentioned three ways of looking at this through the life-cycle approach. Essentially, the life-cycle theory is about households saving to smoothen their consumption in anticipating any abruption to their lifetime income or the return on their savings. When this concept is applied to private sectors saving behavior, it is the anticipation on the abruption in their future income and consumption that would be affected by government saving or dissaving (Aghevli et al, 1990). The three views that discussed on this relationship are neoclassical, Keynesian and Ricardian. In the Neoclassical version of the life-cycle model, when the government saving decreases, the consumption rises and this discourages private saving. In the Keynesian model, the temporary effect when there is an increase in government dissaving (due to unutilized resources) is a rise in consumption and income (due to an increase in employment) and through the multiplier effect, this will generate additional saving in the economy. In the long run, the effect of government dissaving is as described in the Neoclassical version (Aghevli et al, 1990). However, the ‘Ricardian Equivalence’ that has been highly criticized due to the assumptions used, argued that government dissaving (through debt financing or tax financing) to stimulate demand in the economy will not work since the public will still save its excess income to pay

for future tax increases that will be used to offset the debt. Another explanation for negative relation between government saving and private saving is when government saving crowds out the private saving (Edwards, 1990). Another evidence of this negative relation which supported the ‘Ricardian Equivalence Theory’¹⁴ was from Corbo and Schmidt-Hebbel (1991) that showed the partial decline in private saving to offset the rise in public saving although the value differs depending on the fiscal policies taken (taxation or current expenditure).

2. Real Interest Rate (%)¹⁵: The effect of real interest rate on corporate saving is ambiguous from the existing researches that have been carried out. Fry (1978, 1988) showed a positive significant effect of real interest rate on a sample of 14 Asian developing countries using a pooled cross section time series from 1961 to 1983. This is in addition to Mckinnon - Shaw hypothesis (Mckinnon (1989) and Shaw (1973)) that financial liberalization through deregulation of interest rate has positive effect on private saving that will stimulate growth in the economy. On the other hand, Loayza, Schmidt – Hebbel and Serven (2000) found negative coefficients of real interest rate changes on private saving although it is not significant. The ambiguity arises due to the potential offsetting between income effect versus substitution and wealth effects. Under the income effect, when the interest rate increases and the economic agents act as lenders, their future income will increase prompting higher current consumption and lower saving. While the substitution effect of higher real interest rate would cause the price of current consumption is higher relative to the future consumption (decline in current consumption) and this might induce higher saving (for instance, if one would want to take a bank loan at higher interest rate, then the price of its current consumption, that is

¹⁴ It supported the Ricardian Theory on the negative relation but it was not one-to-one effect. Instead the decline in private saving is less than 1.

¹⁵ Real Interest Rate = $\ln [(1 + \text{Nominal Interest Rate}) / (1 + \text{Inflation})]$

borrowing is higher and so he would save more for future consumption). If the substitution effect is greater than the income effect, then saving responds positively to the rise in the real interest rate. The wealth effect is similar to the substitution effect in a way that an increase in real interest rate would lower the future value of financial portfolio of corporations and that would induce higher saving.

3. Financial depth or Domestic Credit Constraints – M2/GDP (%), M2/GNI (%) and Claims on Private Sector/GDP¹⁶ (%): The usage of these traditional variables as proxies to the size and the development of financial intermediation (financial depth), the severity of financial repression or the extent of domestic constraints have been used by Edwards (1991), Corbo and Schmidt-Hebbel (1991), Levine (1997), Loayza et al (1999) and Zhang et al (2007). There have been mixed effects of these variables on savings depending on whether it is viewed as financial depth or as domestic constraints. When M2/GDP has positive effect on corporate saving/GDP, this might indicate that although there is deep financial liquidity in the economy, due to the domestic borrowing constraints, money cannot be channeled easily to the corporations while the negative effect to the corporate saving/GDP implies corporations could easily access this money either via financial intermediaries or stock market. The positive effect of claims on private sector on corporate saving could potentially explain that the credit from the financial system is going to other sectors that are not helping the corporations to deter their saving behavior. Loaza, Hebbel and Servén (1999) found a

¹⁶ From the definition in the International Financial Statistics (IFS) Database, "Claims on private sector includes gross credit from the financial system to individuals, enterprises, nonfinancial public entities not included under net domestic credit, and financial institutions not included elsewhere.

negative significant relation between domestic borrowing constraints and private savings¹⁷ while Schmidt-Hebbel, Webb and Corsetti (1992) showed a negative relation between monetary wealth and the household savings. However, in using these variables as proxies to domestic borrowing constraint, Loayza et. al. (1998) has used the flows (for example M2/GDP Flows) of these variables instead of the stock of these variables. On the other hand, Edwards (1991) found a positive significant effect suggesting that countries with deeper financial system will have higher private savings. The choice of M2/GNI is to test whether this is a better proxy for financial depth in the cross section data than in the time series dimension since the time series dimension often reflect short term factors like monetary policy (Loaza et al., 1999) and could reverse the sign of the coefficients.

4. Income – Real GDP Growth (%) and RGDP per Capita (%): An increase in income represented by real GDP growth or RGDP per capita would lead to higher or lower saving depending on the dominance of either income effect or substitution effect. In addition, the positive sign of the coefficients could also be associated with the consumption theory and life-cycle model. This is supported by Levine and King (1993), Levine, Loayza and Beck (2000) and Levine and Zervos (1993, 1998).

5. Uncertainty – Expected Inflation¹⁸, Capital Flight, Interest Rate Spread: The inflation rate is used as a proxy for price uncertainty (Deaton, 1977) and macroeconomic instability (Fisher, 1993). When there is an increase in the inflation rate or an uncertainty about the future outlook, we would expect a decline in the wealth of corporate sectors and they would compensate these losses by increasing their saving – precautionary motives. The interest rate

¹⁷ The negative effect suggests that relaxing the credit constraints on claims on private sector/GDP leads to the decrease in the private saving rate.

¹⁸ Expected inflation is taken as lagged -1 of inflation.

spread¹⁹ is used as a benchmark to indicate the uncertainty in an economy. A low interest rate spread implies that the economic condition is stable and there is great confidence among the investors that their money is safe. However, a higher spread indicates more volatile, uncertain economic conditions and that higher interest rates need to be charged in order to ascertain that the borrowers will repay their loan.

6. Demographics – Age Dependency Ratio(%), Population and Urbanization Ratio(%): The age dependency ratio refers to population below 15 years old and above 65 years old over the total working population. It is anticipated that the coefficient would be negative which is consistent with the standard life-cycle theory of consumption²⁰. Urbanization refers to proportion of total population that lives in urban area. It is expected to have negative impact on the private saving due to precautionary saving objective (Edward, 1995 and Loayza et al, 1999). For instance, rural residents will most likely have higher saving due to lack of diversification of their source of income in comparison to urban residents that have higher options in the city. In addition, as pointed out by Edward (1995) the saving rate will increase in countries with higher variable in income and this in general referred to countries that depend heavily on agricultural sector.

7. Foreign Borrowing Constraints – Total Foreign Debt/GDP(%)²¹, Financing via International Capital Market²² (Gross Inflows/GDP %) and Current Account

¹⁹ The interest rate spread¹⁹ is defined as the lending rate charged by banks to its prime customers minus the deposit rates on demand deposits, time deposits and savings deposits.

²⁰ Life-Cycle theory of consumption stated that people would borrow against their future earnings during their study years and early working years (negative saving), starts to save more during their most productive working years (positive saving) and use their saved assets during their retirement years (negative saving).

²¹“Total foreign/external debt is debt owed to non-residents and is the sum of public, publicly guaranteed and private non-guaranteed long term debt, use of IMF credit and short term debt which include all debt having maturity of one year or less

Balance/GDP(%): These indicators show the substitutability between foreign savings (current account deficit) and private savings as well as measuring the financial openness in the economy. When the impact is positive, this means that foreign saving have crowded out the private saving while if it is negative, then according to Loayza et. al. (1999), this is coherent to the standard view that foreign lending (external saving) is a complement rather than substitute to domestic saving. In other words, foreign saving is supporting the private investment and consumption.

8. Public (Government) Investment / GDP (%): When government increases its investment, this leads to an increase in the private consumption and a decrease in private saving. Loayza et al (1999) found a negative coefficient of government investment on private saving or in other words, complementarity relation between public goods and private goods.

9. Financial Liberalization Index (FLI) –Many had argued that financial liberalization has caused financial bubbles and crises and we include this as one of our regressors. The data and methodology used for the construction of FLI was from Kaminsky and Schmukler (2007) and we had extended the construction to match with the duration of our data that was until 2009. The FLI comprised of the liberalization of capital account, domestic financial sector and the stock market. Here we have FLI1 that is constructed by modifying the FLI2 from Kaminsky and Schmukler (2007). In their construction, if capital account is repressed – then the assigned value is 3, if it is partially liberalized – then it is 2 and if it is fully liberalized – then it is 1.

and interest in arrears on long term debt. The debt is repayable in foreign currency, goods or services,” World Bank Database.

²² “Financing via International Capital Market includes the sum of notional amount of gross bond issuance by government, public and private sector borrowers in international capital markets, bank lending raised by government, public and private sectors borrowers via international syndicated lending and the notional amount of cross border equity placement,” World Bank Database

For example, if in a particular year, the capital account is repressed (3), domestic financial sector is fully liberalized (1) and the stock market is fully liberalized (1), then the FLI for that year is 1. Our construction on the other hand would prorate the values assigned – for instance if the stock market is repressed from January to May – then the assigned value is $5 \times 3 = 15$ and then it is fully liberalized from June to December – then the assigned value is $7 \times 1 = 7$. Hence, the FLI for that particular year is $(15+7)/12 = 1.833$ instead of 1 in their method.

10. Stocks Market – Stock Market Index, Stocks Traded²³ (Total Stocks Value/GDP %), Market Capitalization of Listed Companies²⁴ (% of GDP), Equity Index²⁵, Stocks Turnover Ratio²⁶(%): These indicators represent how well the economy is doing and how much can the firms obtain their financing via the stocks market. Market capitalization of listed companies show the market size of stocks market relative to the economy and often use to indicate the degree of financial openness in the economy. The positive impact on the corporate saving implies the possibility of difficulty in raising capital via stocks market while the negative impact indicates the opposite.

11. Business Confidence Index (BCI): This is a survey data from the companies on their level of optimism about the economic conditions and the future prospects that their organizations will have. Theoretically, we would expect that as the level of optimism rises, the corporations saving/GDP will decline.

²³ Stocks Traded_t = Total Value of Shares Traded_t.

²⁴“Market Capitalization or market value is the share price times the number of shares outstanding and listed domestic companies are the domestically incorporated companies listed on the country’s stock exchanges at the end of the year and exclude investment companies, mutual funds, or other collective investment vehicles,” World Bank Database.

²⁵ Equity Index refers to S&P Global Equity Indices (annual % change).

²⁶ Turn Over Ratio_t = Total Value of Shares Traded_t / Average Market Capitalization_t.

Average Market Capitalization_t = (Market Capitalization_t + Market Capitalization_{t-1})/2 (Source: World Bank Database)

4.2.2. Banks Specific Indicators

1. Banks' Non-Performing Loans/Total Gross Loans²⁷ (%): When the financial intermediaries have a lot of non-performing loans recorded on their balance sheet, we would expect that they will be reluctant in giving out further loans and would induce higher corporate saving in the economy.

2. Domestic Credit provided by Banks: An easy accessible of credit at satisfactory lending rate would induce lower corporate saving since the opportunity costs of borrowing from the banks are lower than its own saving for financing.

3. Banks' Net Worth: Banks' net worth is the total amount in which the total assets exceed the total liabilities. If the total assets exceed the total liabilities, then the net worth is positive and if the total liabilities exceed the total assets, then the net worth is negative. A high net worth bank is more likely to extend credit to corporations and thus lowering the corporate sectors' saving.

4.2.3. Corporations Specific Indicators

1. Firms' Net Worth: Firms' net worth is defined as its total assets minus total liabilities. The net worth will be what the corporations/banks owe to their owners (shareholders). We would expect the sign to be ambiguous since a positive impact on the corporation savings show that as firms' net worth increases, firms are more likely to save in order

²⁷ Banks' Non Performing Loans/ Total Gross Loans = Value of NonPerforming Loans/ Total Value of the Loan Portfolio (include nonperforming loans before the deduction of specific loan-loss provisions (Source: World Bank Database)

to make their balance sheet looks even better and perhaps to pay higher dividends to its shareholders using its savings. On the other hand, a negative impact on corporate saving could indicate that the firms are more willing to invest in the productivity activities as their net worth improves. Net worth is an important indicator of the firms' creditworthiness since it gives the history of the company's investment in addition to determining the value of a company.

4.3. Estimation Methodology:

We first plotted the graphs (Appendix 1) to see the relation between the independent variables and the corporate saving. The main reason for eye-balling this relationship is to identify if any transformation is needed on the independent variables in order to capture its influence on the dependent variables. Next, we will calculate the correlations between these variables in order to identify the degree of dependency between these predicted variables which could potentially be useful in finding the instrumental variables and to tackle the problem of *multicollinearity* (Appendix 2). Our next step is to employ the Granger-causality test which provide information on whether the lagged of explanatory variables are good predictors of the dependent variable and vice versa (reverse causality). In other words, we can use this test result to see the existence of *joint endogeneity* problem. However, due to the limitation of the number of observation, we will limit the lag used in the Granger test to up until one lag only in such that we don't lose much information from the missing values²⁸ instead of comparing across AIC/BIC. The null hypothesis for Granger non-causality test is: Variable X does not

²⁸ Including lags means the loss of information, both by additional parameters to estimate and decrease in degrees of freedom.

granger cause variable Y (Corporate Saving/GDP) and Variable Y (Corporate Saving/GDP) does not granger cause variable X (Appendix 4). Our results indicate the existence of joint endogeneity between claims on private sector and corporate saving and we can fix this in the regression by using instrumental variable such as domestic credit by banks. We will use the instrumental variable only if the claim on private sector is included in our final model.

Then, prior to our estimation, we will examine another statistical property of our annual data that is stationarity by using Augmented Dickey Fuller (ADF) test statistic. The presence of non-stationarity can be due to unit root which can be corrected by taking differences (differences stationarity) or due to trend component which can be corrected by detrending the variables (trend stationarity). However, take note that differencing the variables could lead us to losing the long run information and theoretically, most of the economic relationships are of long term that involves level variables and not their differences (Nair, 2006). Hence, it is desirable to have level variables that are stationary.

Results from non-stationarity variables can be spurious (biased coefficient) and misleading. If non-stationarity is caused by the former (existence of unit root), the OLS estimate can still be performed if these variables are cointegrated, otherwise, if cointegration doesn't exist, then our data does not have long term equilibrium relationship and only short term equilibrium relationship. The unit root test on our data series is necessary but not sufficient for cointegration. The null hypothesis in ADF test is that variable X has a unit root. We will first carry out this test without specifying the trend and the constant/intercept of the variable and if the test statistic indicates that we should reject the null hypothesis, we will keep the variable as it is. If the unit root condition is still unsatisfactory, we will still run the ADF test with the

first differencing on the variable. If the results indicate that first differencing is needed to satisfy the unit root condition, we will run the cointegration test to see whether the long run equilibrium exists instead of taking the first differencing since our data is non-stationary of degree one. We used Schwarz Info Criterion (SIC) to choose the optimal lag and our results indicate it is optimal at lag zero. The ADF results in Appendix 5 show that most of the variables suffer from unit root problem and taking first differencing will correct for this. Hence, we will proceed with our cointegration test on the entire model by using the rule of thumb proposed by Granger and Newbold (1974) that two series suffer from spurious regression when $R^2 >$ Durbin Watson test.

Equation for Augmented Dickey Fuller (ADF) Test for Variable X

Null Hypothesis: Variable X has unit root

Test: ADF test with level variable (no intercept/constant and no trend)

$$\Delta(\text{Variable X})_t = \beta_0 * (\text{Variable X})_{t-1} + \beta_1 * \Delta(\text{Variable X})_{t-1}$$

Test: ADF test with level variable (include intercept/constant and trend)

$$\Delta(\text{Variable X})_t = \beta_0 * (\text{Variable X})_{t-1} + \beta_1 * \Delta(\text{Variable X})_{t-1} + \beta_2 * (\text{Trend}) + \text{Constant}$$

Test: ADF test with first differencing (no intercept/constant and no trend)

$$\Delta^2(\text{Variable X})_t = \beta_0 * \Delta(\text{Variable X})_{t-1} + \beta_1 * \Delta^2(\text{Variable X})_{t-1}$$

After satisfying these necessarily statistical properties, we will now proceed with our regression estimation. We have two sets of regression models that are of interest to us.

First is the replication of the Feldstein – Horioka (FH) regression for Asean – 3 over the period of 1995 to 2009. The main purpose of doing this is to determine the components of saving in the economy that has significant influence on the corporation’s decision to invest.

The basic empirical specification for FH model is the following:

$$\begin{aligned}
 (I_{\text{corporation}}/\text{GDP})_t = & \beta_0 + \beta_1*(S_{\text{corporation}}/\text{GDP})_t + \beta_2*(S_{\text{government}}/\text{GDP})_t + \\
 & \beta_3*(S_{\text{households}}/\text{GDP})_t + \varepsilon_t
 \end{aligned} \tag{1}$$

Second is the unconditional regression of corporate saving/ GDP on various macroeconomic variables, banks’ specific variables and firms’ specific variables. The reasons for inclusion of these variables have been described in the earlier section.

$$\begin{aligned}
 (\text{Corporation Saving}/\text{GDP})_t = & \beta_0 + \beta_1*(\text{Government Saving}/\text{GDP})_t + \\
 & \beta_2*(\text{Stock Market Index})_t + \beta_3*(\text{Real GDP Growth})_t + \beta_4*(\text{Expected} \\
 & \text{Inflation})_t + \beta_5*(\text{Current Account Balance})_t + \beta_6*(\text{Per Capita Real} \\
 & \text{GDP})_t + \beta_7*(\text{M2}/\text{GDP Stocks})_t + \beta_8*(\text{Total Foreign Debt}/\text{GDP})_t + \\
 & \beta_9*(\text{Capital Flight}/\text{GDP})_t + \beta_{10}*(\text{Urbanization})_t + \beta_{11}*(\text{Age} \\
 & \text{Dependency Ratio})_t + \beta_{12}*(\text{Government Investment}/\text{GDP})_t + \\
 & \beta_{13}*(\text{Real Interest Rate})_t + \beta_{14}*(\text{Financial Liberalization Index})_t +
 \end{aligned}$$

$$\begin{aligned}
& \beta_{15}*(\text{Banks' Non-Performing Loans})_t + \beta_{16}*(\text{Stocks Traded/GDP})_t + \\
& \beta_{17}*(\text{Business Confidence Index})_t + \beta_{18}*(\text{Claims on Private} \\
& \text{Sectors/GDP})_t + \beta_{19}*(\text{Domestic Credit by Banks/GDP})_t + \beta_{20}*(\text{Interest} \\
& \text{Rate Spread})_t + \beta_{21}*(\text{Gross Inflows/GDP})_t + \beta_{22}*(\text{Market} \\
& \text{Capitalization/GDP})_t + \beta_{23}*(\text{Equity Index})_t + \beta_{24}*(\text{Stocks Turn Over} \\
& \text{Ratio})_t + \beta_{25}*(\text{Firms' Net Worth})_t + \beta_{25}*(\text{Banks' Net Worth})_t + \varepsilon_t
\end{aligned}
\tag{2}$$

We first run the standard OLS regression on Equation 1 and Equation 2 and by comparing across the adjusted R-square, we will omit the irrelevant variables that do not improve our model. Hence, we will have our final reduced-form model that will yield the highest adjusted R-square. . Take note that OLS provides a good base for examining the potential problems that we might have with our data and the structural model. For instance, a significantly high coefficient and R-square could be due to serial correlation. OLS will not be performed unless the data is cointegrated and even if the data is not cointegrated and the OLS is performed, then there might not exist the long term relationship and the result only shows the short term relationship. Our final reduced-form regression model for Equation 2 is the following empirical specification which yields the highest adjusted R-square and includes most of the statistically significant variables that are of interest to us.

$$\begin{aligned}
(\text{Corporation Saving/GDP})_t = & \beta_0 + \beta_1 * (\text{Stock Market Index})_t + \\
& \beta_2 * (\text{Current Account Balance})_t + \beta_3 * (\text{Capital Flight/GDP})_t + \\
& \beta_4 * (\text{Urbanization})_t + \beta_5 * (\text{Age Dependency Ratio})_t + \\
& \beta_6 * (\text{Government Investment/GDP})_t + \beta_7 * (\text{Real Interest Rate})_t + \\
& \beta_8 * (\text{Financial Liberalization Index 1})_t + \beta_9 * (\text{Banks' Non-} \\
& \text{Performing Loans})_t + \beta_{10} * (\text{Stocks Traded/GDP})_t + \beta_{11} * (\text{Business} \\
& \text{Confidence Index})_t + \beta_{12} * (\text{Domestic Credit by Banks/GDP})_t + \\
& \beta_{13} * (\text{Market Capitalization/GDP})_t + \beta_{14} * (\text{Equity Index})_t + \\
& \beta_{15} * (\text{Stocks Turn Over Ratio})_t + \beta_{16} * (\text{Firms' Net Worth})_t + \\
& \beta_{17} * (\text{Banks' Net Worth})_t + \varepsilon_t \tag{3}
\end{aligned}$$

The regression result of our OLS regression on reduced-form corporate saving/GDP model is in Appendix 9 (Table 1.7). We then examined the statistical properties of this regression specifically the significance of the variables, the sign of the coefficients, the common problem in panel data series that is heteroskedasticity (using the white test), the common problem in time series data that is autocorrelation (using Durbin –Watson test²⁹), the existence of cointegration using the rule of thumb proposed by Granger and Newbold (1974) that two series suffer from spurious regression when $R^2 >$ Durbin Watson test and the F-statistic to

²⁹DW test statistic that is close to 2 indicates no presence of autocorrelation/serial correlation – the present residual is correlated with the past residual.

investigate the null hypothesis that there is no linear relationship between the dependent variable and the explanatory variables in the model.

Our result in Appendix 7 indicates that our model suffers from negative autocorrelation since the Durbin-Watson test statistic is greater than 2. We then plotted the graphs of residuals on lagged 1 of residuals and the graph in Appendix 8 shows the existence of negative autocorrelation. The result for heteroskedasticity is satisfactory given the fact that we have only panel data set across three countries but longer period of time (the effect of time series problem (autocorrelation) takes greater weight than the effect of panel data problem (heteroskedasticity)). Our rule of thumb that is R-square < Durbin Watson test statistic is satisfactory and hence we know that there are one or more cointegrated time series data in our model. Finally, our F(17, 21) that assumes the null of no linear relationship in the model is rejected.

One way to correct for autocorrelation is to run the autoregressive model of order 1, AR(1) for our reduced-form model. The equation for AR(1) is as follows:

$$\begin{aligned}
 (\text{Corporation Saving/GDP})_t = & \beta_0 + \gamma_1 * (\text{Corporation Saving/GDP})_{t-1} \\
 & \beta_1 * (\text{Stock Market Index})_t + \beta_2 * (\text{Current Account Balance})_t + \\
 & \beta_3 * (\text{Capital Flight/GDP})_t + \beta_4 * (\text{Urbanization})_t + \beta_5 * (\text{Age Dependency} \\
 & \text{Ratio})_t + \beta_6 * (\text{Government Investment/GDP})_t + \beta_7 * (\text{Real Interest Rate})_t \\
 & + \beta_8 * (\text{Financial Liberalization Index 1})_t + \beta_9 * (\text{Banks' Non-Performing} \\
 & \text{Loans})_t + \beta_{10} * (\text{Stocks Traded/GDP})_t + \beta_{11} * (\text{Business Confidence}
 \end{aligned}$$

$$\begin{aligned}
& \text{Index})_t + \beta_{12}*(\text{Domestic Credit by Banks/GDP})_t + \beta_{13}*(\text{Market} \\
& \text{Capitalization/GDP})_t + \beta_{14}*(\text{Equity Index})_t + \beta_{15}*(\text{Stocks Turn Over} \\
& \text{Ratio})_t + \beta_{16}*(\text{Firms' Net Worth})_t + \beta_{17}*(\text{Banks' Net Worth})_t + \\
& \beta_{18}*(\text{Dummy}^{30}1) + \beta_{19}*(\text{Dummy}2) \tag{4}
\end{aligned}$$

The AR (1) result is shown in Table 1.8 of Appendix 12. In order to strengthen our analysis on the determinants of corporate saving across Asean-3, we run additional regression that is Vector Auto Regression (VAR) and examine the impulse response function and the variance decomposition. VAR is ordering-dependent and we can check the robustness of our result by changing the order. Our main interest is in the variance decomposition that shows how much of a change in a variable is due to its own shock and how much is due to shocks of other variables. However, prior to the variance decomposition, we need to inspect the result of our impulse response which will trace the time path of the effect of structural shocks on our dependent variables in the model.

A two-variable VAR(1) with k=2.

$$y_t = b_{10} - b_{12}z_t + c_{11}y_{t-1} + c_{12}z_{t-1} + \varepsilon_{yt} \tag{5}$$

$$z_t = b_{20} - b_{21}y_t + c_{21}y_{t-1} + c_{22}z_{t-1} + \varepsilon_{zt} \tag{6}$$

Equation (5) and equation (6) can be written in the VAR system in the standard form:

$$\begin{bmatrix} y_t \\ z_t \end{bmatrix} = \begin{bmatrix} b_{10} - b_{12}b_{20} \\ b_{20} \end{bmatrix} + \begin{bmatrix} (c_{11} - b_{12}c_{21}) & (c_{12} - b_{12}c_{22}) \\ c_{21} & c_{22} \end{bmatrix} \begin{bmatrix} y_{t-1} \\ z_{t-1} \end{bmatrix} + \begin{bmatrix} \varepsilon_{yt} - b_{12}\varepsilon_{zt} \\ \varepsilon_{zt} \end{bmatrix} \tag{7}$$

³⁰ Since we have unbalanced panel data set, the dummy variables take values of 1 in the last year of these two out of three countries, specifically in the year of 2009 for Thailand (Dummy 1) and in the year of 2009 for Philippines (Dummy 2).

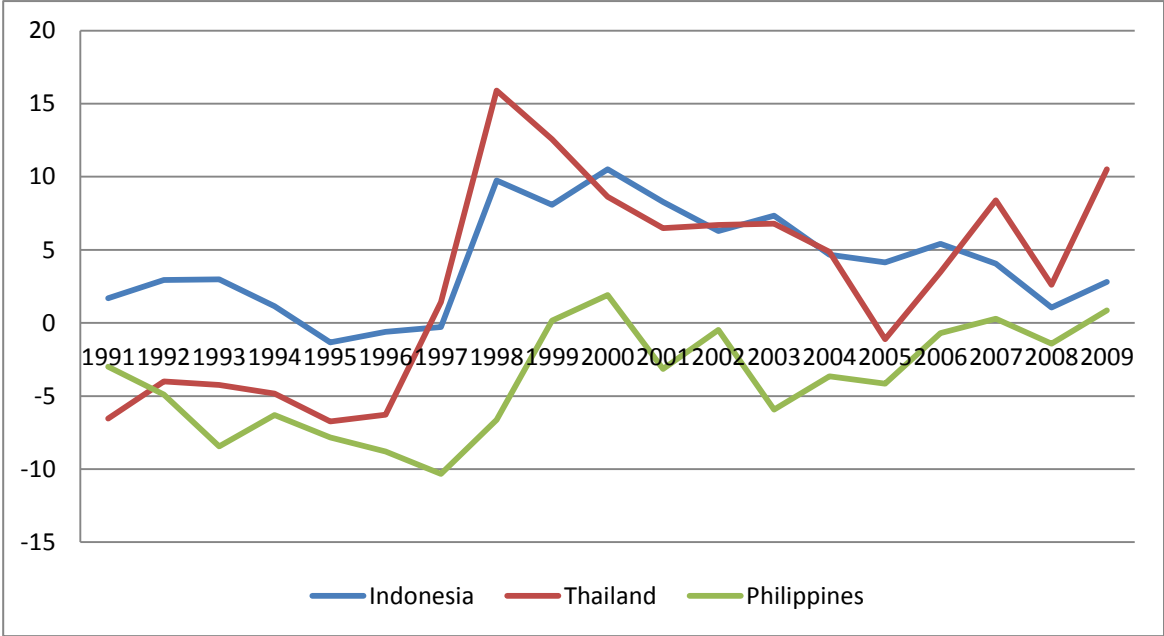
5. Results and Analysis

5.1. Gross Saving versus Gross Capital Formation in Asean-3?

Figure 1.9 shows the excess saving for the entire domestic economy³¹ with Indonesia and Thailand achieving the level above zero after 1997. A negative excess saving implies that investment exceeds saving while positive excess saving means that saving exceeds investment. However, in the case of Philippines, the domestic economy excess saving takes a turning point from negative excess saving (over investment) prior to 1998 to fluctuation around zero afterwards, implying balanced domestic saving and domestic gross capital formation. When we analyzed only the gross saving for the entire economy in Figure 1.10, Thailand shows a slight drop after 1998 but its corporate gross saving component shows a tremendous significant increase after 1998 approaching to about 35% of GDP (Figure 1.11). Indonesia domestic economy gross saving (Figure 1.10) stays relatively the same throughout the period except for the biggest plunge in 1999 but for its corporate sector, the gross saving surges to about 35% of GDP in 1998 and approaches to about 20% of GDP hereafter (Figure 1.11). In Philippines, the domestic gross saving is relatively about 15% - 20% of GDP with a high peak in 2000 while the corporate gross saving shows a significant upward trend since 2000. From these three figures, we can conclude that the domestic excess savings spiked up in 1997 to 1999 during the period of Asian financial crisis, and dropped during the recovery period to the level it was before the 1997 crisis. Although this was the case for the countries domestic gross savings, the corporate saving however, have shown an upward trending since 2001 for both Thailand and Philippines and 2003 for Indonesia. This is insinuating that

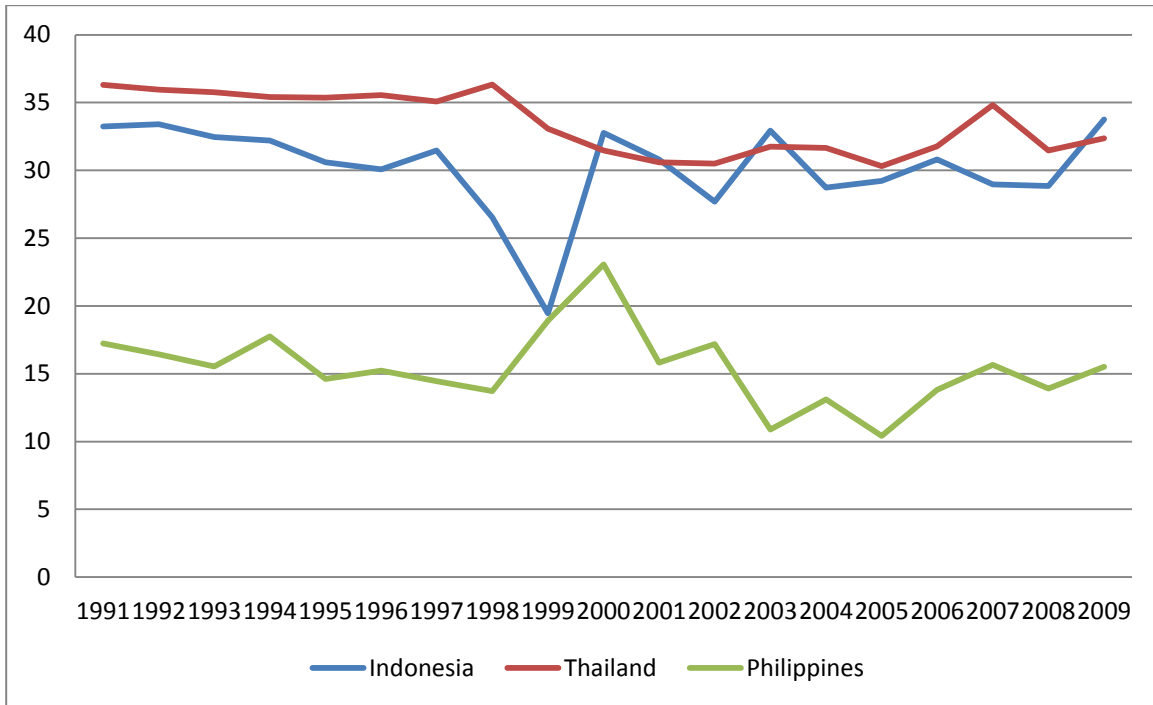
³¹ Domestic economy includes non-financial corporations, government, households, financial corporations and rest of the world.

despite the relatively level domestic gross saving, there are significant rise in the corporate gross saving across Asean-3.



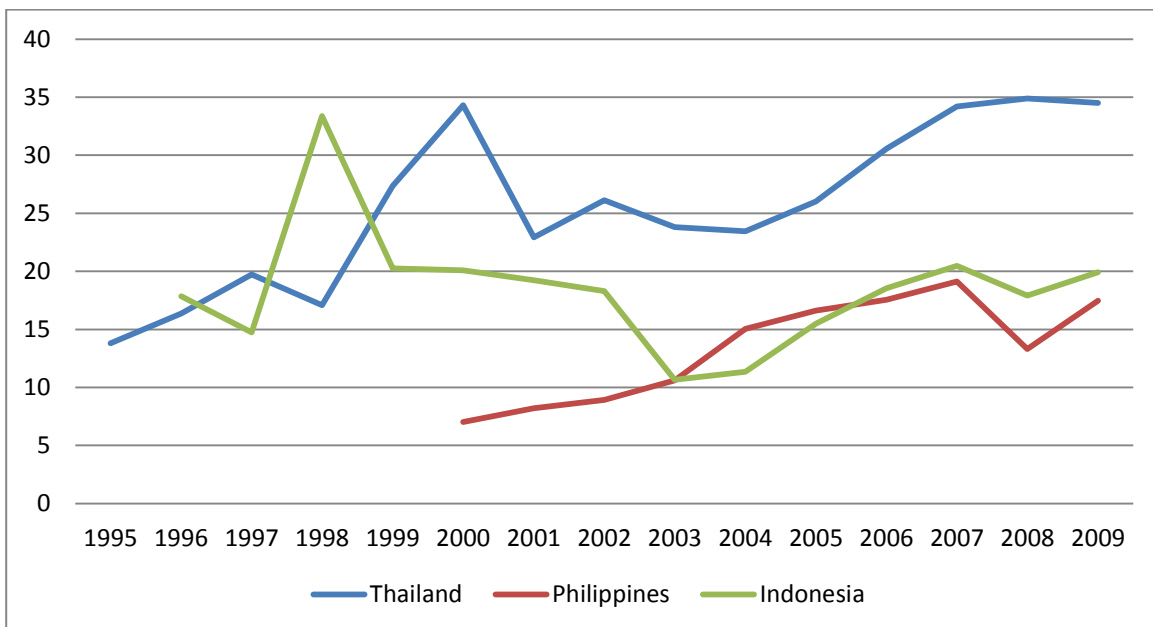
Source: IFS Database

Figure 1.9: Domestic Gross Saving over Gross Investment in Asean- 3 (in percent of GDP)



Source: IFS Database

Figure 1.10: Domestic Gross Saving in Asean- 3 (in percent of GDP)



Source: Flow-of-Funds Accounts

Figure 1.11: Corporation Gross Saving in Asean- 3 (in percent of GDP)

5.1.1. The Evidence of Positive Excess Saving in Thailand?

Figure 1.12 showed the overall domestic gross saving and gross capital formation in Thailand, including the financial corporations sector and the rest of the world sector. It was apparent from the graph that Thailand experienced higher gross investment prior to 1997 and in 1997, it took a reversed turning point when gross saving started to exceed gross capital formation until 2009.

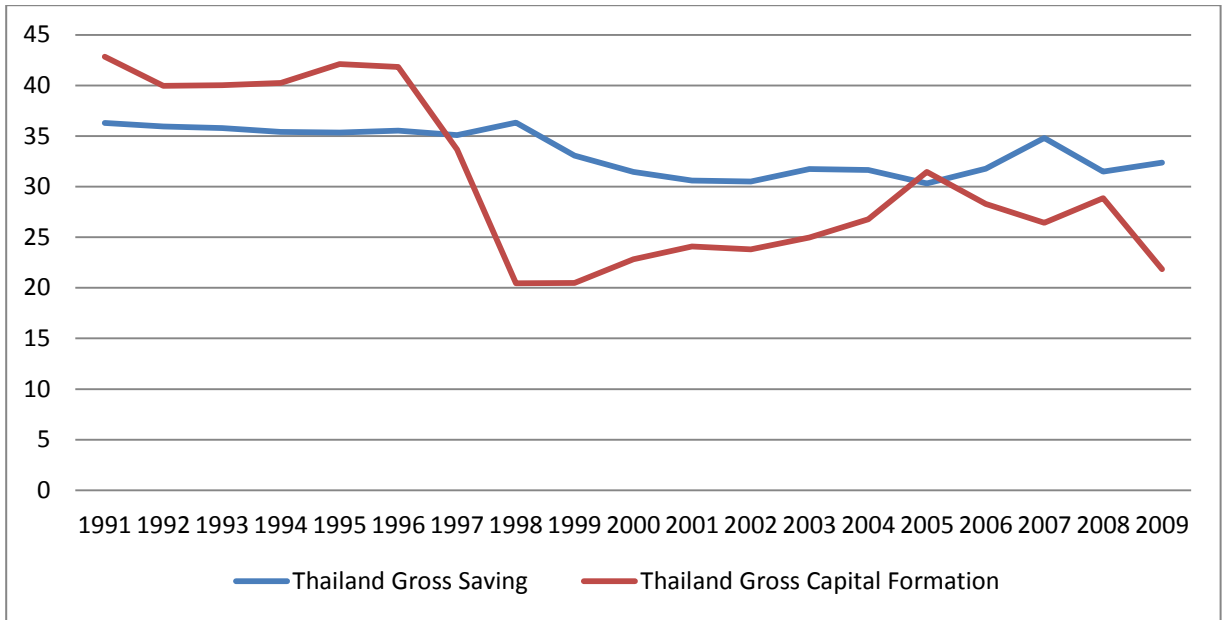
Now in Figure 1.13, we have compared the gross saving and the gross capital formation in Thailand's economy by excluding the financial corporations and the rest of the world (ROW)³². The graph indicated that Thailand experienced negative excess saving prior to 1997 AFC and positive excess saving from 1997 to 2003. However, a different trend was witnessed prior to 2008 GFC in which positive excess saving existed prior to the recent crisis. When the non-financial corporations sector saved more than they invested during the recovery period of 1998 – 2002, the household sector' saving level started to decline in response to the rise of corporate sector saving (Figure 1.14). The household sector saving picked its increasing pace again in 2002 when the non-financial corporations started to exhibit negative excess saving – more investment than saving. Overall, the household sector and the government sector in Thailand often have positive excess saving during these years of observation but the non-financial corporations suffered negative excess saving except for during the period of crisis and its recovery (Figure 1.15 and Figure 1.16). When the firms save more than they are

³² We exclude the financial corporations because they are financial intermediaries that have high saving but very small concentration in the gross capital formation investment. The ROW is excluded because in the FoF accounts, they have no gross capital formation and only gross saving which could distort our excess saving analysis.

investing in real sectors, the government sector will start to counter back by investing more although the household sector saving will still decline.

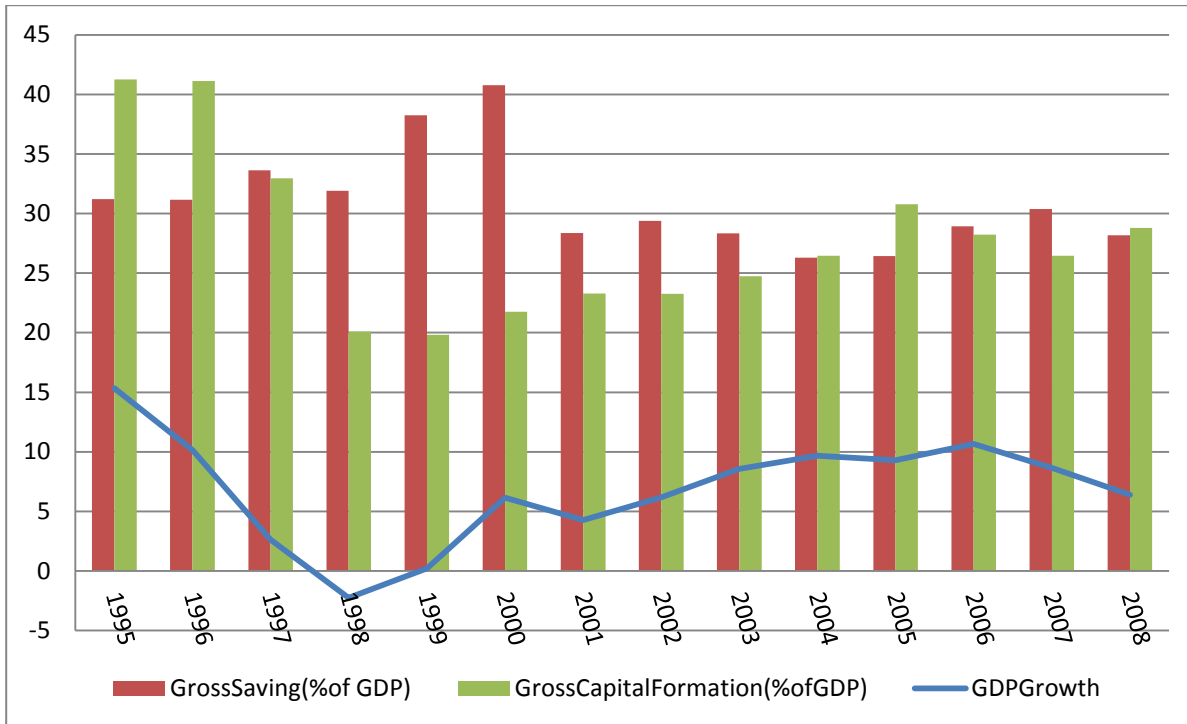
The AFC in Thailand started in July 1997 when Thai's fixed exchange rate came under attack. It exacerbated in 1998 when many other countries were affected. In order to prevent further precipitation of Bath and to comply with IMF conditionality, the monetary authority raised the interest rate³³ and the government implemented structural reform in corporate governance, international debt and finance. This could possibly explain the increased of saving and a declined in investment for non-financial corporations sector (Figure 1.15 and Figure 1.16). On the other hand, due to tight credit, the household sector used their saving to support their consumption. The government saving was declining too during this period because of its repayment of debts falling due and to stabilize exchange rate. In 2002, after the new Prime Minister, Thaksin was elected, the household saving and the government saving started to increase again during in which the non-financial corporations gross capital formation started to outpace the gross saving again (Figure 1.14).

³³ In January 1998, the lending rate was 17%.



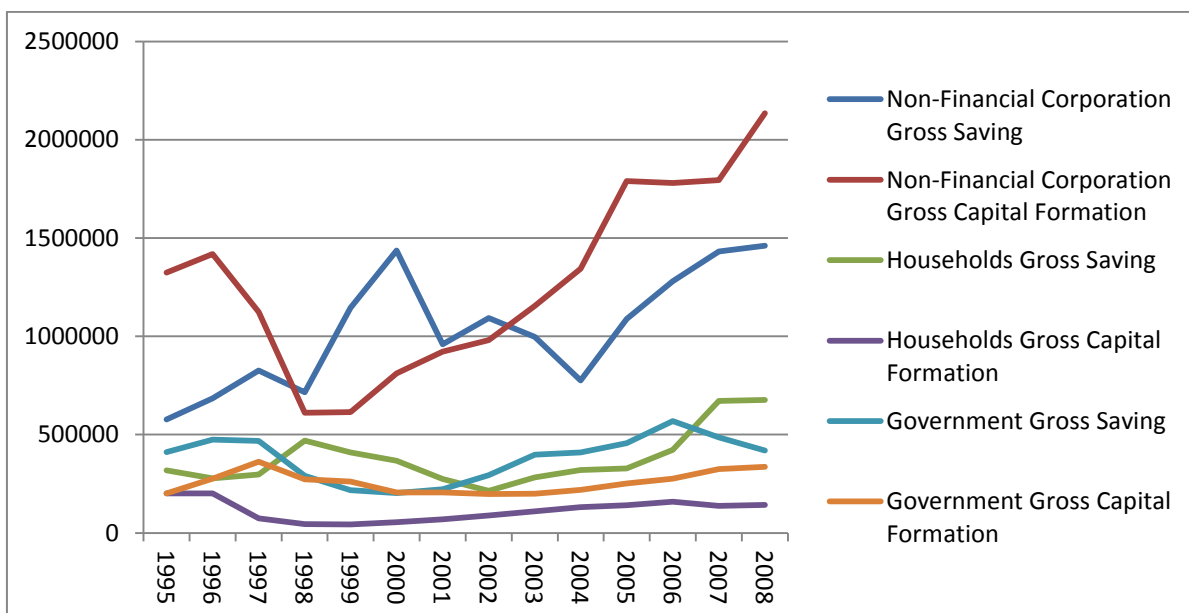
Source: Trading Economics Database

Figure 1.12: Domestic Gross Saving and Gross Capital Formation - Thailand (in percent of GDP)



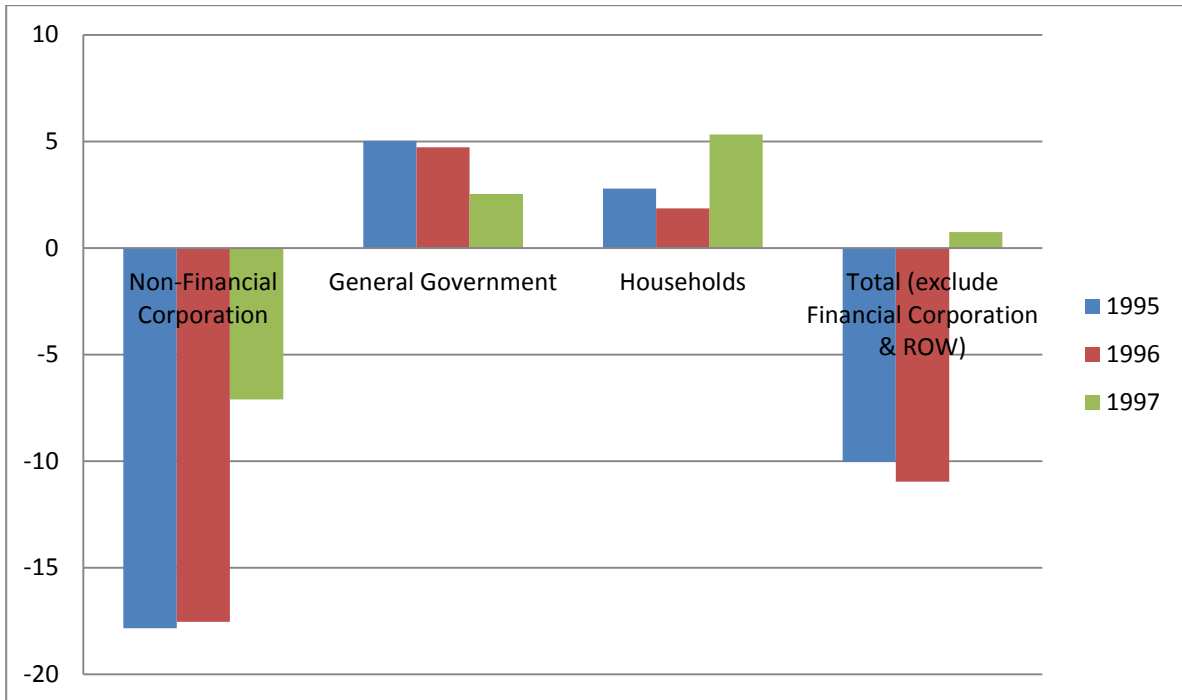
Source: Flow-of-Funds Accounts

Figure 1.13: Saving-Investment Balance - Thailand (in percent of GDP)



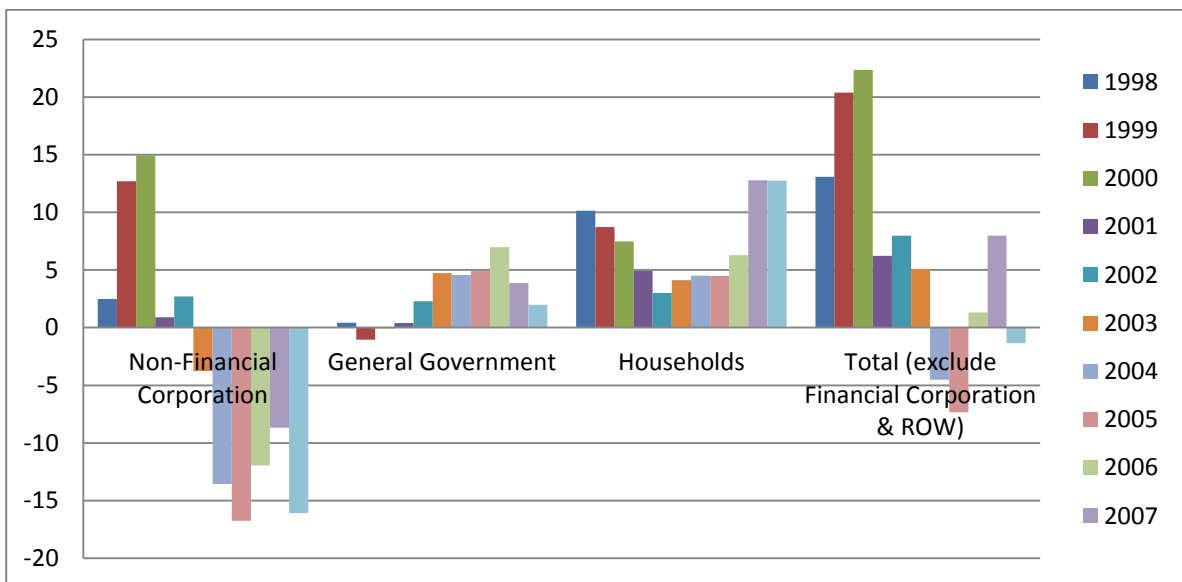
Source: Flow-of-Funds Accounts

Figure 1.14: Saving vs Investment by Economic Sectors - Thailand (Millions of Bath)



Source: Flow-of-Funds Accounts

Figure 1.15: Excess Saving Pre-97 AFC - Thailand (in percent of GDP)



Source: Flow-of-Funds Accounts

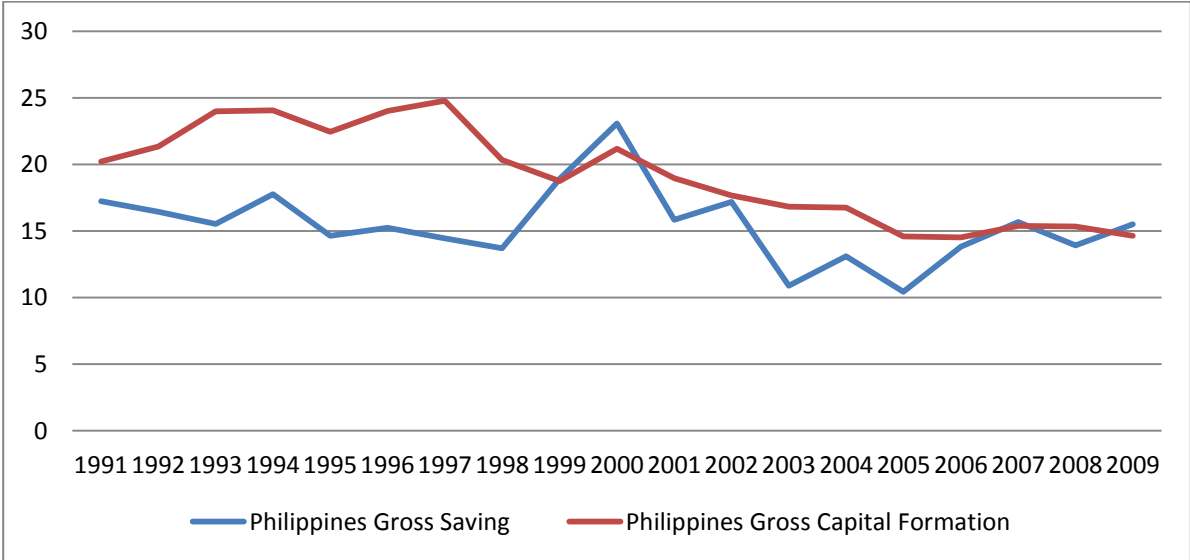
Figure 1.16: Excess Saving Post-97 AFC - Thailand (in percent of GDP)

5.1.2. The Evidence of Positive Excess Saving in Philippines?

When we compare across all economic players³⁴ in Philippines, Figure 1.17 shows that gross capital formation exceeds gross saving from 1991 to 2009, with exception to the year of 2000 2007 and 2009. The gross saving spikes up in the year of 2000 and stay relatively stable around 15% of GDP. On the other hand, the gross capital formation is declining and eventually starts to converge to about 15% of GDP as well. In Figure 1.18, we exclude the ROW and the financial corporations because their roles are mainly to save and very little investment in the real sector which could distort our excess saving analysis. In these graphs that are based on Philippines FoFs accounts, we find that the domestic economy saving has been rising since 2000 while the domestic investment has been declining. In other words, we can see that from the year of 2000 to 2002, Philippines domestic economy (excluding the financial corporations and the ROW) experience negative excess saving and positive excess saving beginning in 2004 onwards. When we examine the behavior of these economic agents in Figure 1.19, there are an upward trend in the gross saving of firms and the government. The household sector shows the opposite behavior in which its gross saving is declining when the firms gross saving is rising and its investment in the real sector is also rising up after a plunge in 2003. The changes in Philippines saving-investment structure confirmed with what many economists have argued – an increased in saving and a decline in real sector investment for corporate sector. Tan (1997) argued that the rise in saving mobilization in Philippines began since 1994 when President Ramos administration launched an aggressive financial liberalization such as the relaxation of foreign bank entry, raising the foreign equity limits and

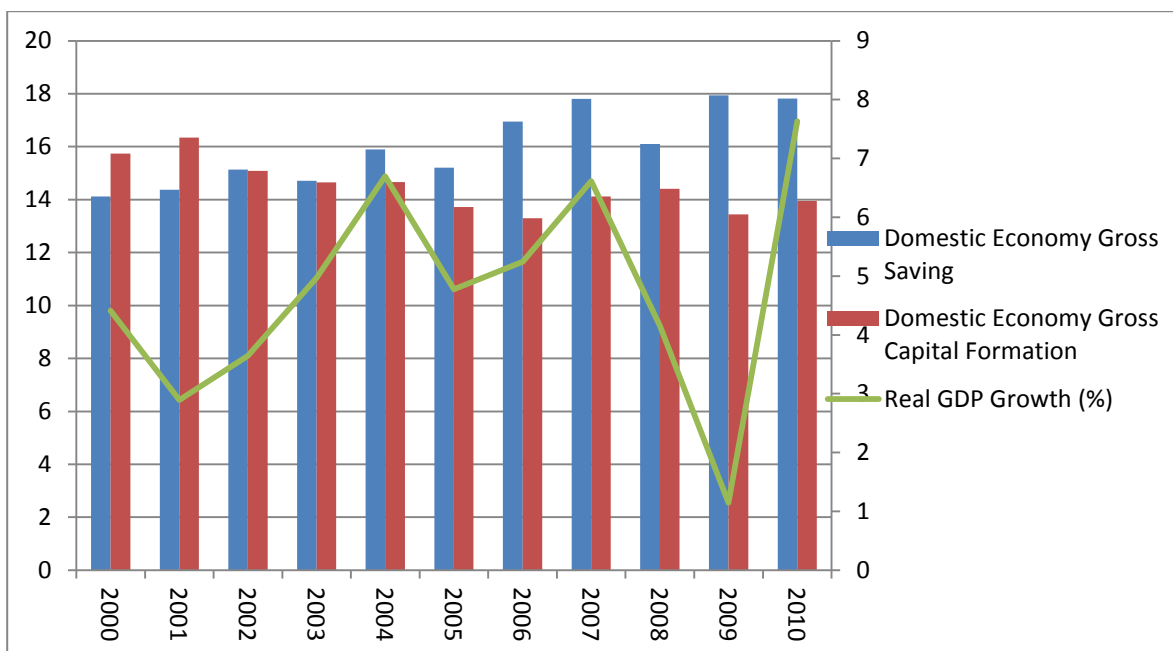
³⁴ All economic players include non-financial corporation, government, households, financial corporation and rest of the world.

establishing a more independent central bank. Furthermore, the requirement for non-financial corporations sector to establish statutory saving or mandatory saving through pension funds also increased its saving. The government saving although it was rising overtime was lower than its investment due to slow growth rates per capita income and political instability in Philippines. The annual per capita income grew slowly and this decelerated the government tax collections. Furthermore, in order to stimulate the economy, the government needs to increase its expenditure and this explained the declined in its saving and a higher level of investment.



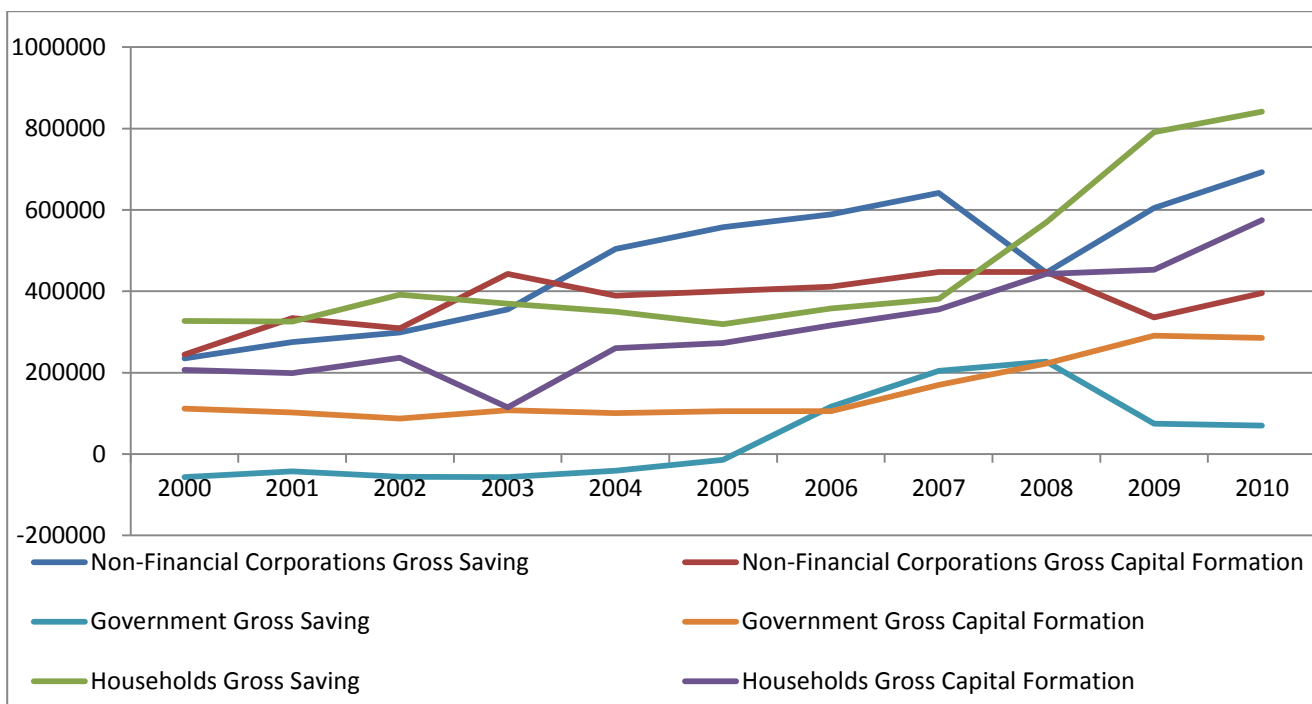
Source: Trading Economics Database

Figure 1.17: Domestic Gross Saving and Gross Capital Formation - Philippines (in percent of GDP)



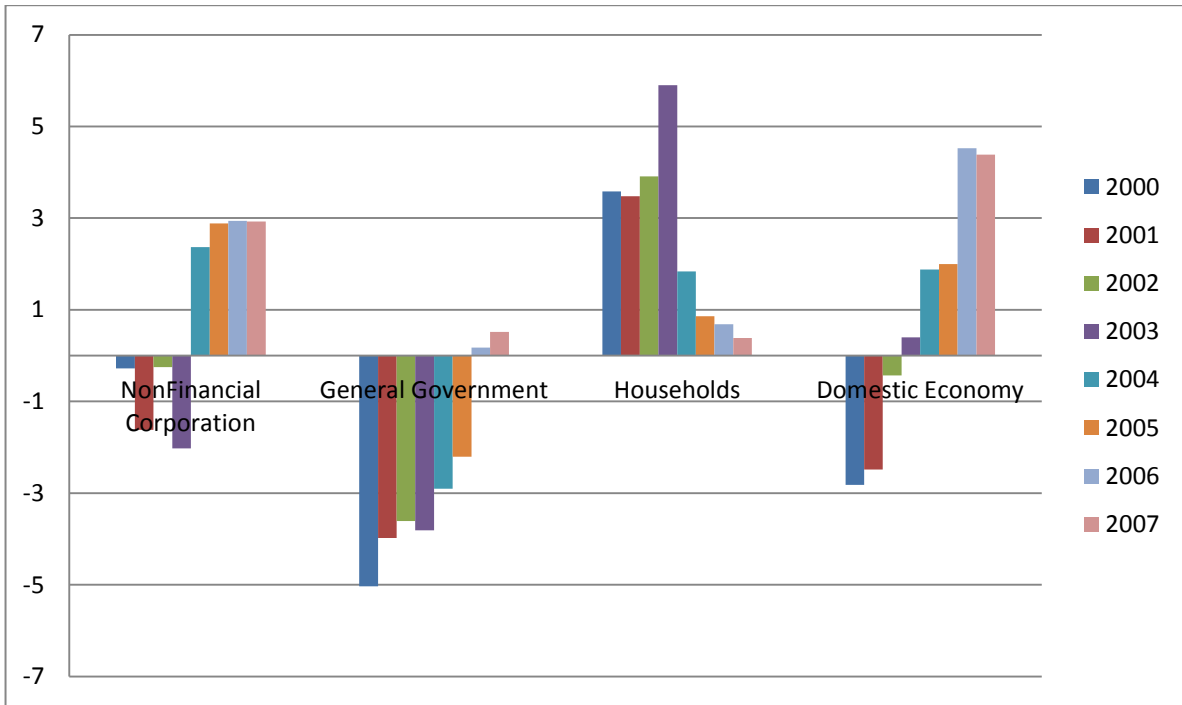
Source: Flow-of-Funds Accounts

Figure 1.18: Saving-Investment Balance - Philippines (in percent of GDP)



Source: Flow-of-Funds Accounts

Figure 1.19: Saving vs Investment by Economic Sectors - Philippines (Millions of Pesos)



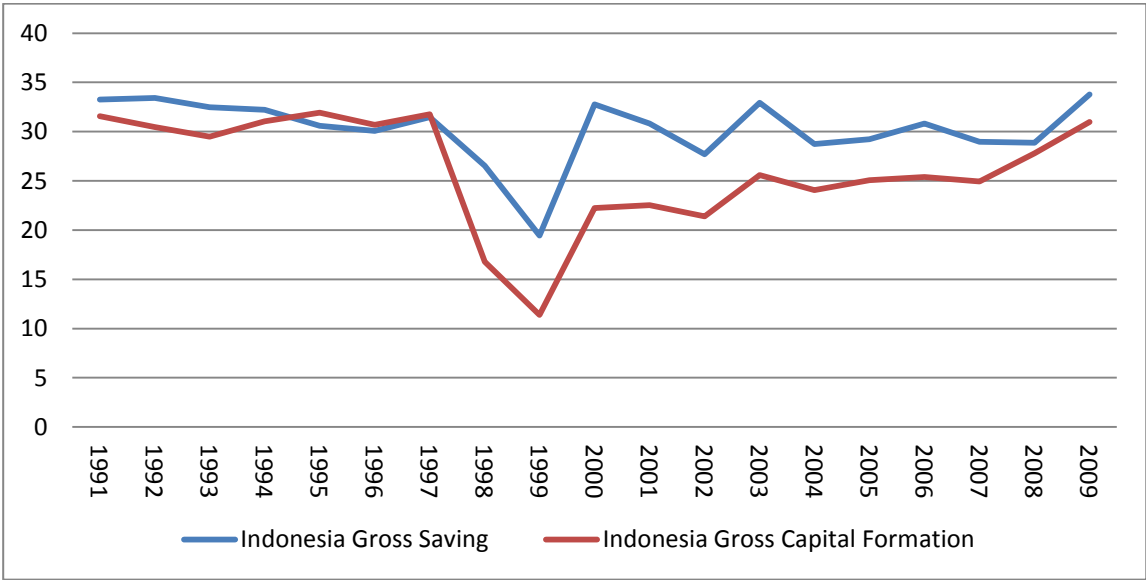
Source: Flow-of-Funds Accounts

Figure 1.20: Excess Saving Post-97 AFC - Philippines (in percent of GDP)

5.1.3. The Evidence of Positive Excess Saving in Indonesia?

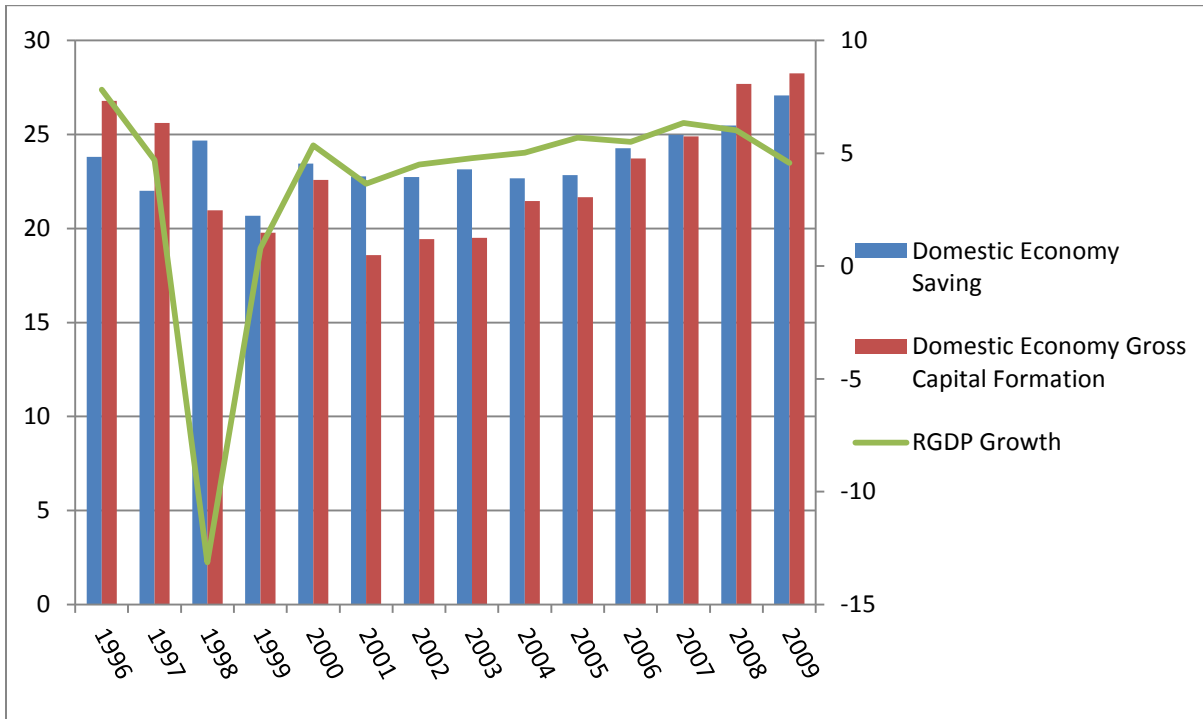
In the case of Indonesia from 1997 to 2009, the domestic gross saving across all economic players including the financial corporations and the rest of the world in Figure 1.21 was higher than the gross capital formation. However, two years prior to the 1997 AFC, this relationship was reversed but not prior to 2008 GFC. In Figure 1.22, we excluded the financial corporations and the rest of the world. The graph showed an existence of positive excess saving from 1998 to 2007. However, the excess saving was negative pre and during the crisis period of 1997 AFC and in 2008 to 2009 pre and during GFC. In Figure 1.22, we could see an upward trend in the real sector investment beginning in 2001 until 2009 while the gross saving showed a rise starting in 1999. The saving rate in Indonesia was highest immediately during the crisis that was in 1998 at 25% of GDP (Figure 1.22). During this year, the real GDP growth in Indonesia was also at its lowest throughout the 12 year period from 1997 to 2009 while the real sector investment was at its lowest in 2001. In Figure 1.23, it is obvious that the movements of the gross saving and the gross capital formation are in the same direction. The government sector has consistently displayed positive excess saving with the highest gap arising in 1996 to 1997 and 2008 to 2009. This was a substitute to the behavior of the non-financial corporations and the households which have positive excess saving from 1998 to 2002 and in 2006 hereafter, their investment surpassed the saving. Both investment and saving for non-financial corporations exhibited a similar trend that was a declining trend in 1998 to 2003 and an increasing trend onwards (2003-2009). During the AFC that witnessed the ending of Suharto long time presidency and the austerity measures imposed by the IMF including increasing the tax, no government bailouts and corporate reformation, it made sense to see the obvious spike of gross saving for the firms and the households sectors and the

plunged in the real sector investment. On the other hand, the government in its effort to stabilize the political, economic and social conditions there had to step up, dis-saving and increased its spending.



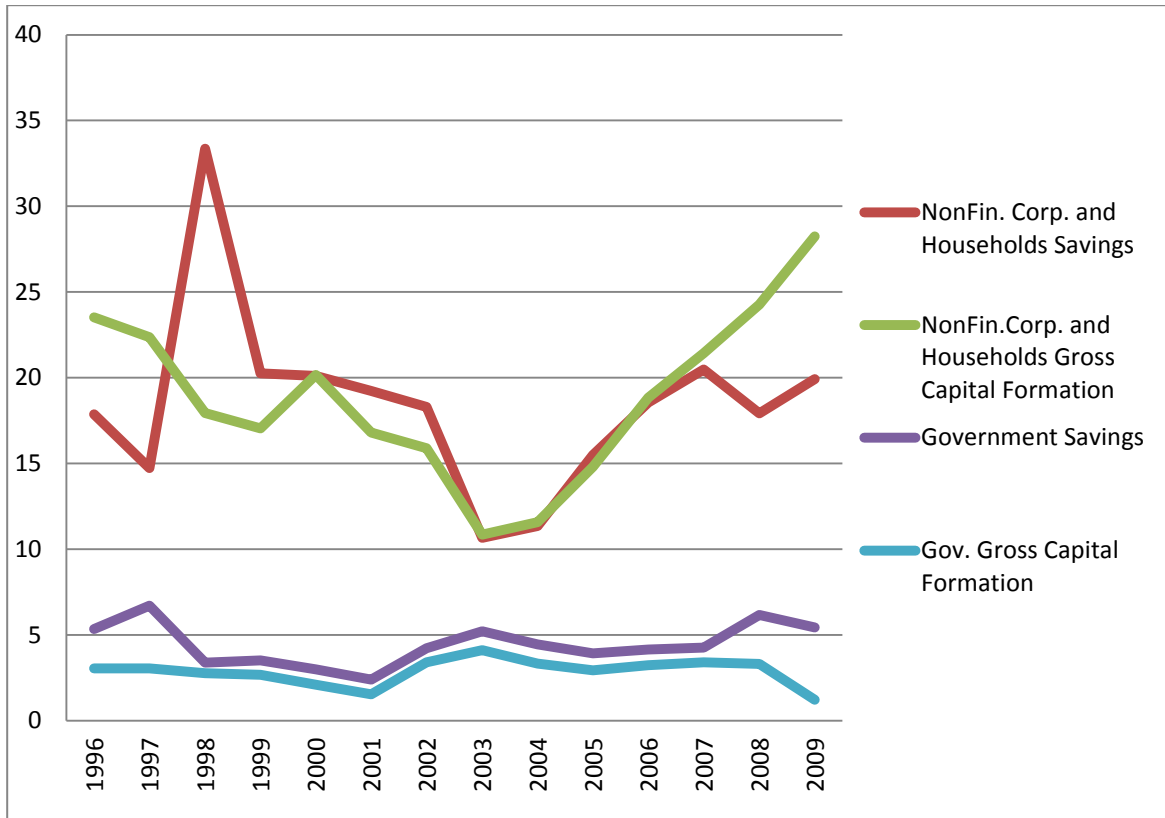
Source: Trading Economics Database

Figure 1.21: Domestic Gross Saving and Gross Capital Formation – Indonesia (in percent of GDP)



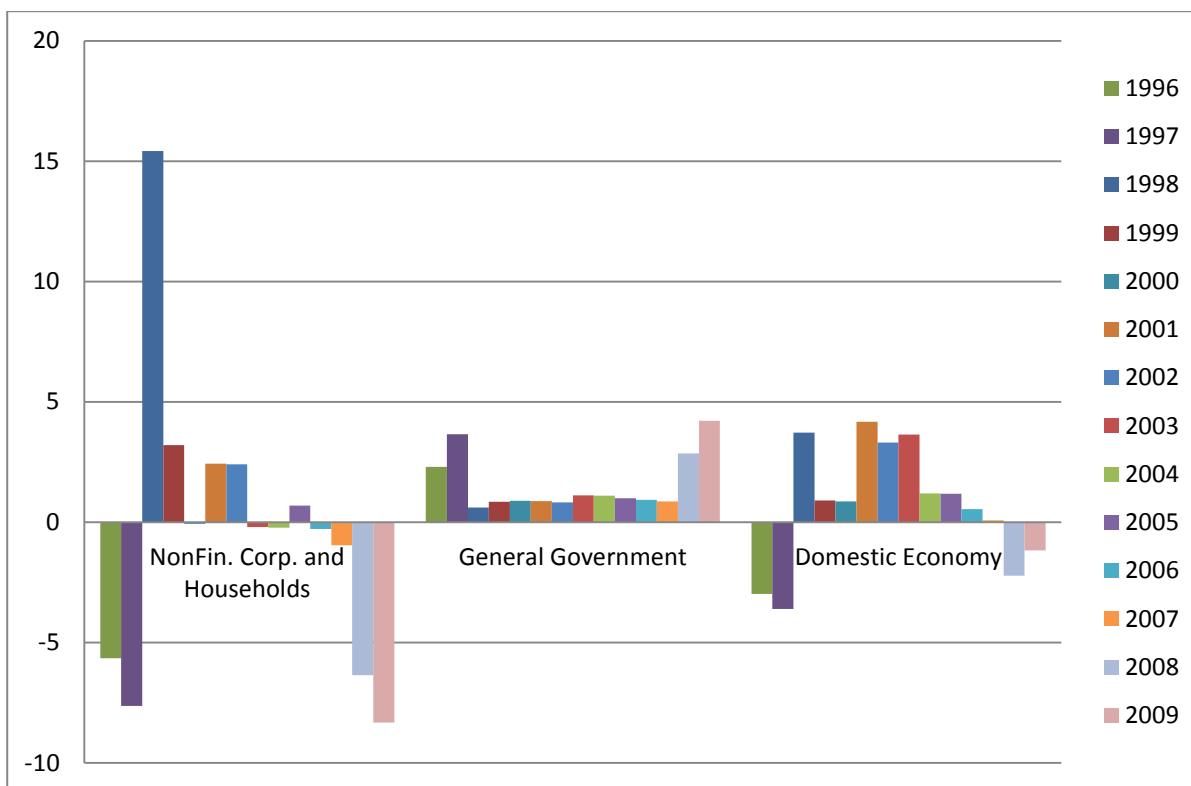
Source: Flow-of-Funds Accounts

Figure 1.22: Saving-Investment Balance - Indonesia (in percent of GDP)



Source: Flow-of-Funds Accounts

Figure 1.23: Saving vs Investment by Economic Sectors - Indonesia (Billions of Rupiahs)



Source: Flow-of-Funds Accounts

Figure 1.24: Excess Saving Pre and Post 97 AFC- Indonesia (in percent of GDP)

Although the interpretation of excess saving in the *domestic economy* depends on whether one includes the financial corporations and the rest of the world, ours in particular opted to exclude these economic players. When they were included in the aggregate, Thailand experienced positive excess saving from 1997 onwards, Philippines experienced it only for brief period of 1997 and Indonesia experienced it from 1997 onwards. By excluding the financial corporations and the rest of the world, Thailand experienced a domestic positive excess saving from 1998 to 2003, Philippines experienced a positive domestic excess saving from 2003 onwards and Indonesia experienced a positive domestic excess saving from 1998 to 2007. As for corporate sector, only Philippines showed a positive excess saving along with

a continuous increase in saving since 2000 to 2009 and a decline in real sector investment since 2003 to 2009. The results for Thailand and Indonesia corporate sectors were the same in which the positive excess saving appeared only from 1998 to 2002. Finally, we could intuitively conclude that the government policies (including financial liberalization, controlling interest rate, complying with IMF conditionality and etc.) influenced the decisions of corporate sectors to invest and to save either by complementing the behavior of firms (in the case of Philippines) or substituting it (in the case of Thailand and Indonesia).

5.2. *The Estimation Results:*

5.2.1. *Feldstein-Horioka Regression Result*

Next, we will validate our intuition from the graphical results by looking at the institutions' influence on corporate sector investment decision. Following the study by Feldstein-Horioka (1980) on 16 OCED countries over the average of 15 years for each country, when there is perfect capital mobility, we should observe low correlation between domestic saving and domestic investment. Corporate sector decision to invest domestically will not depend on the domestic financing since they have free access to international market at world rate and at the same time, domestic savers could lend their entire saving to foreign investors. As we have described earlier, we regressed the corporate sector gross investment on the institutional savings to identify the institution that have the highest influence on its investment decision. The results in Table 1.5 of Appendix 6 showed that all the institutional saving have significant positive impact on the corporate investment with the government saving has the most influence in all the three regression models. The R-square in each scenario is reasonably high – greater than 0.5. The greater sensitivity of gross corporate investment to government saving

indicates that fiscal policies and rigidities in the economy in terms of regulations, domestic borrowing constraint, capital control and etc. influence the corporate sector's decisions. The large coefficient indicates that corporation investment is greater in countries with higher government saving. In addition, this sensitivity results provides a basis in looking at policies that would stimulate investment by changing the form of institutional saving and in this case, it appears to be the government saving that has the highest impact on the corporate investment.

5.2.2. Determinants of Corporate Saving Regression Result

Our regression result in Table 1.5 shows that the corporate sector investment is most sensitive to the government saving and there is no perfect capital mobility among these developing countries which is shown from the coefficients that are statistically positive and different from 0. However, here, we are looking at the other side of the coin, that is the corporate sector saving which is the substitute of corporate sector investment.

In this section, we presented our estimation results obtained from the regression on Asean-3 using yearly data from 1995-2009. These results will be used to address the question on what drive the corporate sector saving behaviour within Asean-3 in addition to the fact that there is no perfect world capital mobility and the highest sensitivity to the government saving. We first run the standard unconditional OLS regression on various variables to see their statistical impact on the corporate sector saving decision.

In Table 1.6 of Appendix 7, we have the results of our unconditional regression on all the variables that we have specified earlier. However, our approach is to reduce this full – form

model into reduced – form model with the highest adjusted R-square and the most number of variables that are statistically significant and to our interest. The results of our OLS reduced-form model is in Table 1.7 of Appendix 9. In this model, the statistically significant variables are *stock market index (SMI)*, *current account balance (CAB)*, *urbanization (Urban)*, *age dependency ratio (Age)*, *government investment (GovInv)*, *financial liberalization index I (FLII)*, *banks' non -performing loans (BankNPL)*, *stocks traded, domestic credit to banks (DomCreditbyBanks)*, *market capitalization of listed companies (MarketCap)*, *equity index (EqIndex)*, *stocks turnover ratio (StockTurnOver)*, *firms' networth (FirmsNetworth)* and *banks' networth (BanksNetworth)*. The insignificant variables are *business confidence index (bci)*, *real interest rate (rint)* and *capital flight (CapFlight)*.

Although the reduced-form model yields the highest adjusted R-square and it satisfies some of the statistical properties such as cointegration, heteroskedasticity and F- test statistic, it suffers from negative autocorrelation – the Durbin Watson test statistic is 2.360685 and the plot of residuals against residuals of lagged-1 period (Graph 1.5 of Appendix 11) indicates the negative correlation which could make our results unuseful. As we have mentioned in our data and methodology, we will then correct this autocorrelation problem by running an AR(1) regression on our reduced-form model variables and the results are shown in Table 1.8 of Appendix 12. We chose lagged 1 period to avoid losing the degree of freedom and the richness of information from our model considering that we have only limited observations across three countries.

From our AR(1) results, it shows that capital flight and dummy 2 are the only variables that are statistically insignificant. Based on this result, we can categorized the variables in the reduced-form model into three categories for our analysis purposes.

-Variables that are related to the economic outlook in the future: stock market index, current account balance, government investment, financial liberalization index, stocks traded, business confidence index, market capitalization of listed companies, equity index, stocks turnover ratio, capital flight.

-Variables that are related to the domestic borrowing constraints: real interest rate, banks' non-performing loans, domestic credit by banks, firms' networth and banks' networth.

-Other type of variables such as demographic variables: urbanization and age dependency ratio.

The following provides the description on how these regressors affect the corporate saving/gdp:

1. Current Account Balance: The *current account balance* positive impact on the corporate saving implies that the increase in current account balance (reduce in current account deficit or lower foreign saving) by one percentage point will increase the corporate saving by 0.75857 percentage points. As argued in many existing literature, when the foreign saving increases, it will crowd out the corporate saving due to the competition for the saving instruments indicated by the coefficient that represents the degree of substitutability between foreign saving (current account deficit) and national private saving. Edwards (1997) have argued that when the coefficient value is less than 1, it will crowd out the private saving in

less than one to one manner – in our case, it is 0.75857 (Appendix 12). In addition, to relate this result to Feldstein-Horioka puzzle, we draw the conclusion from Blanchard and Giavazzi (2002) study on Greece and Portugal that high current account deficit could be the potential explanation for FH puzzle. Another supporter of this claim is in a study by Amornthum (2003) mentioning that current account solvency is one of the six possible explanations of FH puzzle.

2. Stock Market Index: An increase by one point of stock market index increases the predicted value of corporate saving by 0.00445 percentage points. Stock market index typically indicates the confidence and expectations of investors towards the prospects of economy. It is one of the good barometers in judging the investors anticipation of the future market direction and velocity. From the investors point of view, when the stock market index is high, this reflect the sentiment of less concern/fearful about the market and they anticipate low volatility in the economy. We find it interesting that despite the bullish sentiment of investors, the corporate saving is rising and intuitively, we think that although the firms are optimist about the economy, the domestic borrowing constraints made them rely on their own saving for future investment.

3. Urbanization: A one percentage point increase in the proportion of urban population to total population lead to an increase of corporate saving by 3.6256 percentage points. This is contrary to the finding of negative coefficients in the existing literattues that would be along the argument of precautionary saving objectives; the urban residents have more options to diversify the uncertainty in their income and hence will save less. The rural residents, however, lack the means to diversify their income uncertainty and that would lead them to

save a large portion of their income (Loaza et. al. 1997). This new finding of positive coefficient is consistent with the new finding of Ramajo et al. (2007) in which they claim that perhaps due to a widespread income support program in the agricultural sector have lessen the precautionary motive for saving in the rural area. Another reason for high corporate saving in the urban area could potentially be that the higher proportion of urban population would mean more congestive and other welfare problems that lead firms to save more and if the firm employs more employees, then the requirement to provide the employees' benefits, pensions, medical support, insurance and etc. could lead the firms to save more.

4. Age Dependency Ratio: The next variable that is significant is the age dependency ratio. When there is a one percentage point increase in the proportion of population aged <15 years old and >65 years old relative to total population, there will be a decline of 0.706093 percentage points in the corporate saving. The coefficient estimate is significantly negative which is consistent with the life-cycle consumption – an increase in the age dependency ratio means lower proportion of people in the working age group and less for firms to support these working people employees' benefits, medical expenses, insurance coverage and etc.

5. Government Investment: An increase by one percentage point in the government investment would decrease the firms saving by 1.61086 percentage points. This means that the increase in government investment would increase the firms investment and the firms saving would drop by more than one-to-one relation, Our result on FH regression earlier indicates that an increase in the government saving will increase the corporate sector saving by about 2%, implying the complementarity relationship between the government investment/saving and the corporate saving/investment. The crowding-in effect of

government investment could happen in these developing countries considering that their economy resources are under-employed.

6. Financial Liberalization Index (FLII): The next variable that is positively significant is the *financial liberalization index 1* (FLI1). The positive sign indicates that the more liberalized the financial market in these countries are, the higher is the corporate saving. This is contrary to the finding of Bandiera et.al(2000) in which he had found a negative significant relation between FLI and Indonesia private saving using the data from 1975 to 1994. Earlier, we have shown graphically that the corporate sector saving has increased post 1997 AFC and despite the reform in the financial governance and the liberalization of financial markets in these countries, it still fail to induce higher corporate investment. It is in our opinion that although there is a significant financial development both at the institutional level and the innovation of financial instruments such as mutual funds, hedge funds, options, futures and etc. within these countries post-1997 AFC, the rigidity and the constraints imposed by the financial lenders a.k.a. the banks made it harder for these firms to borrow from the banks and hence they have to rely upon their own saving for any future investment.

7. Domestic Credit by Banks: The result indicates that an increase by one percentage point in the domestic credit by banks would lead to a decline by 0.3361 percentage points in the corporate saving. Since domestic credit by banks reflect the monetary policy within a country, a declined implies that if the firms have easy access to the banks due to loose monetary regulations, they will less likely save. Furthermore, this is related to the earlier explanation that despite a significant financial liberalization (FLI1) in these countries, the firms still opt to

save more due to domestic borrowing constraints and here we have shown that an easy access to the banks would reduce their saving level.

8. Business Confidence Index (BCI): The coefficient value of -0.04725 indicates that when business confidence index increases by one point, the corporate saving will decline by 0.04725 percentage points. When the firms have bullish view on the future prospects of the economy, they will reduce their saving level. As mentioned earlier, the BCI is the survey data of the firms themselves on the future economic conditions and the prospects of their firms in the economy.

9. Market Capitalization of Listed Companies: An increase by one percentage point in the value of the firms' shares lead to a declined by 0.1651 percentage points in the corporate saving. The market capitalization reflects the financial depth in the economy and when the value of corporate shares rises, they will more likely save less and raise capital via external financing where their shares value will be higher.

10. Stocks Traded: When the stocks traded increases by one percentage point relative to the GDP, the corporate saving increases by 0.2688 percentage points. Unlike the market capitalization that shows the value of corporation shares, high trading volumes mean that the stock can be traded easily, has high liquidity and narrow spread, more competitive and less volatile. The price of the security is more expensive when the trading volume is high because people are willing to buy it. In our result, it seems that the higher trading volume does not deter the corporate saving behaviour, similar to the effect of stock market index but contrary to the effect of market capitalization of listed companies. It is possible that the corporate sectors are less likely to issue shares/equity as this would increase the ownership in their firms

and hence trading volume or stock market index would not make them save less. Instead, if the value of their existing shares increase, indicated by the market capitalization of listed companies, then they would save less to raise their capital via external financing.

11. Stocks Turnover Ratio: A one percentage point increase in the stock turnover ratio will decrease the corporate saving by 0.3361 percentage points. Stocks turnover ratio is a measure of stock market liquidity and the higher the turnover ratio, the more liquid is the secondary market. We have defined it as the extent of total value of stocks traded in the secondary market relative to the total value of outstanding stocks. When the firms' traded stocks value increases relative to its outstanding value, the investors will perceive it as efficiency in the firms stocks management and would lead the firms to reduce its saving and raise capital via the secondary market. It is noteworthy that the volume of the stocks traded alone does not deter the corporate saving but when the value of these volume rises, then the firms would reduce its corporate saving and most likely tap the market.

12. Equity Index: A one percentage point increase in the annual percentage change of S&P Global Equity Indices will cause a decline in the predicted value of corporate saving by 0.01801 percentage points. Unlike the stock market index above that causes an increase in corporate saving, the equity index on the other hand causes a decline. The stock market index refers to the national index of a given nation's stock market performance and usually composed of the stocks of large companies listed on a nation's largest stock exchanges like Jakarta Stock Exchange, Philippines Stock Exchange and Stock Exchange of Thailand. The S&P global equity indices is the annual US dollar price change in the stock markets covered by the S&P/IFCI and S& P/Frontier BMI Country indices. The S&P/IFCI and S&P/Frontier

BMI Country will monitor and evaluate a nation's stock market before it can be included in the S&P Global Equity Index series. For example, one of the requirements for S&P/IFCI is that a country must represent at least 40 bp of the total market weight of the combined S&P/IFCI countries and if the country drops below 40bp over long periods of time, then S&P will remove it. Furthermore, the country's classification will be based on economic and political conditions, relative market size, market capitalization and etc. It is in our opinion that since the equity index takes into account many factors, including total market value before listing the country's index, this gives an opportunity for firms to raise capital via equity market instead of using their own internal financing. The stock market index does not deter the corporate saving behavior but equity index that reflects many criteria including market value of listed companies will deter corporate saving behaviour.

13. Real Interest Rate: A one percentage point increase in the real interest rate lead to a decline of about 0.12 percentage points in the corporate saving. The negative coefficient of real interest rate on corporate saving is consistent with Loayza, Schmidt – Hebbel and Serven (2000) and Edwards (1995). Furthermore, a lot of empirical study on private saving in developed and developing countries have shown low interest rate elasticity of domestic aggregate saving including Boskin (1978) and Giovannini (1983). Existing literatures would argue that the income effect outweighs the sum of the substitution effect and the wealth effect. Under income effect, when the interest rate is lower, the price of future consumption is lower than the price of current consumption and if the firms perceive that they will be obtaining lower income in the future, they will decrease the current consumption and increase their corporate saving. In other words, despite the low interest rate, the firms are still saving

because they perceive the low income they will be getting in the future could affect their obligation in meeting up their operational expenses, hence leading to higher saving.

14. Banks' Non-Performing Loans: The result is intuitively clear that when the banks non-performing loans increase, the corporate sector will save more since the banks are less likely to extend out any credits. This was obvious during the 1997-AFC in which the banks were left with many non-performing loans that led to a credit crunch in the economy.

15. Firms' Net Worth: Our results indicate that when the firms' net worth increases by one percentage point, the corporate saving will increase by 0.1342 percentage points. We find it quite strange that when the firms' net worth rises, the corporations tend to save more which reflects what is happening around the world now, that although the firms' balance sheet looks good, the firms still choose to save rather than to invest . This intuitively suggests that firms might be saving either because of domestic borrowing constraints from the financial institutions in their countries or the uncertainty about the future prospects. It is noteworthy that currently the economic situation in Asean-3 is not similar to the economic environment in the US in which despite the negative real interest rate and the willingness of the banks to extend their credit, the firms in the US prefer to hoard their cash than to invest. In Asean-3, the real interest rate have been relatively stable except for a huge plunge in 1997 (Graph 1.2, Appendix 3). Hence, it is not obvious whether the firms' decision to save despite the increase in their net worth is attributed to the domestic borrowing constraints or the uncertainty about the future.

16. Banks' Net Worth: When the banks' net worth increases by one percentage point, the corporate saving will decline by 0.3395 percentage points. The negative coefficient of banks'

net worth and domestic credit by banks strongly support that an easy access to domestic borrowing would reduce the firms likelihood to save. Furthermore, since the variables firms' net worth and stock market index do not reduce the corporate saving, it is possible that what matter to the firms is available credit from financial intermediaries.

17. *Capital Flight*: Another variable that is used as a proxy to macroeconomic uncertainty is *capital flight/gdp*. It is positive although insignificant in our model. The positive coefficient indicates that when there is an increase in the capital flight from a country, the corporate saving will also increase due to precautionary motives although it is not in one to one fashion – the coefficient value is 0.04821 (Table 1.8, Appendix 12).

Our regression results have shown the variables that statistically influence the corporate sector behavior to save rather than to invest, but we can't conclude the main reason for such behavior. To summarize, some of these variables represent the uncertainty about the future, the domestic borrowing constraints, the firms' performance and the demographic landscapes – but which of this category is the main driver of corporate saving. In Table 1.9 of Appendix 15, we have listed the expected and the actual sign of the AR(1) model regression coefficients in order to provide intuitively the main category for firms to save. The variables stock market index, firms' net worth and urbanization ratio deviate from our expectation. As explained earlier, we have expected that when investors have positive sentiment of the future economic condition as reflected by the stock market index, the corporate sector will save less, but this wasn't the case which in a way, give more weight to the domestic borrowing constraints relative to the future uncertainty. Similarly, we expect that when the firms' net worth increases, which means that the firms are performing well, they will save less but instead the

result show that they will save even more –intuitively, again giving more weight to the domestic borrowing constraints relative to the future uncertainty.

As we have mentioned earlier, there are four main categories of variables in our AR(1) model listed in Table 1.10 of Appendix 16. We assume that the variables that are related to the economic uncertainty as representing the independent shocks in the economy. Our next step is to compare the adjusted R-square from dropping off each of these variables from our reduced form model. The purpose is to see the impact of the excluded variable on the linear combinations of the remaining variables in explaining the total variation of corporate saving. Take note that adjusted R-square is the square of correlation coefficient between the actual data and the predicted values and it measures how well does the regression line fits the actual data points. This we hope could intuitively gives us an idea of which category of the variables that is the main driver of corporate saving. The result in Table 1. 11 of Appendix 17 shows that the top five excluded variables that cause the highest reduction in adjusted R-square (by 17% decline for FLI1) come from the demographic category and the future economic uncertainty. Although this was not what we were expecting, the results show that the exclusion of FLI for example, would have the highest effect on the linear combination of other regressors in predicting the values of corporate saving. Finally, we will use a formal empirical approach of VAR to address our question on the main category of variables that drive corporate saving. The VAR is ordering-dependent and our initial shock will be from the economic uncertainty variables. As mentioned earlier, we can check the robustness of this ordering by reorder them or to use generalized impulse (where ordering is not a matter) instead of Cholesky Decomposition. We run several VAR(1) of different orders to determine the category of variables that highly influence the corporate saving.

Government Investment -> Real Interest Rate -> Banks' Non-Performing Loans -> Banks' Net Worth -> Domestic Credit by Banks -> Firms' Net Worth -> Corporate Saving (1)

Stock Market Index ->Business Confidence Index-> Real Interest Rate -> Banks' Non-Performing Loans -> Banks' Net Worth -> Domestic Credit by Banks -> Firms' Net Worth -> Corporate Saving (2)

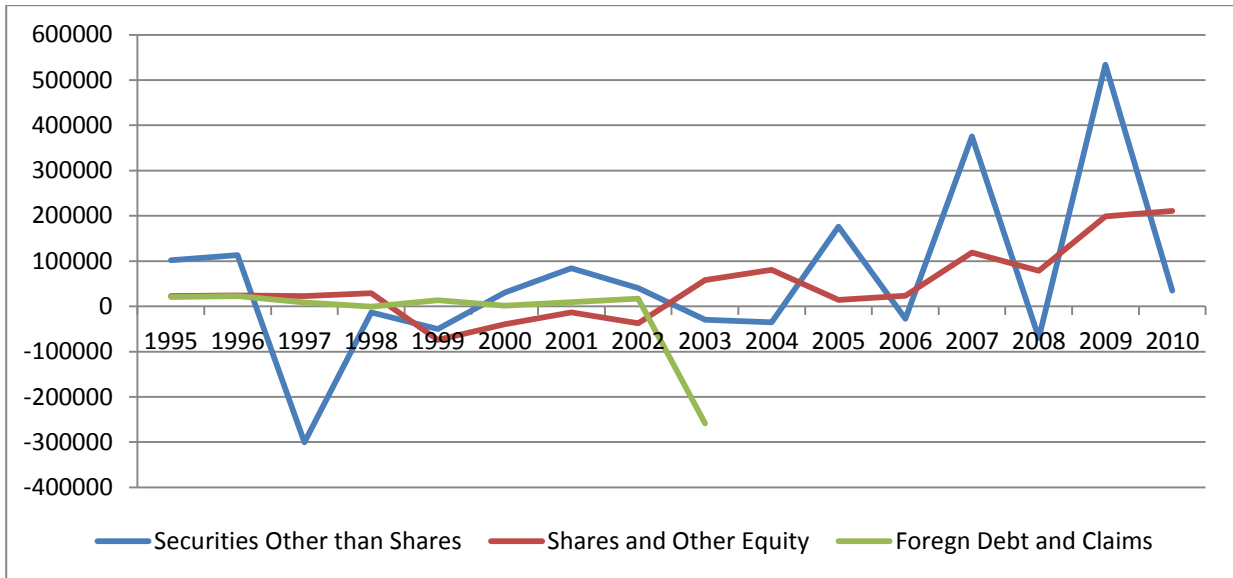
Financial Liberalization Index ->Current Account Balance -> Real Interest Rate -> Banks Non-Performing Loans -> Banks' Net Worth -> Domestic Credit by Banks -> Firms' Net Worth -> Corporate Saving (3)

For equation (1), the results in Graph 1.9 of Appendix 18 shows that when the government investment increases, the real interest rate will increase, the banks' non performing loans decreases, the banks' net worth will increase, the domestic credit by banks will increase leading to firms' net worth decreases and the corporate saving decreases as well. In Appendix 19, we show the variance decomposition of corporate saving and it is apparent that the highest variation comes from domestic credit by banks, followed by real interest rate and banks' non-performing loans, the variables in the category of domestic borrowing constraints. In this result, we find it quite strange that when the real interest rate increases, the banks' non-performing loans decreases. In our opinion, this could be due to the initial shocks of government investment that increases the firms investment and lead to lower banks' non-performing loans. For equation (2), the results in our Appendix 20 shows the impulse response from the transmission of shock that is initiated by the stock market index and the business confidence index. The variance decomposition in Appendix 21 shows that for the first two period, the highest variation in corporate saving is due to real interest rate but in the

long run, about 30% of the variation comes from both real interest rate and domestic credit by banks. Banks' non-performing loans and business confidence index contribute about 10% of the corporate saving variance. Overall, we can conclude that the domestic borrowing constraint variables explain higher variation in the corporate saving relative to variables in other categories. In Appendix 22, we can see the impulse response that is initiated by an increase in the financial liberalization index causing a decline in the current account balance (more foreign saving) followed by an increase in the real interest rate, a decline in the banks' non-performing loans, an increase in banks' net worth, an increase in the domestic credit by banks that would reduce the firms' net worth and their corporate saving. However, unlike the previous two variance decomposition, the effect of current account balance is the highest on corporate saving variation relation to real interest rate, banks' non-performing loans and domestic credit by banks. In conclusion, although we strongly believe that domestic borrowing constraint is the main category that drives the corporate saving, we don't have solid evidence to support this claim. The variance decompositions from the government investment shock and the stock market index shock clearly show that the highest percentage of variation in corporate saving comes from real interest rate and domestic credit by banks but the shock to financial liberalization index cause the variation to be highest from current account balance.

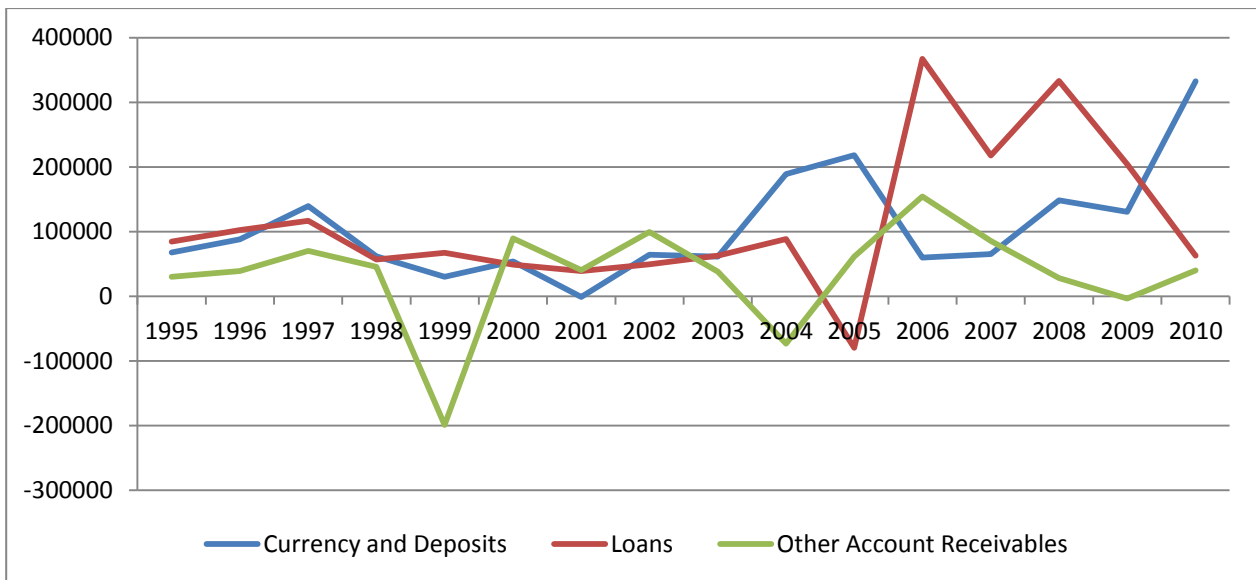
5.3. The Evidence of an Increase in Financial Market Investment Post-97 AFC by Corporate Sector?

In Figure 1.25, we have plotted three different categories of financial market instruments (securities other than shares, shares and other equity, foreign debt and claims) that non-financial corporations have invested while in Figure 1.26, we have their investment in non-financial market instruments (currency and deposits, loans, other account receivables). For the non-financial corporations in Thailand, there was a large withdrawal/liquidation of securities other than shares in 1997 (Figure 1.25) and other account receivables in 1999 and 2004 (Figure 1.26). Securities other than shares comprised of commercial bills, debentures, debt securities and public authority securities. During the period of 1998 to 2003, when the corporate sector was experiencing positive excess saving, the only instrument holding that had rebounded from a huge plunge in 1997 was securities other than shares while other assets including shares and other equities, loans and currency and deposits remain below the level it was prior to 1997. Hence, this supported our hypothesis that the non-financial corporations channeled their excess saving to financial market specifically in the holding of securities other than shares. After 2003, we can see that the holding of shares and other equity is not as demanding as loans, currency and deposits, and securities other than shares, which support our earlier finding that the corporations are less likely to raise capital via stock market. In addition to looking at the behavior of non-financial corporations, we also found that there was a decline in the loan/credit issuance by financial corporations from 1998 to 2003 during which the corporations were experiencing positive excess saving (Figure 1.27), supporting the claim that the investment in productivity sectors were declining and the investment in securities other than shares were rising (Figure 1.25).



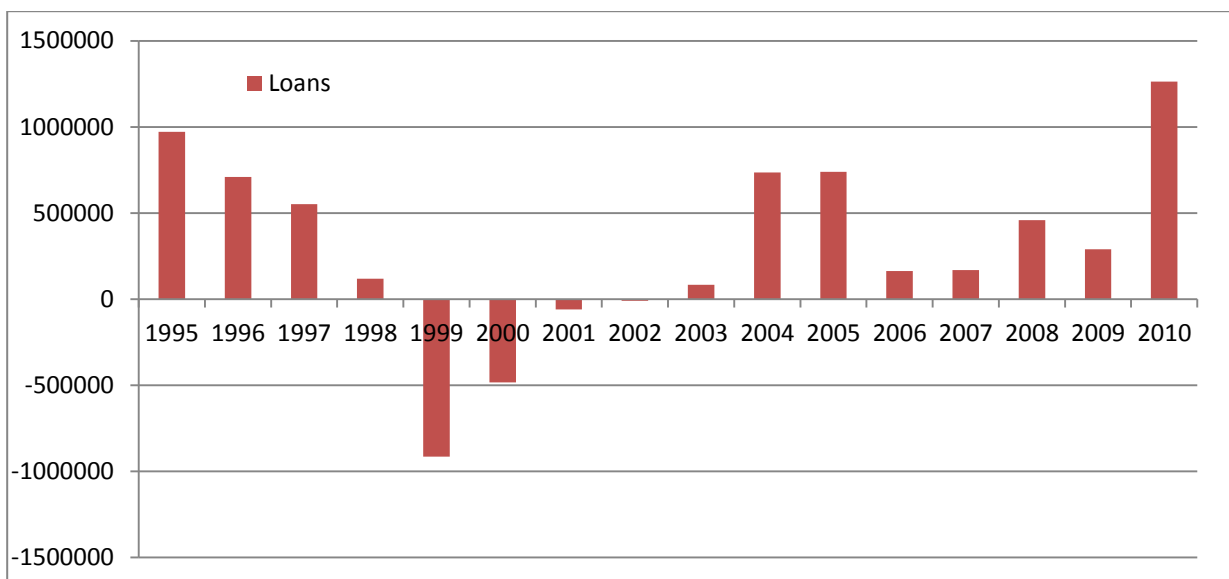
Source: Flow-of-Funds Accounts

Figure 1.25: Non-Financial Corporations Used of Financial Instruments - Thailand (Millions of Bath)



Source: Flow-of-Funds Accounts

Figure 1.26: Non-Financial Corporations Used of Non-Financial Instruments - Thailand (Millions of Bath)

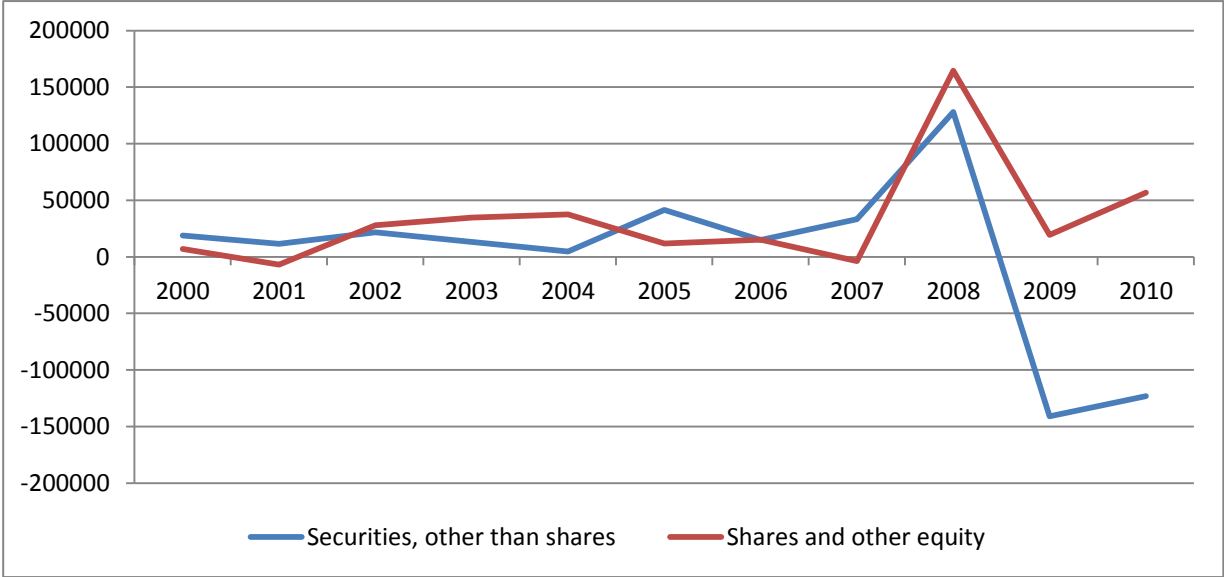


Source: Flow-of-Funds Accounts

**Figure 1.27: Financial Corporations Issuance of Loans - Thailand
(Millions of Bath)**

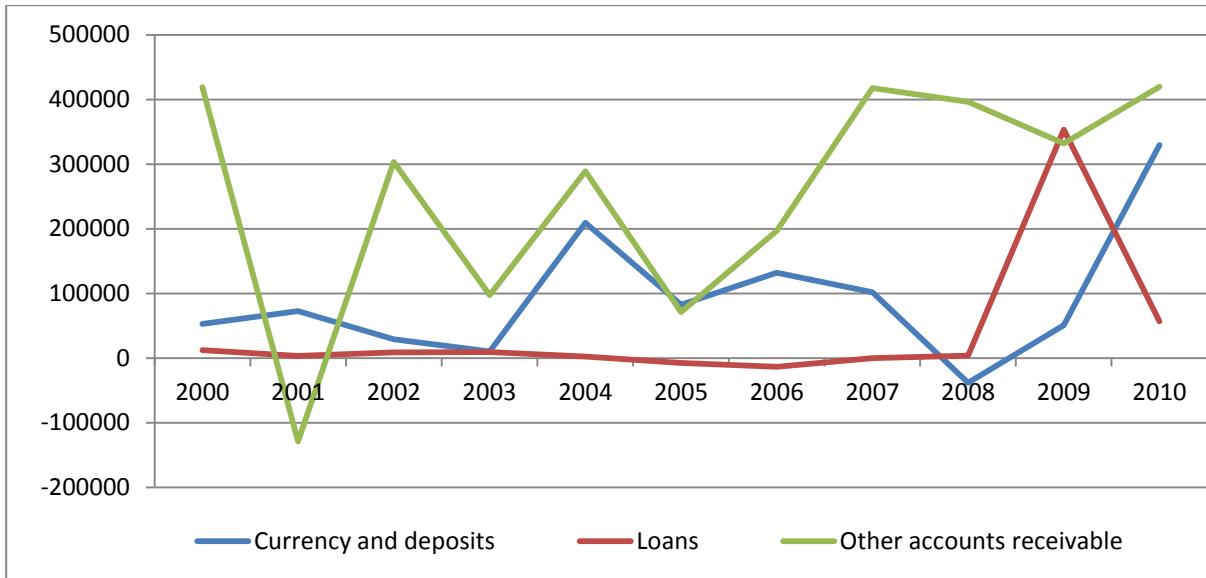
In the case of Philippines, the non-financial corporations experienced positive excess saving from year 2004 onwards. From Figure 1.29, we can conclude that these extra saving were used mainly in the holding of account receivables/payables such as trade credit and securities other than shares (Figure 1.28). Other categories of instruments exhibited declining trends post-2004 with biggest drop in 2007/2008 during the GFC before they started to increase again. The loan/credit extended by the financial corporations in Figure 1.30 showed an increasing trend during this positive excess saving period. In our opinion, it was interesting to see that despite the positive excess saving, the issuances of loans/credits were also increasing. The financial liberalization of financial market in Philippines could potentially have opened up a lot of business opportunities that lead them to buy trade credit as the source of their external financing. Although it was quite clear that financial corporations did not exhibit borrowing constraints (Figure 1.29), the corporate sector still choose to save their cash for

their trade investment and if they are the trade creditor, the delayed payment due to trade credit lead them to hold their cash balances for longer period.



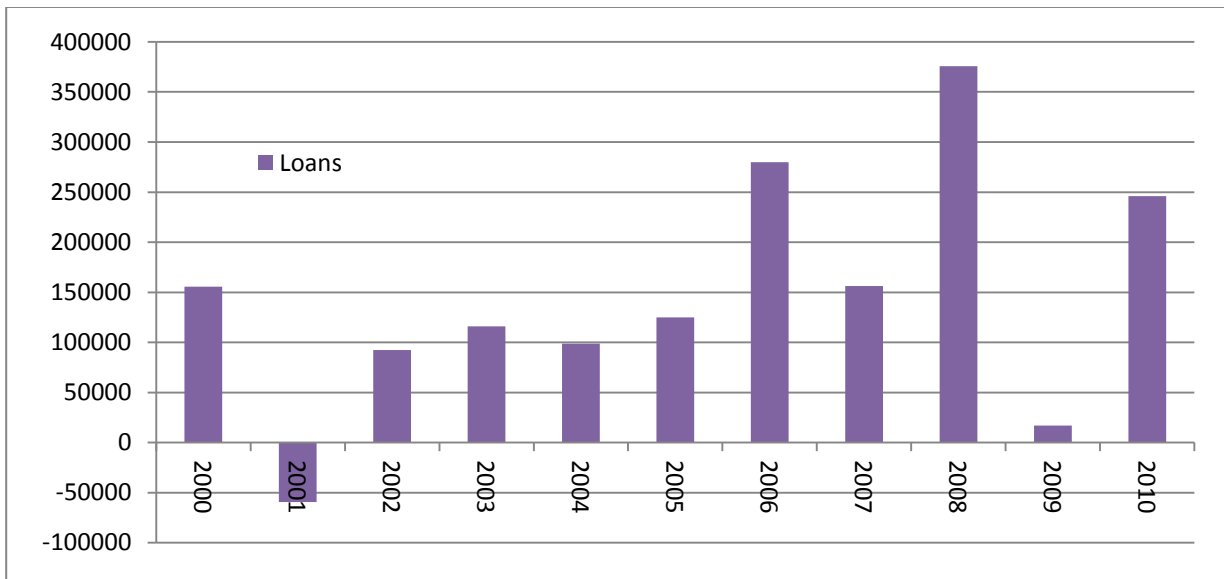
Source: Flow-of-Funds Accounts

Figure 1.28: Non-Financial Corporations Used of Financial Instruments - Philippines (Millions of Pesos)



Source: Flow-of-Funds Accounts

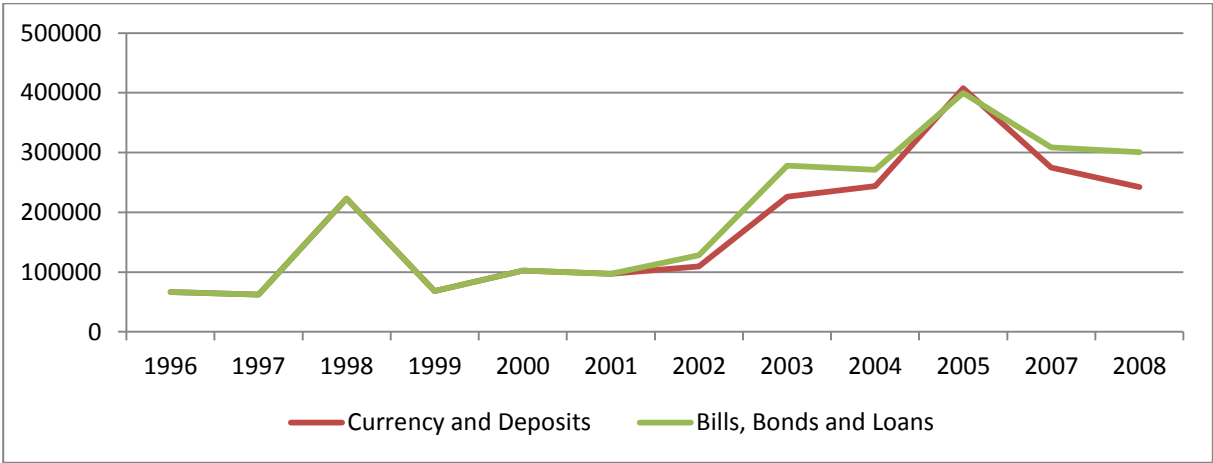
Figure 1.29: Non-Financial Corporations Used of Non-Financial Instruments – Philippines (Millions of Pesos)



Source: Flow-of-Funds Accounts

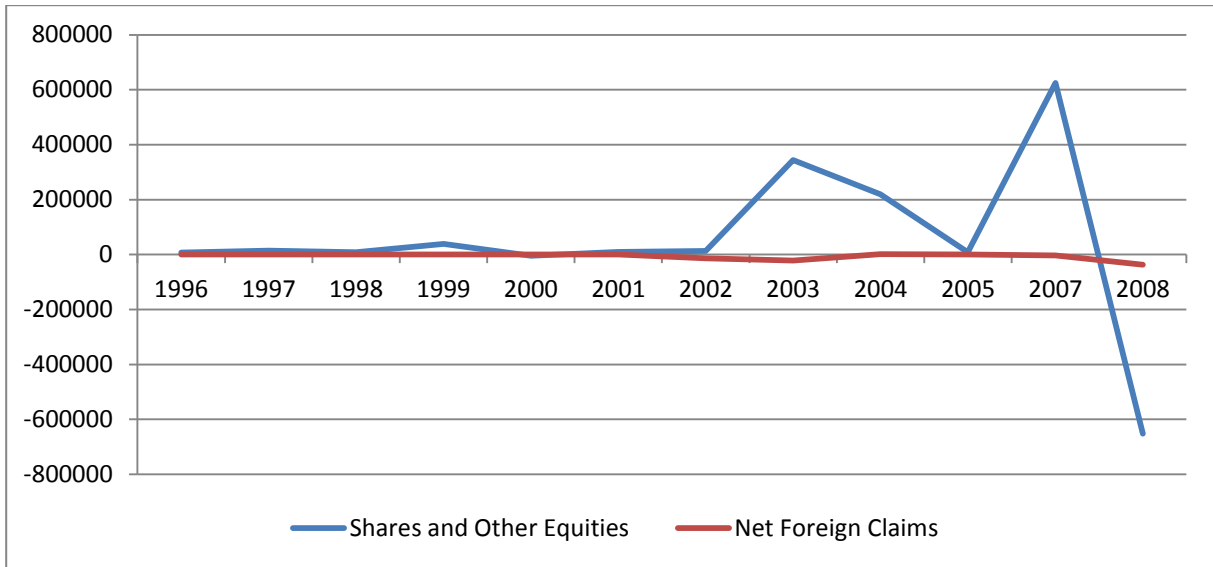
Figure 1.30: Financial Corporations Issuance of Loans - Philippines (Millions of Pesos)

Indonesia experienced positive excess saving from 1998 to 2003. In Figure 1.31 and 1.32, we can see that there was a gradual rise in the holding of currency and deposits and bills, bonds and loans. The holding of financial instrument such as shares and other equities showed an increase only in 2002 to 2003. In Figure 1.33, we can see that the issuance of loans by financial corporations were declining during the corresponding period, indicating that the rise in the bills, bonds and loans was more likely on the holding of bills and bonds. During the 1997 AFC, there was a large capital outflows from these countries and since the Indonesia government needs to finance their budget deficits and recapitalized the banking system, they raised capital by issuing the government bonds and bills that the non-financial corporations and households had to hold. Furthermore, after the AFC, there was a high priority on the development of Asia bond market which could attribute to the gradual rise in the holding of these instruments.



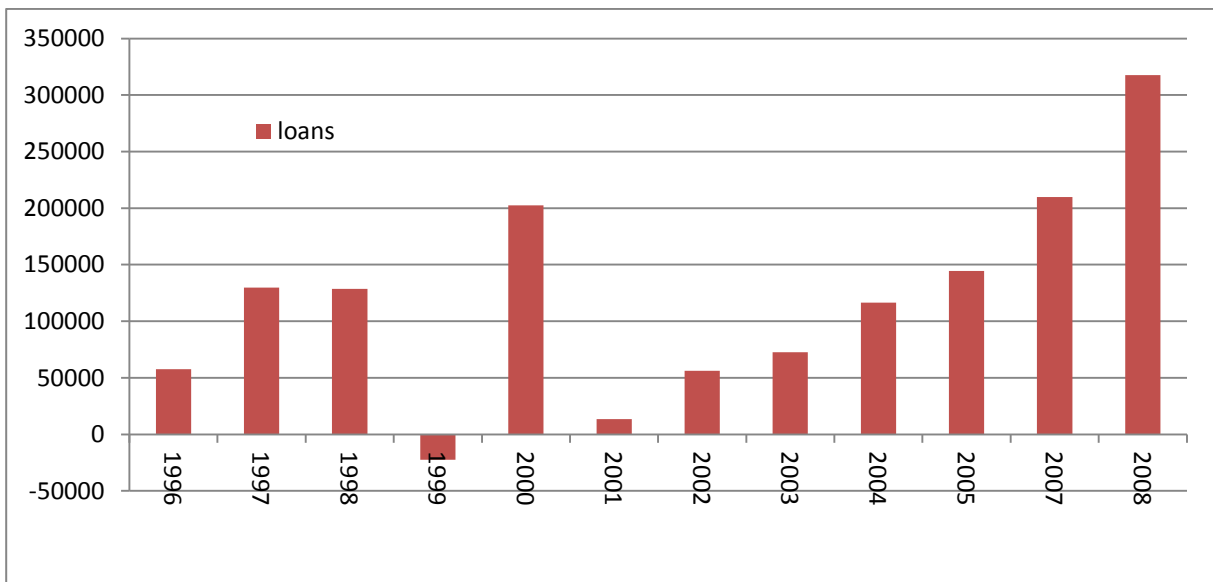
Source: Flow-of-Funds Accounts

Figure 1.31: Non-Financial Corporations and Households Used of Financial Instruments – Indonesia (Billions of Rupiahs)



Source: Flow-of-Funds Accounts

Figure 1.32: Non-Financial Corporations and Households Used of Non-Financial Instruments – Indonesia (Billions of Rupiahs)



Source: Flow-of-Funds Accounts

Figure 1.33: Financial Corporations Issuance of Loans - Indonesia (Billions of Rupiahs)

6. Conclusion

6.1. Concluding Remarks:

We started this paper at the beginning with fivefold. Firstly, we described the current issue of the rise in corporations hoarding behavior that was at the center stage of debate among economists as our source of motivation to investigate the saving of corporate sector. Most empirical studies on private saving aggregated both the household and the corporate savings, but in this study, we focused solely on corporate/non-financial corporations saving. The discrepancy of the claim on the duration of corporate positive excess saving or commonly known as corporation savings glut among the economists arises depending on how one defines corporate saving. In our case, we used the data from the flow-of-funds and defined excess saving to be the difference between gross saving and gross capital formation. Secondly, we examined graphically the claim on excess saving existence in Asean-3 especially in the aftermath of 1997 AFC. It was interesting to note from the graphical evidence that the hoarding behavior of the firms lasted even after the recovery period and this prompted us to look at the sensitivity of their saving - investment behavior. In Thailand and Indonesia, the corporate positive excess saving was from 1998 to 2003 while in Philippines, it was from 2004 to 2009. Thirdly, we relate this results to the larger body of research initiated by Feldstein-Horioka (FH) puzzle and found that the corporate investment decision was very positively significant to the government saving. It was also positively significant to the corporate saving and the household saving but in terms of the value of estimated coefficients, the government saving was the main determinant factor. This intuitively telling us that perhaps government policies are the main driver of corporate saving in addition to the claim that current account balance is one of the answers to FH puzzle. Although Feldstein-Horioka

puzzle stemmed from the research on OECD countries and it was concluded that there was no perfect capital mobility, we extended this methodology to developing countries in Asia and as expected, FH puzzle held. We agree that despite the financial globalisation and financial liberalization that take place much after the 1997 AFC, the regression result still shows that there is no perfect capital mobility. In our opinion, this is because along with the liberalization of financial market and financial governance come stricter and more prudent regulations imposed on the economic sectors in these countries in addition to the fact that their financial system is not fully liberalized or being liberalized in stages. Forthly, we investigate empirically the determinant of corporate saving using not only the standard macroeconomic variables but also the firms and banks' specific factors such as business confidence index, firms' net worth, banks' net worth, banks' non-performing loans and etc. We employed AR(1) approach that will correct for autocorrelation and our results have shown that stock market index, current account balance, urbanization, age dependency ratio, government investment, financial liberalization index, banks' non-performing loans, stocks traded, business confidence index, domestic credit by banks, market capitalization, equity index, stocks turnover ratio, firms' net worth, banks' net worth and real interest rate are the significant variables while capital flight is the only insignificant variable. We categorized these variables from our reduced-form model into three categories: future economic uncertainty, domestic borrowing constraint and others such as demographic category in order to determine the main category that influences the corporate saving. Our intuitive approach is to first exclude one variable at a time and compare across adjusted R-square. Our empirical approach is to use impulse response and variance decomposition which indicate that the dominant category depends on the initial shock of the variable that we have used. For

instance, the shocks transmitted from government investment, stock market index and business confidence index show that the highest percentage of variation in corporate saving comes from domestic credit by banks and real interest rate while the shock that was initiated from financial liberalization index and current account balance resulting in highest variation that comes from current account balance itself. Hence, we conclude, that there are no conclusive category that have highest weight on corporate saving since the main driver of corporate saving depends on the source of the shocks. Furthermore, since our economy itself is a complex mechanism in which there is no single factor that is independent/exogeneous without being affected by other variables or is affecting other variables, and the web of economic integration itself is entangled with more complexity due to financial globalization and liberalization, it is impossible to rule out single dominant category that drives saving glut around the world, and in our case Asean-3. However, our finding on the possible determinant variables that could influence the corporate saving will provide an avenue for policy-makers to adjust these variables in their effort to balance the saving investment in the economy. Based on our empirical results, we can say that the main variable that drives the saving-investment behavior of corporation is the current account balance, reflecting the importance of export-import sector within a country. In addition, we have also shown the economic players' behaviour ranging from households, non-financial corporations and government sectors decisions to save and to invest that will give an insight to the government and monetary authority to target the right economic player in order to achieve their economic goal. Finally, we investigate graphically whether corporate sector investment in the financial market has increased post-1997 AFC. In the case of Thailand that experienced positive excess saving from 1997/1998 to 2003, there was an increase in corporations holding of securities

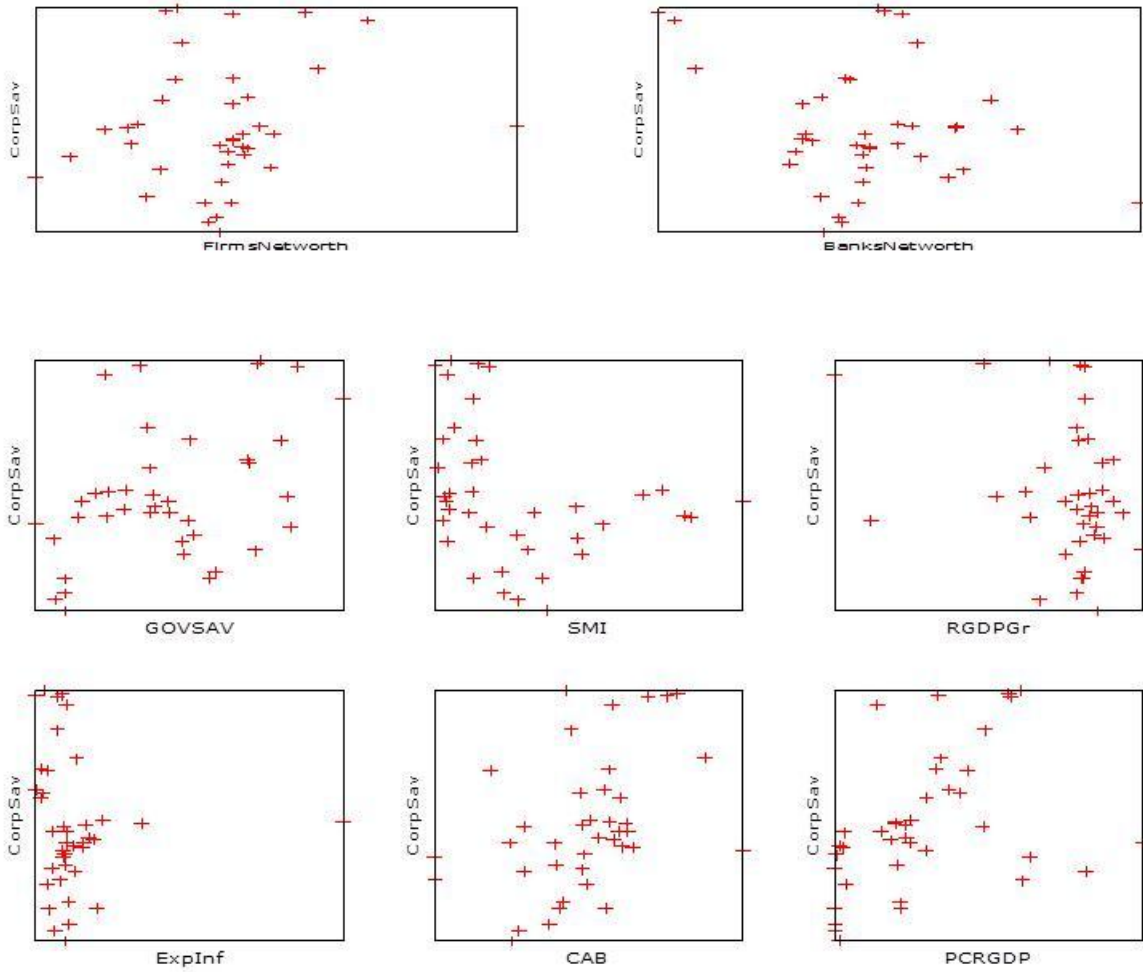
other than shares and the issuance of loans by financial corporation were declining during these same period. Similarly, in the case of Indonesia, the period of positive excess saving (1998 to 2003) showed a significant increased in the holding of bills and bonds and the issuance of loans by financial corporations were declining. These trends of declining in the issuance of loans by financial corporations and the increase of investment in financial market instruments during the period of positive excess saving (or recovery period from 1997 AFC) in our results could be viewed as the combination of Blinder and Stiglitz (1983) theoretical work on broad credit channel and the expansion of alternative financial investment. In their work, it is arguably that the ability of firms to borrow depends on its balance sheet in particular when its net worth is low. Otherwise, at all times, the condition of the balance sheet would be in least consideration for firms to seek funding for its investment. However, in the case of Philippines that was experiencing positive excess saving from 2004 and onwards, bulk of the corporations' assets were in terms of account receivables/payables (trade credit) although there was a gradual increase in the holding of securities other than shares. The financial corporations issuance of loans were increasing during these corresponding period and most of it were used by corporations as trade credit. This again supports the classical case of Blinder and Stiglitz (1983) broad credit channel argument that the condition of a firm's balance sheet would affect its ability to borrow, especially when its net worth is low. Philippines experienced positive excess saving from 2004 onwards and was not hard-hitted by the 1997 AFC as Thailand and Indonesia. Hence, it is sufficient to conclude that its firms were not suffering from low net worth that would otherwise deter the extension of loans by financial corporations.

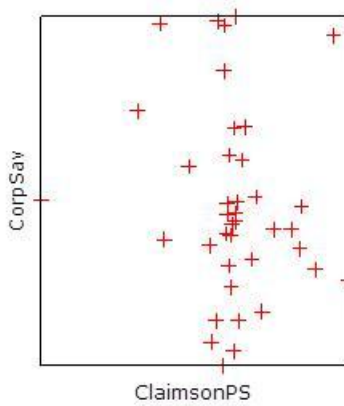
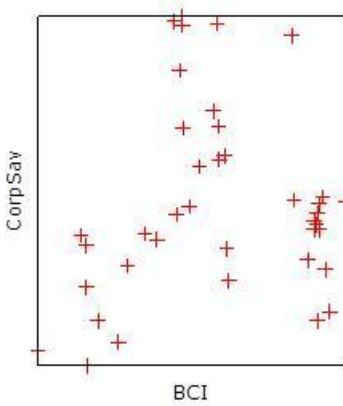
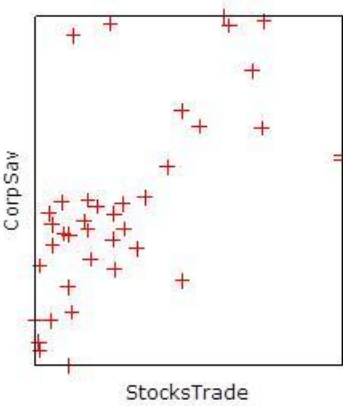
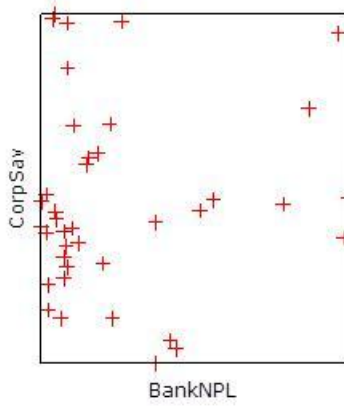
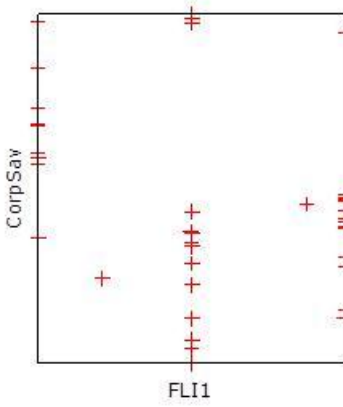
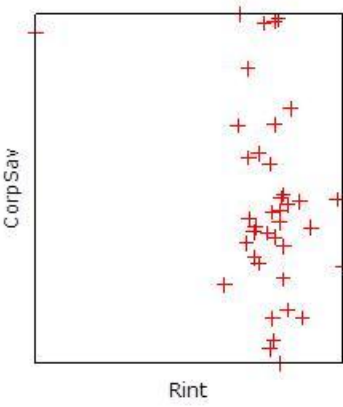
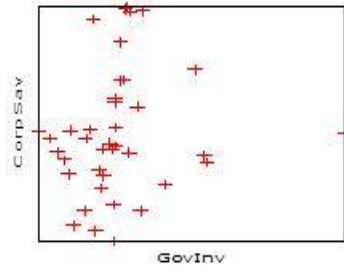
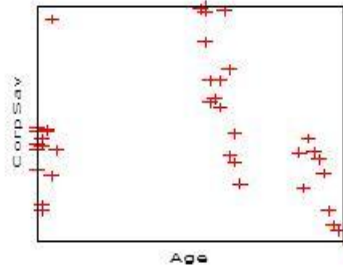
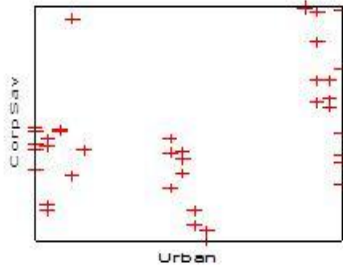
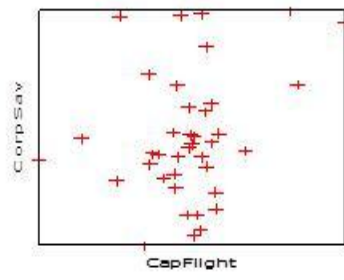
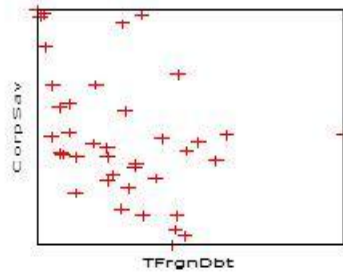
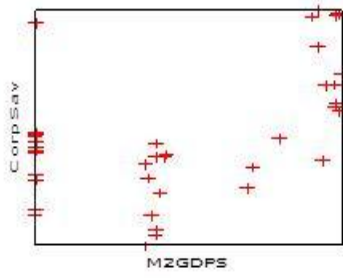
Our paper is unique in the sense that we incorporate new variables to our regression analysis that deviate from the traditional approach of focusing solely on macroeconomic variables. Furthermore, the source of data that comes from flow-of-funds provides a clear insight into the economic landscapes of these countries including the economic players' behaviour to invest or to save in addition to how they use their funds and the source of these funds that they choose from. However, further research using larger data source from flow-of-funds could be conducted to validate our claim and the mixed results for the dominant category of corporate saving deserve additional research attention.

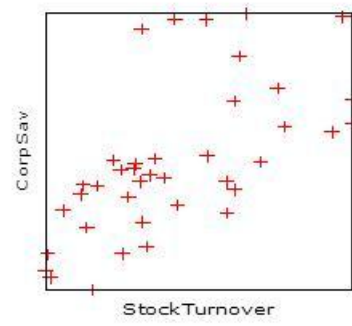
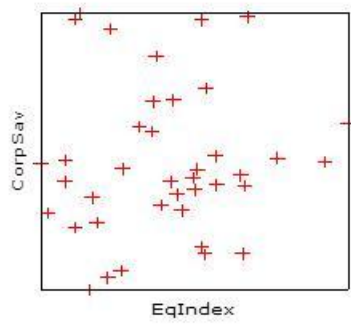
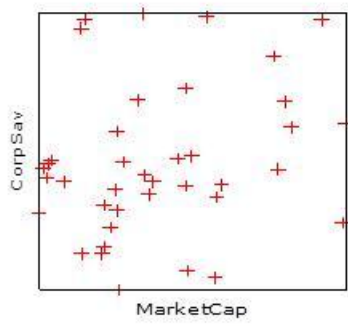
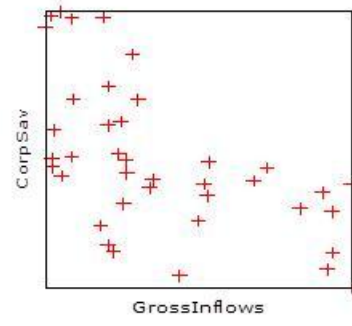
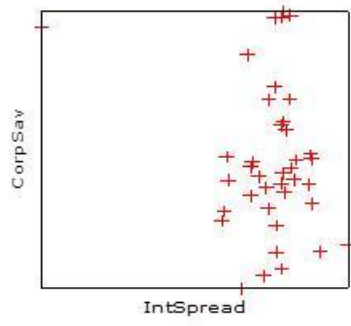
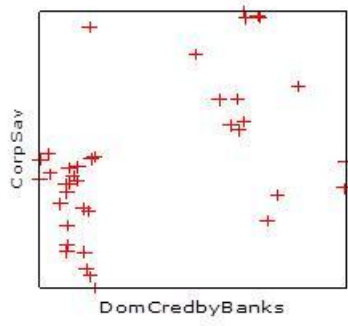
APPENDIX

Appendix 1

Graph 1.1: Graphs of Corporate Saving/GDP and its Determinant Variables







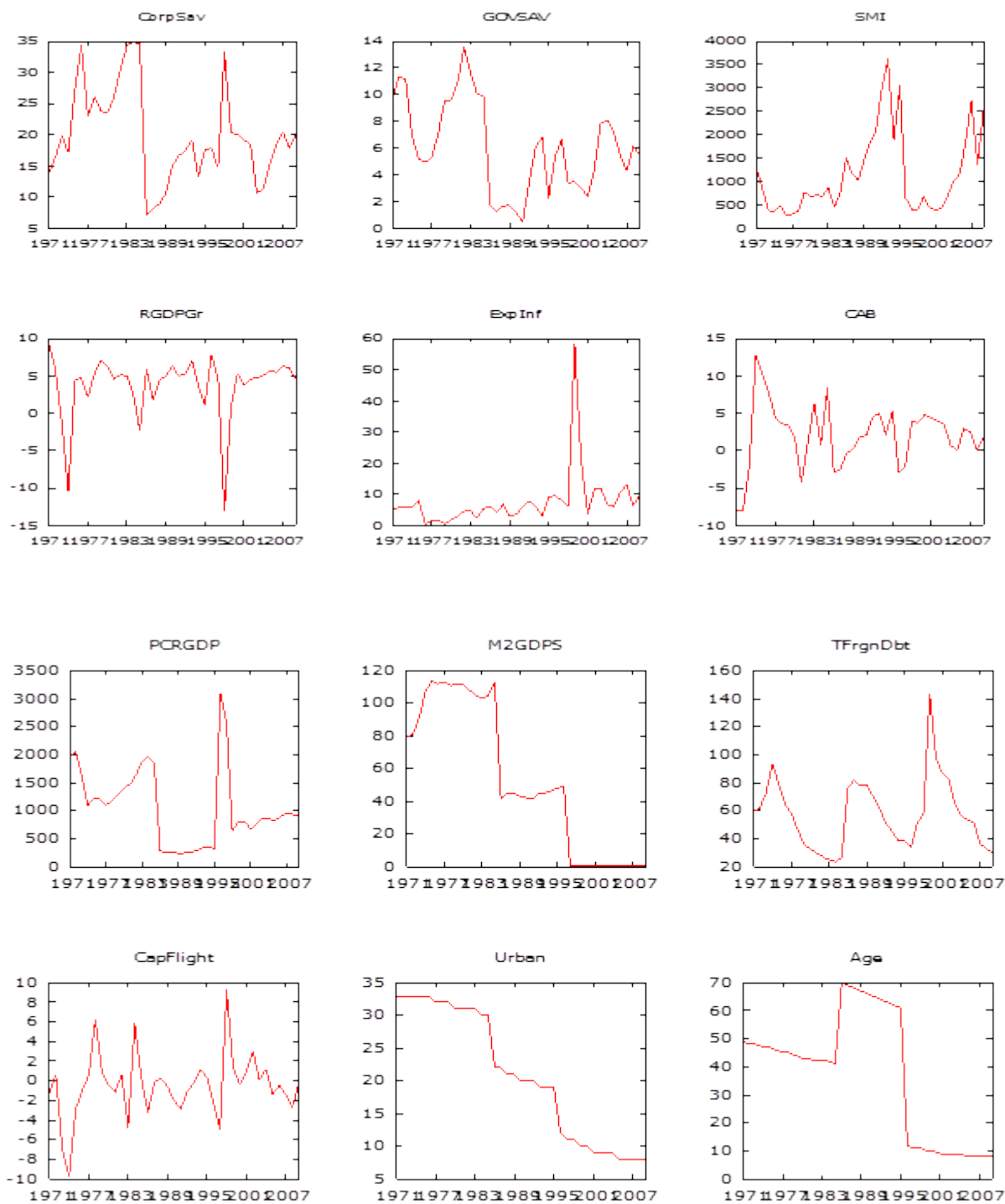
Appendix 2

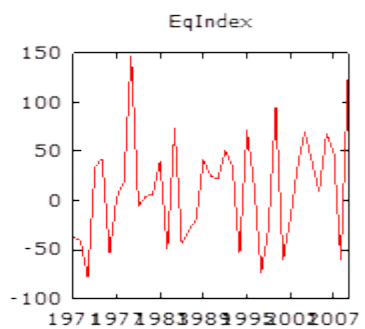
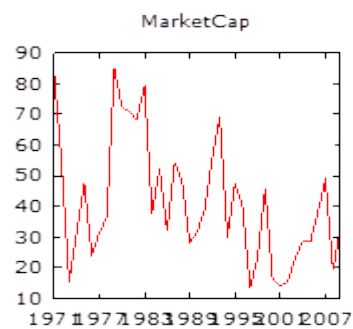
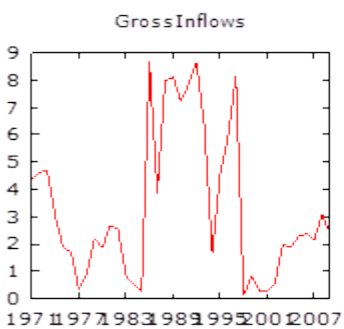
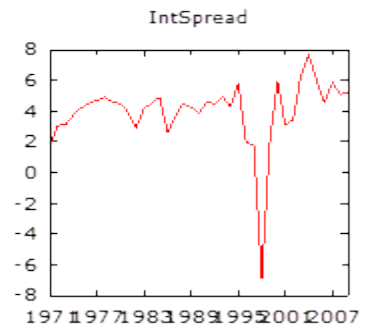
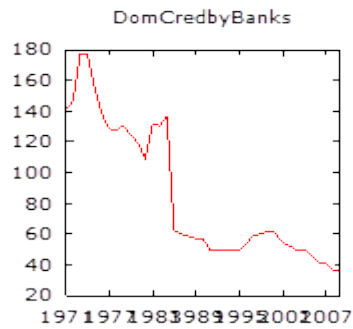
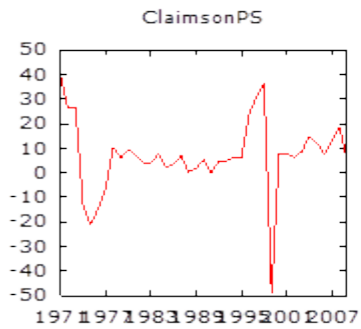
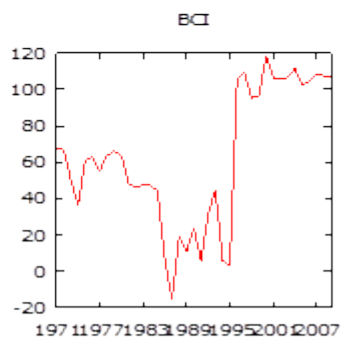
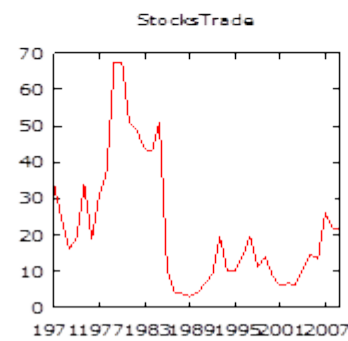
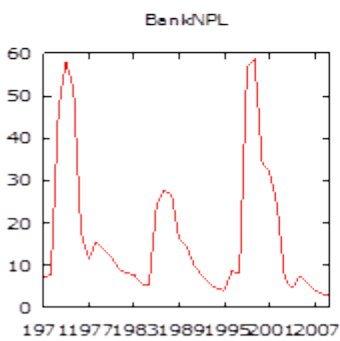
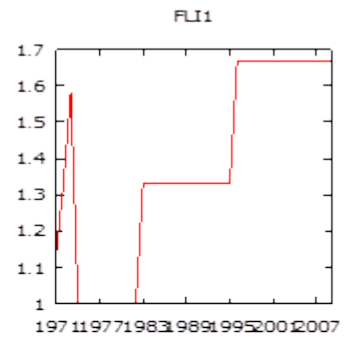
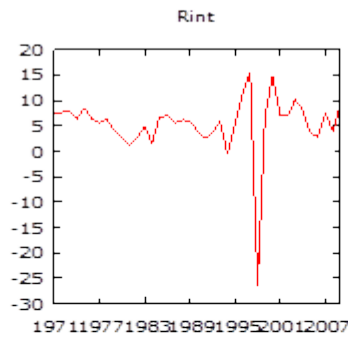
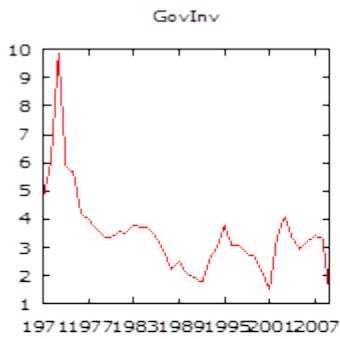
Table 1.2: Correlation Matrix of Corporate Savings and its Determinant Variables

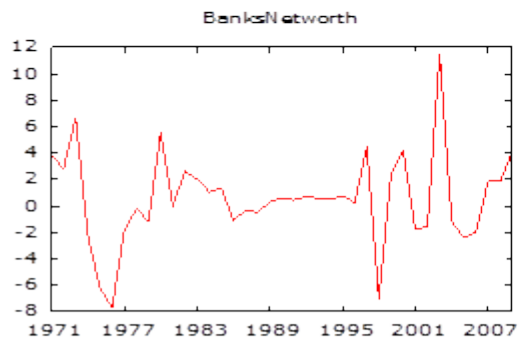
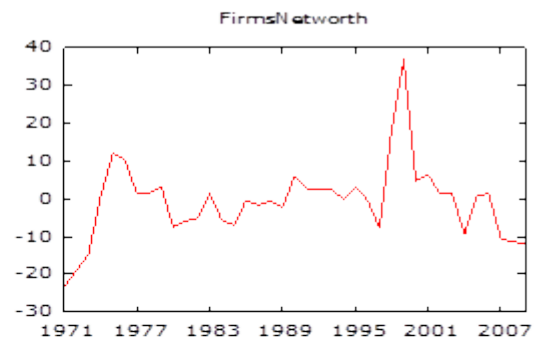
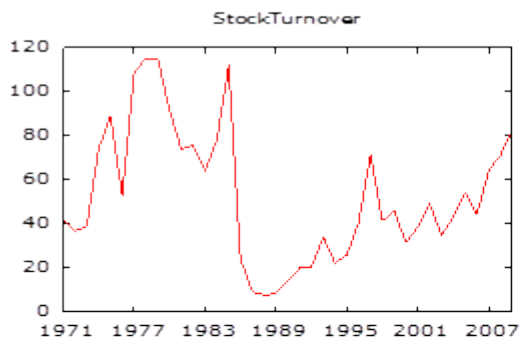
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corpsav	1																										
govsav	0.451	1																									
smi	-0.32	-0.325	1																								
rydgr	-0.273	0.0559	0.2749	1																							
expinf	-0.095	-0.216	0.0072	-0.078	1																						
cab	0.4214	-0.172	-0.019	-0.42	0.0916	1																					
percip	0.4105	0.679	-0.488	0.0968	-0.081	-0.26	1																				
m2	0.5121	0.5172	-0.308	-0.056	-0.429	0.1382	0.3796	1																			
capfig	-0.386	-0.508	-0.247	-0.224	0.5958	0.1286	-0.371	-0.295	1																		
urban	0.2875	-0.066	-0.074	-0.078	0.0397	-0.044	-0.151	-0.123	-0.12	1																	
age	0.397	0.4799	-0.286	-0.071	-0.42	0.0318	0.305	0.9659	-0.375	-0.158	1																
govint	-0.134	-0.12	0.2729	0.0447	-0.385	-0.051	-0.3	0.5676	-0.018	-0.162	0.66	1															
rint	0.1372	0.5284	-0.362	-0.248	-0.128	-0.066	0.4054	0.48	0.0478	-0.376	0.5424	0.1227	1														
fill	-0.346	0.031	-0.008	0.5483	0.1768	-0.074	0.2505	-0.016	0.1802	-0.509	-0.025	-0.065	0.1056	1													
bankpl	-0.309	-0.28	0.1429	-0.027	0.4299	-0.162	-0.071	-0.883	0.1779	0.0725	-0.881	-0.672	-0.233	0.0682	1												
stocks	0.066	-0.256	-0.44	-0.637	0.3991	0.382	-0.157	0.0063	0.7388	-0.077	0.0714	-0.034	0.2899	-0.21	0.0047	1											
bci	0.6238	0.7245	-0.258	0.1101	-0.239	0.041	0.535	0.6956	-0.55	0.0626	0.6028	0.0433	0.2176	-0.053	-0.59	-0.214	1										
claims	0.1386	0.1778	-0.276	0.0954	0.3296	0.028	0.3639	-0.483	0.0227	0.147	-0.556	-0.951	-0.063	0.1488	0.5774	0.003	0.0238	1									
domred	-0.131	0.2614	0.0262	0.0845	-0.496	-0.587	0.3342	-0.161	-0.465	0.0959	-0.106	-0.159	0.1386	-0.172	0.267	-0.353	0.0088	0.2067	1								
intpre	0.4996	0.6155	-0.532	-0.232	-0.265	0.1186	0.5078	0.8704	-0.059	-0.217	0.8903	0.3007	0.7333	0.0388	-0.677	-0.2671	-0.6207	-0.198	-0.073	1							
grossin	-0.216	0.0657	0.2789	0.5252	-0.08	0.1604	-0.159	0.0518	-0.15	-0.27	-0.014	0.0633	-0.045	0.6475	-0.079	-0.496	0.0593	-0.039	-0.279	-0.074	1						
market	-0.357	0.4551	0.2763	-0.139	-0.388	-0.179	-0.11	0.0655	-0.416	-0.006	0.522	-0.106	0.1984	-0.033	-0.163	-0.373	-0.55	0.164	-0.258	-0.008	1						
index	0.2194	0.4221	0.239	0.2807	-0.095	-0.144	0.1966	0.5211	-0.368	-0.011	0.5145	0.3927	0.0073	-0.107	-0.551	-0.264	0.6501	-0.319	-0.033	0.3291	0.045	0.0505	1				
stock	0.0648	-0.044	0.3362	0.041	0.2657	0.4006	-0.167	-0.043	-0.071	0.0727	-0.138	-0.122	-0.264	0.0629	-0.016	-0.108	0.1766	0.0658	-0.412	-0.147	0.2715	-0.119	0.335	1			
firm	0.6243	0.5505	-0.378	-0.07	-0.146	0.297	0.4985	0.5037	-0.412	0.0949	0.3703	-0.259	0.1976	0.0417	-0.366	-0.084	0.8079	0.2967	-0.1	-0.5268	0.1007	-0.551	0.2209	0.2574	1		
banisue	-0.1914	-0.474	-0.11	-0.31	0.5487	0.546	-0.368	-0.159	0.5282	0.2487	-0.208	-0.076	-0.313	-0.274	0.0497	-0.241	0.0668	-0.67	-0.196	-0.271	-0.194	-0.163	0.2702	-0.105	1		
	-0.269	0.3303	0.1001	0.2785	0.2025	-0.345	0.2211	-0.13	-0.11	-0.214	-0.095	-0.112	0.1311	0.4361	0.2441	-0.299	0.0908	0.1242	0.246	-0.058	0.2747	0.1284	0.0902	0.0106	-0.051	-0.425	1

Appendix 3

Graph 1.2: Relevant Variables across Time (1970 – 2009)







Appendix 4

Table 1.3: Pairwise Granger – Causality Test

Pairwise Granger Causality Tests			
Lags: 1			
Null Hypothesis:	Obs	F-Statistic	Prob.
GOVSAV does not Granger Cause CORPSAV	38	3.1579	0.0843
CORPSAV does not Granger Cause GOVSAV		0.07771	0.7821
TOTALSAV does not Granger Cause CORPSAV	38	0.09997	0.7537
CORPSAV does not Granger Cause TOTALSAV		0.18205	0.6722
SMI does not Granger Cause CORPSAV	38	1.13818	0.2933
CORPSAV does not Granger Cause SMI		0.68148	0.4147
RGDPGR does not Granger Cause CORPSAV	38	0.73205	0.398
CORPSAV does not Granger Cause RGDPGR		0.00099	0.9751
POP does not Granger Cause CORPSAV	38	0.52991	0.4715
CORPSAV does not Granger Cause POP		0.06984	0.7931
INF does not Granger Cause CORPSAV	38	0.9699	0.3315
CORPSAV does not Granger Cause INF		1.35088	0.253
EXPINF does not Granger Cause CORPSAV	38	0.13052	0.7201
CORPSAV does not Granger Cause EXPINF		1.26832	0.2677
CAB does not Granger Cause CORPSAV	38	0.22471	0.6384
CORPSAV does not Granger Cause CAB		0.27338	0.6044
PCNGDP does not Granger Cause CORPSAV	38	2.78383	0.1041
CORPSAV does not Granger Cause PCNGDP		0.26132	0.6124
PCRGDP does not Granger Cause CORPSAV	38	3.00925	0.0916
CORPSAV does not Granger Cause PCRGDP		0.92019	0.344
M2GDPS does not Granger Cause CORPSAV	38	1.59945	0.2143
CORPSAV does not Granger Cause M2GDPS		1.47908	0.2321
M2GNI does not Granger Cause CORPSAV	38	0.00035	0.9853
CORPSAV does not Granger Cause M2GNI		0.02715	0.8701
TFRGNDBT does not Granger Cause CORPSAV	38	0.16512	0.687
CORPSAV does not Granger Cause TFRGNDBT		1.35261	0.2527
CAPFLIGHT does not Granger Cause CORPSAV	38	4.27399	0.0462
CORPSAV does not Granger Cause CAPFLIGHT		0.04534	0.8326

URBAN does not Granger Cause CORPSAV	38	1.62358	0.211
CORPSAV does not Granger Cause URBAN		1.78191	0.1905
AGE does not Granger Cause CORPSAV	38	0.00444	0.9473
CORPSAV does not Granger Cause AGE		1.34125	0.2547
GOVINV does not Granger Cause CORPSAV	38	0.56539	0.4571
CORPSAV does not Granger Cause GOVINV		0.0009	0.9763
LNDINT does not Granger Cause CORPSAV	38	0.3396	0.5638
CORPSAV does not Granger Cause LNDINT		0.46978	0.4976
RINT does not Granger Cause CORPSAV	38	0.98087	0.3288
CORPSAV does not Granger Cause RINT		0.01139	0.9156
FLI1 does not Granger Cause CORPSAV	38	3.15772	0.0843
CORPSAV does not Granger Cause FLI1		0.13653	0.714
FLI2 does not Granger Cause CORPSAV	38	0.21069	0.6491
CORPSAV does not Granger Cause FLI2		0.21099	0.6488
M2GDPF does not Granger Cause CORPSAV	38	0.01293	0.9101
CORPSAV does not Granger Cause M2GDPF		0.57992	0.4514
BANKNPL does not Granger Cause CORPSAV	38	0.00143	0.9701
CORPSAV does not Granger Cause BANKNPL		0.15153	0.6994
STOCKSVAL does not Granger Cause CORPSAV	38	0.78871	0.3806
CORPSAV does not Granger Cause STOCKSVAL		0.08939	0.7667
STOCKSTRADE does not Granger Cause CORPSAV	38	3.29433	0.0781
CORPSAV does not Granger Cause STOCKSTRADE		0.74444	0.3941
BCI does not Granger Cause CORPSAV	38	0.05564	0.8149
CORPSAV does not Granger Cause BCI		0.56973	0.4554
CLAIMSONPS does not Granger Cause CORPSAV	38	0.1034	0.7497
CORPSAV does not Granger Cause CLAIMSONPS		4.86258	0.0341
DOMCREDBYBANKS does not Granger Cause CORPSAV	38	2.36348	0.1332
CORPSAV does not Granger Cause DOMCREDBYBANKS		1.24024	0.273
INTSPREAD does not Granger Cause CORPSAV	38	0.12649	0.7242
CORPSAV does not Granger Cause INTSPREAD		0.11759	0.7337
GROSSINFLOWS does not Granger Cause CORPSAV	38	0.38384	0.5396
CORPSAV does not Granger Cause GROSSINFLOWS		0.4769	0.4944
MARKETCAP does not Granger Cause CORPSAV	38	0.33487	0.5665
CORPSAV does not Granger Cause MARKETCAP		0.44555	0.5088
EQINDEX does not Granger Cause CORPSAV	38	0.7435	0.3944
CORPSAV does not Granger Cause EQINDEX		0.09126	0.7644
STOCKTURNOVER does not Granger Cause CORPSAV	38	2.72264	0.1079
CORPSAV does not Granger Cause STOCKTURNOVER		2.5408	0.1199
FIRMSNETWORTH does not Granger Cause CORPSAV	38	0.2405	0.6269
CORPSAV does not Granger Cause FIRMSNETWORTH		0.23854	0.6283
BANKSNETWORTH does not Granger Cause CORPSAV	38	0.21356	0.6468
CORPSAV does not Granger Cause BANKSNETWORTH		0.06575	0.7991

Appendix 5

Table 1.4: Results of Unit Root Tests Using Augmented Dickey Fuller Statistic

Augmented Dickey Fuller Test Statistics			
Variables (Level)	Without Intercept and Trend	With Intercept and Trend	Inference
corpsav	-0.887879	(-3.430003)*	I(1)
govsav	-1.372942	-2.326222	I(1)
smi	-0.538457	-2.777449	I(1)
rgdpgr	-3.591333	(-5.19335)***	I(0)
expinf	(-3.213759)***	(-5.112635)***	I(0)
cab	(-3.564052)***	(-4.309982)***	I(0)
pcrgdp	(-1.896734)*	(-3.281447)*	I(0)
m2gdps	-1.138583	-3.007623	I(1)
tfrgnbdt	-1.143126	-2.402912	I(1)
capflight	(-5.170463)***	(-5.275114)***	I(1)
urban	(-2.355016)**	-2.381188	I(0)
age	-1.111578	-1.697483	I(1)
govinv	-1.332689	-3.064643	I(1)
rint	(-4.26717)***	(-6.243382)***	I(0)
fli1	0.356272	-3.079938	I(1)
banknpl	(-1.77054)*	(-3.822424)**	I(0)
stockstrade	-1.378156	-2.132003	I(1)
bci	-0.599539	-2.32631	I(1)
claimsonps	(-4.88429)***	(-5.420978)***	I(0)
domcredbybanks	-1.549153	-2.216929	I(1)
intspread	-1.522075	(-4.067635)**	I(0)
grossinflows	(-1.952454)**	-3.050025	I(0)
marketcap	(-1.933717)*	(-4.274873)**	I(0)
eqindex	(-6.46132)***	(-7.01204)***	I(0)
stockturnover	-0.871759	-2.387263	I(1)
firmsnetworth	(-3.762436)***	(-3.481798)*	I(0)
banksnetworth	(-5.619809)***	(-5.68651)***	I(0)

Appendix 6

Table 1.5: Determinants of Corporate Investment/GDP (F-H Regression)

	1	2	3
	OLS Estimate	Weighted Least Square (WLS)	Panel Data (FE)
Corporate Saving/GDP	0.4340** (2.553)	0.3872*** (2.900)	0.5986*** (5.221)
Household Saving/GDP	0.6341* (2.01)	0.6704* (1.799)	0.1566 (1.689)
Government Saving/GDP	2.3308*** (7.593)	2.0074*** (7.878)	2.6267*** (5.75)
F(3,35)	49.1828***	46.829***	F(5,35): 25.0292***
R-Square	0.7578	0.8005	0.7913
Multicollinearity (VIF)	CS/GDP: 1.488	CS/GDP: 1.488	-
	HS/GDP: 1.217	HS/GDP: 1.217	-
	GS/GDP: 1.412	GS/GDP: 1.412	-
Heteroskedasticity	19.503*** (WT) 5.5865 (BP)	-	1.8049 (Wald Test)
Autocorrelation (Durbin Watson)	1.5423	1.5323	1.492
Cointegration	Yes	Yes	Yes

1.*** indicates significant values at 1%, ** indicates significant at 5% and * indicates significant at 10%.

2. The values in parentheses are the t-statistics.

3. The null hypothesis for F(3,35) test statistic: There is no linear relationship between corporate saving/GDP and the explanatory variables

4. Multicollinearity is a problem when several explanatory variables are highly correlated. VIF>10 indicates the existence of multicollinearity problem.

5. The null hypothesis to check the heteroskedasticity is: There is no presence of heteroskedasticity. We used both White's test and Breusch-Pagan test to examine its existence.

6. The null hypothesis for autocorrelation using Durbin Watson is that there is no presence of autocorrelation.

7. We used Rule of Thumb proposed by Granger – Newbold to test the existence of cointegration. Essentially if $R^2 < \text{Durbin Watson statistics}$, the cointegration exists and we don't have the problem of spurious regression

Appendix 7

Table 1.6: Ordinary Least Square Full-Form Model of Corporate Saving/GDP

	Coefficient	Std. Error	t-ratio	p-value
const	-13.2228 1	7.0633	-0.7749	0.4534
GOVSAV	-0.0533978	0.140862	-0.3791	0.7113
SMI	0.00356584	0.000962663	3.704	0.0030 ***
RGDPGr	0.182546	0.178831	1.021	0.3275
ExpInf	0.126006	0.139603	0.9026	0.3845
CAB	0.81182	0.198037	4.099	0.0015 ***
PCRGDP	-0.00287484	0.00344205	-0.8352	0.4199
M2GDPS	0.0445369	0.0602524	0.7392	0.474
TFrgnDbt	-0.118897	0.0734049	-1.62	0.1313
CapFlight	0.46952	0.172939	2.715	0.0188 **
Urban	2.43804	0.493535	4.94	0.0003 ***
Age	-0.723994	0.115444	-6.271	4.12e-05 ***
GovInv	-1.64046	0.40701	-4.031	0.0017 ***
Rint	0.109325	0.237707	0.4599	0.6538
FLI1	26.3706	4.12549	6.392	3.44e-05 ***
BankNPL	0.0527147	0.0470003	1.122	0.284
StocksTrade	0.161703	0.0566456	2.855	0.0145 **
BCI	-0.0915983	0.0374177	-2.448	0.0307 **
ClaimsonPS	0.00142455	0.0400178	0.0356	0.9722
DomCredbyBanks	-0.119052	0.0900222	-1.322	0.2107
IntSpread	-0.536962	0.575999	-0.9322	0.3696
GrossInflows	0.598163	0.366843	1.631	0.1289
MarketCap	-0.0982401	0.042412	-2.316	0.0390 **
EqIndex	-0.0281001	0.0103105	-2.725	0.0184 **
StockTurnover	-0.0901405	0.0204116	-4.416	0.0008 ***
FirmsNetworth	0.155395	0.0721	2.155	0.0522 *
BanksNetworth	-0.301667	0.116366	-2.592	0.0236 **

Mean dependent var	19.93004	S.D. dependent var	7.591806
Sum squared resid	69.00895	S.E. of regression	2.398071
R-squared	0.968491	Adjusted R-squared	0.900222
F(26, 12)	1886.159	P-value(F)	3.97E-18
Log-likelihood	-66.46676	Akaike criterion	186.9335
Schwarz criterion	231.8497	Hannan-Quinn	203.049
rho	-0.298163	Durbin-Watson	2.593014

1.*** indicates significant values at 1%, ** indicates significant at 5% and * indicates significant at 10%.

3. The null hypothesis for F(26,12) test statistic: There is no linear relationship between corporate saving/GDP and the explanatory variables

4. Multicollinearity is a problem when several explanatory variables are highly correlated. VIF>10 indicates the existence of multicollinearity problem.

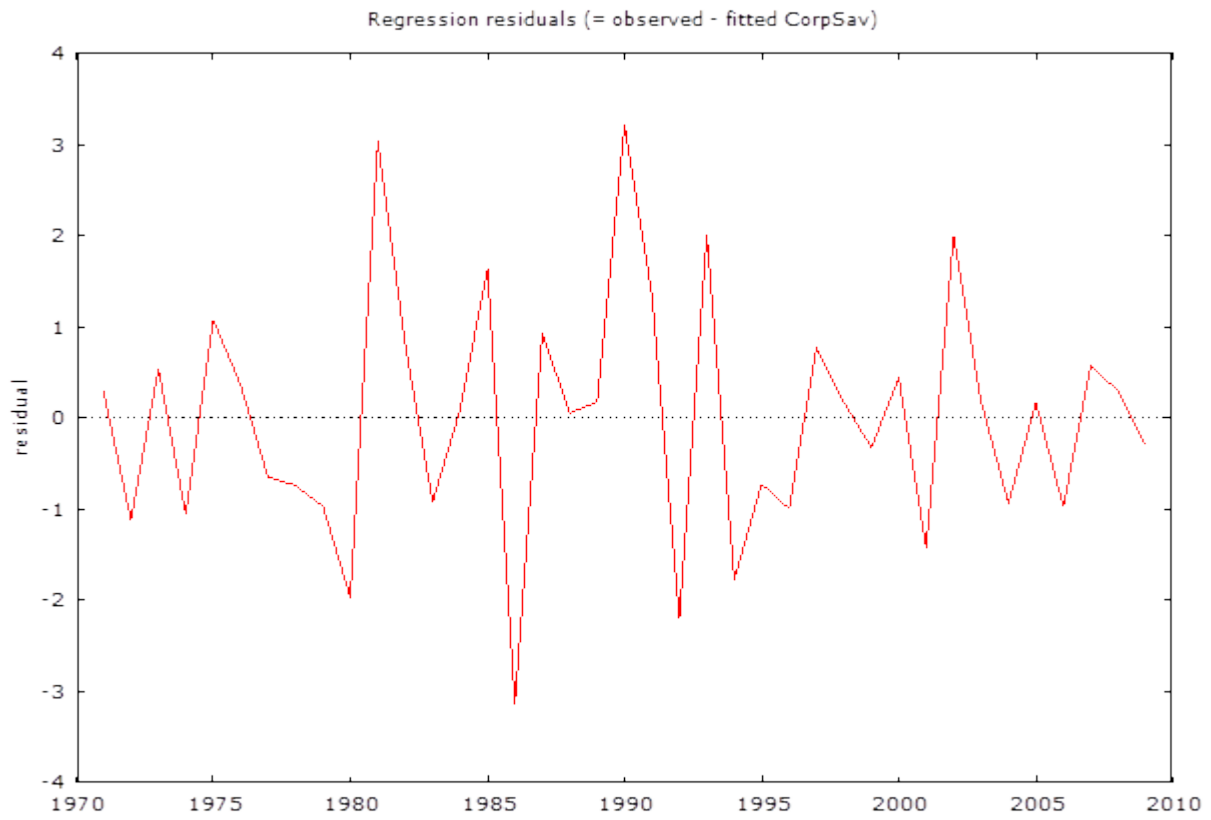
5. The null hypothesis to check the heteroskedasticity is: There is no presence of heteroskedasticity. We used both White's test and Breusch-Pagan test to examine its existence.

6. The null hypothesis for autocorrelation using Durbin Watson is that there is no presence of autocorrelation.

7. We used Rule of Thumb proposed by Granger – Newbold to test the existence of cointegration. Essentially if $R^2 < \text{Durbin Watson statistics}$, the cointegration exists and we don't have the problem of spurious regression.

Appendix 8

Graph 1.3: Plotted of Residuals over Time for the OLS Full-Form Model



Appendix 9

Table 1.7: Ordinary Least Square Reduced-Form Model of Corporate Saving/GDP

OLS Regression Results for Reduced-Form Model				
	coefficient	std. error	t-ratio	p-value
const	-41.6564	8.1	-5.143	4.28e-05 ***
SMI	0.004601	0.000645	7.132	4.93e-07 ***
CAB	0.765179	0.132265	5.785	9.64e-06 ***
Urban	3.51853	0.271708	12.95	1.77e-011 ***
Age	-0.68486	0.090682	-7.552	2.05e-07 ***
GovInv	-1.42907	0.365469	-3.91	0.0008 ***
FLI1	33.4119	2.92907	11.41	1.84e-010 ***
BankNPL	0.067263	0.031995	2.102	0.0478 **
StocksTrac	0.241937	0.063147	3.831	0.0010 ***
BCI	-0.03599	0.03055	-1.178	0.2519
DomCredit	-0.31916	0.049554	-6.441	2.20e-06 ***
MarketCap	-0.13953	0.030436	-4.584	0.0002 ***
EqIndex	-0.02104	0.005282	-3.983	0.0007 ***
StockTurn	-0.07756	0.026983	-2.874	0.0091 ***
FirmsNetw	0.152118	0.033188	4.584	0.0002 ***
BanksNetw	-0.32786	0.083089	-3.946	0.0007 ***
Rint	-0.08469	0.05695	-1.487	0.1518
CapFlight	0.142225	0.117144	1.214	0.2382

Mean dependent var	19.93004	S.D. dependent var	7.591806
Sum squared resid	90.44611	S.E. of regression	2.075321
R-squared	0.958703	Adjusted R-squared	0.925273
F(17, 21)	235.8036	P-value(F)	3.95E-20
Log-likelihood	-71.7419	Akaike criterion	179.4837
Schwarz criterion	209.4278	Hannan-Quinn	190.2274
rho	-0.18284	Durbin-Watson	2.360685

White's test for heteroskedasticity -

Null hypothesis: heteroskedasticity not present

Test statistic: LM = 36.0409

with p-value = $P(\text{Chi-square}(34) > 38.7617) = 0.373246$

LM test for autocorrelation up to order 1 -

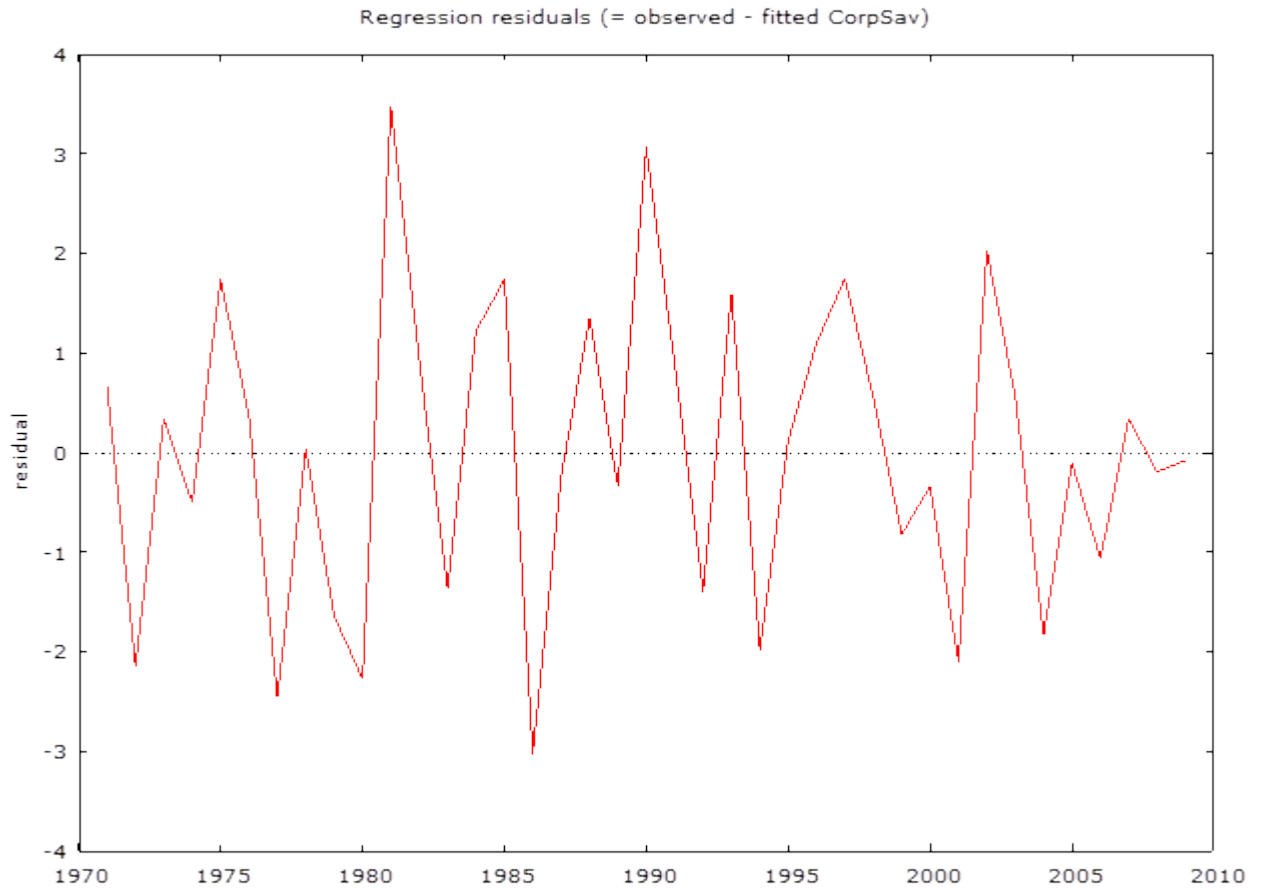
Null hypothesis: no autocorrelation

Test statistic: LMF = 1.13006

with p-value = $P(F(1,120) > 1.32303) = 0.300431$

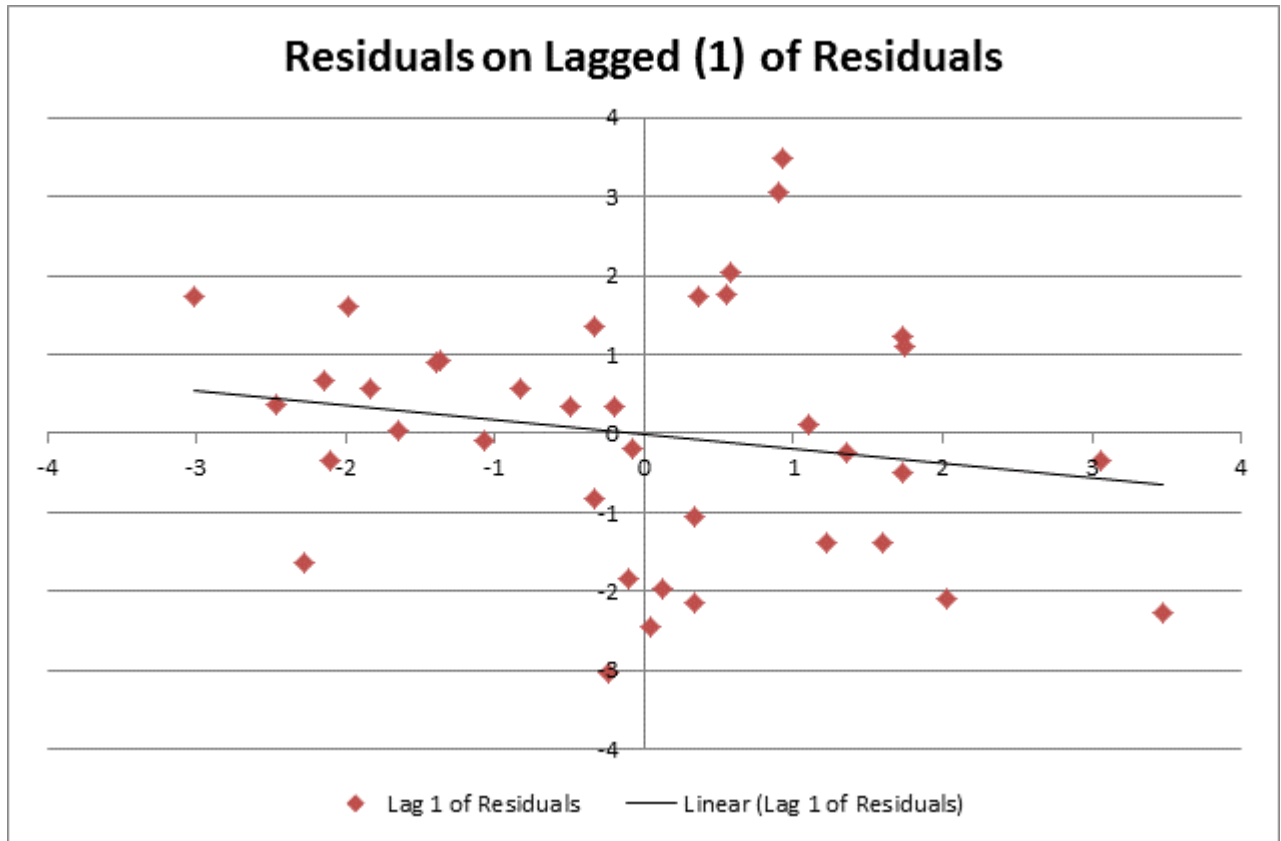
Appendix 10

Graph 1.4: Plotted of Residuals over Time for the OLS Reduced-Form Model



Appendix 11

Graph 1.5: Plotted of Residuals over Lagged-1 of Residual for the OLS Reduced-Form Model



Appendix 12

Table 1.8: Autoregressive of Order (1) Model of Corporate Saving/GDP

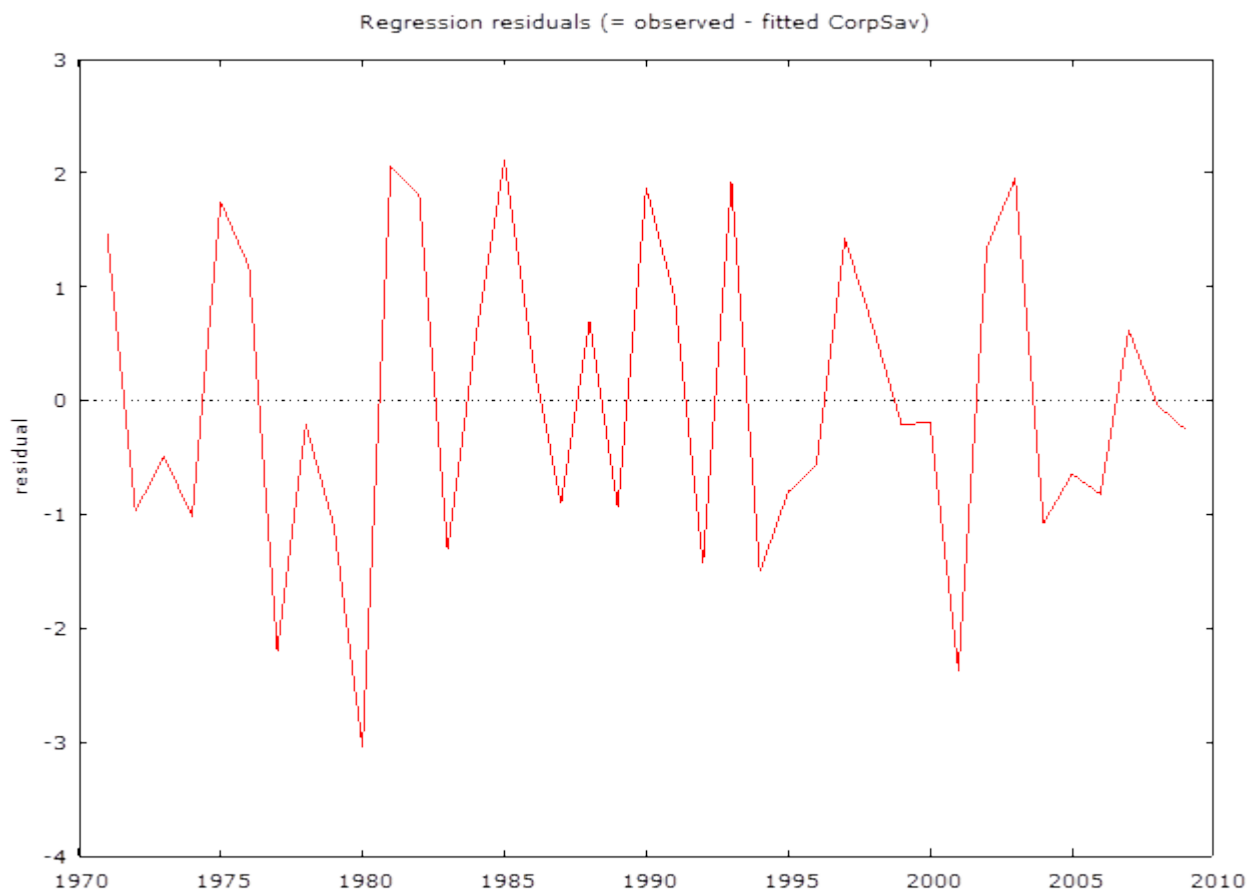
AR(1) Model of Corporate Saving/GDP					
		coefficient	std. error	z	p-value
const	-	40.0047	7.45077	-5.369	7.91e-08 ***
phi_1		-0.397195	0.190431	-2.086	0.0370 **
SMI		0.00444888	0.00059688	7.454	9.09e-014 ***
CAB		0.75857	0.104578	7.254	4.06e-013 ***
Urban		3.62569	0.324586	11.17	5.71e-029 ***
Age		-0.706093	0.064841	-10.89	1.29e-027 ***
GovInv		-1.61086	0.338779	-4.755	1.99e-06 ***
FLI1		34.0507	3.17826	10.71	8.78e-027 ***
BankNPL		0.078261	0.0321899	2.431	0.0150 **
StocksTrade		0.268778	0.0509311	5.277	1.31e-07 ***
BCI		-0.04725	0.0232898	-2.029	0.0425 **
DomCredbyBanks		-0.336079	0.0552184	-6.086	1.16e-09 ***
MarketCap		-0.165111	0.0319933	-5.161	2.46e-07 ***
EqIndex		-0.0180162	0.0065623	-2.745	0.0060 ***
StockTurnover		-0.0886819	0.0242753	-3.653	0.0003 ***
FirmsNetworth		0.134154	0.0482845	2.778	0.0055 ***
BanksNetworth		-0.33947	0.0959536	-3.538	0.0004 ***
Rint		-0.120122	0.0682742	-1.759	0.0785 *
CapFlight		0.0482071	0.104032	0.4634	0.6431
Dummy1		-3.55263	1.68163	-2.113	0.0346 **
Dummy2		1.84879	1.69786	1.089	0.2762

Mean dependent var	19.93004	S.D. dependent var	7.591806
Mean of innovations	0.014974	S.D. of innovations	1.339132
Log-likelihood	-66.8133	Akaike criterion	177.6266
Schwarz criterion	214.2249	Hannan-Quinn	190.7578

	Real	Imaginary	Modulus	Frequency
AR Root 1	-2.5177	0	2.5177	0.5

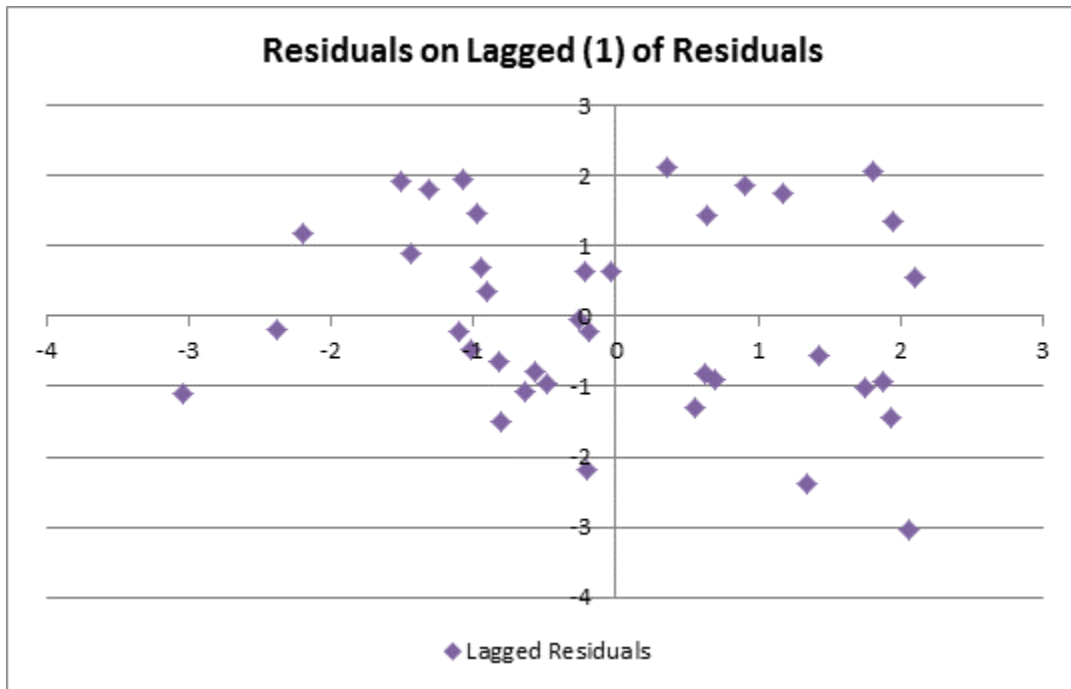
Appendix 13

Graph 1.6: Plotted of Residuals over Time for AR(1) Model of Corporate Saving/GDP



Appendix 14

Graph 1.7: Plotted of Residuals on Lagged-1 of Residuals for AR(1) Model



Appendix 15

Table 1.9: Expected and Actual Sign of the AR(1) Regression Coefficients

	Actual	Expected
SMI	+	-
CAB	+	+
Urban	+	-
Age	-	-
GovInv	-	-
FLI1	+	+/-
BankNPL	+	+
StocksTrade	+	+/-
BCI	-	-
DomCredbyBanks	-	-
MarketCap	-	+/-
EqIndex	-	-
StockTurnover	-	-
FirmsNetworth	+	-
BanksNetworth	-	-
Rint	-	+/-
CapFlight	+	+

Appendix 16

Table 1.10: Categories of Variables in our AR(1) Model

Variables that are Related to Economic Uncertainty			
Stock Market Index	Current Account Balance	Government Investment	Financial Liberalization Index
Business Confidence Index	Stocks Traded	Market Capitalization	Equity Index
Stocks Turnover Ratio		Capital Flight	
Variables that are Related to Borrowing Constraints			
Banks' Non-Performing Loans	Domestic Credit by Banks	Real Interest Rate	Banks' Net Worth
Variables that are Related to Firms' Perspectives			
Firms' Net Worth			
Variables that are Related to Demographic Landscapes			
Urbanization		Age Dependency Ratio	

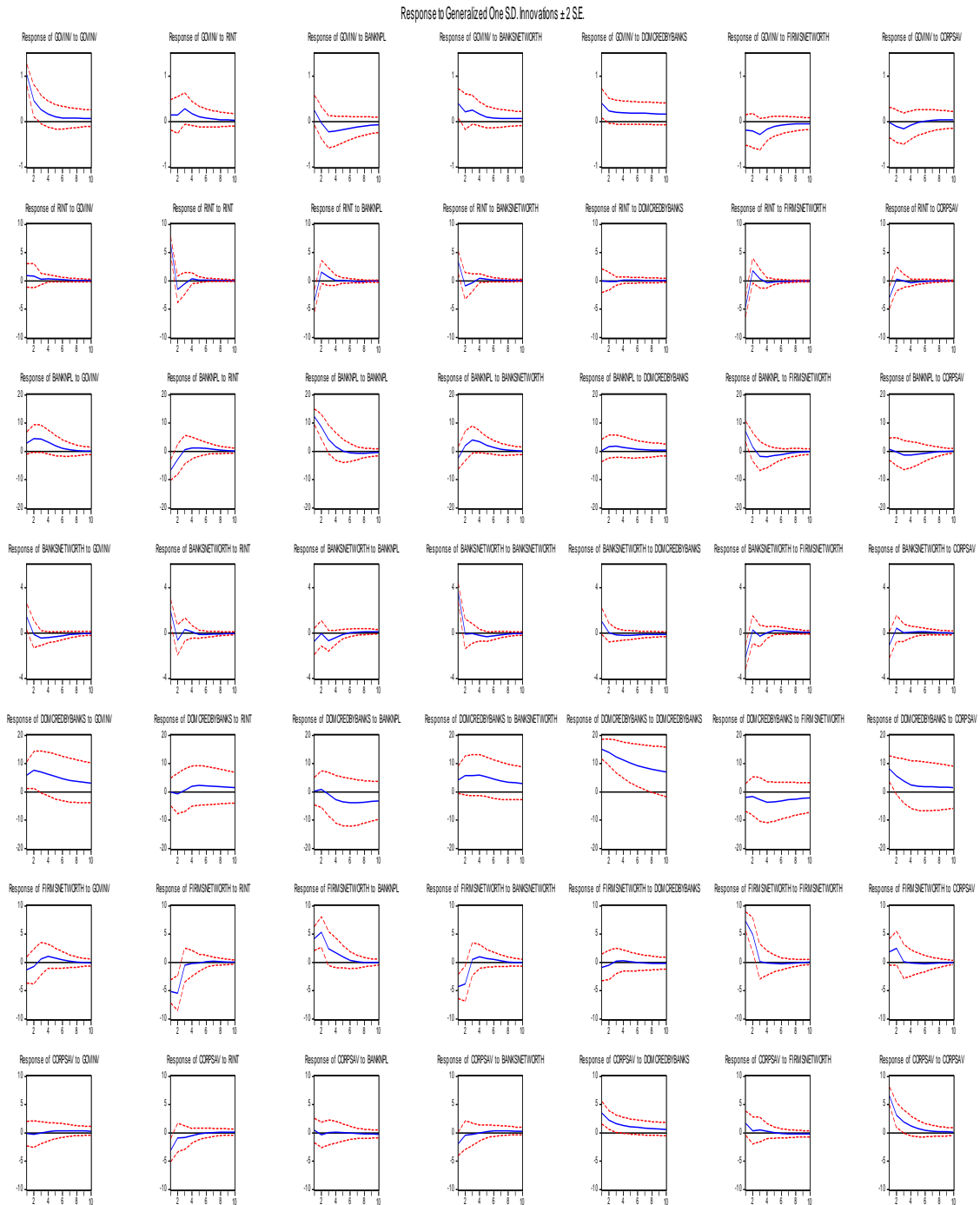
Appendix 17

Table 1.11: Adjusted R-Square Results from Variable Exclusion

Excluded Variable	Adjusted R-Square from lowest to highest
FLI1	0.765334
Urban	0.771845
Age	0.78758
CAB	0.839174
SMI	0.849109
DomCredbyBanks	0.880671
StocksTrade	0.898637
GovInv	0.901103
MarketCap	0.901272
BanksNetworth	0.90934
FirmsNetworth	0.912062
EqIndex	0.914751
StockTurnover	0.914911
BankNPL	0.922803
BCI	0.925347
Rint	0.925695
CapFlight	0.925871

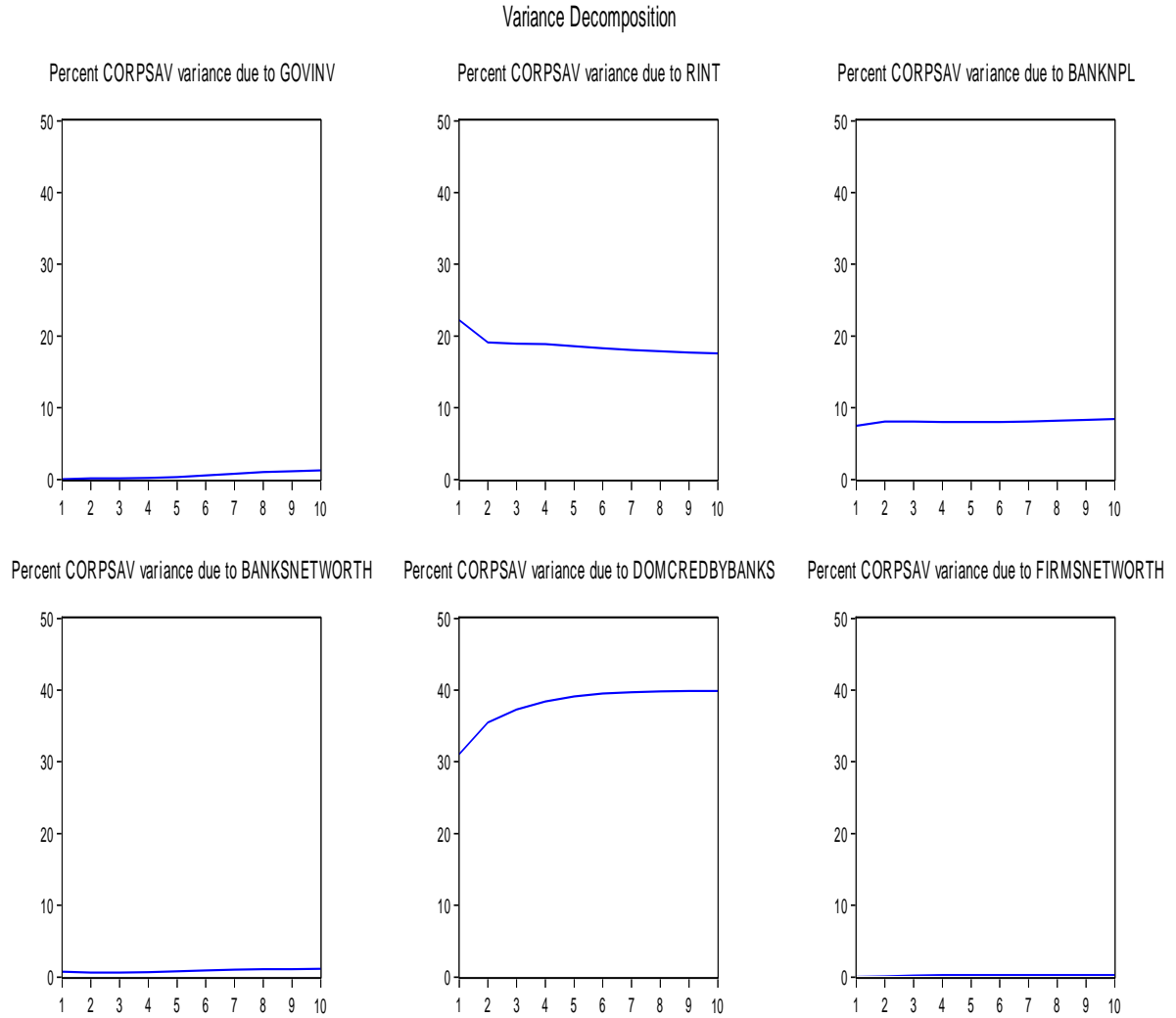
Appendix 18

Graph 1.8: The Impulse Response Function to VAR(1) of Variables Government Investment, Real Interest Rate, Banks' Non-Performing Loans, Banks' Net Worth, Domestic Credit by Banks, Firms' Net Worth and Corporate Saving.



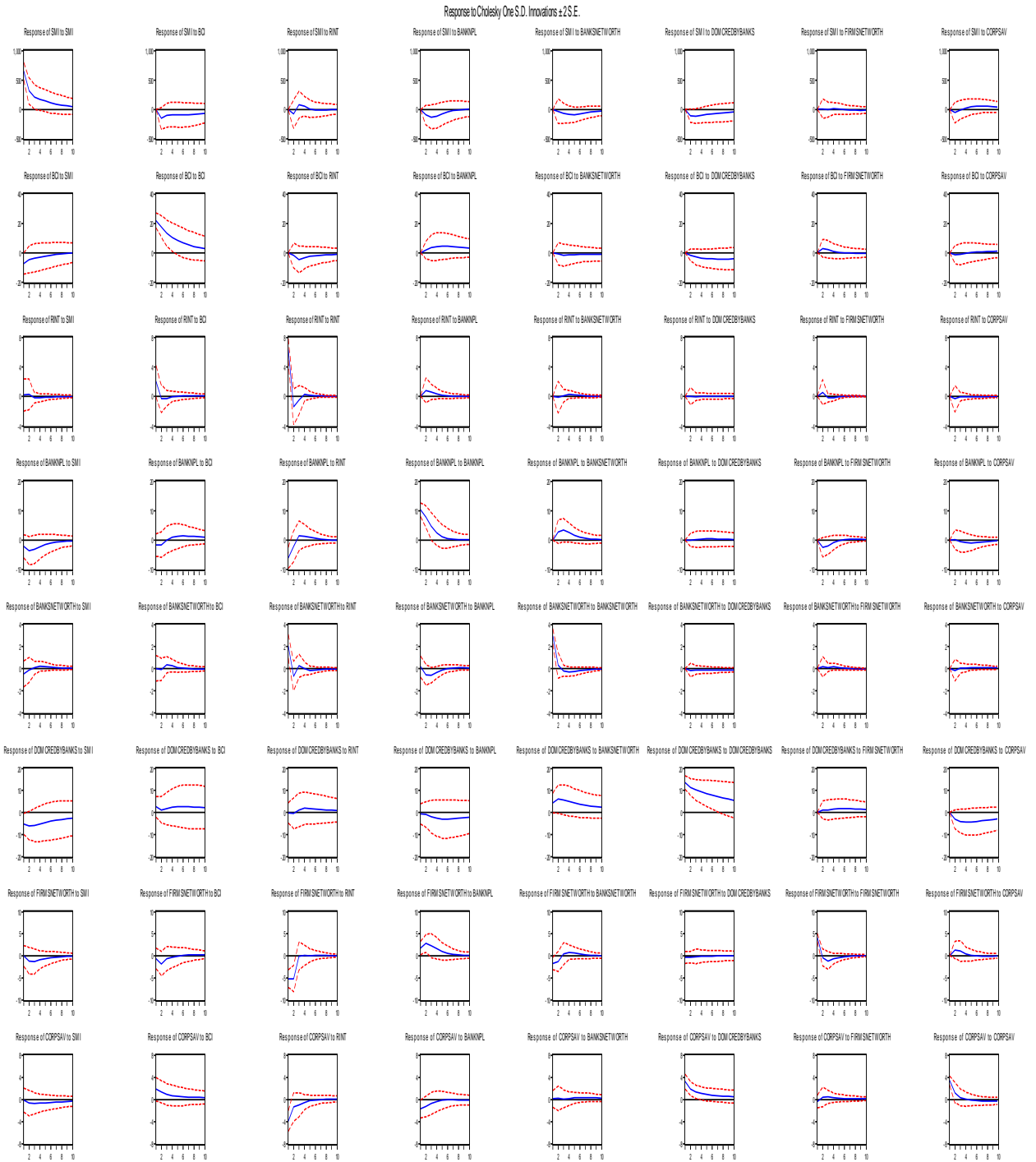
Appendix 19

Graph 1.9: Variance Decomposition of Corporate Saving to Government Investment, Real Interest Rate, Banks' Non-Performing Loans, Banks' Net Worth, Domestic Credit by Banks and Firms' Net Worth



Appendix 20

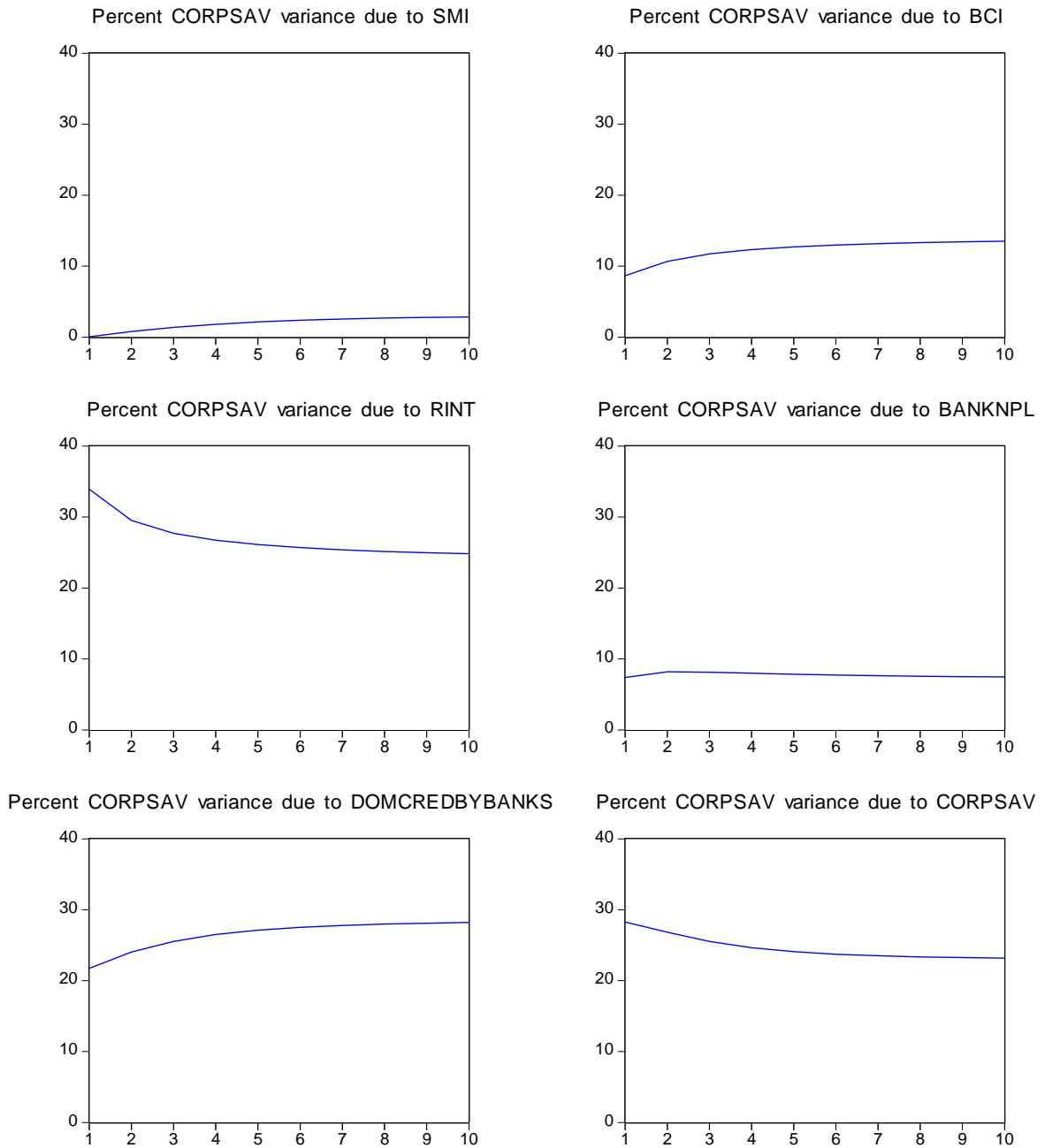
Graph 1.10: The Impulse Response Function of VAR(1) with Variables Stock Market Index, Business Confidence Index, Real Interest Rate, Banks' Non-Performing Loans, Banks' Net Worth, Domestic Credit by Banks, Firms' Net Worth and Corporate Saving.



Appendix 21

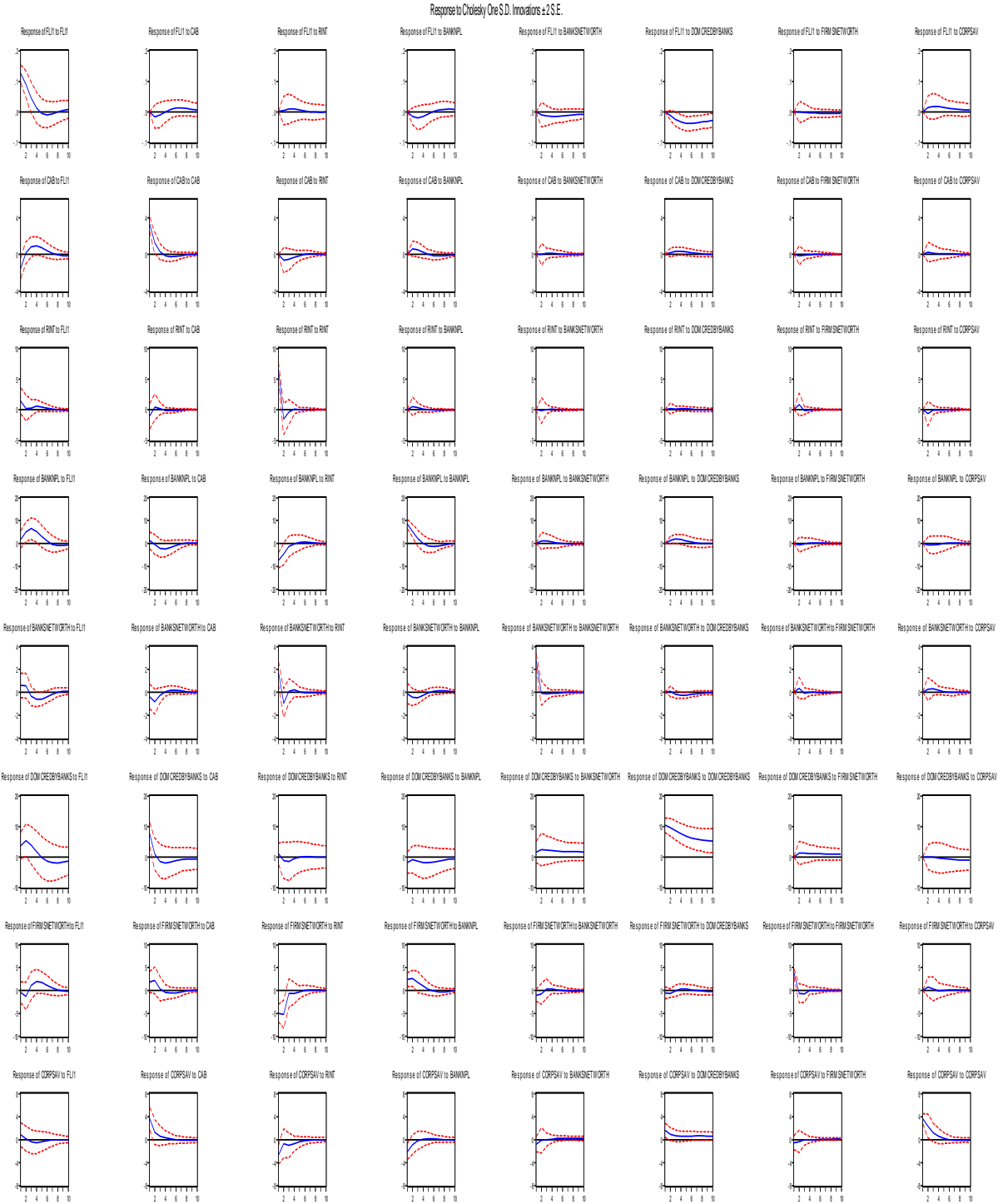
Graph 1.11: Variance Decomposition of Corporate Saving to Stock Market Index, Business Confidence Index, Real Interest Rate, Banks' Non-Performing Loans, Banks' Net Worth, Domestic Credit by Banks and Firms' Net Worth

Variance Decomposition



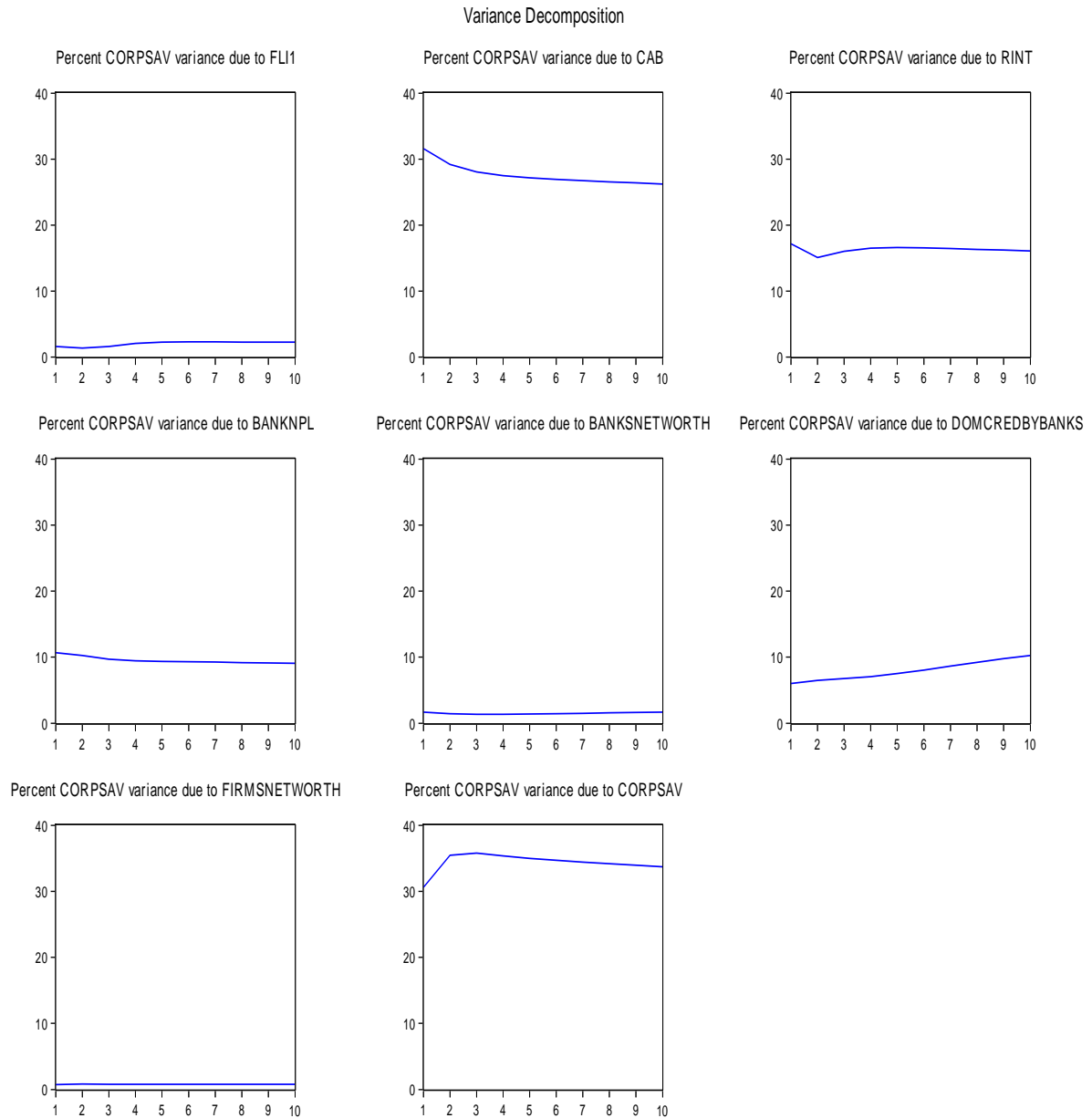
Appendix 22

Graph 1.12: The Impulse Response Function of VAR(1) with Variables Financial Liberalization Index, Current Account Balance, Real Interest Rate, Banks' Non-Performing Loans, Banks' Net Worth, Domestic Credit by Banks, Firms' Net Worth and Corporate Saving.



Appendix 23

Graph 1.13: Variance Decomposition of Corporate Saving to Financial Liberalization Index, Current Account Balance, Real Interest Rate, Banks' Non-Performing Loans, Banks' Net Worth, Domestic Credit by Banks and Firms' Net Worth



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CHAPTER 2

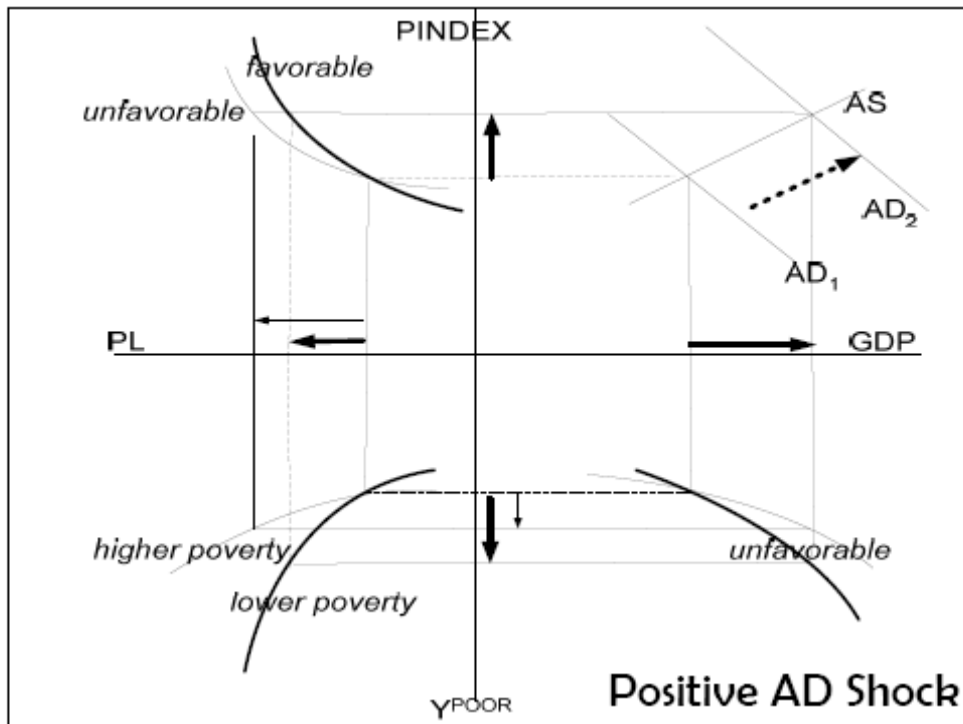
The Impact of Macroeconomic Policies on Poverty Incidence Using Financial Computable General Equilibrium Method: Case Evidence of Thailand

1. Introduction

This research paper is looking at the impact of Thailand macroeconomic policies on the poverty line and income of the poor households. A lot of studies have shown that economic growth is an important factor in reducing poverty. In order to achieve the economic growth, it is necessary for a country to have macroeconomic stability. While, we agree that macroeconomic stability promotes growth, we find it rather ambiguous to conclude that this will also improve a country's poverty situation. There is another factor that is often being overlooked in describing the poverty and that is income of the poor households. Due to this, when macroeconomic stability impacts GDP growth and price, the implication on poverty is uncertain since poverty is critically determined by both income of the poor households and the poverty line.

In Figure 2.1, when there is either a positive monetary shock such as Fed moves to lower the interest rate or a fiscal shock such as government increases its spending, then the AD curve will shift up, to the right. This will increase the GDP (stimulate growth) and increase the price (higher inflation). The poverty line will increase since the poverty line is a function of price but the magnitude will depend on the elasticity of the curve. An increase in poverty line *ceteris paribus* would mean an increase in the number of people that fall below the poverty threshold. Simultaneously, an increase in GDP will increase the income of the poor but the magnitude of the shift depends on the elasticity of income. In this situation, we have growth

that improves the income of the poor but at the same time increase the country's poverty line. A favorable situation is reflected by the darker line in the third quadrant where we have a small increase in poverty line but higher increase in average income of the poor.

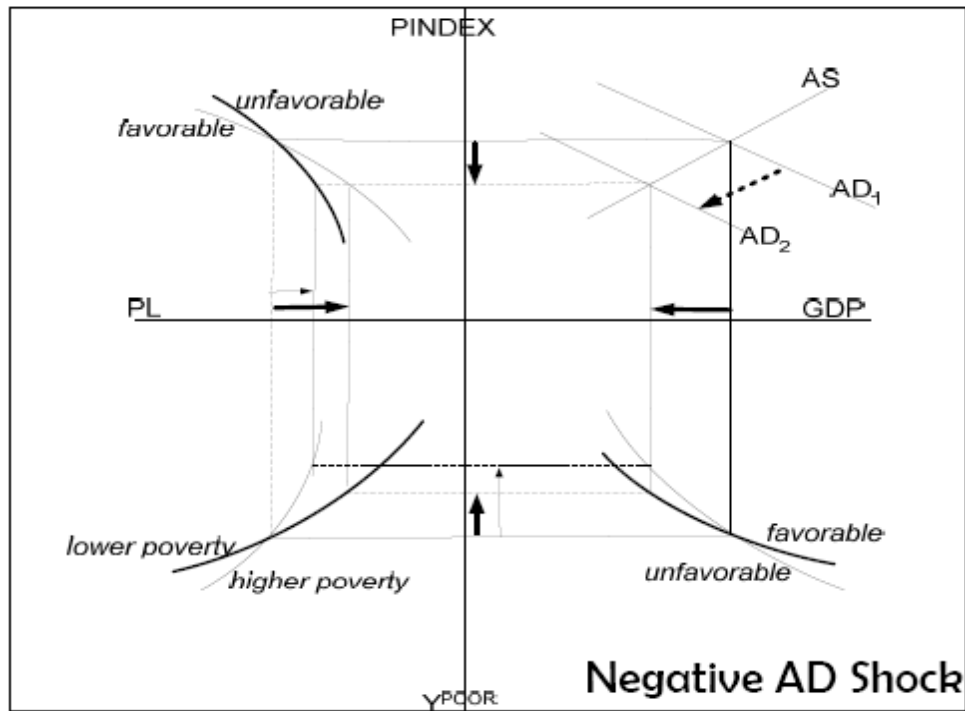


Source: Azis (2009)

Figure 2.1: The Impact of Positive Aggregate Demand Shock on Poverty Line and Income of the Poor

In Figure 2.2 below, if we have contractionary economic policy that resulted in the shift of AD curve down, then the GDP (growth) and price (inflation) will decline. As a result, the poverty line will decline but income of the poor households will also decrease. The magnitude of change varies depending on the elasticity of these curves. The worst situation is depicted by the darker shaded line whereby the decrease in income of the poor dominates the small

decrease of poverty line implying that most likely more households will fall below the poverty line.



Source: Azis (2009)

Figure 2.2: The Impact of Negative Aggregate Demand Shock on Poverty Line and Income of the Poor

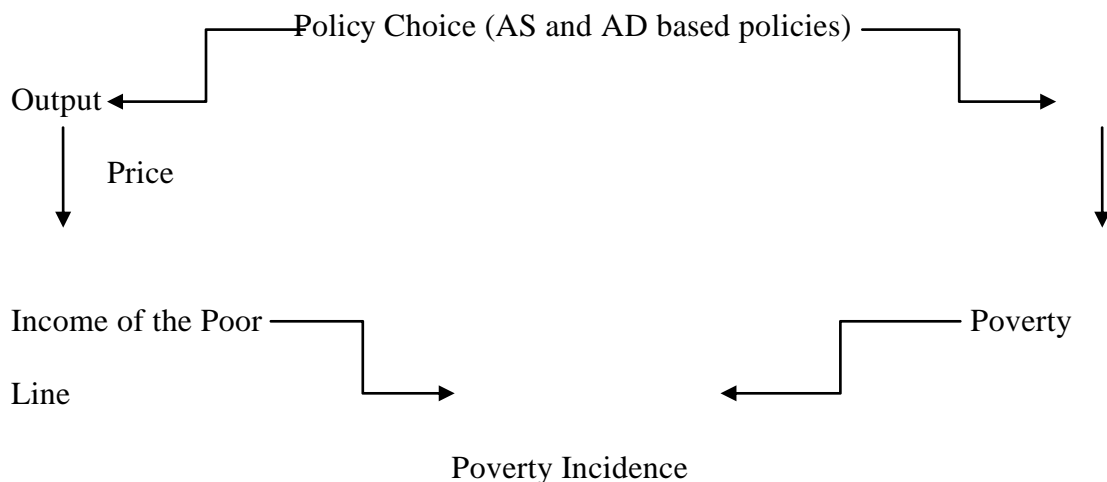
Here, we are taking another step further from Azis (2009) that is in linking the poverty line and income of the poor with the aggregate supply and aggregate demand curves empirically. Azis has set up the framework hypothetically and has only constructed the aggregate demand and aggregate supply in the first quadrants empirically for Thailand and Indonesia. Since Azis has argued the impact of macro stability on poverty line and income of the poor, we will advance his argument by testing this empirically using Thailand's data. Furthermore, Azis has shown a convex and concave relationship in quadrant-2, quadrant-3 and quadrant-4, and using our data, we will investigate if this hold true for Thailand.

In addition to the graphical approach described above, we will extend our investigation of the impact of fiscal and monetary shocks on poverty line and income distribution using Financial Computable General Equilibrium (FCGE) Model. Furthermore, we will illustrate in detail the data used and the construction of the FCGE. Unlike our graphical evidence, in FCGE we could trace the channel of a shock before it hit our final target and our aim is to calculate whether the percentage change in income distribution (relative income of the poor households to the rich households) or the percentage change in the poverty line has greater effect as a result of fiscal or monetary policies. As we had mentioned earlier, any growth policy should take into account two aspects: income inequality/ income distribution and poverty line. By examining the impact using FCGE as a support to our graphical approach, we will have a solid conclusion on the changes in poverty line versus changes in income distribution.

1.2. Problem Statement and Hypotheses

From the above broad conceptual framework presented by Azis (2008), we are testing the following hypothesis empirically using case study of Thailand.

1. What is the impact of macroeconomic policy choices on poverty line and income distribution using both graphical evidence and Financial Computable General Equilibrium (FCGE) Method?



2. Literature Review

A lot of studies have been done on growth and its impact on poverty. Dollar and Kray (2000) in their study of 92 countries in the past four decades have shown that growth on average benefits the poor as much as others in the society and so standard growth enhancing policies should be at the center of any effective poverty reduction strategy (pg. 27). However, they don't deny the effect on the income share of the poorest quantile but were unable to relate them to any changes across countries and over time. Ames, Brown, Devarajan and Izquierdo (2001) argued that economic growth is the single most important factor influencing poverty and macroeconomic stability is essential for high and sustainable growth. Nevertheless, according to them this will work effectively in some situation than others depending on the impact of growth on poverty measured by distributional income and sectoral composition of growth. Another study by Lin (2003) argued that the selection of growth policies should maximize the sum of income and inequality using a new poverty reduction index. By drawing an example of China, she showed that although the economic growth implemented between 1985 and 2001 has successfully reduced the poverty, the effectiveness of poverty reduction

was declining due to the rising in income inequality. Bourguignon (2004) established the poverty-growth-inequality triangle and acknowledge that the real challenge in establishing development strategy to reduce poverty is the interactions between growth and distributions and not the interactions between growth and poverty or poverty and inequality separately. This implies that the mechanism of linking growth to poverty and inequality is more complex and not direct. Fan et.al (2004) research on government spending and poverty reduction in Vietnam has shown that government investment in agricultural research followed by roads and education has the largest poverty reduction. The same conclusion was reached for rural Uganda by Fan et.al (2004). In investigating the contractionary policy such as the reduction in government spending, Buiter (1988) has shown the importance in distinguishing between the cuts in public consumption expenditure and public sector capital formation since they would have different effect on deficit.

Azis (2009) has linked hypothetically the macroeconomic policies that stimulate growth to poverty line and income of the poor households. He further used Indonesia Financial Computable General Equilibrium (FCGE) model to illustrate the possible impact on poverty line and income of the poor households when there is a macroeconomic shock. In his model, the economic growth has caused the poverty incidence to rise due to the higher decline in income distribution that dominates the slight increase in poverty line. The usage of Computable General Equilibrium (CGE) model is one of the most popular approaches in investigating the impact of economic shocks such as policy changes and exogenous events on poverty and inequality. Robinson and Lofgren (2005) were among the two leading scholars in developing/extending the approaches of using FCGE in macro models and poverty analysis. In their specifications, they cautioned that the ability of CGE to analyze at macro-end

depended on its macro closures and due to limited data and information on the processes that underlie the portfolio choices and expectations formation, the impact on short run equilibrium and its distributional impact remained limited. Earlier study for instance by Cockburn (2001) models all the households from the national representative households survey data in investigating the impact of fiscal reforms and trade liberalization on poverty and inequality. Others such as Schweickert et.al (2005) instead looked at specific shock in the CGE model that was exchange rate policy in the dollarized Bolivia economy. Their finding showed that the nominal devaluation of exchange rate after a negative shock depended on the wage indexation and has no significant effect on poverty alleviation. Another study by Mahjabeen (2008) that have refined the specification in CGE model investigated the impact of microfinancing in Bangladesh and concluded that microfinance institutions indeed help to increase the income and the consumption of households, enhance the welfare and reduce inequality. Finally, Taylor and Resensweig (1984) were the among the earliest study using the Thailand CGE to analyze the effect of exchange rate, fiscal and monetary policies on economic growth, investment and national income. In addition to Hazledine (1992) various usage of CGE/FCGE in investigating the economy-wide impact, one still has to be cautioned of the limitation that such model imposed. In particular, as mentioned by Hazledine (1992) that among the weaknesses of CGE/FCGE are weaknesses or shortages of data, micro foundations and the macro closures defines in closing the big aggregated model. Another critique by Devarajan and Robinson (2002) has outlined several arguments in which the CGE model has enlightened the debate on policy analysis but at the same time they considered the misuse of CGE in policy analysis. One of the interesting points that they mentioned was the ‘Black Box’ syndrome in which the results of the policy changes are not transparent/opaque.

Nevertheless, our research will contribute further to existing literatures that have used FCGE by testing Azis's claim empirically using Thailand as our case study. As mentioned earlier, it is not a straight-forward solution in determining the impact of growth on poverty line and average income of the poor. These effects are inter-related and occur simultaneously and sometimes due to limited data and information underlying our portfolio choices, the short run equilibriums obtained may be limited. However, the choice of using FCGE is still the best option in looking at growth and poverty analysis that requires using the multi-sectoral, multi class model and here we accompanied our FCGE approach with the graphical approach described earlier.

3. Data and Methodology 1:

Our first methodology is to construct the four quadrants similar to Figure 2.1 and 2.2 above.

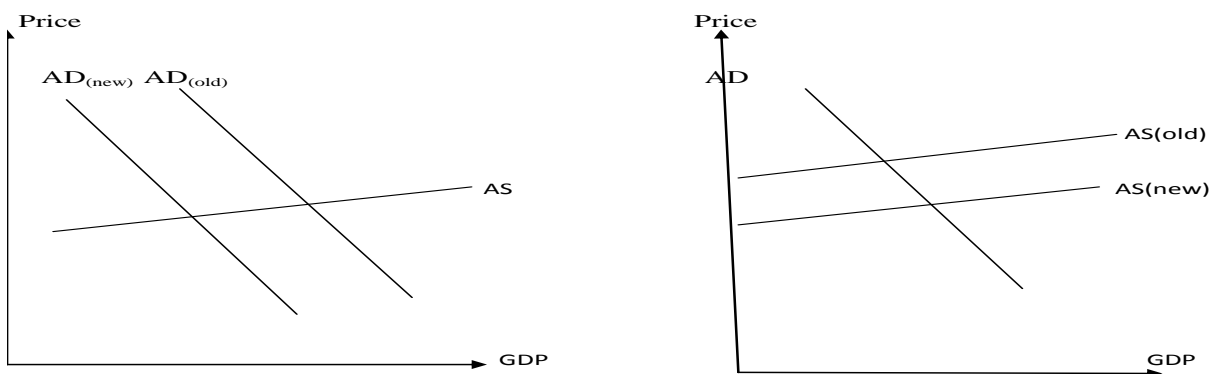
3.1. Construction of Quadrant - 1: Aggregate Demand and Aggregate Supply Curves

In the first quadrant, we are estimating the aggregate supply and demand (AS-AD) curves using structural vector auto regression (SVAR) approach. The method was first proposed by Blanchard and Quah (1989) that identified the restrictions on SVAR by imposing long run restrictions on its disturbances. Using GNP and unemployment, they concluded that the fluctuations in these two variables were due to orthogonal shocks of supply³⁵ shocks and demand³⁶ shocks. From the result, they have shown that demand shocks have only temporary effect on output (GNP) while supply shocks have a permanent effect. However, both shocks

³⁵ Examples of supply shocks include increase in energy price, bad weather and etc. that would affect the supply.

³⁶ Examples of demand shocks include fiscal policies (taxation and government spending) and monetary policies (reserve requirement, open market operations, interest rate).

do not have long run effect on unemployment. Following B&Q's line, Gamber (1996) instead used CPI and real GDP to decompose them into supply and demands shocks that are orthogonal to each other. He investigated whether B&Q's methodology yield 'textbook' aggregate supply and aggregate demand curves (Gamber, 1996). His result using US post war data from 1949 quarter 1 until 1992 quarter 2 showed aggregate supply and aggregate demand derived using this method did in fact corresponded to historical aggregate supply and aggregate demand shocks. Taking further step, Azis (2009) combined B&Q model with macroeconomic policies implemented by Indonesia, Thailand, Malaysia and Korea during 1997 Asian financial crisis. Azis concluded that given the slopes of AS-AD curves, appropriate economic policy response can be chosen. For instance, during 1997 Asian financial crisis, Indonesia had followed IMF policies of tightening monetary policies such as increased the interest rate and cut the government spending. However, by decomposing AS and AD components, it has revealed that since AS curve is relatively flatter than AD curve; demand based policies are effective in stimulating growth but not in controlling inflation. Furthermore, the decomposition has shown that the high price during crisis was due to a supply shock and hence IMF policies on contractionary of aggregate demand were not effective. This is illustrated below:



From these two graphs, we can see that when AS curve is flat relative to AD curve and our objective is to control the inflation as in 1997 Asian Financial Crisis, tight monetary policies as prescribed by IMF would reduce the growth but has little impact in reducing the inflation. On the other hand, increasing the aggregate supply would stimulate the growth and reduce the inflation significantly more.

In order to construct the AD-AS curves for the first quadrant, we've collected yearly data on GDP and consumer price index (CPI) from the Economic Intelligence Unit (EIU) database ranging from 1980 to 2009. The longer period of observation is required to ensure consistency and accuracy of the curves. Based on the shocks that have been generated, we truncated it only to a period that matched with the period we have for poverty line and average income of the poor households.

3.1.1. Blanchard & Quah Decomposition in this Framework³⁷

Let $Y_t = (\Delta \ln \text{GDP}, \text{Inflation})^T$

According to Blanchard and Quah Decomposition method, we first need to define regular vector autoregression, VAR (p) model:

$$Y_t = A_0 + A_1LY_t + \dots + A_pL^pY_t + V_t \quad (1)$$

$$\text{Var}(V)=\Omega$$

where V_t = residuals with covariance matrix Ω

³⁷ Some of these derivations and notations are adapted from document compiled by Nattapong Puttanapong and Yiou Zhu.

L = lag operator

p = number of lags that are included in the model

Next, we invert this VAR(p) model into moving average representation,

$$Y_t = V_t + C_1 V_{t-1} + \dots = \sum_{j=0}^{\infty} C_j V_{t-j} \quad (2)$$

$$\text{Var}(V) = \Omega$$

Since the innovations V_t 's are contemporaneously correlated, this implies that C_j 's will not exhibit independent responses to any innovations. Hence, Ω is a full matrix. However, under B&Q assumptions, we can decompose these innovations into two orthogonal effects: supply innovation and demand innovation, in which equation (2) will become:

$$Y_t = A_0 + A_1 e_{t-1} + \dots = \sum_{j=0}^{\infty} A_j e_{t-j} \quad (3)$$

$$\text{Var}(e) = \Sigma$$

Where $e =$ uncorrelated shock pair $(e_d, e_s)^T$

$\Sigma =$ diagonal covariance matrix.

The relationship between (2) and (3) are as follow:

$$A_j = C_j \cdot A_0, \quad j = 0, 1, 2, \dots \quad (4)$$

$$A_0 \cdot \Sigma \cdot A_0^T = \Omega \quad (5)$$

$$C_0 = I$$

Therefore, we need to identify A_0 in order to solve for (3). Let ω_{ij} and σ_{ij} represent elements in matrix Ω and Σ respectively, then equation (5) can be written as:

$$\begin{bmatrix} a_{11} & a_{12} \\ a_{21} & a_{22} \end{bmatrix} \begin{bmatrix} \sigma_{11} & 0 \\ 0 & \sigma_{22} \end{bmatrix} \begin{bmatrix} a_{11} & a_{21} \\ a_{12} & a_{22} \end{bmatrix} = \begin{bmatrix} \omega_{11} & \omega_{12} \\ \omega_{21} & \omega_{22} \end{bmatrix} \quad (6)$$

There are three restrictions imposed by Equation (6) on the four elements of A_0 :

$$a_{11}^2 \sigma_{11} + a_{12}^2 \sigma_{22} = \omega_{11} \quad (7)$$

$$a_{21} a_{11} \sigma_{11} + a_{12} a_{22} \sigma_{22} = \omega_{21} \quad (8)$$

$$a_{21}^2 \sigma_{11} + a_{22}^2 \sigma_{22} = \omega_{22} \quad (9)$$

We normalize Σ to be identity matrix, implying that $\sigma_{11} = \sigma_{22} = 1$. Since we have four unknowns, $a_{21}, a_{22}, a_{12}, a_{11}$ and three equations, (7) – (9), we need to impose another restriction to ensure that A_0 is unique. This is where we redefine our VAR model into structural VAR in which we will use economic theory to identify the elements in A_0 . The long run restriction imposed by Blanchard and Quah stated that there are no long run impact from aggregate demand shock on the growth of output. This implies that aggregate demand shock is a transitory shock and that our output will go back to natural rate of output. Thus, the additional constraint is:

$$\sum_{j=0}^{\infty} c_{11,j} a_{11,0} + \sum_{j=0}^{\infty} c_{12,j} a_{21,0} = 0 \quad (10)$$

since we define the element $a_{11,j}$ in A_j matrix to reflect the impact from demand shock on real GDP growth in period j . Hence the accumulated effect of demand shock on real GDP in the long run will be $\sum_{j=0}^{\infty} A_j$.

Now, we can solve for equation (6) - (10) (with $\sigma_{11} = \sigma_{22} = 1$) that will give the A_0 matrix in which equation (3) can be derived. In order to obtain the aggregate demand curve, we will set the supply shock to zero (Equation 11) and similarly, to obtain the aggregate supply curve, we will set the demand shock to zero (Equation 12). From here, we will obtain our AS-AD curve.

$$Y_t^{AD} = \sum_{j=0}^{t-1} A_{j,t} \cdot \begin{bmatrix} e_{d,t-j} \\ 0 \end{bmatrix} + \hat{y}_t \quad (11)$$

$$Y_t^{AS} = \sum_{j=0}^{t-1} A_{j,t} \cdot \begin{bmatrix} 0 \\ e_{s,t-j} \end{bmatrix} + \hat{y}_t \quad (12)$$

Another Procedure of Blanchard & Quah Decomposition using Choleski Decomposition Matrix is in Appendix 1.

This procedure is adapted by earlier literature on vector autoregression (VAR) method.

3.1.2. Construction of Quadrant - 2: CPI and Poverty Line

In the second quadrant, we will find the relation between poverty line and price (CPI) simply by plotting the graph. In our case study of Thailand, we managed to obtain yearly data from 1988 to 2002 for the poverty line and poverty incidence from Thailand National Economic and Social Development Board (NESDB). For the poverty line data, we took an average across the regions in Thailand to find an estimate of the country's poverty line. Thailand's official poverty line is defined as the cost of basic needs for food and non-food items. A household is considered as poor if his or her per capita income is less than the defined poverty line.

Thailand Poverty Line = Food Poverty Line + Non-Food Poverty Line

Food Poverty Line³⁸:

The food poverty line is estimated from the cost of food baskets which contain the minimum calorie requirements for an individual household. The per capita household calorie requirement is defined as the aggregated required calories per day of each household member with respect to their age and sex. Then this minimum calorie requirement for a household is converted into money metric terms: amount of calories that one bath can buy.

$$\text{Step 1: } CAL_h = \sum_{i \in h} CAL_i$$

$$\text{Step 2: } CALBHT_r(rural) = (\sum_{s=rural} \frac{cq_s}{E_{rs}}) / 5$$

$$\text{Step 3: } FPL_h = \frac{CAL_h}{CALBHT_h}$$

Where c = conversion vector that translates the amount of each food items consumed into calorie unit

q_s = quantity vector of food basket in region s

E_{rs} = total food expenditure in region s using the price of region r

The food baskets and spatial price indices of 1992 are used to construct the cost of calories. Moreover, the cost of calories is based on average sanitary basket in different regions rather than using municipal baskets since they are most cost efficient. The cost of calories is then being updated using the food price indices. The food poverty line is then defined by:

³⁸ Source: NESDB

Food Poverty Line = [Calorie Requirement from Step 1 * 30 Days] / [Calories Obtained per Bath from Step 2]

Non-Food Poverty Line:

According to NESDB, the calculation for non-food poverty line is using Engle's ratio. The estimated food to total expenditure ratio is used in calculating the non-food poverty line and in Thailand, it is assumed that food consumption is 60% of total consumption at the poverty lines before adjusted for regional price differences. The non-food poverty line is two third of food poverty line

Total Poverty Line:

Poverty Line = Food Poverty Line + Non-Food Poverty Line

$$\begin{aligned}
 PL_h &= FPL_h + NFPL_h \\
 &= FPL_h * \left(1 + \frac{2}{3} * \frac{SPInf_r}{SPIf_r}\right)
 \end{aligned}$$

where $SPInf_r$ = non – food spatial price index for region r

$SPIf_r$ = food spatial price index for region r

Azis (2009) has defined the poverty line as:

$$\sum (\text{Baskets of Basic Needs for Food in Calorie Requirement} * \text{Price})$$

In Azis's conceptualization, there is a relation between price index and poverty line because there's a basic need bundle whose price will change when there is a macroeconomic shock that will affect the demand. The data that we obtained on poverty line is as derived above and included non-food poverty line.

After plotting the graph of price index and the poverty line directly without any modification, we will then use impulse response function to trace out the time path of the effect of structural shocks on the dependent variables of the model³⁹. The impulse response will be applied after we have estimated the relation of CPI and poverty line using Vector Auto Regression of lag p ⁴⁰. In other words, we can see the response of dependent variable to the shocks over time. We will use the Cholesky decomposition in assuming that dependent variable at time (t) does not have a contemporaneous effect on independent variable at time (t). In our case, we assume that any shock in price index at time (t) will only affect the poverty line at time (t+1) and vice versa.

3.1.3. Construction of Quadrant - 3: Poverty Line and Average Income of the Poor

The third quadrant depicts the relation between poverty line and the income of the poor as a result of macroeconomic shock. This can be traced out from the equilibrium in the second and the fourth quadrant.

³⁹ The structural shocks and dependent variables trace out the impulse response function of both CPI and Poverty Line. When there is a structural shock from CPI, then we can see the impulse response of poverty line as the dependent variable; vice versa when there is a structural shock of poverty line, then we can trace the impulse response of CPI.

⁴⁰ Refer to Equation 1 of 4.1.1. Instead of CPI and Real GDP, we now have VAR (p) of CPI and Poverty Line.

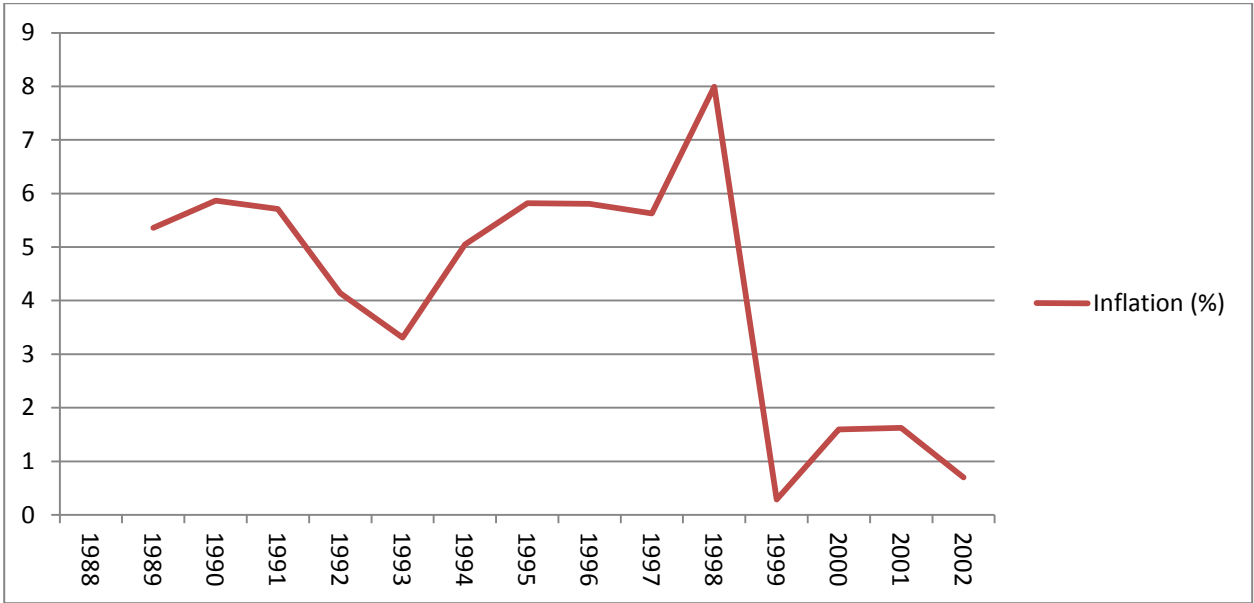
3.1.4. Construction of Quadrant - 4: GDP and Average Income of the Poor

In the fourth quadrant, we will again directly plot the graph of GDP and the average income of the poor without any modification. As in construction of the second quadrant, we will then use the impulse response function to see the impact of a unit shock on independent variable over time as explained above.

4. Results and Analysis I

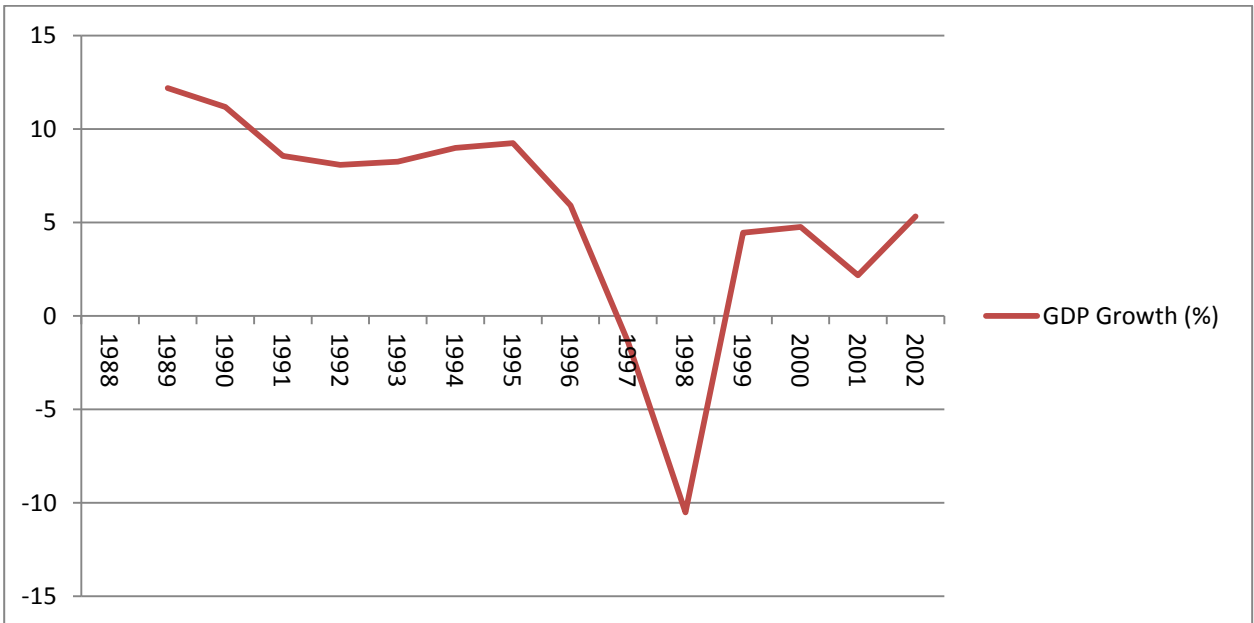
4.1. Results for General Economy in Thailand using Real GDP, CPI, Poverty Line and Average Income of the Poor

The following graph showed that Thailand's inflation (Figure 2.3) has been moving up and down during the period of 1988 until 1997. It reached the peak in 1998 before dropped significantly in 1999. This is consistent with the decline in economic GDP growth (Figure 2.4) from 1995 until 1998 before bouncing back in 1999. Thailand has experienced a U-shaped recovery after the Asian Financial Crisis (AFC) 1997 and although it recovered after 1999, the growth was not as high as prior to 1995. One factor that could be attributed to the decline in Thailand's GDP growth in 1995 was the devaluation of Chinese yuan in 1994. This devaluation had made export from China cheaper and hence a decline in the demand for Thailand's export.



Source: EIU

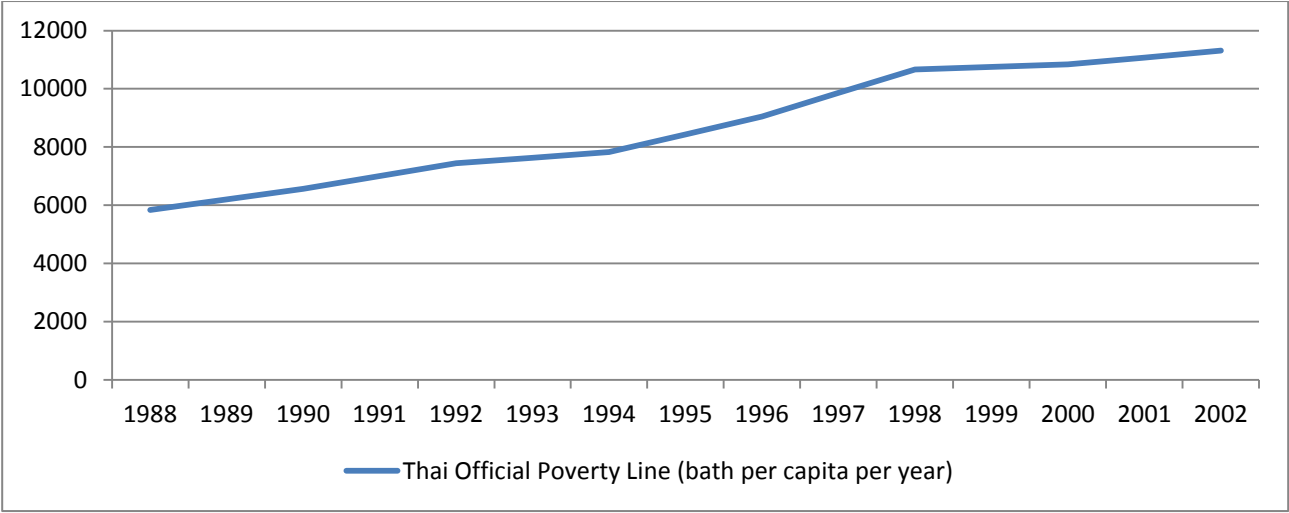
Figure 2.3: Thailand's Inflation (%)



Source: EIU

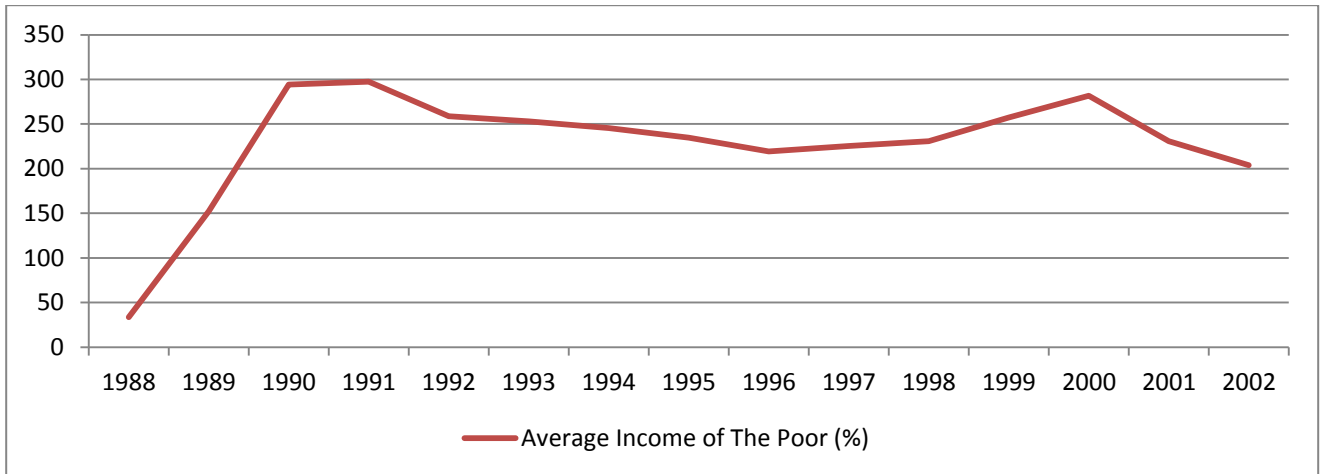
Figure 2.4: Thailand's GDP Growth (%)

In Figure 2.5, it showed that despite the ups and down in the inflation rate and the GDP growth, the poverty line in Thailand had been steadily increasing from 1988 until 2002. Meanwhile, the average income of the poor (Figure 2.6) increased tremendously from 1988 – 1991 before declining to the lowest point in 1996 and gradually increased until 2000.



Source: NESDB

Figure 2.5: Thailand’s Official Poverty Line

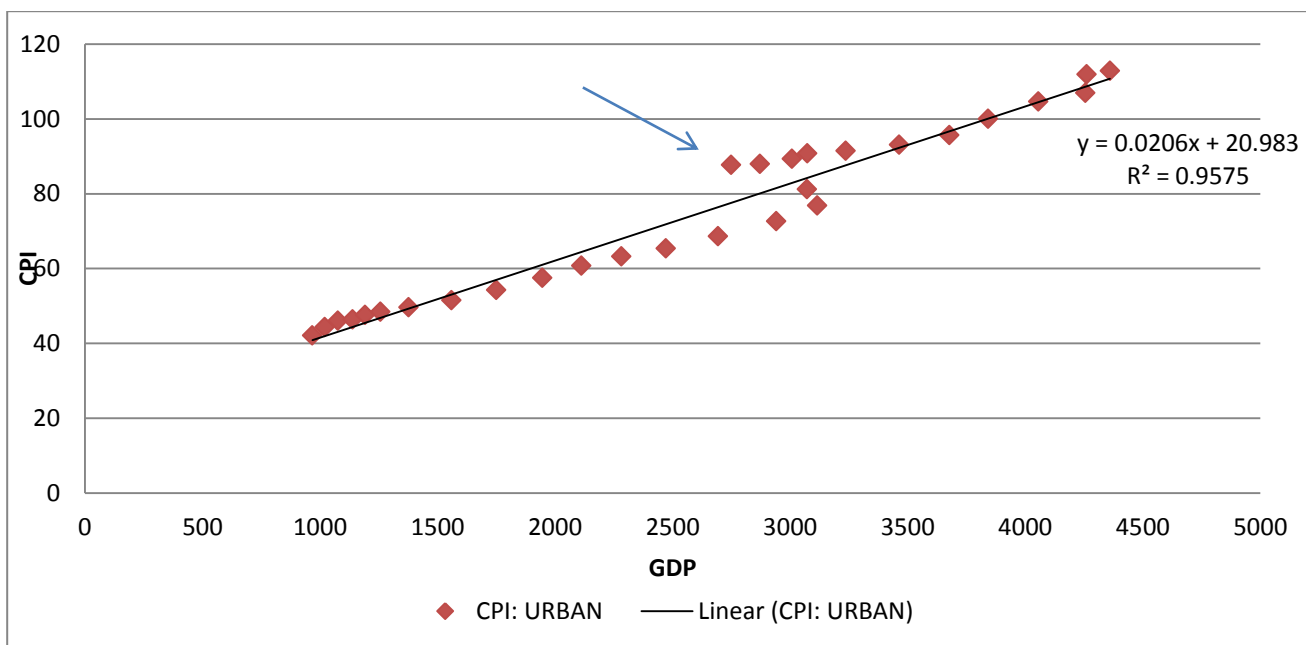


Source: NESDB

Figure 2.6: Thailand’s Average Income of the Poor (%)

4.2. Results for Quadrant – 1: Aggregate Demand and Aggregate Supply Curves

In Figure 2.7, we can see that there is almost a linear relationship between CPI and GDP except for the point where the arrow is pointing which is the period of 1997-AFC. During this period of 1997 to 1998, the GDP declined but the price kept on increasing.



Source: EIU

Figure 2.7: CPI versus GDP – Thailand (1981 – 2009)

Next, we run our data for the Blanchard and Quah Decomposition explained earlier using Gauss Software and Figure 2.8 showed the long run restrictions we have imposed. For the impulse response to transitory shock (demand shock) on the left hand side in Figure 2.8, we can see that the response of green line (output growth) will eventually dies off by converging to the zero horizontal line while the response of blue line (price) will keep on fluctuating and not dies off. For example, when there is a cut in government spending (transitory/demand shock), the output growth (green line) will be affected temporarily but in the long run it will revert back to the natural rate of output. On the other hand, this demand or transitory shock has a long lasting effect on the price.

On the right hand side, it shows the impulse response to permanent shock (supply shock). A supply shock will not cause high increase in the price level (blue line) but high response from

the output growth. For instance, a productivity shock or improved in the labor market will not affect the price too much, in fact the price will fluctuate and not dies off but the output will be very much affected at the beginning and eventually converge to a certain level.

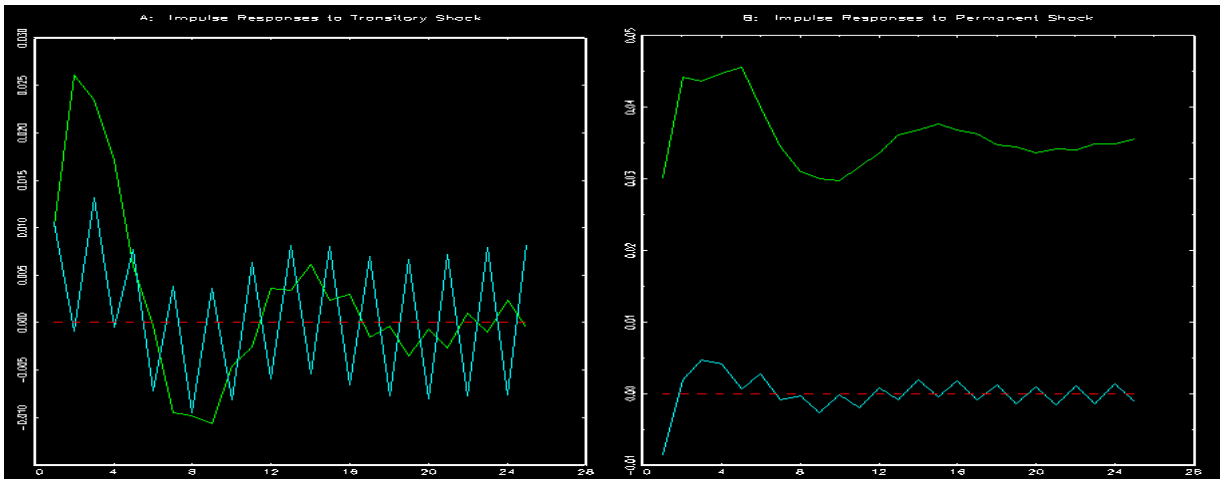


Figure 2.8: Impulse Response of Output Growth and Price to Demand Shock (left hand side) and Supply Shock (right hand side)

In Figure 2.9 and Figure 2.10 below, we have obtained the results from our Blanchard and Quah Decomposition. In Figure 2.9, it shows that a movement from the demand shock will trace out the aggregate supply curve and the movement from the supply shock will trace out the aggregate demand curve. From the slope of these curves, we can see that the aggregate demand curve is steeper than aggregate supply curve. Hence, since aggregate supply curve is flat relative to aggregate demand curve, then if the objective is to raise output, it would be more effective to use aggregate demand shock otherwise the supply shock is used if the objective is to reduce price. In Azis (2009), he has used the data from 1997Q1 – 2007Q2 to construct the AS-AD curves. The slope of AS curve he has obtained is 0.01 and the slope of AD curve is -0.799. In our research, we have used yearly data from 1980-2009 and our results

have shown that the slope of our AS curve is 0.0003 and AD curve is -0.0017. It is obvious that Azis has obtained steeper slopes for both AD and AS curve, but nevertheless the conclusion is the same that in the case of Thailand, the average AS slope is relatively flatter in comparison to the average AD slope. Furthermore, due to the yearly data of poverty line and average income of the poor, we are unable to emulate Azis in using the quarterly data for CPI and GDP.

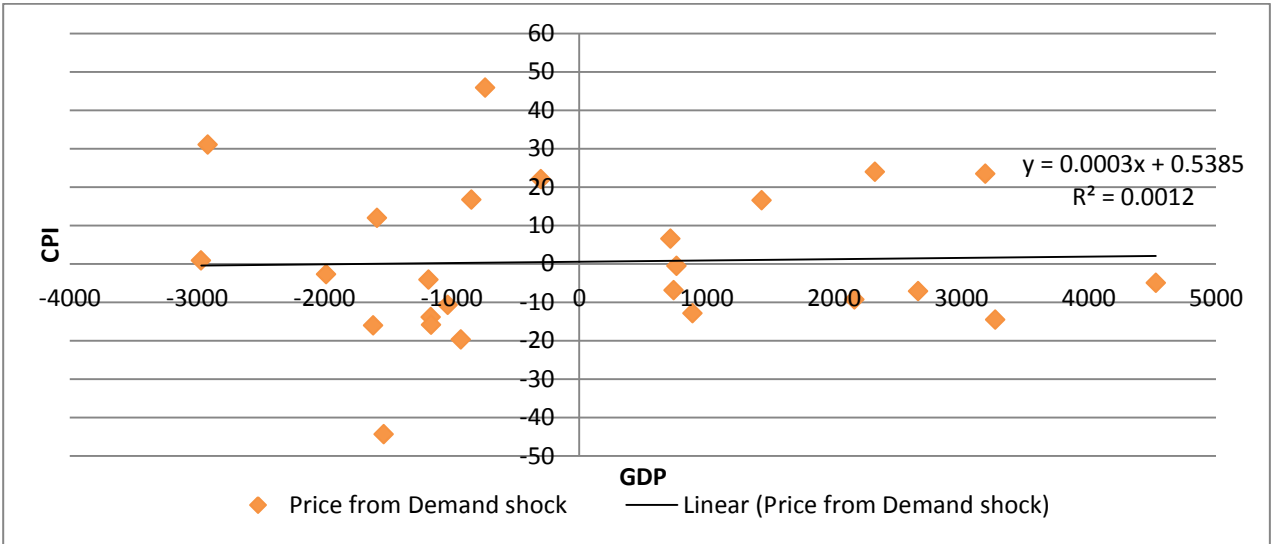


Figure 2.9: Aggregate Supply Curve – Thailand (1985-2009)

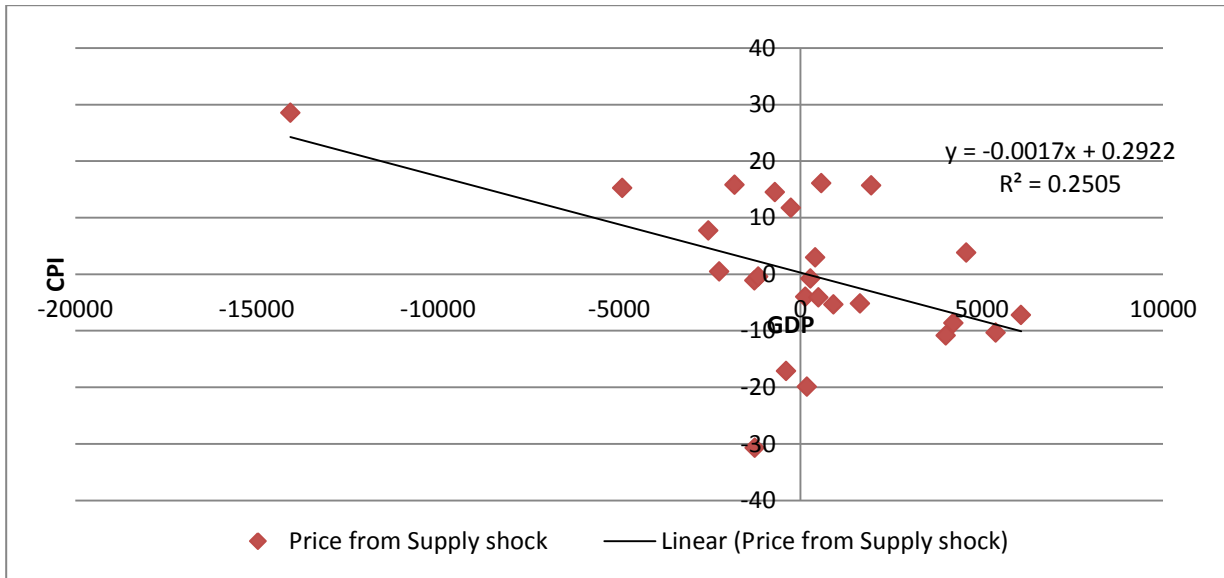


Figure 2.10: Aggregate Demand Curve – Thailand (1985-2009)

However, since the slopes we have obtained above only shows the average slope from 1981-2009, we next plot the dynamic slopes over time in Figure 2.11.

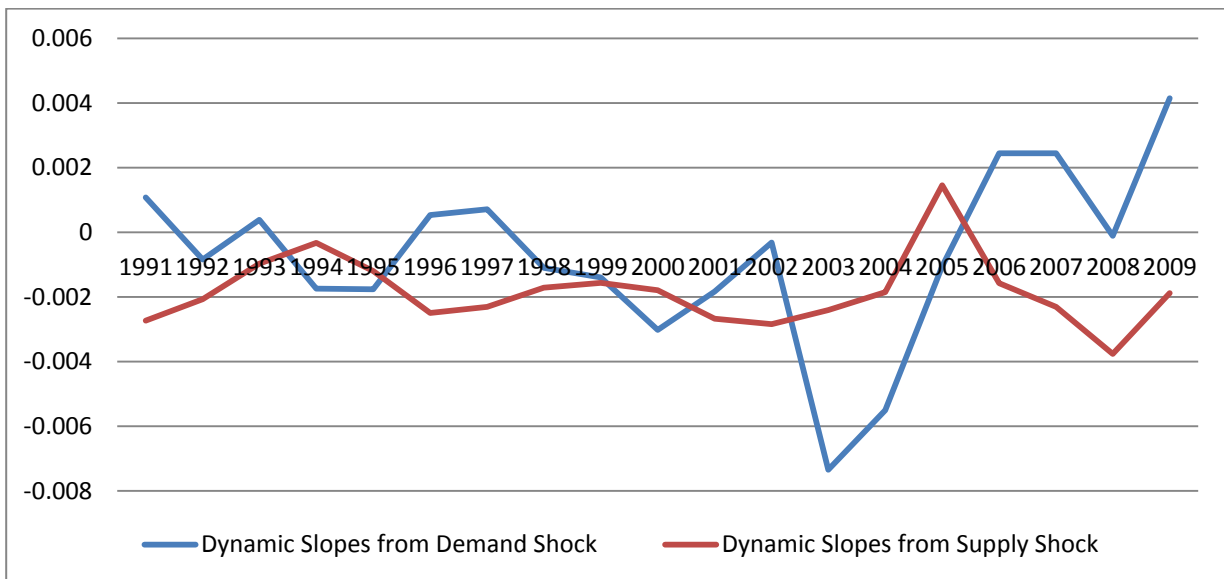
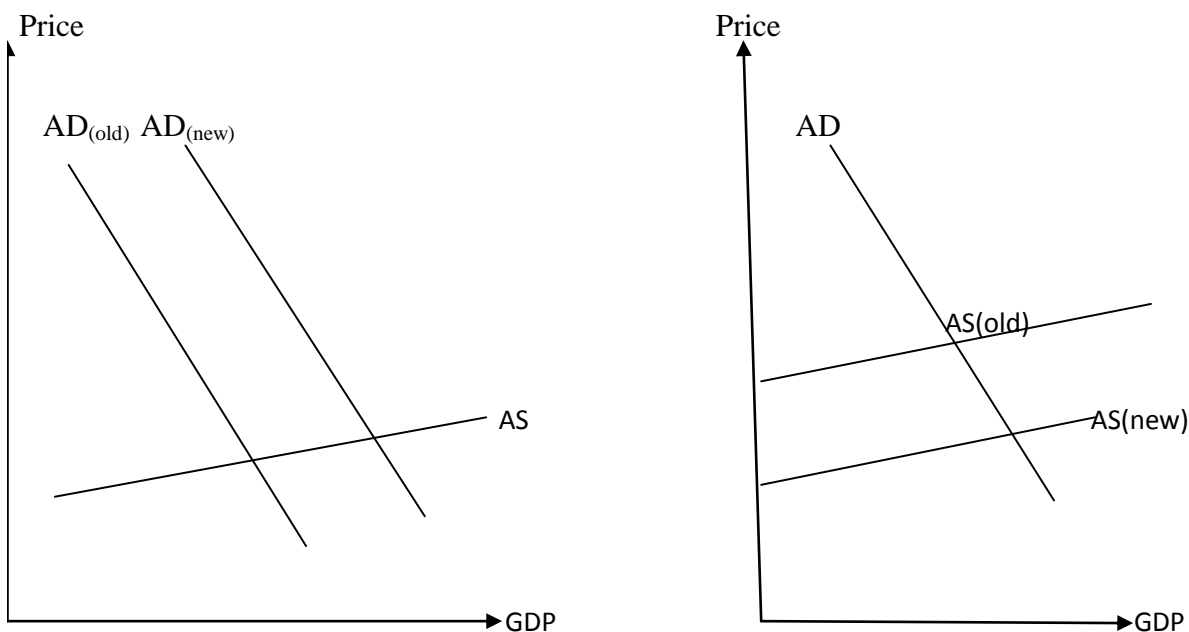


Figure 2.11: Thailand Dynamic Slopes (1991 – 2009)

We can see that in 1997, the magnitude of slope for aggregate demand is higher than for aggregate supply curve, and so IMF policies during the crisis would result in higher decline in output than in price reduction. Hence, to stimulate output during this period, it would be more effective to use demand shock (monetary and fiscal policy) while to reduce price inflation, it would be more effective to use supply shock (productivity, labor market and etc).



In Figure 2.12 and Figure 2.13, we showed the sensitivity of output and price to demand and supply shock. For instance, during 1997-AFC, the response of price to supply shock is greater than its response to demand shock, hence supporting our argument that in order to control inflation, it would be more effective to use the supply shock (Figure 2.12). In other words, the supply shock dominated the sharp fluctuation during 1997 – 1999 periods. In Figure 2.13, we can conclude that the source of the sharp fluctuation in output especially in 1998 originated from the supply shock due to the higher magnitude than the magnitude shocks from demand shock. The supply shocks caused the source of the sharp fluctuations of price in Thailand from 1997 - 1999.

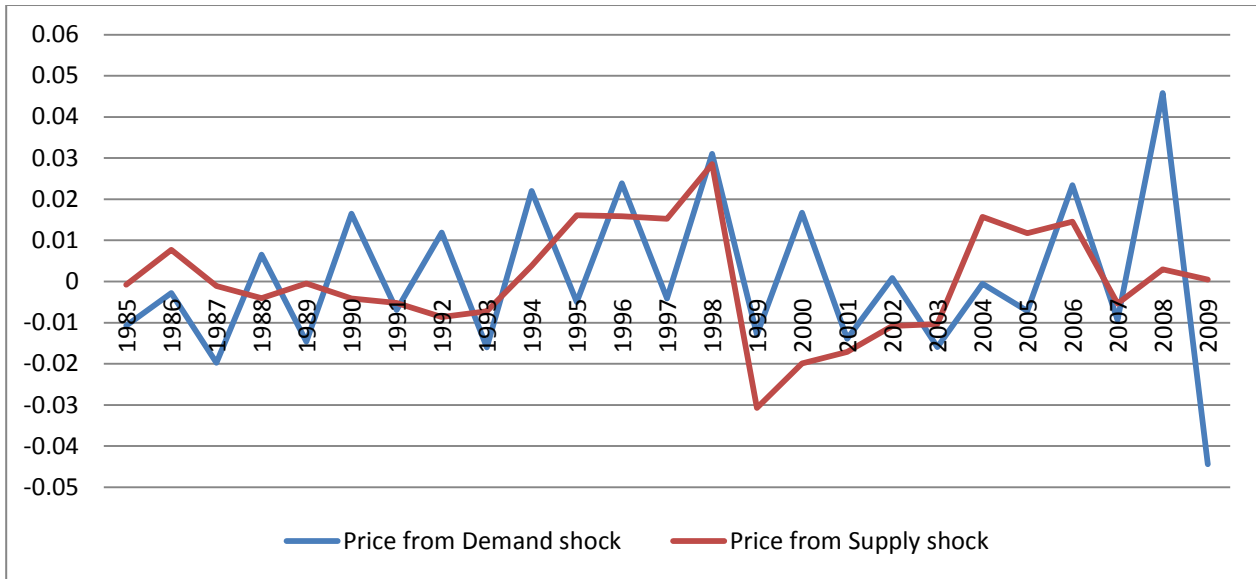


Figure 2.12: Response of Price to Demand and Supply Shocks – Thailand (1985-2009)

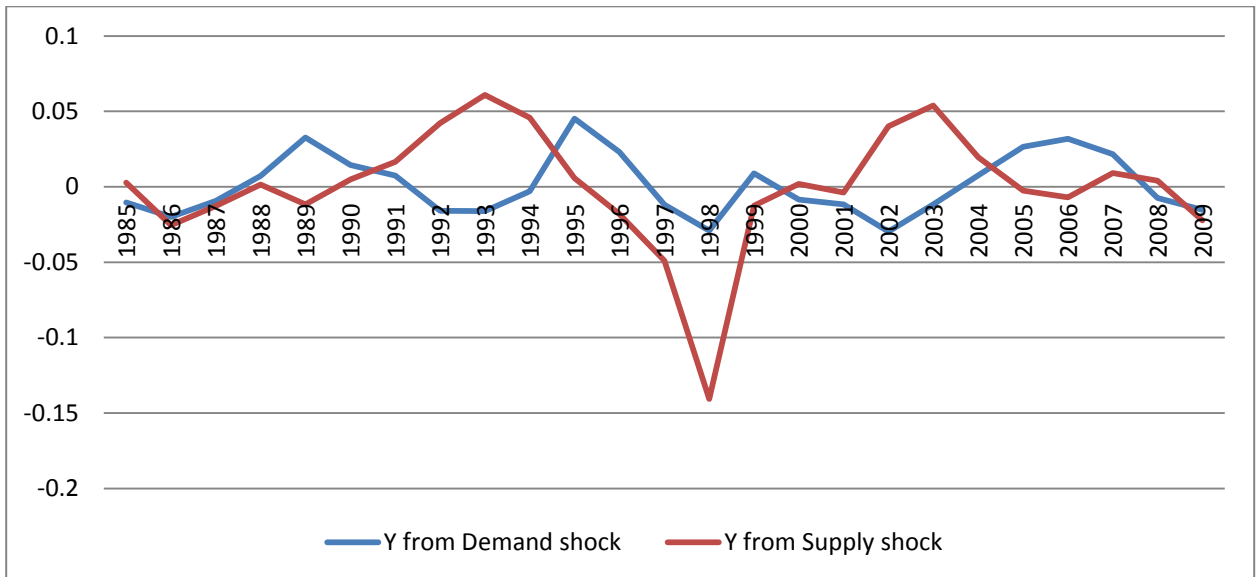


Figure 2.13: Response of GDP Output to Demand and Supply Shocks – Thailand (1985 -2009)

4.3. Results for Quadrant – 2: CPI and Poverty Line

Figure 2.14 shows the result for the second quadrant that is the relation of consumer price index against the poverty line. As it shows, the relationship is linear from 1988 to 2002.

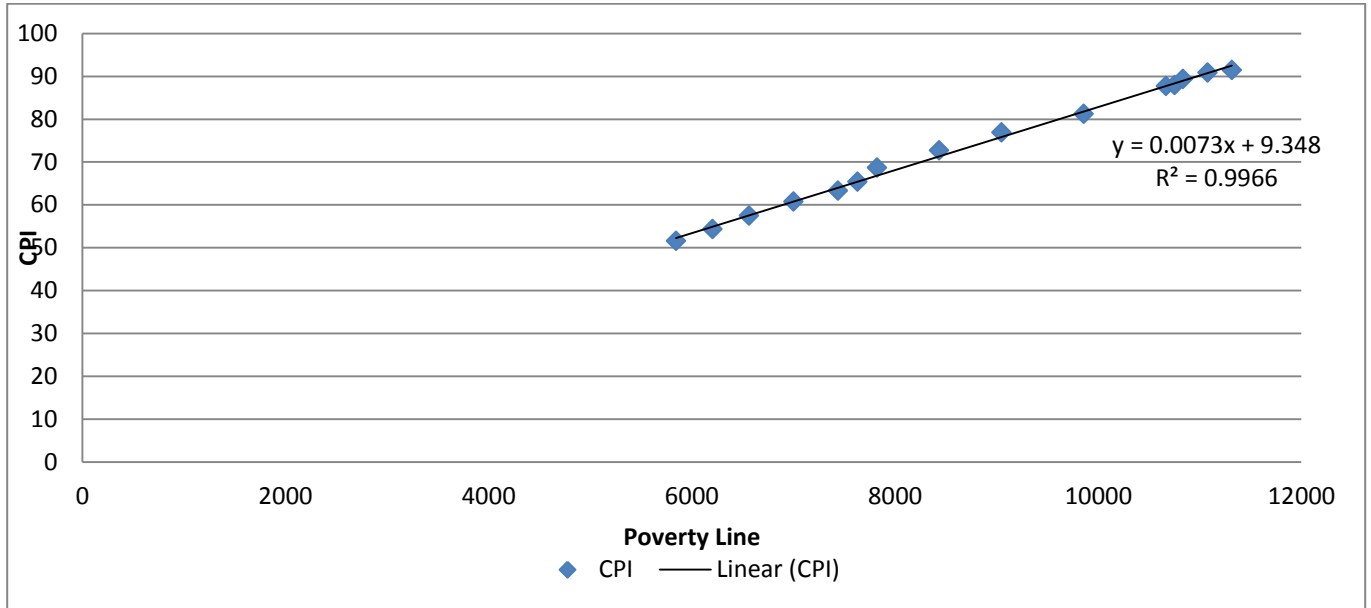


Figure 2.14: Consumer Price Index against the Poverty Line – Thailand (1988 -2002)

Since linear regression only captured the response of dependent variable to the independent variable, in this case CPI to Poverty Line, we applied Vector Autoregression (VAR) of lag p to see the reverse response. In Figure 2.15 below, it showed VAR (2) for Thailand poverty line and cpi. We took VAR (2) since the results showed more statistically significant relation for Response of CPI to Thai Poverty Line and Response of Thai Poverty Line to CPI than to use VAR (1). The equation for VAR (2) is as follow:

$$\text{PovertyLine}_t = \alpha_{10} + \alpha_{11} \text{Poverty Line}_{t-1} + \alpha_{12} \text{CPI}_{t-1} + \alpha_{13} \text{Poverty Line}_{t-2} + \alpha_{14} \text{CPI}_{t-2} + \varepsilon_{1t}$$

$$CPI_t = \alpha_{20} + \alpha_{21} \text{Poverty Line}_{t-1} + \alpha_{22} CPI_{t-1} + \alpha_{23} \text{Poverty Line}_{t-2} + \alpha_{24} CPI_{t-2} + \varepsilon_{2t}$$

For Response of Thai Poverty Line to CPI, we can conclude that as price (CPI) increases the poverty line will immediately increase statistically significant⁴¹ throughout time. While in the Response of CPI to Thai Poverty Line, the negative relation implies that when Thai poverty line increases, the CPI will decline after the third period.



Figure 2.15: VAR (2) for Thailand Poverty Line and CPI

⁴¹ The two red lines in the graphs are the asymptotically estimated standard error and the blue line is the estimated response of the dependent variable. If the two red lines fall in the same quadrant (below or above the zero horizontal line), this indicates that the response of the blue line is statistically significant, otherwise if for example one red line is above the zero line and the other red line is below the zero line, then the response of the blue line is statistically insignificant.

4.4. Results for Quadrant – 4:

In Figure 2.16, we could see that from 1994 to 1996, average income of the poor decreased as GDP increased. From 1997 to 2000, annual GDP declined but average income of the poor increased. This was the period during and posts Asian Financial Crisis in Thailand that began in July 1997. One reason for this was the fact that during the crisis period, the exchange rate in Thailand depreciated badly and farmers (as part of the poor households group) benefited as the demand for their agricultural products/ exports increased. After 2000, the pattern went back to its initial trend that is average income of the poor decreases as the annual GDP increases.

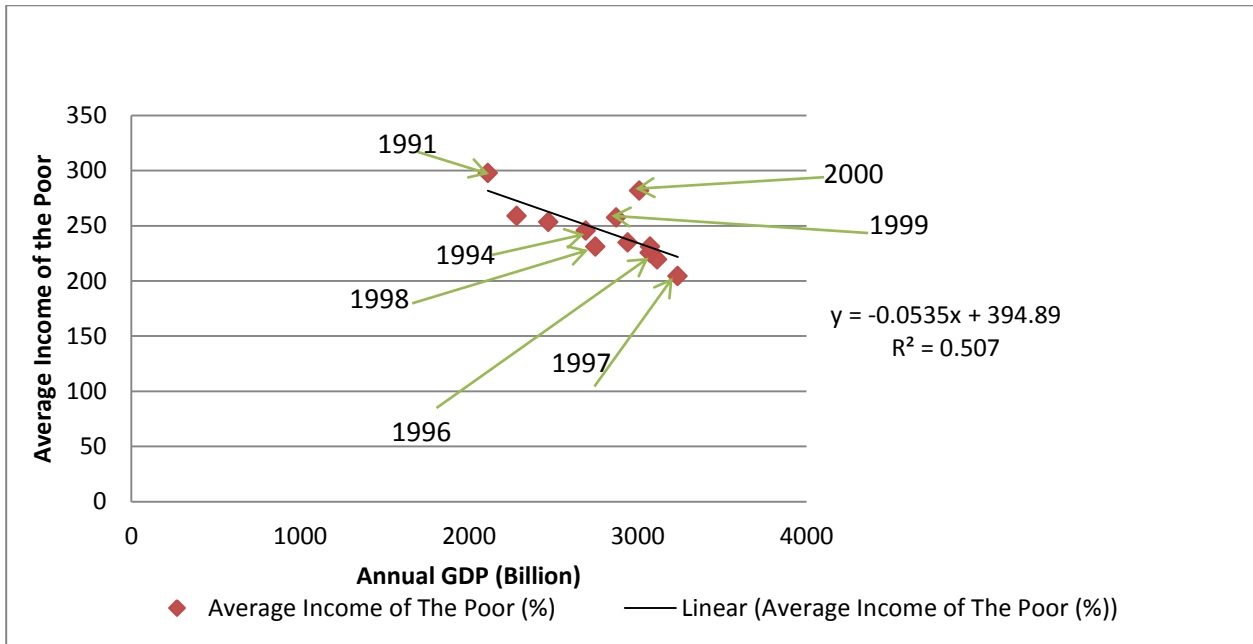


Figure 2.16: Average Income of the Poor against GDP – Thailand

In Figure 2.17 below, it showed the short run estimated vector auto regression VAR(1) for GDP output and average income of the poor in Thailand. The equations for VAR (1) as we have explained earlier are:

$$GDP_t = \alpha_{10} + \alpha_{11}GDP_{t-1} + \alpha_{12}AvrgIncPoor_{t-1} + \varepsilon_{1t}$$

$$AvrgIncPoor_t = \lambda_{10} + \lambda_{21}GDP_{t-1} + \lambda_{22}AvrgIncPoor_{t-1} + \varepsilon_{2t}$$

From the result of lower left graph, that is Response of Avrgincomeofthepoor⁴² to GDP, we can see that when GDP increases, the average income of the poor tend to decline significantly, but over time (from period 4 to period 8) it shows significantly positive relation. We can conclude that for Thai economy, an economic shock that lead to an increase in GDP would not immediately benefit the poor households but after a period of time, the average income of the poor will increase significantly. On the other hand, the GDP doesn't response to any shock on the average income of the poor (Graph Response of GDP to Average Income of the Poor)

⁴² Avrgincomeofthepoor is the abbreviation for Average Income of the Poor

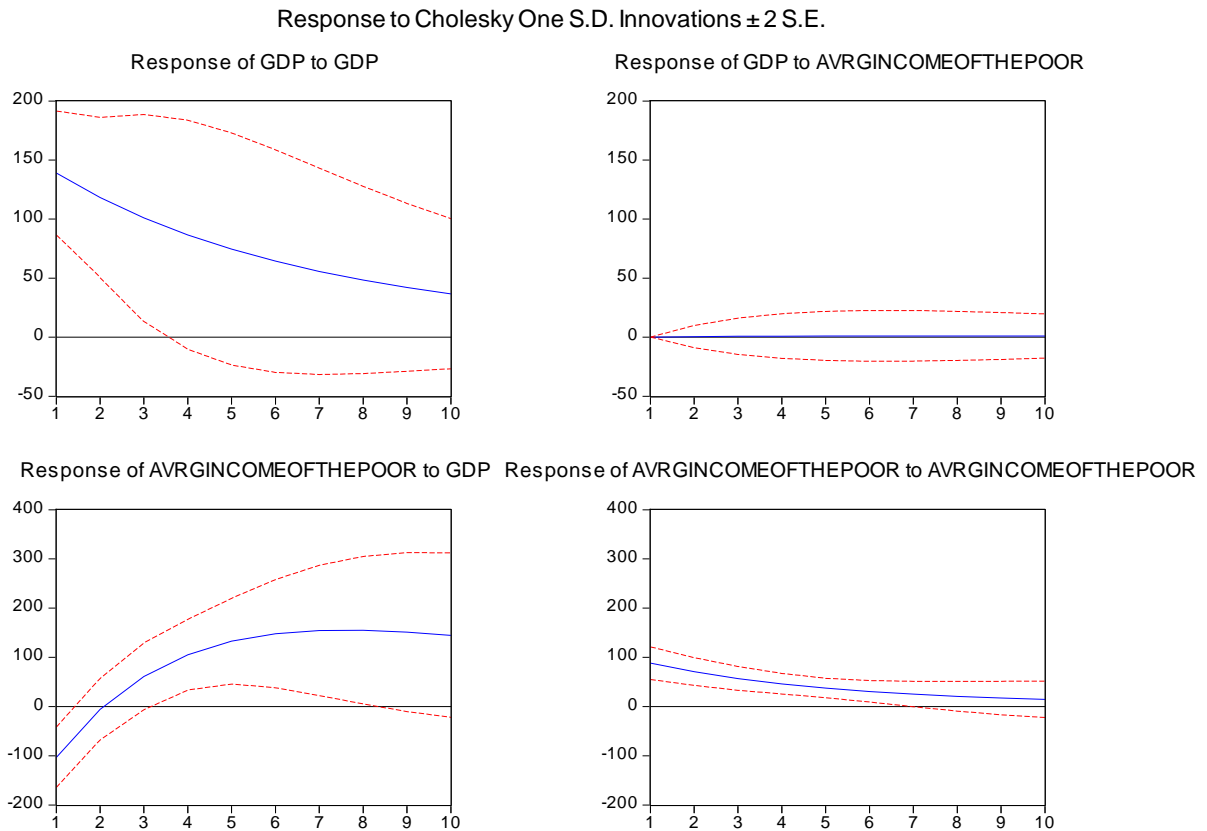


Figure 2.17: VAR (1) for Thailand GDP and Average Income of the Poor

4.5 Results for Quadrant – 3:

Figure 2.18 showed the results of three quadrants that we have constructed above. The equations for each relation are:

Aggregate Supply: $CPI = 0.0003 (GDP) + 0.5385$

Aggregate Demand: $CPI = -0.0017(GDP) + 0.2922$

Poverty Line: $CPI = -0.0073(Poverty\ Line) + 9.348$

Average Income of the Poor: $Average\ Income\ of\ the\ Poor = 0.0535(GDP) - 349.89$

In Figure 2.18, the relation between poverty line and CPI is linear with adjusted R-Square of 0.9996. The best relation between average income of the poor and GDP is also linear with adjusted R-Square of 0.507 (changing to polynomial relationship will not improve the adjusted R-Square). Moreover, in Azis conceptual framework, he showed that an increase in GDP will lead to an increase in the average income of the poor, however, in the case of Thailand, our result showed differently. When there is a shock that results in higher GDP, the average income of the poor tend to decline.

Next we can see the impact of macroeconomic shocks on the poverty line and average income of the poor in Figure 2.19. When there is contractionary aggregate demand that shifts from AD1 to AD2, the average income of the poor improve tremendously while the poverty line decreases a little. In other words, the change in average income of the poor dominates the change in the poverty line. This implies that any economic growth in Thailand will increase the poverty line but the average income of the poor will decrease more, which will worsen the economy of the poor households. This could perhaps be the case that most poor households in Thailand are farmers and when a crisis hits, the agricultural sector is not affected much but in fact act as a buffer to Thai's economy. However, during booming period, most economic growth and expansionary policies are in manufacturing sector, real estate and financial sector which will not benefit the poor households.

Finally, the results in our third quadrant from the economic shocks depict a convex relationship between poverty line and average income of the poor. It can be seen that when poverty line increases, the average income of the poor decreases which is unlike Azis's framework that shows when poverty line increases, average income of the poor increases. In

summary, putting all these pieces together, we can see that when there is expansionary in aggregate demand to stimulate growth, the poverty line will increase but at smaller magnitude than the decrease in average income of the poor and vice versa when we have contractionary aggregate demand policy. Thailand is an example of a country where at least from our result shows that there is no trade-off between poverty line and average income of the poor.

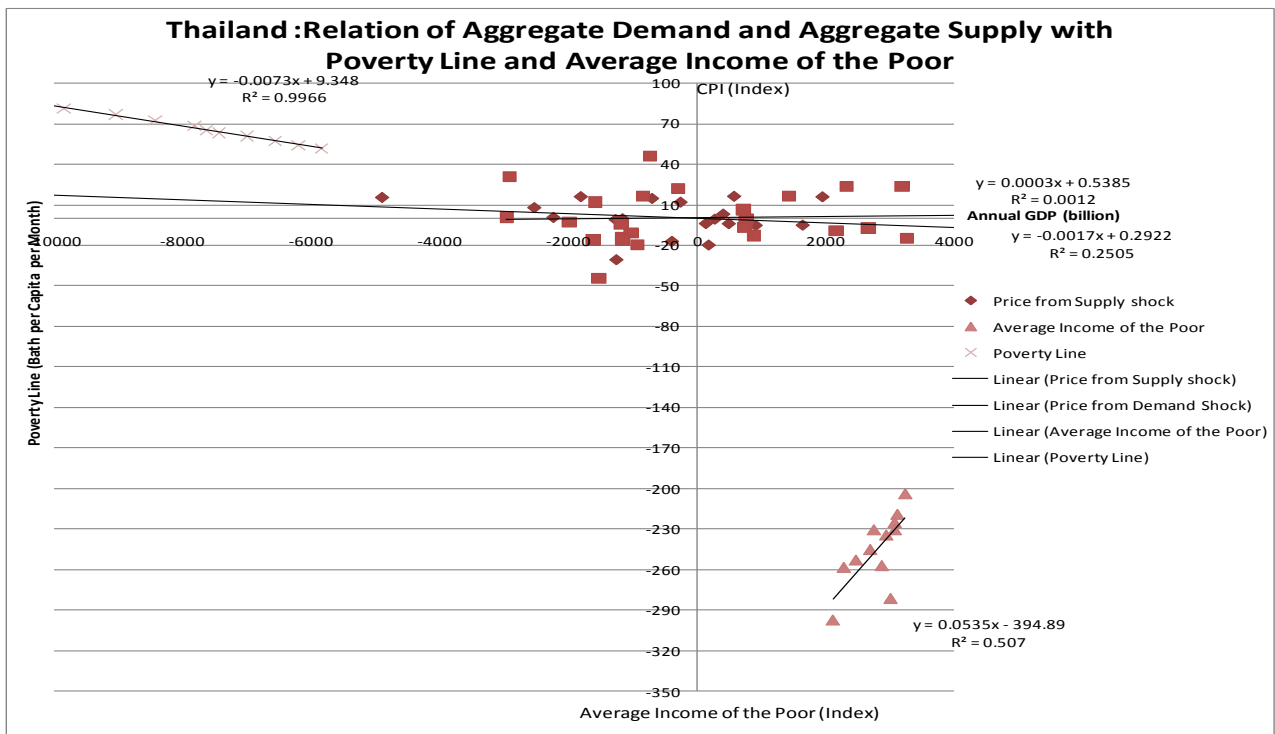


Figure 2.18: Relation of Aggregate Demand and Aggregate Supply with Poverty Line and Average Income of the Poor (3 Quadrants) - Thailand

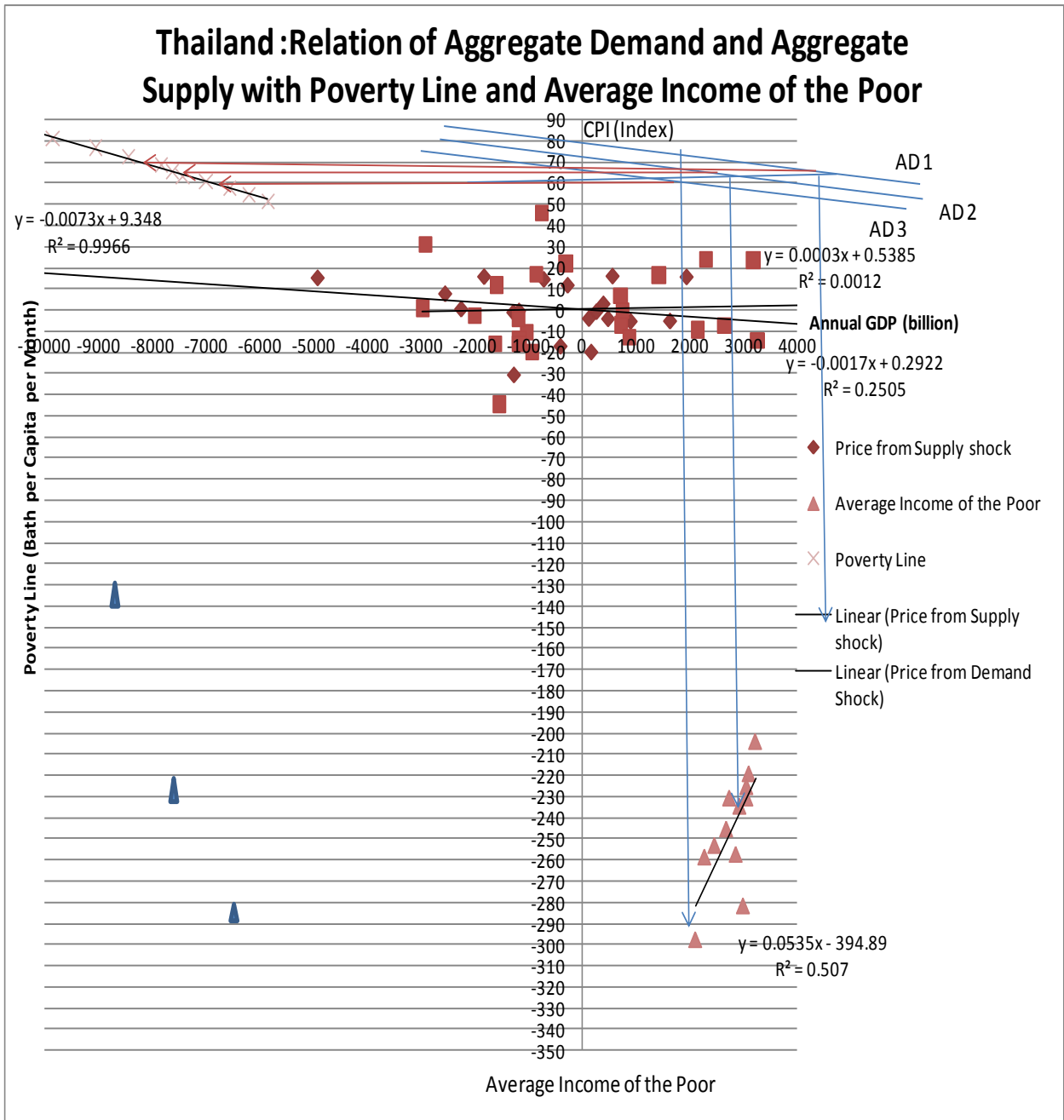


Figure 2.19: Relation of Aggregate Demand and Aggregate Supply with Poverty Line and Average Income of the Poor (4 Quadrants) - Thailand

5. Data and Methodology II:

The data used in constructing our FCGE is Thailand's Financial Social Accounting Matrix (FSAM). We will use the FSAM to develop the Financial Computable General Equilibrium (FCGE) model. The FSAM is a combination of Flow-of-Funds and Social Accounting Matrix (SAM).

5.1. A 2004 Social Accounting Matrix (SAM) for Thailand

In this paper, we will be using the SAM of 2004 shown in Table 2.1 below. SAM is a snapshot of an economy activity for one particular year and all the values shown are the aggregated amount of transactions taken place from one sector to another. The SAM was constructed by Thailand Development Research Institute (TDRI) and it included 114 production factors, two types of factors of production (labor and capital), the private sector (households and enterprise), the government, and the rest of the world. Puttanapong (2008) compressed the 114 production factors into 3 main sectors, agricultural, manufacturing and services and using this, we disaggregated the household sector into five categories of households based on their income level; HHH5 referred to the top 20% of households with the highest income, HHH4 referred to the next top 20% of households with the second highest income, HHH3 referred to the next top 20% of households with the third highest income, HHH2 referred to the next top 20% of households with the fourth highest income and finally HHH1 referred to the bottom 20% of households with the lowest income in the economy. The main objective of disaggregating the household sector is to see the impact of any shocks on income distribution – define as the ratio of HHH1 to HHH5. Table 2.1 below shows the SAM of Thailand for the year of 2004 along with the interpretation of each cell.

Table 2.1: Thailand's Social Accounting Matrix in 2004 (billions of bath)

		Thailand Social Accounting Matrix (2007)																	
		1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18
		AGRI	MANU	SERVICE	LABOR	CAP	HHH1	HHH2	HHH3	HHH4	HHH5	ENTP	GOV	DIRTAX	INDTAX	TARIFF	SUBSIDY	KA	ROW
1	AGRI	84.274744	471.540458	78.794234	0	0	9.919662	17.292070	30.028021	67.891606	142.798697	0	1.578735	0	0	0	0	1.358319	66.185458
2	MANU	160.133455	4479.596924	1384.850347	0	0	59.928313	104.467736	181.410281	410.158081	862.699278	0	66.026459	0	0	0	0	1094.215672	3838.969818
3	SERVICE	96.178828	1455.457117	3537.715760	0	0	60.222464	104.980504	182.300711	412.171292	866.933733	0	653.708806	0	0	0	0	666.296011	682.704724
4	LABOR	431.282409	423.216932	1468.128171	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
5	CAP	125.307077	1677.361946	1684.386782	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
6	HHH1	0	0	0	85.991395	22.839473	0	0	0	0	0	79.053156	0	0	0	0	0	0	-8.774931
7	HHH2	0	0	0	149.901206	39.814967	0	0	0	0	0	137.805454	0	0	0	0	0	0	-15.296562
8	HHH3	0	0	0	260.306395	69.139474	0	0	0	0	0	239.301884	0	0	0	0	0	0	-26.562780
9	HHH4	0	0	0	588.537600	156.320324	0	0	0	0	0	541.047625	0	0	0	0	0	0	-60.056899
10	HHH5	0	0	0	1237.890916	328.793793	0	0	0	0	0	1138.008679	0	0	0	0	0	0	-126.319696
11	ENTP	0	0	0	0	2810.361774	0	0	0	0	0	0	0	0	0	0	0	0	0
12	GOV	0	0	0	0	59.786000	1.319104	2.299478	3.993088	9.028140	18.989214	0	0	422.622000	600.221880	93.582681	0	0	4.874009
13	DIRTAX	0	0	0	0	0	7.483229	13.044852	22.652642	51.216304	107.724973	220.500000	0	0	0	0	0	0	0
14	INDTAX	0	386.539758	213.682122	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
15	TARIFF	1.220490	92.355241	0.006950	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
16	SUBSIDY	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
17	KA	0	0	0	0	0	40.236321	70.140425	121.800230	275.383227	579.222797	454.649976	495.401594	0	0	0	0	0	-274.964560
18	ROW	73.265001	3656.387988	351.105584	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0

ABBREVIATIONS: AGRI: Agricultural, MANU: Manufacturing, SERVICE: Service, LABOR: Labor, CAP: Capital, HHH1: Households with income at the lowest 20% of income scale, HHH5: Households with income at the highest 20% of income scale, ENTP: Enterprise, GOV: Government, DIRTAX: Direct Tax, INDTAX: Indirect tax, TARIFF: Tariff, SUBSIDY: Subsidy, KA: Capital Account, ROW: Rest of the World

Interpretation of the data in Social Accounting matrix:

1. For cells (1, 1)⁴³ to (3, 3): In cell (2, 1) the value 160.133455 means the agricultural sector pays \$160.133455 billions of bath to manufacturing sector for its product to use as agricultural sector intermediate input.
2. For cell (4, 1) to (5, 3): In cell (4, 1) the value 431.282409 means the agricultural sector pays \$431.282409 billions of bath to the labor sector for the labor input (value added). Similarly, in cell (5, 3) the value 1684.386782 means the service sector pays \$1684.386782 billions of bath to the capital sector for its used of capital input.
3. For cell (14, 1) to (14, 3): In cell (14, 2) the value 386.539758 means the manufacturing sector pays \$386.539758 billions of bath as indirect tax.
4. For cell (15, 1) to (15, 3): In cell (15, 1) the value 1.220490 means the agricultural sector pays \$1.220490 billions of bath for its import tariff.

⁴³ Cell (i,j) refers to row i and column j

5. For cell (18, 1) to (18, 3): In cell (18, 1) the value 73.265001 means the agricultural sector pays \$73.265001 billions of bath for its import from the rest of the world.

6. For cell (6, 4) to (12, 5): In cell (6, 3), the value 85.991395 means the labor sector pays \$85.991395 billions of bath to household 1 for their labors (labor income). Similarly, for cell (6, 4) the value 22.839473 means that the capital sector pays \$22.839473 billions of bath to household 1 for using their capital (capital income). In cell (12, 5), the transaction between the capital sector and the government sector represents the factor income paid to the government. In other words, \$59.786000 of factor income from the capital sector was paid to the government.

7. For cell (1, 6) to (3, 10): In cell (1, 6) the value 9.919662 means the household 1 sector pays \$9.919662 billions of bath to agricultural sector for the sales of agricultural products.

8. For cell (12, 6) to (12, 10): In cell (12, 6) the value 1.319104 means the household 1 sector pays the government \$1.319104 billions of bath for tax purpose (eg. income tax).

9. For cell (13, 6) to (13, 11): In cell (13, 6) the value 7.483229 means the household 1 sector spends \$7.483229 billions of bath on direct tax.

10. For cell (17, 6) to (17, 12): In cell (17, 6) the value 40.236321 means the household sector total saving is \$40.236321 billions of bath. In cell (17, 11) the enterprise total saving is \$454.649976 billions of bath and in cell (17, 12) the government total saving is \$495.401594 billions of bath.

11. For cell (6, 11) to (10, 11): In cell (6, 11) the enterprise pays \$79.053156 billions of bath to household 1 sector for its labor input.

12. For cell (1, 12) to (3, 12): In cell (1, 12), the government consumption of agricultural sector is \$1.5788735 billions of bath.

13. For cell (12, 13) to (12, 15): These cells show the amount of direct tax, indirect tax and tariffs that the government has collected. For instance, in cell (12, 13) the total value of direct tax collected by the government is \$422.622000 billions of bath.

14. For cell (1, 17) to (3, 17): In cell (1, 17) the total investment in the agricultural sector is \$1.358319 billions of bath.

15. For cell (1, 18) to (3, 18): In cell (1, 18) the rest of the world exports \$66.185458 billions of bath of the agricultural product from the agricultural sector.

16. For cell (6, 18) to (12, 18): In cell (6, 18) the value -8.774931 refers to the remittance or net foreign payments from the rest of the world to Thailand and since the value is negative, this means that there is outflow of payments/transfer to the rest of the world. In the cell (12, 18), this refers to the foreign grants from the rest of the world to the government is \$4.874009 billions of bath.

17. In cell (17, 18): This cell represents the current account balance for Thailand which is the difference between total exports and total imports. In the case of Thailand, the current account balance is positive, indicating negative foreign saving (capital outflow) for an amount of \$274.964560 billions of bath.

5.2. A 2004 Flow-of-Funds (FoF) Accounts of Thailand

The flow-of-fund is constructed using the balance sheet for 10 institutions and 13 financial assets and one fixed asset. Since flow-of-funds represent the changes in assets and liabilities, we have to take the difference of the balance sheet items in 2004 and 2003 to construct it. These values are then categorized into two separate tables; sources of funds (liabilities) and users of funds (assets). Take note that in the flow-of-funds accounts, the demand and the

supply of each asset are equal. Table 2.2 below shows the standard flow-of-funds table publicly available on the website of Thailand Office of National Economic and Social Development Board (NESDB). However, for the households' accounts, we have disaggregated them into five separate categories similar to our approach in the SAM table. In addition, we have combined the account for the central government and the local government into one account (government) and combined the account for incorporated business (BINC) and state enterprise business (BSE) into one account (enterprise) to make it compatible with the institutions that we have in the our SAM table.

Table 2.2: Flow-of-Funds Account of Thailand in 2004

FLOW-OF-FUNDS ACCOUNTS OF THAILAND, 2004P								
							(MILLIONS OF BAHT)	
	HH	BINC	GC	GL	BSE	R/W	FIN.CON	TOTAL
A. NON FINANCIAL ACCOUNT								
1. GROSS SAVING	324,212	764,255	301,303	99,458	217,970	(265,812)	347,234	1,788,620
2. TRANSFER								0
3. GROSS CAPITAL FORMATION	137,360	1,143,724	117,363	102,113	216,474		44,836	1,761,870
4. PURCHASE OF LAND (NET)	(29,193)	13,410	7,240	995	5,136		2,412	0
5. STATISTICAL DISCREPANCY		49,564					(22,814)	26,750
6. TOTAL SURPLUS OR DEFICIT (-) (1+2-3-4-5)	216,045	(442,443)	176,700	(3,650)	(3,640)	(265,812)	322,800	0
B. FINANCIAL ACCOUNT								
I. ACQUISITION OF FINANCIAL ASSETS								
1. CURRENCY	553,318	215,390	132,276	28,628	143,401	4,782	1,031,115	2,108,910
2. DEPOSITS	53,051	5,634	(14,903)		(800)			42,982
3. PUBLIC AUTHORITY SECURITIES	142,798	88,346	21,991	28,517	55,875		(13,640)	323,887
4. GOVERNMENT NON-BUDGETARY ACCOUNTS	96,062	71,974	26,716		(17,290)		46,474	223,936
5. CREDIT AND CAPITAL MARKET INSTRUMENTS	890	8,008		(20)	(263)		(373)	8,242
5.1 SHORT-TERM LOANS	260,517	41,428	98,472	131	105,879	4,782	998,654	1,509,863
5.2 LONG-TERM LOANS	819	120	22,831	(9)	39		16,816	40,616
5.3 COMMERCIAL BILLS	5	7	(10,073)	(99)	3,924		515,260	509,024
5.4 SHARE CAPITAL	(35,544)	(45,542)	1,187		50,176		130,450	100,727
5.5 DEBENTURES	209,824	78,484	20,816	6	37,351		(22,363)	324,118
5.6 LIFE ASSURANCE AND PENSION FUNDS	(3,343)	8,497					31,338	36,492
5.7 MORTGAGES	90,873							90,873
5.8 DEBTORS							171,812	171,812
5.9 HIRE PURCHASE DEBTS	3,564	18,404	17		24,915		261	47,161
5.10 INTERNATIONAL RESERVE POSITION		73,720			(173)		46,896	120,443
5.11 FOREIGN DEBTS AND CLAIMS							229,927	229,927
5.12 OTHERS		11,686	(1,289)		(9,475)	4,782	(11,751)	(6,047)
5.12 OTHERS	(5,681)	(103,948)	64,983	233	(878)		(109,992)	(155,283)
II. INCURRENCE OF LIABILITIES								
1. CURRENCY	492,685	372,582	170,751	970	144,509	219,098	708,315	2,108,910
2. DEPOSITS			2,342				40,640	42,982
3. PUBLIC AUTHORITY SECURITIES			(13,640)				337,527	323,887
4. GOVERNMENT NON-BUDGETARY ACCOUNTS			195,894		15,658		12,384	223,936
5. CREDIT AND CAPITAL MARKET INSTRUMENTS			8,242					8,242
5.1 SHORT-TERM LOANS	492,685	372,582	(22,087)	970	128,851	219,098	317,764	1,509,863
5.2 LONG-TERM LOANS	(3,719)	(11,255)	14,379	305	21,611		19,295	40,616
5.3 COMMERCIAL BILLS	172,877	316,411	6,037	323	20,738		(7,362)	509,024
5.4 SHARE CAPITAL	21,702	84,968	20,095		3,701		(29,739)	100,727
5.5 DEBENTURES		111,635			22,645		189,838	324,118
5.6 LIFE ASSURANCE AND PENSION FUNDS		27,291			8,747		454	36,492
5.7 MORTGAGES					2,987		87,886	90,873
5.8 CREDITORS	144,540	27,272						171,812
5.9 HIRE PURCHASE DEBTS	9,128	15,666	382		19,838		2,147	47,161
5.10 INTERNATIONAL RESERVE POSITION	111,708	8,735						120,443
5.11 FOREIGN DEBTS AND CLAIMS						229,927		229,927
5.12 OTHERS		(63,843)	(59,989)		(9,797)	(10,829)	138,411	(6,047)
5.12 OTHERS	36,449	(144,298)	(2,991)	342	38,381		(83,166)	(155,283)
III. FINANCIAL SURPLUS OR DEFICIT (I-II)								
	60,633	(157,192)	(38,475)	27,658	(1,108)	(214,316)	322,800	0
C. SECTOR DISCREPANCY (A6.-BIII.)								
	155,412	(285,251)	215,175	(31,308)	(2,532)	(51,496)	0	0

Abbreviations: HH : Households, GC: Central Government, GL: Local Government, RW: Rest of the World, Fin. Con: Financial Corporation, BSE: State Enterprise, Binc: Incorporated Business

5.3. A 2004 Financial Social Accounting Matrix (FSAM) of Thailand

Using both the data from our SAM table and flow-of-funds table, we can construct the FSAM table which will be the basis of our FCGE model. The row and column 17th of Table 2.1 earlier shows the capital account (KA) which is the saving and investment of each institution in the economy. This account will be disaggregated into capital account for each institution; in other words we will add more rows and columns to our standard SAM table (Table 2.1) to include the assets and institutions data obtained from our flow-of-funds (Table 2.2). Each transaction in flow-of-funds are then being filled in its own corresponding cells of the ‘new extended’ SAM, producing our 2004 Financial Social Accounting Matrix or FSAM. The FSAM shows the inter-connection between the real sector activities and the activities in the financial market via saving-investment account. When an institution saves the income that they have obtained from the activities in the real sector (e.g. Profit or wages), these savings will be used to acquire financial assets or to invest in productivity activities. The transfer of these savings from real sectors activities to investment in the financial assets or the fixed asset is the linkage of SAM and Flow-of-Funds. Table 2.3 below shows an example of FSAM table depicting the transactions between the standard SAM table and the data obtained from the flow-of-funds accounts.

Table 2.3: Structure of Financial SAM (FSAM)⁴⁴

	Productions	Factors	HH	ENTP	Gov	ROW	Tariff	Taxes	KA.BOT	KA.BANK	KA.HH	KA.ENTP	KA.GOV	KA.ROW	Fixed Asset	Financial Assets
Productions	Intermediate Inputs		HH consumption		Gov Consumption										Investment	
Factors	Value Added															
HH																
ENTP		Factor Income		Institutional Transfers			Tariff Revenue	Tax Revenue								
Gov																
ROW	Imports															
Tariff	Tariff															
Taxes	Indirect Taxes		Income Tax	Income Tax												
KA.BOT																BOT ΔLiabilities
KA.BANK																Bank ΔLiabilities
KA.HH			HH Saving													HH ΔLiabilities
KA.ENTP				ENTP Saving												ENTP ΔLiabilities
KA.GOV					Gov Saving											Gov ΔLiabilities
KA.ROW						ROW Saving										ROW ΔLiabilities
Fixed Asset											HH Investment	ENTP Investment	Gov Investment	Foreign Investment		
Financial Assets									BOT ΔAsset Portfolio	Bank ΔAsset Portfolio	HH ΔAsset Portfolio	ENTP ΔAsset Portfolio	Gov ΔAsset Portfolio	ROW ΔAsset Portfolio		

⁴⁴ (Source: Puttanapong (2008))

5.4. A 2004 Financial Computable General Equilibrium (FCGE) Model of Thailand

The financial computable general equilibrium (FCGE) is a combination of computable general equilibrium (CGE) model and flow-of-funds transactions. Our construction of FCGE will follow closely the models developed by Azis (2002), Manopiniwes (2005) and Puttanapong (2008) with exception that we had extended our model to include the poverty line and income distribution between the rich and the poor households. Azis (2002) has developed the FCGE model for Indonesia followed by Manopiniwes (2005) who developed one for Thailand using 1998 financial SAM as its base data. Manopiniwes (2005) was looking at the impact of environmental policies in Thailand's economy that has incorporated both financial market and real sectors. Puttanapong (2008) then proposed a structural FCGE that used 2004 financial SAM as its data in looking at the economy wide impact of shocks to foreign and domestic interest rate in addition to applying Monte-Carlo simulation technique to examine the volatilities in both financial and real markets. Our model is nevertheless an extension of what have been developed by Manopiniwes (2005) and Puttanapong (2008). We extended the existing model by incorporating poverty line and income distribution in order to analyze the impact of macroeconomic shocks such as government spending, interest rate, reserve requirement and wages on different categories of households. We illustrate here the basic equations used which are taken from Puttanapong (2008). Following his approach, we will divide the equations into two main categories, core module and financial module. The core module consists of all the activities and transactions that would essentially exist in the CGE model while the financial module shows the transactions in the flow-of-funds. At the end of both modules, we introduce our extension that is the poverty block which consists of poverty line equations and income distribution.

5.5. Core Module of FCGE

The key specifications in the core model are:

1. Three production sectors (agricultural, manufacturing and services), two factors of production (labor and capital), four types of taxes (direct tax, indirect tax, tariff and subsidy), nine institutions (government, rest of the world, enterprise and another five categories of households described earlier – HHH1, HHH2, HHH3, HHH4, HHH5).
2. The exchange rate and the current account balance are endogenous variables (FSAV).
3. The government spending is an exogenous variable while the government saving is an endogenous variable.
4. The marginal propensity to save (MPS) is an endogenous variable while the investment (invest) is an exogenous variable.
5. Labor and capital are mobile and while capital is at full capacity, the labor is not fully employed.

The equations in the core model can be divided into five separate blocks: price block, production block, income block, expenditure block, and system constraint block . All the equations used in this FCGE model are listed in Appendix 2.

5.5.1. Price Block

The price block shows the equations for prices use in the model. Equations (1) and (2) define the domestic import price and the domestic export price that are affected by the world import price (PWM_{im}) and the world export price (PWE_{ie}) along with endogenous exchange rate and taxes. Equation (3) shows the total amount of composite goods/goods in the domestic market

$(PQ_i * Q_i)$ for each sector as the summation of total goods produced locally and total goods imported. Equation (4) shows the value of total output produced as the summation of total goods produced domestically (consumed domestically) and total goods exported abroad. Equation (5) shows the price of value added as the difference of after-tax price of output and the share price of composite goods. The price index in Equation (6) is defined as the ratio of value-added GDP to the real GDP. Finally in Equation (7), we have the price of capital goods by sector of destination to be the share of price of composite goods.

5.5.2. Production Block

The production block shows the activities for each production sector and represents the supply side of our CGE model. The production process of Armington composite goods is described using the constant elasticity of substitution (CES) function and the transformation of the gross domestic output into goods consumed domestically or goods exported abroad is described using constant elasticity of transformation (CET) function. In Equation (8) we have the total output produced by sector i as a Cobb-Douglas function of labor and capital. In Equation (9) we have derived the factor demand for labor and capital from our cost minimization of Cobb-Douglas function. The optimal demand for labor and capital depends on wage rate and cost of capital. In Equation (10), the quantity of intermediate input goods is the share of input output coefficient on the total output produced by sector i . Equation (11) is based on the assumption of imperfect substitution/imperfect transformation between exports and domestic goods supply in addition to the assumption that the firms can transform their domestically produced goods into goods that are sold abroad (export) and sold domestically. The transformation process in Equation (11) is the CET function. Equation (12) shows the supply ratio that is the

relative demand of our exported goods to the domestically sold goods as a function of their prices, share parameters and parameter defined by elasticity of transformation. In Equation (13), we have the quantity of goods exported determined by the relative sectoral price of world exports and the sectoral price of world exports substitutes. Equation (14) is a production process using CES function that shows the quantity of Armington composite goods as a combination of imported and domestic goods. Finally, in Equation (15), the ratio of imported goods over the goods sold domestically is determined by their relative prices, input share coefficients and parameter defined by the elasticity of substitutions.

5.5.3. Income Block

The income block consists of equations that show the total income and the total saving of the economic players in our model. The income flows from value added (labor and capital) to the institutions and finally into the hands of households. Equation (16) shows the factor income for each labor and capital as the summation of the product of the demand for each factor across sector and their average wages or cost of capital. Equation (17) defines the total income for private institutions (households and enterprise) as the summation of income received from the supply of their labors (wages), capital (rent) and transfer from the government (e.g. subsidies) and the rest of the world (remittance) along with other inter-institutional transfers. In Equation (18), the tariffs collected are defined as the proportion of imported tariff rate across sectors on aggregated value of imported goods. Equation (19) defines the aggregated indirect tax as a function of tax rate and aggregated total output. In Equation (20), the aggregated tax collected from the household sector is a summation of income tax rate across each category of households on their respective total income. Equation

(21) shows the total private saving that depends on their marginal propensity to save and its disposable income. In Equation (22), we have the total government revenue as the summation of tariff, indirect tax, household tax and other transfers from other institutions to the government. Finally, in Equation (23) we define the aggregated saving as the summation of private saving and government saving less the saving from overseas.

5.5.4. Expenditure Block

The expenditure block completes the cycle of the core module by showing the equations that represent the consumption and investment of each economic player. Equation (24) defines the household consumption on good i that depends on marginal propensity to consume off their disposable income and the price of composite goods. In Equation (25), we have the total income of each private institution as the summation of their expenditure/consumption, saving, tax payment and inter-institutional transfers. Equation (26) defines the government consumption for each sector's products as a fixed proportion of government total expenditure. Equation (27) shows the government revenue that depends on the government saving, transfer from the government to other institutions (e.g. subsidies, benefits) and the total value of government consumption on each sector. In Equation (28), we have the changes in inventories for each sector as a ratio of inventory investment to its output on the total output produced for each sector. In Equation (29), the aggregated fixed investment is defined as the total investment in the economy less the summation of the changes in inventory for each sector. Equation (30) defines the investment in each destination sector as a fixed proportion of total fixed investment. Finally, Equation (31) shows the amount of capital goods i used for

investment that depends on the capital matrix coefficients and the volume of investment in each destination sector.

5.5.5. System Constraints Block

The system constraints block shows the balance of supply and demand side for each market in the economy. In Equation (32) we have the equilibrium in the composite good i market as the summation of demand for intermediate inputs i , household's consumption on good i , government's consumption on good i , the amount of good i used for investment and the capital inventory of good i . Equation (33) shows the total factor demand employed as the summation of the demand for each factor across the sectors. Equation (34) shows the current account balance (FSAV) which is the difference between capital flowing in via exports and foreign transfers with the capital flowing out. The assumption of saving-investment balance is represented in Equation (35) where the total saving equals to total investment and a slack variable for correcting the model since the equilibrium price vector may not cleared all the markets. Equation (36) defines the nominal GDP using the value-added approach and finally in Equation (37), we have the real GDP computed using conventional way of summing across the consumption, investment, government expenditure and trade balance.

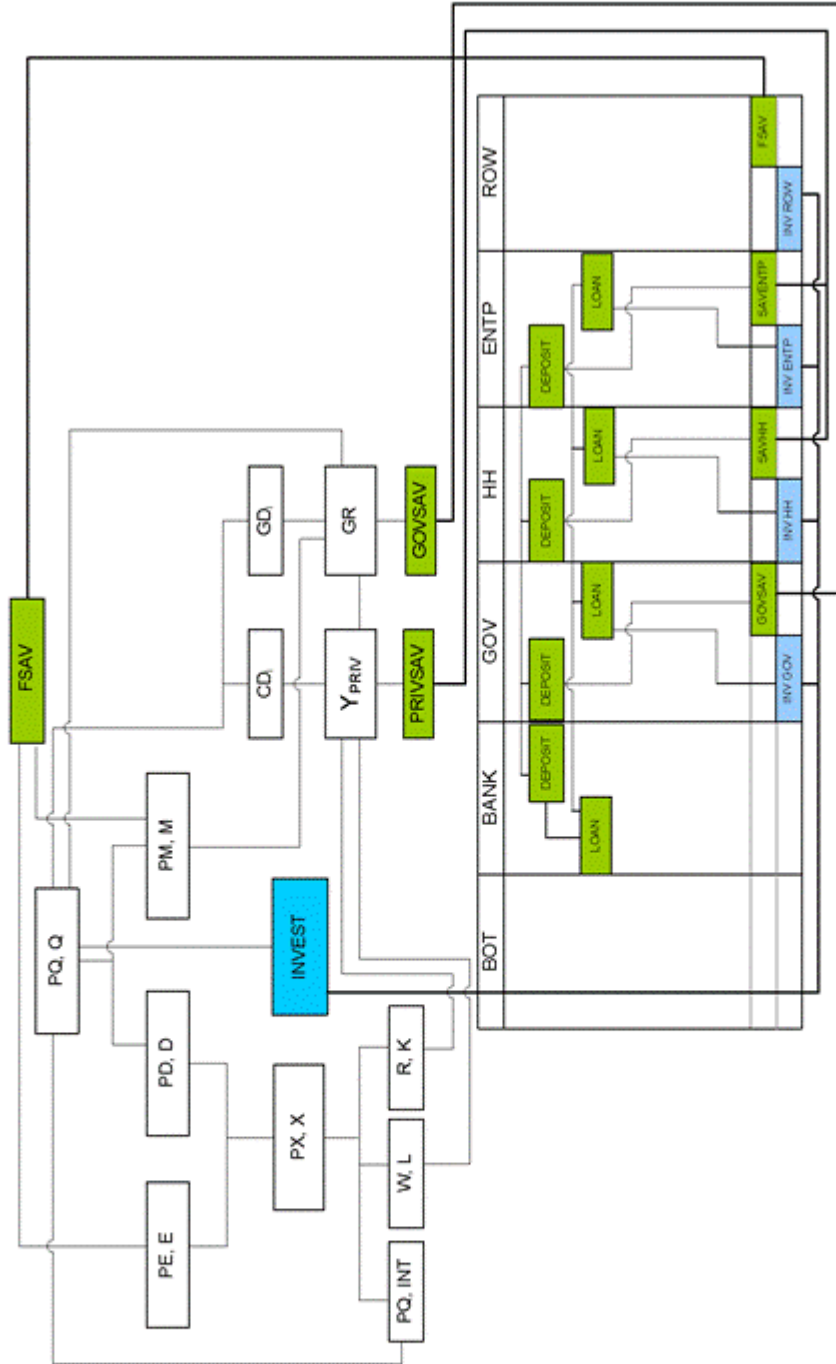
5.6. Financial Module of FCGE⁴⁵

The equations in the financial module show the behavioral specifications of six institutions⁴⁶ we have in the flow-of-funds, precisely the use and the source of their funds. The main assumption is that there is a market clearing mechanism in which total quantity supply of each asset equals to its total quantity demand (quantity clearing concept). Furthermore, there exist exogenous factors that would determine the quantity supplied and quantity demanded and the market will clear with at least one endogenous variable. In Figure 2.20, we have the linkage of core module and financial module through saving and investments transactions while Table 2.4 shows the structure of financial module and its corresponding equations available in Appendix 2.

⁴⁵ There are variables in the equations that have bar/line above it indicating that these are exogenous variables.

⁴⁶ The six institutions are Bank of Thailand (BOT), government, Rest-of-the-World (ROW), households (HHH), banks and enterprise.

Figure 2.20: Connecting Core CGE Module and Financial Module¹



¹ source: Puttanapong (2008)

	BOT		BANK		HH		ENTP		GOV		ROW	
	UoF	SoF	UoF	SoF	UoF	SoF	UoF	SoF	UoF	SoF	UoF	SoF
CH	Eq. 122	Endo	Eq. 117	Eq. 118	Eq. 117	Eq. 118	Eq. 78	Eq. 107				Eq. 136
DE	Eq. 116	Eq. 117	Eq. 118	Eq. 118	Eq. 117	Eq. 118	Eq. 64	Endo	Eq. 125			Eq. 136
LO	Fixed	Endo	Eq. 54	Eq. 54	Eq. 65	Eq. 65	Eq. 65	Fixed	Eq. 124			Eq. 136
RP	Eq. 123	Endo										Eq. 136
GB	Fixed	Eq. 90	Eq. 49	Eq. 49				Eq. 101	Eq. 126			Eq. 136
BOTB	Eq. 108	Eq. 91	Eq. 50	Eq. 50								Eq. 136
FIDFB		Eq. 92	Eq. 51	Eq. 51				Eq. 103				Eq. 136
SOEB	Fixed	Eq. 93	Eq. 52	Eq. 52	Eq. 68	Fixed						Eq. 136
CBOND		Eq. 94	Eq. 53	Eq. 53	Eq. 70	Eq. 70			Eq. 127			Eq. 136
EQL		Eq. 89	Eq. 48	Eq. 48	Eq. 66	Eq. 66			Eq. 128			Eq. 136
FA	Eq. 113	Eq. 98	Eq. 58	Eq. 58	Eq. 75	Eq. 75				Endo		Eq. 136
EQNL	Eq. 110	Eq. 95	Eq. 55	Eq. 55	Eq. 72	Eq. 72		Eq. 105				Eq. 136
OTH	Endo	Fixed	Endo	Endo	Endo	Endo			Fixed			
SAVING			Eq. 144	Eq. 144	Endo	Endo		Eq. 148		Eq. 149		
INV			Eq. 61	Eq. 61	Eq. 63	Eq. 63		Fixed	Fixed			
TOTAL	Eq. 137	Eq. 137	Eq. 137	Eq. 137	Eq. 137	Eq. 137	Eq. 137	Eq. 137	Eq. 137	Eq. 137	Eq. 137	Eq. 137

Table 2.4: Financial Module Equations

5.6.1. Households' Behavioral Specifications

In Equation (38), we defined the households' portfolio ($HHPORTS$) as its allocation in equities and bonds⁴⁷. Due to imperfect substitutions between the financial assets, the main assumption in portfolio decision is that it is based on hierarchical process. In other words, households need to make pairwise comparisons between one particular asset vis-a-vis other assets. Equations (39) to (42) calculate the relative return of investing in different types of bonds and using these, one can establish the weighted average return of investing in each asset. For instance, in Equation (43), GHI illustrates the proportion of households' portfolio invested in equity assets based on its return on equity versus its weighted average return of investing in the other five bonds. Similarly for Equations (44) to (47) whereby the proportions of households' investment in a particular financial asset is based on its return from that asset versus its weighted average return of investing in others (hierarchical process). In Equations (48) to (53), we have households demand for these assets financed by bank loans ($SOF_{S_{LO,HH}}$ in Equation 54), non-listed equities ($SOF_{S_{EQNL,HH}}$ in Equation (55)) that include household savings, income from the interest rate ($INTEXPADJ_{HH}$ in Equation (56)) and capital gains from the investment in foreign assets ($EXRADJ_{HH}$ in Equation (57)). Equations (58) to (60) show the households demand for foreign assets induced by the exchange rate, real GDP and interest rate differential between domestic interest rate and foreign interest rate. In Equation (61) we have the households demand for fixed assets ($UOF_{F_{FIXED,HH}}$) and in Equation (62) is its cash holding ($UOF_{F_{DCH,HH}}$).

⁴⁷ There are five type of bonds in our module: Government Bonds (GB), Bank of Thailand Bonds (BOTB), Financial Institutional Development Fund Bond (FIDFB), State-Owned Enterprise Bond (SOEB) and Corporate Bond (CBOND).

5.6.2. Enterprise' Behavioral Specifications

The enterprise demands for financial assets are specified in Equations (63) for fixed assets ($UOF_{S_{FIXED, ENTP}}$), in Equation (64) for deposit ($UOF_{S_{DE, ENTP}}$), in Equations (75) to (76) for foreign assets ($UOF_{S_{FA, ENTP}}$) and in Equation (78) for cash ($UOF_{S_{CH, ENTP}}$). The source of financing comes from loans ($SOF_{S_{LO, ENTP}}$ in Equation (65)), listed equities ($SOF_{S_{EQL, ENTP}}$ in Equation (66)), bonds ($SOF_{S_{SOEB, ENTP}}$ in Equation (68) and $SOF_{S_{CBOND, ENTP}}$ in Equation (71)), non-listed equities ($SOF_{S_{EQNL, ENTP}}$ in Equation (72)), net interest on its financial investment ($INTEXPADJ_{ENTP}$ in Equation (73)) and capital gains on foreign assets ($EXRADJ_{ENTP}$ in Equation (74)). The price of equity listed in Equation (67) and the price of bonds in Equations (68) and (69) are set as endogenous variables that equilibrate the supply and the demand for each asset.

5.6.3. Banks' Behavioral Specifications

In Equation (79), we have the banks' portfolio defined as the summation of the banks demand/investment in equity and bonds. Following the structure of households' behavioral specifications, we defined the relative return of investing in combination of assets to its total value (Equations (80) to (83)). Using these, we can construct the proportion/weighted average of return on banks allocation to each asset defined in Equations (84) to (88). In Equation (89) to (94), the banks will make pairwise comparison of investing in a particular asset vis-à-vis other assets. For instance in Equation (90), $UOF_{S_{GB, BANK}}$ specifies the banks investment in government bonds that are influenced by the return on government bonds itself (GB2) and the weighted average of return from investing in other available assets other than equity (1-GB1). The source of banks financing comes from non-listed equity ($SOF_{S_{EQNL, BANK}}$ in Equation

(95)) , net interest on banks investment ($INTEXP_{ADJBANK}$ in Equation (96)) and capital gains from investing in foreign assets ($EXRADJ_{BANK}$ in Equation (97)). Finally, Equations (98) to (100) specify the total amount of banks investment in foreign assets as a function of exchange rate, interest rate differential and real GDP.

5.6.4. Government's Behavioral Specifications

The main function of the government is in policy-making and in order to investigate the effect of fiscal policies in our model, we have to set the policy instruments such as government spending and taxes as exogenous variables. In Equations (101) and (103), we have defined the source of government funds in the financial market that come mainly from issuing bonds. There are two types of bonds that Thailand government issues: government bonds and Financial Institution Development Fund Bonds (FIDFB). The government bonds are issued to finance the government expenditures while FIDFB are issued to inject capital into financial institutions that are affected from the 1997 Asian Financial Crisis. These equations are derived by equalizing the total supply and the total demand while the prices of these bonds in Equations (102) and (104) govern the market equilibrium for the bond market. Other source of government funds come from non-listed equities that include the net interest income from holding various financial assets ($INTEXP_{ADJGOV}$) and the net capital gain on foreign assets ($EXRADJ_{GOV}$). Finally in Equation (107), the cash that the government holds come from its own saving and net interest on its financial assets.

5.6.5. Bank of Thailand (BoT)'s Behavioral Specifications

In Equation (108), we have the total supplied of BoT bonds that is equals to its total demand. One of the sources of BoT's funds come from issuing bonds and in Equation (109), we have defined the prices of these bonds that provide equilibrium in the bond markets. In Equation (110) to (112), we have other sources of funds for BoT that come from its non-listed equities ($SOF_{FEQNL, BOT}$), net interest from the return of its assets ($INTEXPADJ_{BOT}$) and capital gain from foreign assets ($EXRADJ_{BOT}$). The deposit held in Equation (116) comes from the banks deposit with BoT including reserve requirements and other type of deposits. In Equations (117) to (120), we constructed the money multiplier that determines the money supply, M2 in Equation (121). One of the objectives of monetary authority is to control inflation through price stabilization. Hence, the amount of cash that BoT decides to hold in Equation (122) will be determined by the loan interest rate and the real GDP in the economy. Any inflation targeting policy is done through bond repurchased market in Equation (123).

5.6.7. Rest of the World (RoW)'s Behavioral Specifications

In our model, the RoW is linked to other domestic institutions through capital account. The demand for Thailand's domestic assets for the year of 2004 in Equations (124) to (128) depend on the expected exchange rate and the interest rate differential, that is the difference between interest earned from holding that particular asset and foreign interest rate⁴⁸. Finally, in Equation (129) to (133), we have the total stocks of financial assets that are held by RoW as the summation of its current year (2004) investment and the aggregated investment from the previous year.

⁴⁸ In Puttanapong (2008), the foreign interest rate is set as the average Fed Funds Rate in 2004.

5.6.8. System Constraint Specifications

In Equations (134) and (135), we have aggregated assets and liabilities stocks for the current year as the summation of previous year stocks and the current year flows. Equations (136) and (137) showed the equilibrium for each institution uses and sources of its funds. In Equation (138), we defined total investment as the aggregated investment in fixed assets across all the institutions. Equation (139) shows the uncovered interest parity (UIP) relation in which the interest rate differentials depend on the expected exchange rate and exchange rate itself. Equation (140) defined the interest rate spread as the difference between the loan interest rate and the deposit interest rate while in Equations (141) to (145), we have the relative return of investing in each financial asset over depositing the cash with the banks. If the relative return is positive, then investors would choose the alternative than to save their cash. Equations (146) and (147) provide the linkage between the core module and the financial module through savings of both households and enterprises that depend on marginal propensity to save, income and direct tax. The government saving in Equation (148) depends on government income and its expenditure. Finally, the current account balance (*FSAV*) and the exchange rate influence the rest of the world saving in Thailand's economy (Equation 149).

5.6.7. Poverty Block Specifications

The main reason of introducing the poverty block is to calculate the poverty line and the income distribution. In Equation (150), we first defined the average price of domestic goods (*PDAVG*) and in Equation (151), we constructed the poverty line as a function of average price of domestic goods, price index, sectoral share parameter and the aggregated domestic prices for the sectors used in our model. Finally, Equation (152) showed the income

distribution as the relative income of the lowest 20% of household in the economy to the top 20% of households in the economy.

6. Results and Analysis II

We have done series of shocks including both the expansionary and contractionary fiscal and monetary policies to investigate their impact on poverty line and income distribution. Our main goal is to construct Quadrant-2 and Quadrant-4 of Azis's framework and the standard income distribution in an economy is depicted in Figure 2.21 below:

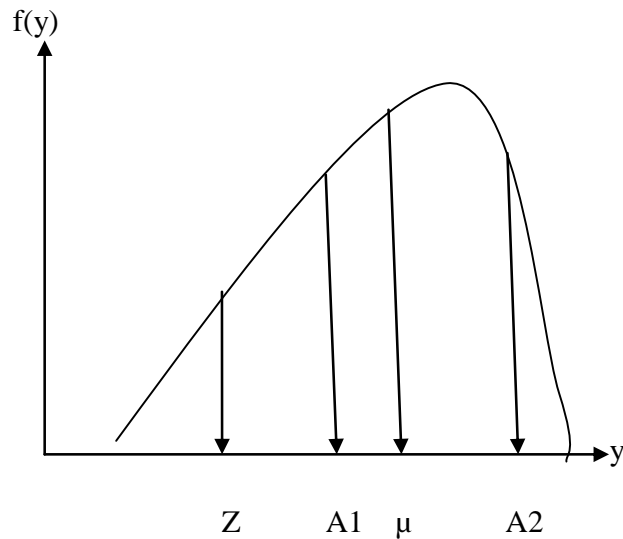


Figure 2.21: Income Distribution of a Population

Where Z = Poverty Line, $A2-A1$ = Income Inequality, μ = the mean income of the population
Our framework that is based on Azis argument is looking at the shift in Z and the spread of $A2-A1$, precisely trying to see which of these two are more affected to the economic shocks in our model.

6.1. Shock 1: Increase in Government Expenditure

In this shock, we increased the government expenditure (*GDTOT*) to see its impact on poverty line and income distribution. In Figure 2.22, we have the poverty line that increases as the government expenditure increases. As expected, when the government increases its spending, the aggregate demand curve would shift to the right (outward) leading to an increase in price and GDP. Since the poverty line is a function of price, an increase in price leads to an increase in poverty line which is shown below (Figure 2.22).

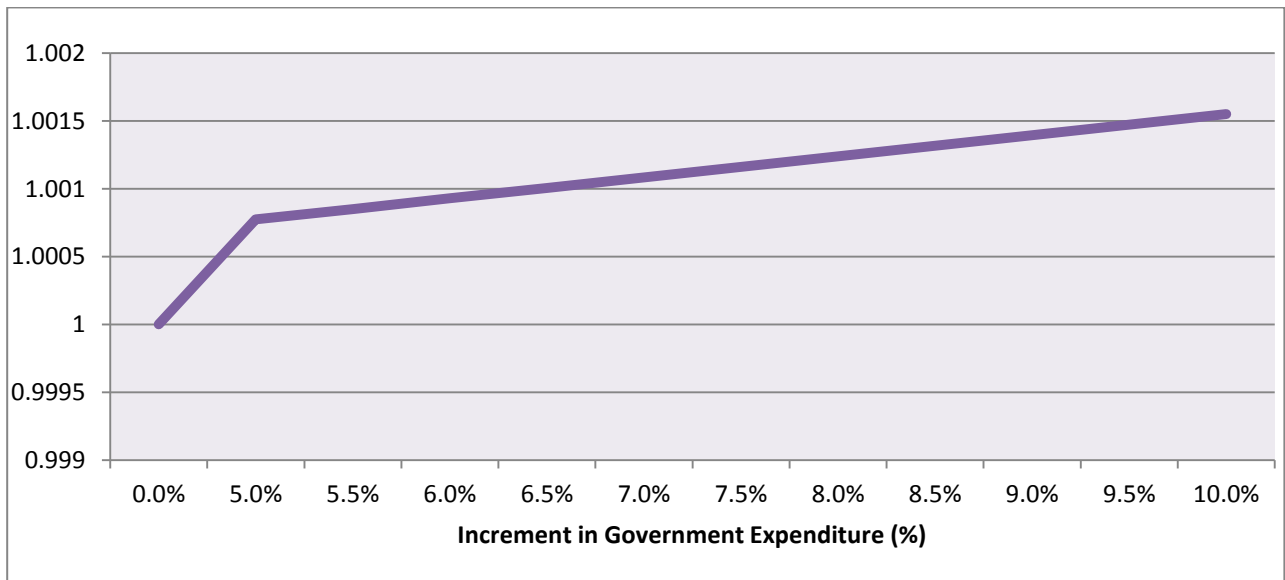


Figure 2.22: Level of Poverty Line (Index) in Thailand

In Figure 2.23, we have the income distribution of the bottom 20% of the population to the top 20% of the population and since income of the bottom 20% of the population increases at a rate higher than income of the top 20% of the population, the income distribution improves. Take note that the impact of initial percentage of shock (up to 5%) causes steeper changes to these variables than the subsequent increments. This is because in CGE model, our baseline model has exogenized certain variables and when we shock the model, some of these initial

exogenized variables are being endogenized. This is one of the critiques of CGE model as mentioned by authors such as Hazledine (1992) about the macro issues that arise when closing the model in aggregate. In Figure 2.24, we have the income of the bottom 20% of the population and the level of RGDP (Figure 2.25) that increase as the government increases its expenditure.

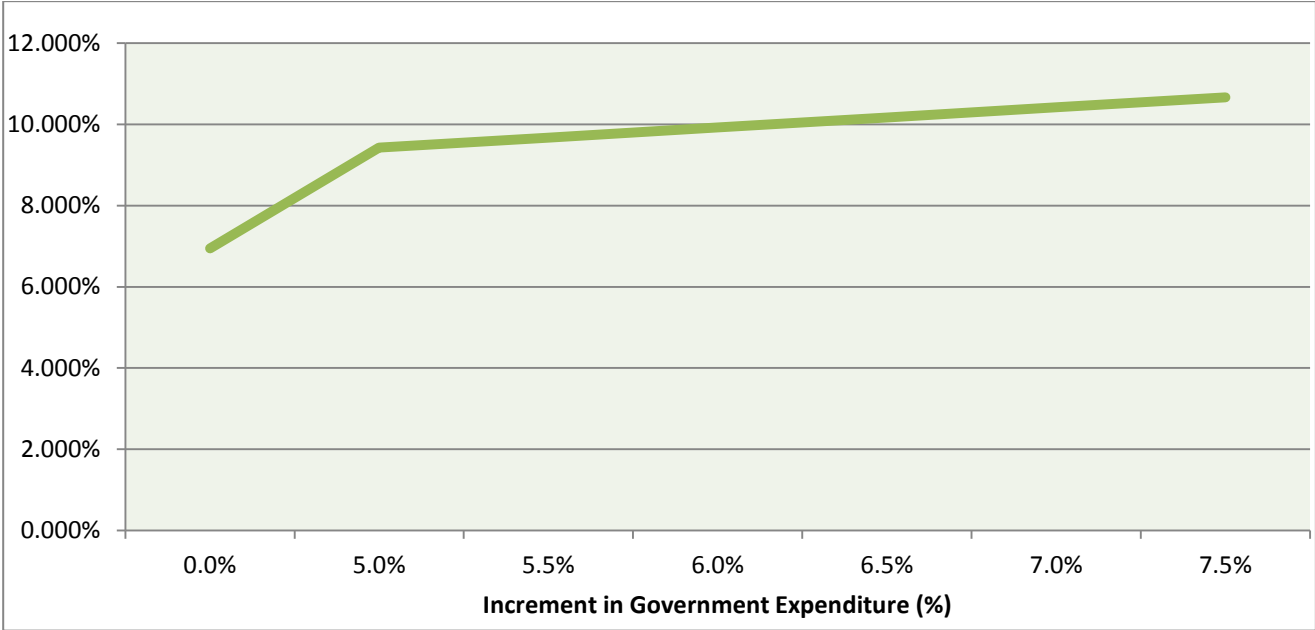


Figure 2.23: Income Distribution of the Bottom 20% of the Population to the Top 20% of the Population - Thailand (%)

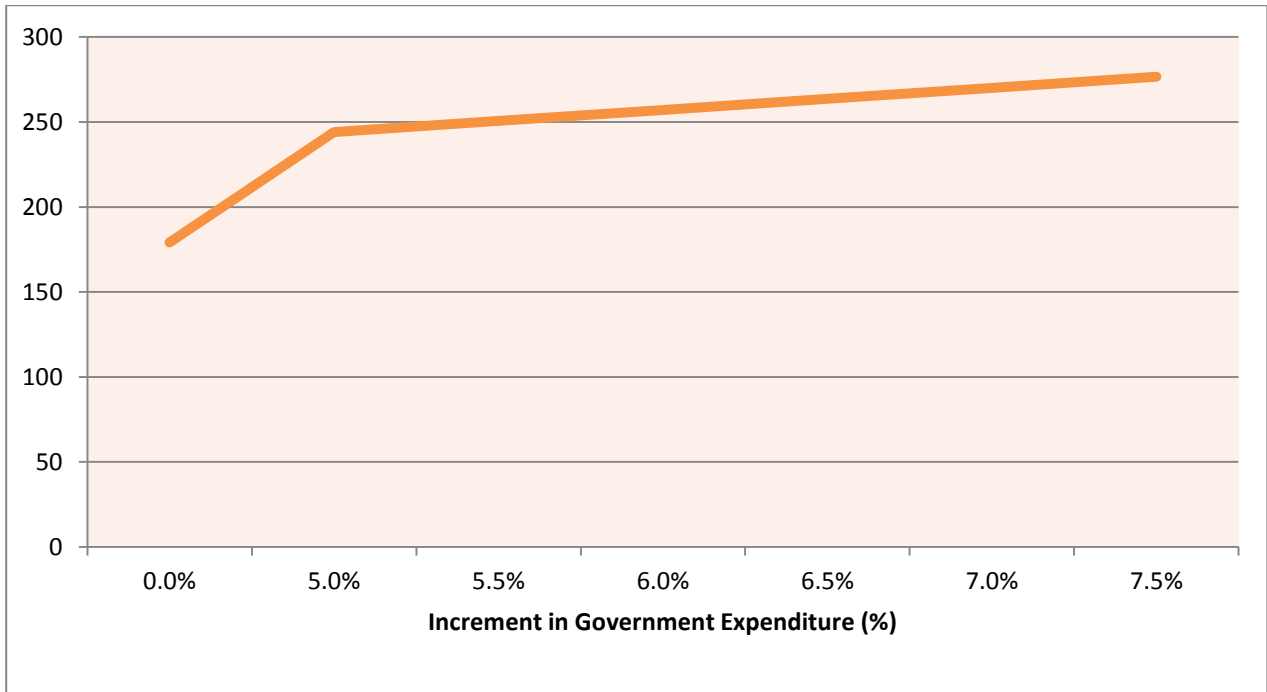


Figure 2.24: Income of the Bottom 20% of the Population - Thailand (billions of bath)

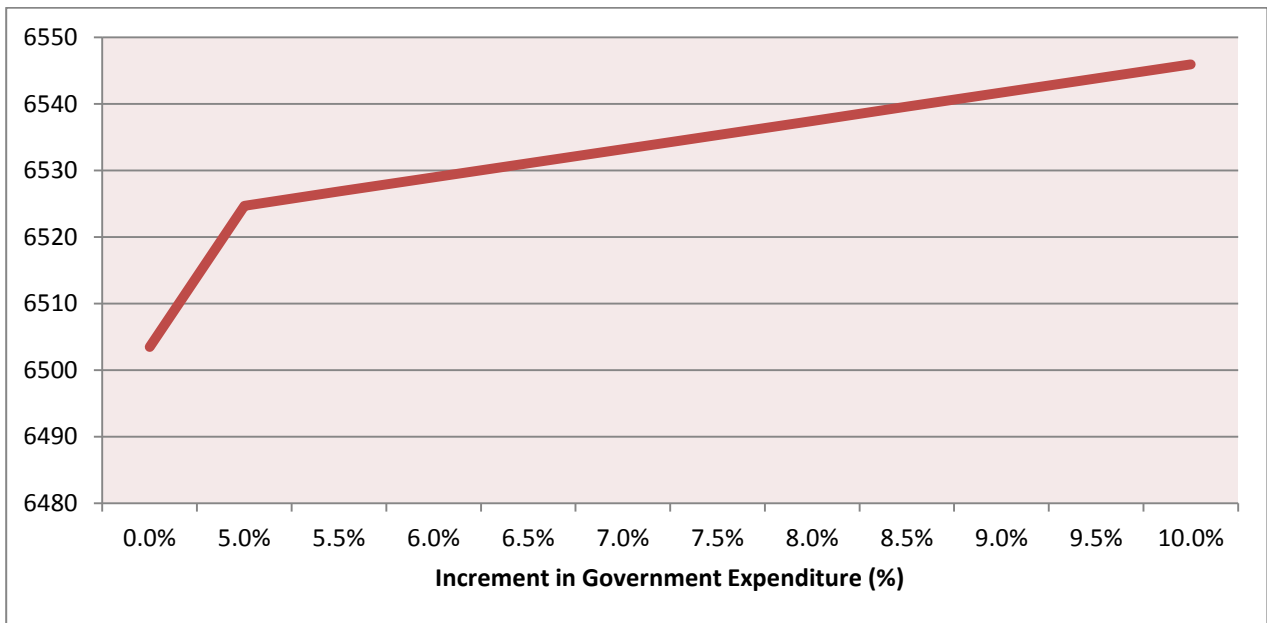


Figure 2.25: The Level of RGDP as the Government Increases its Spending - Thailand (billions of bath)

Since our main goal is to investigate the poverty incidence, we now look at Figures 2.26, 2.27 and 2.28. The trend lines for these graphs show that a 1% increase in RGDP leads to 0.1998% increase in the income of the bottom 20% of the population (Figure 2.28) but only 0.0008% increase in the price index (Figure 2.26). The increase in the price index is almost negligible that it almost has no effect on the increase in the poverty line (Figure 2.27).

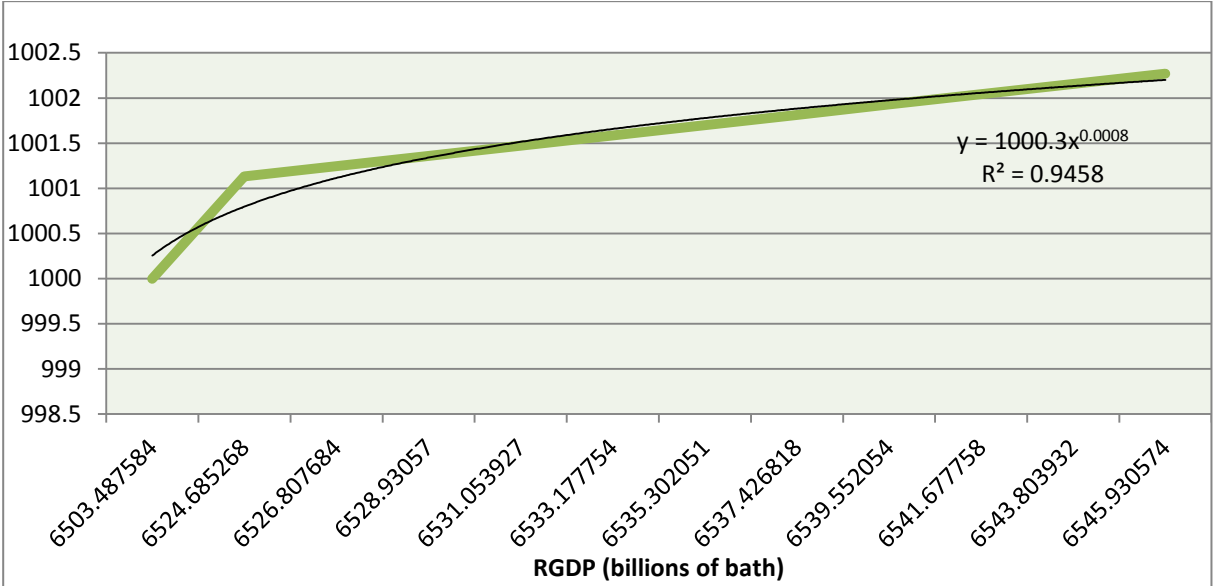


Figure 2.26: Price Index across the RGDP – Thailand

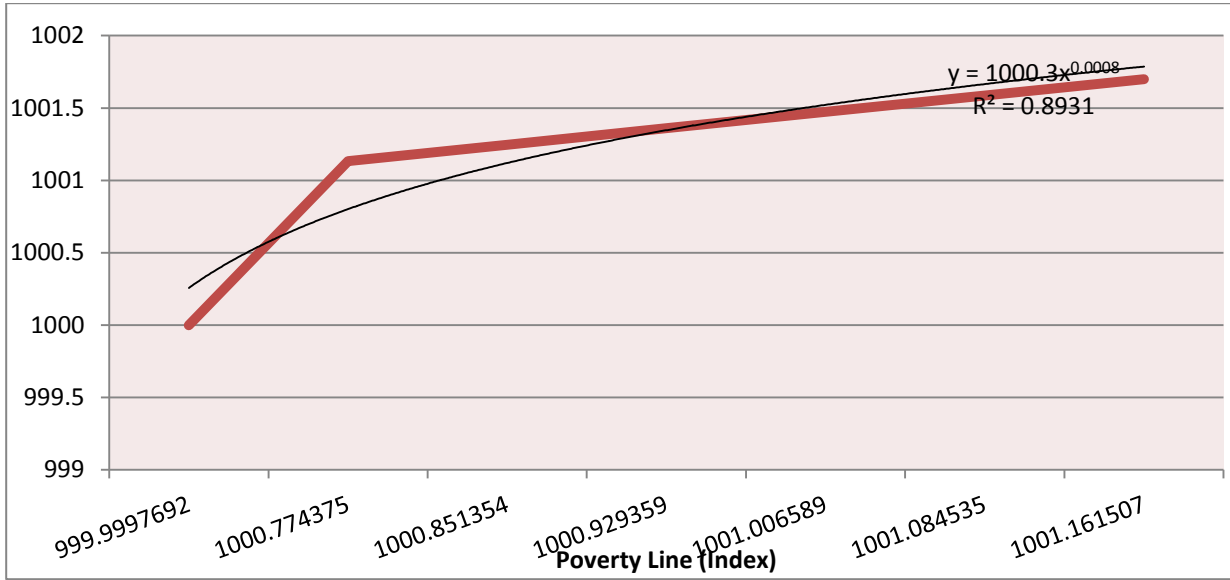


Figure 2.27: (Construction of Quadrant – 2) Price Index across the Poverty Line – Thailand

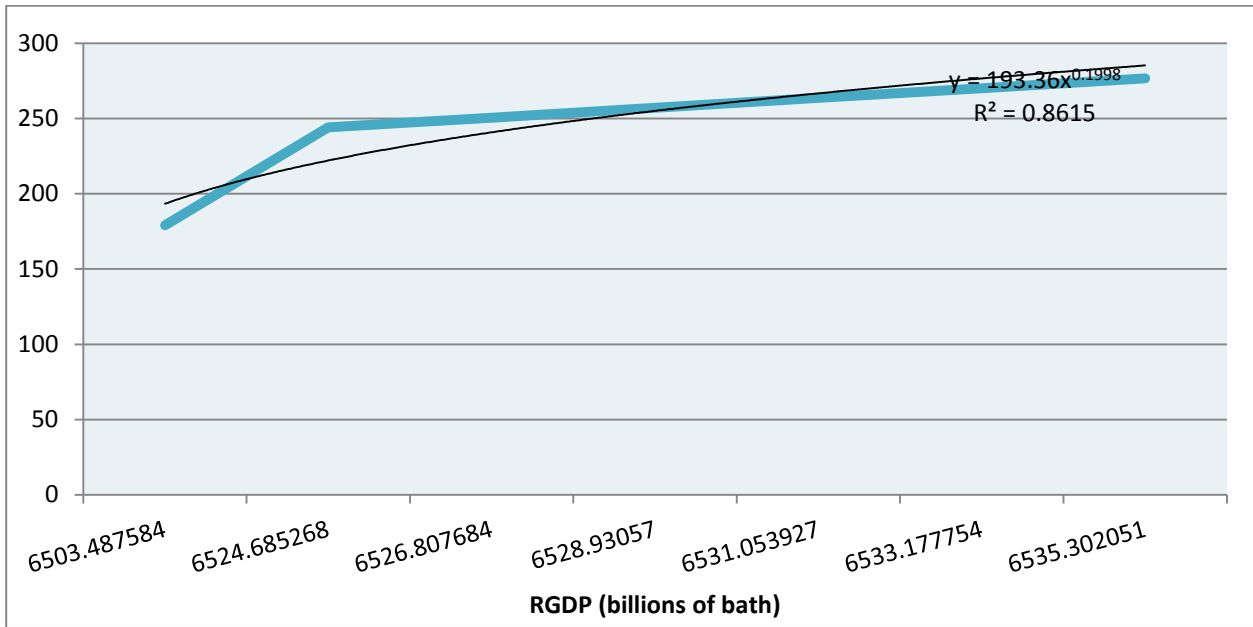


Figure 2.28: (Construction of Quadrant – 4) Income of the Bottom 20% of the Population across RGDP - Thailand (billions of bath)

Now, instead of looking at elasticity, our next approach is to calculate the magnitude of change for poverty line and income of the bottom 20% of the population. First we constructed the split linear function for the graphs.

From Figure 2.26, we have:

$$\text{Price Index}_{steep} = 0.0534 * \text{RGDP}_{steep} + 652.3936^{49}$$

$$\text{Price Index}_{flat} = 0.0532 * \text{RGDP}_{flat} + 654.2929^{50}$$

From Figure 2.27, we have:

$$\text{Price Index}_{steep} = 1.4627 * \text{PovertyLine}_{steep} - 462.68$$

$$\text{Price Index}_{flat} = 1.4626 * \text{PovertyLine}_{flat} - 462.55$$

From Figure 2.28, we have:

$$Y^{\text{Poor}}_{steep} = 3.0702 * \text{RGDP}_{steep} - 19787.9842$$

$$Y^{\text{Poor}}_{flat} = 3.0690 * \text{RGDP}_{flat} - 19780.1817$$

Analysis I: Steeper part of the Graph

A \$1 billion increase in RGDP_{steep} leads to an increase in $\text{Price Index}_{steep}$ by 0.0534 and an increase in the income of the bottom 20% of the population (Y^{Poor}_{steep}) by \$3.0702 billions of bath. An increase in $\text{Price Index}_{steep}$ by 0.0534 leads to an increase in $\text{PovertyLine}_{steep}$ by 0.0365.

Analysis II: Flatter part of the Graph

A \$1 billion increase in RGDP leads to an increase in $\text{Price Index}_{flat}$ by 0.0532 and an increase in the income of the bottom 20% of the population (Y^{Poor}_{flat}) by \$3.069 billions of bath. An increase in $\text{Price Index}_{flat}$ by 0.0532 leads to an increase in $\text{PovertyLine}_{flat}$ by 0.0363.

⁴⁹ Any equation with subscript 'steep' refers to the steep part of the graph.

⁵⁰ Any equation with subscript 'flat' refers to the flatter part of the graph.

Since our two approaches of using elasticity and split linear functions have shown significant improvement of income distribution to the increase in government spending and an almost negligible response of poverty line to the same shock, we conclude that the poverty incidence has improved.

The results show that in our FCGE model, when the government increases its total expenditure ($GDTOT$), the final demand of government consumption for agricultural, manufacturing and services sectors' products will also increase (GD_i in Equation (26)) which will affect the total domestic consumption (Q_i in Equation (32)). An increase in total domestic consumption will affect the prices (Equation (3)), the composition of imported goods (M) and domestic goods (D) (Equations (13) and (14)) and the total output for each sector ($PX*X$ in Equation (4)). The increase in the prices will also affect the household consumption (Equation (24)). This will ultimately affect the real GDP (Equation (36)) and the value added GDP (Equation (37)). Since the price index ($PINDEX$) is the ratio of value added GDP over the real GDP (Equation (6)), the change in this ratio affects the price index and the poverty line (Equation (151)). The effect on the total output of each sector (X_i) will affect the wages and the rent (Equation (9)) which means affecting the factor income for labor and capital ($YFCTR_f$ in Equation (16)). Some of these factor incomes would be saved and some will be invested back into the productivity sector ($Invest$ in Equation (29)). The amount that will be saved and invested in these real sectors will then be linked to our financial sector (Equations (137) and (138)). This will affect the enterprise portfolio ($UOF_{S_{FIXED,ENTP}}$ in Equation (63)) and households portfolio ($UOF_{F_{FIXED,HH}}$ in Equation (61)). The change in their portfolio will finally determine the total income of domestic institutions (YH_{dprivt} in Equation 25). From this, we could determine the income distribution as the ratio of total income of the bottom 20% of

the population to the total income of the top 20% of the population (Equation (152)). Finally, take note that the income of the bottom 20% of the population in Figure 2.24 is converging to a certain level (diminishing marginal return) as the government keeps on increasing its expenditure.

6.2. Shock 2: Decrease in Government Expenditure

One of the contractionary fiscal policies that we have in the model is to reduce the government spending. In Figure 2.29 below, we have the poverty line declining as the government decreases its expenditure. In the standard economic theory, any contractionary fiscal policy would shift the aggregate demand curve to the left (downward) resulting in the decrease of price and GDP. Since poverty line is defined as a function of price, a decrease in price leads to a decrease in poverty line.

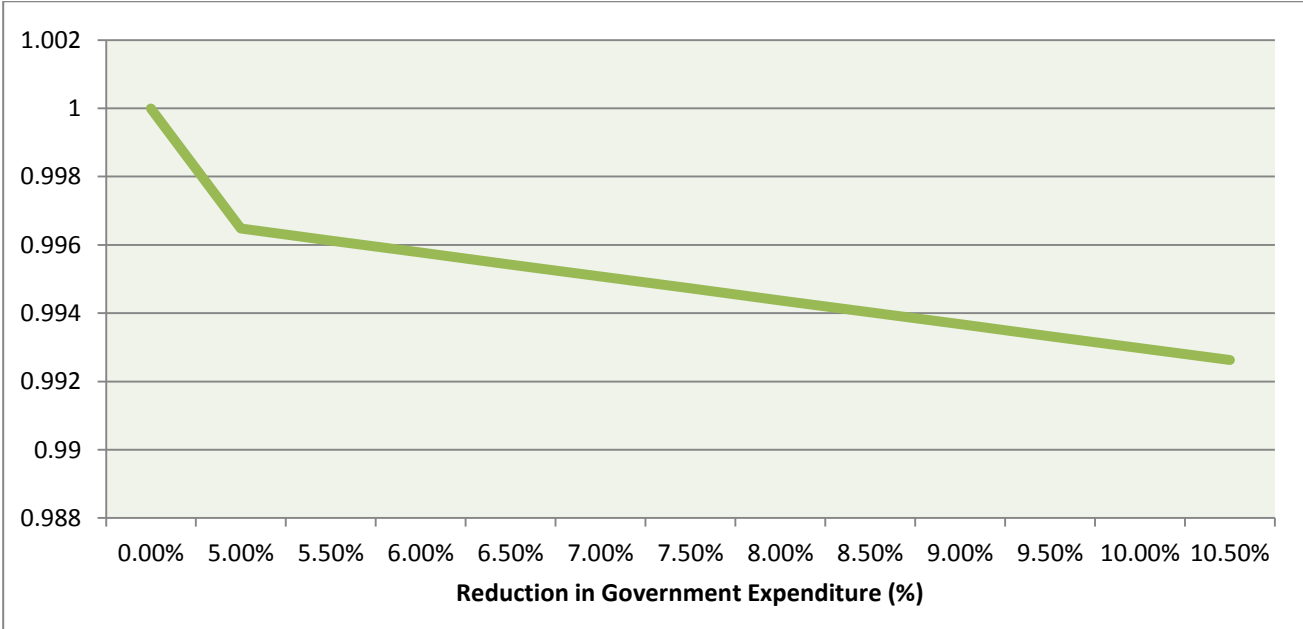


Figure 2.29: Level of Poverty Line (Index) in Thailand

In Figure 2.30, our model shows that the income distribution improves although the income of the bottom 20% of the population is declining (Figure 2.31). Unlike in Shock 1, whereby the increase in government expenditure would benefit the income of the bottom 20% of the population, the contractionary fiscal policy however, would lower their total income. The income distribution improves because the declined in the income of the top 20% of the population is greater than the declined in the income of the bottom 20% of the population.

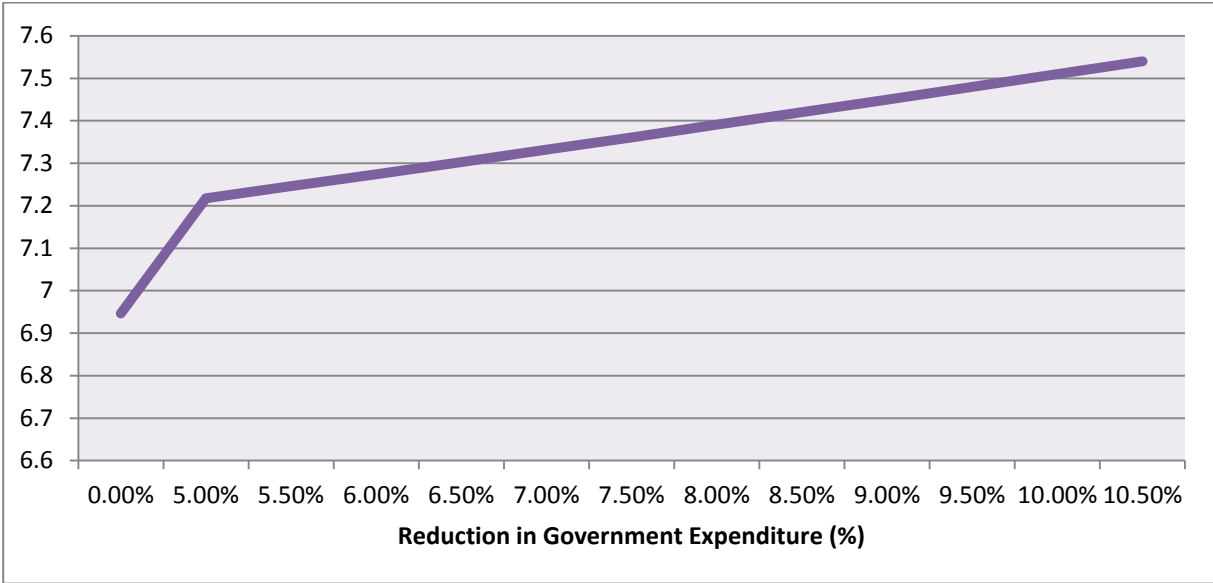


Figure 2.30: Income Distribution of the Bottom 20% of the Population to the Top 20% of the Population - Thailand (%)

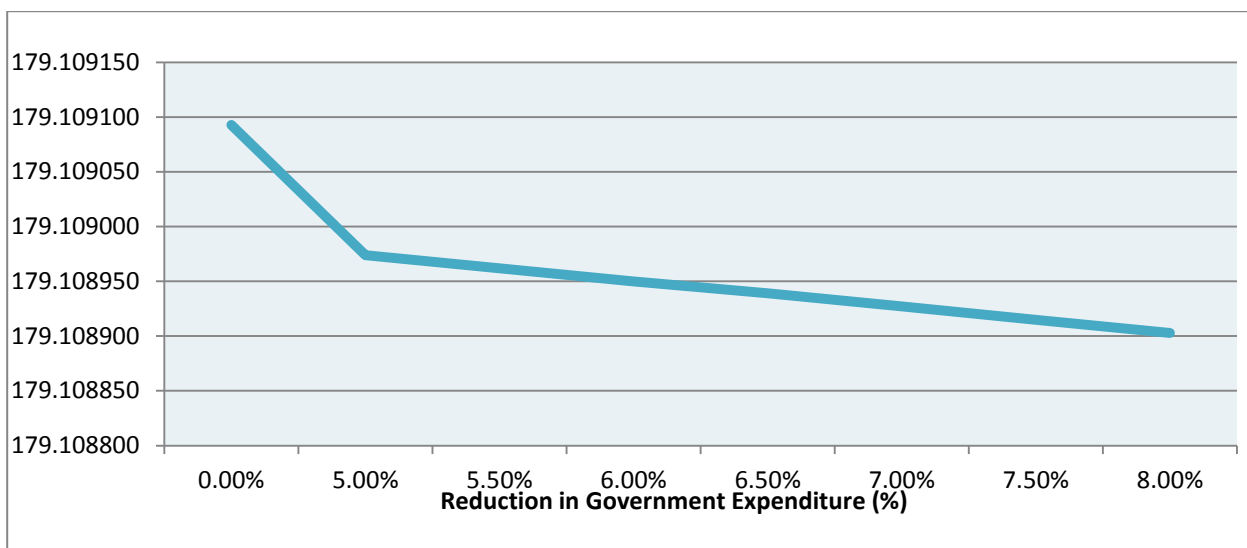


Figure 2.31: Income of the Bottom 20% of the Population - Thailand (billions of bath)

Our next step is to calculate the poverty incidence as a result of this shock. In Figure 2.32, the trend line shows that a 1% increase in the RGDP leads to 0.0022% increase in the price index, which means that the change in the poverty line would almost surely is negligible as well (Figure 2.33). Similarly, the elasticity of income to the output in Figure 2.34 also shows a very insignificant change. A 1% increase in the RGDP leads to null (0.0000%) increase in the income of the bottom 20% of the population.

As mentioned in Shock 1 earlier, take note that the impact of initial percentage of shock (up to 5%) causes steeper changes to these variables than the subsequent increments. This is because in CGE model, our baseline model has exogenized certain variables and when we shock the model, some of these initial exogenized variables are being endogenized. This is one of the critiques of CGE model as mentioned by authors such as Hazledine (1992) about the macro issues that arise when closing the model in aggregate.

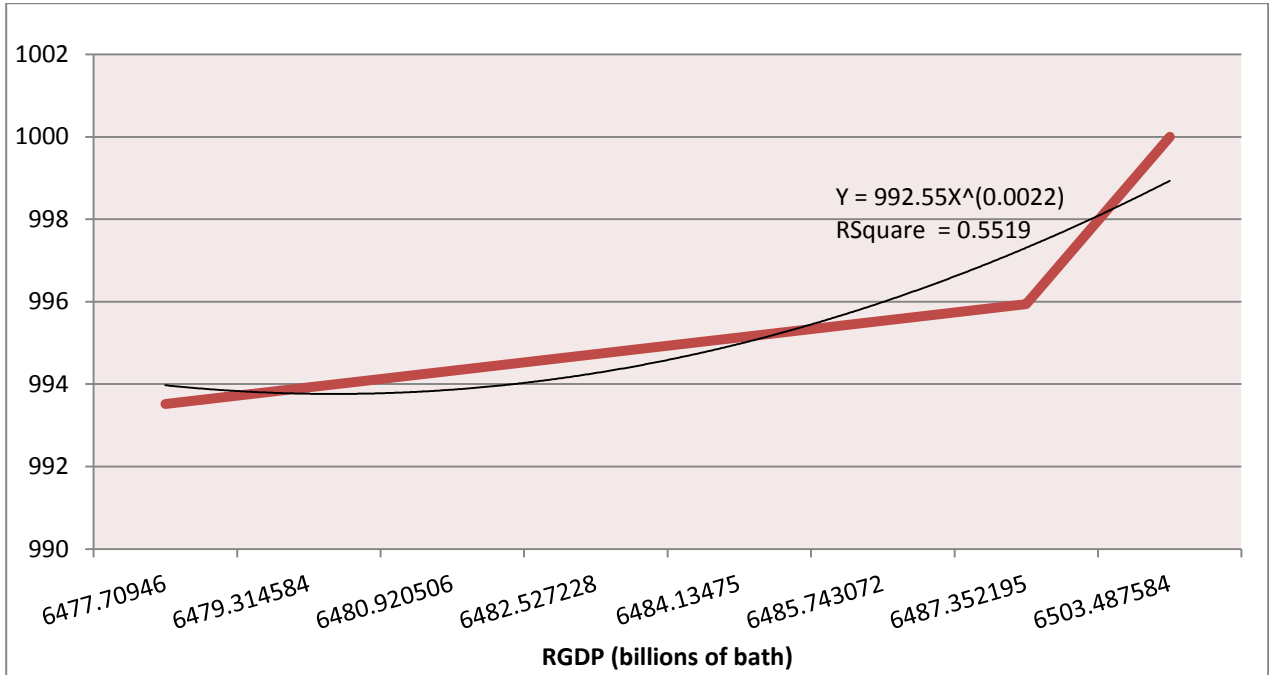


Figure 2.32: Price Index across the RGDP – Thailand

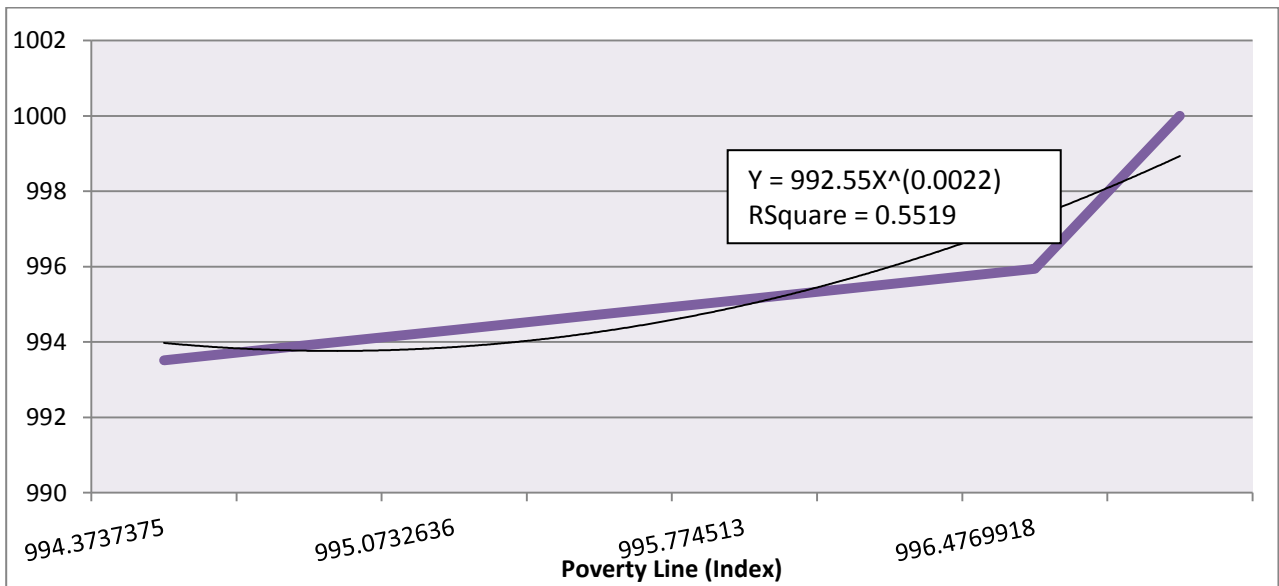


Figure 2.33: (Construction of Quadrant – 2) Price Index across the Poverty Line – Thailand

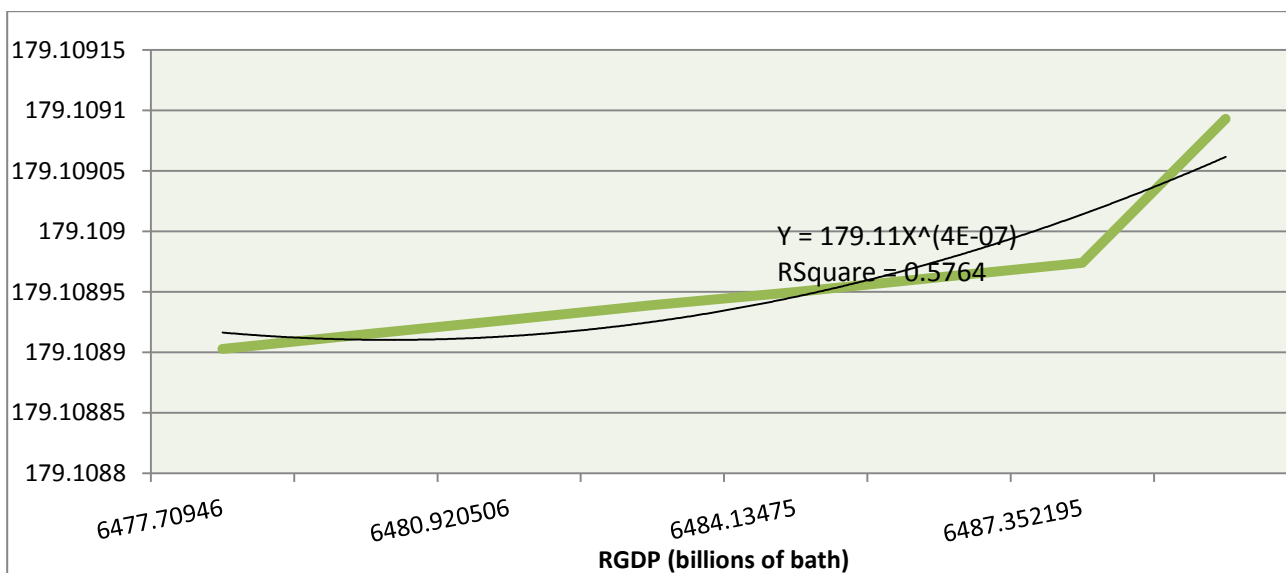


Figure 2.34: (Construction of Quadrant – 4) Income of the Bottom 20% of the Population across RGDP - Thailand (billions of bath)

Similar to the earlier analysis, we will now calculate the change in the magnitude of poverty line and income of the bottom 20% of the population when government decreases its spending. The split linear functions for each graph are as follow:

From Figure 2.32, we have:

$$\text{Price Index}_{steep} = 0.2509 * \text{RGDP}_{steep} - 632.0393^{51}$$

$$\text{Price Index}_{flat} = 0.2516 * \text{RGDP}_{flat} - 636.4129^{52}$$

From Figure 2.33, we have:

$$\text{Price Index}_{steep} = 1.1524 * \text{PovertyLine}_{steep} - 152.4242$$

$$\text{Price Index}_{flat} = 0.2509 * \text{PovertyLine}_{flat} - 632.0393$$

From Figure 2.34, we have:

$$Y^{\text{Poor}}_{steep} = 0.000007375 * \text{RGDP}_{steep} + 179.0611$$

$$Y^{\text{Poor}}_{flat} = 0.000007472 * \text{RGDP}_{flat} + 179.060479$$

⁵¹ Any equation with subscript 'steep' refers to the steep part of the graph.

⁵² Any equation with subscript 'flat' refers to the flatter part of the graph.

Analysis I: Steeper part of the Graph

A \$1 billion decrease in $RGDP_{steep}$ leads to a decrease in $Price\ Index_{steep}$ by 0.2509 and a decrease in the income of the bottom 20% of the population (Y^{Poor}_{steep}) by \$0.000007375 billions of bath (\$7375 bath). A decrease in $Price\ Index_{steep}$ by 0.2509 leads to a decrease in $PovertyLine_{steep}$ by 0.2178.

Analysis II: Flatter part of the Graph

A \$1 billion decrease in $RGDP$ leads to a decrease in $Price\ Index_{flat}$ by 0.2516 and a decrease in the income of the bottom 20% of the population (Y^{Poor}_{flat}) by \$0.000007472 billions of bath (\$7472). A decrease in $Price\ Index_{flat}$ by 0.2516 leads to a decrease in $PovertyLine_{flat}$ by 1.0027.

Hence, based on our two approaches, we concluded that contractionary fiscal policy does not improve the level of income for the bottom 20% of the population despite the decline in the poverty line. The impact on poverty incidence is ambiguous.

In our FCGE model, when the government decreases its total expenditure ($GDTOT$), the final demand of government consumption for agricultural, manufacturing and services sectors' products will also decrease (GD_i in Equation (26)) which will affect the total domestic consumption (Q_i in Equation (32)). A decrease in total domestic consumption will affect the prices (Equation (3)), the composition of imported goods (M) and domestic goods (D) defined in Equations (13) and (14) and the total output for each sector ($PX*X$ in Equation (4)). The decrease in the prices will also affect the household consumption (Equation (24)). This will ultimately affect the real GDP (Equation (36)) and the value added GDP (Equation (37)). Since the price index ($PINDEX$) is the ratio of value added GDP over the real GDP (Equation

(6)), the change in this ratio affects the price index and the poverty line (Equation (151)). The effect on the total output of each sector (X_i) will affect the wages and the rent (Equation (9)) which means affecting the factor income for labor and capital ($YFCTR_f$ in Equation (16)). Some of these factor incomes would be saved and some will be invested back into the productivity sector ($Invest$ in Equation (29)). The amount that will be saved and invested in these real sectors will then be linked to our financial sector (Equations (137) and (138)). This will affect the enterprise portfolio ($UOF_{S_{FIXED,ENTP}}$ in Equation (63)) and households portfolio ($UOF_{F_{FIXED,HH}}$ in Equation (61)). The change in their portfolio will finally determine the total income of domestic institutions (YH_{dprivt} in Equation (25)). As in the earlier shock, the income of the bottom 20% of the population in Figure 2.31 is converging to a certain level (diminishing marginal return) as the government keeps on decreasing its expenditure.

6.3. Shock 3: Increase in Interest Rate

Our third shock that is an increment in the interest rate is one of the contractionary monetary policies. We would expect that an increase in the interest rate would shift the aggregate demand curve to the left (downward) resulting in lower GDP and lower price. Since the poverty line is a function of price index, a decrease in price index leads to a decrease in poverty line (Figure 2.35). In Figure 2.36, we can see that the income distribution worsens before diminishing to a constant level and income of the bottom 20% of the population in Figure 2.37 also drops significantly as a response to the initial shock before converges/diminishes to a constant level. This shows that unlike contractionary fiscal policy

described earlier, contractionary monetary policy has negative effect on both income distribution and income of the bottom 20% of the population.

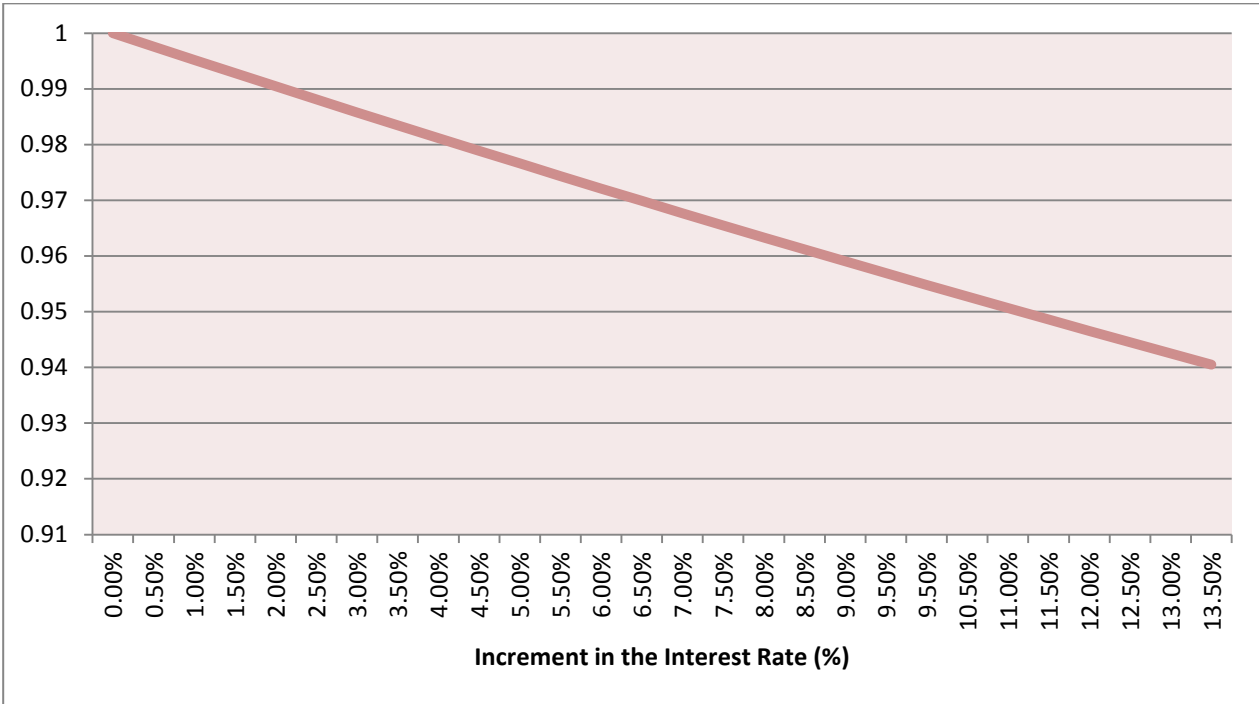


Figure 2.35: Level of Poverty Line (Index) in Thailand

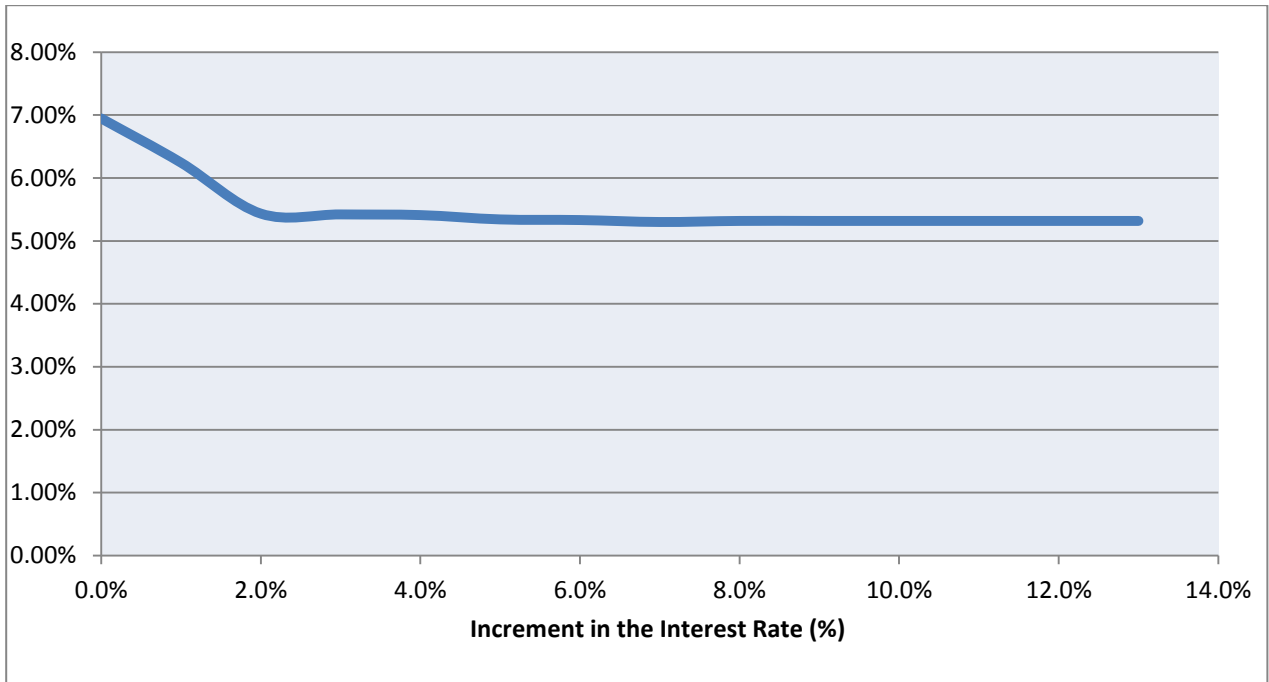


Figure 2.36: Income Distribution of the Bottom 20% of the Population to the Top 20% of the Population - Thailand (%)

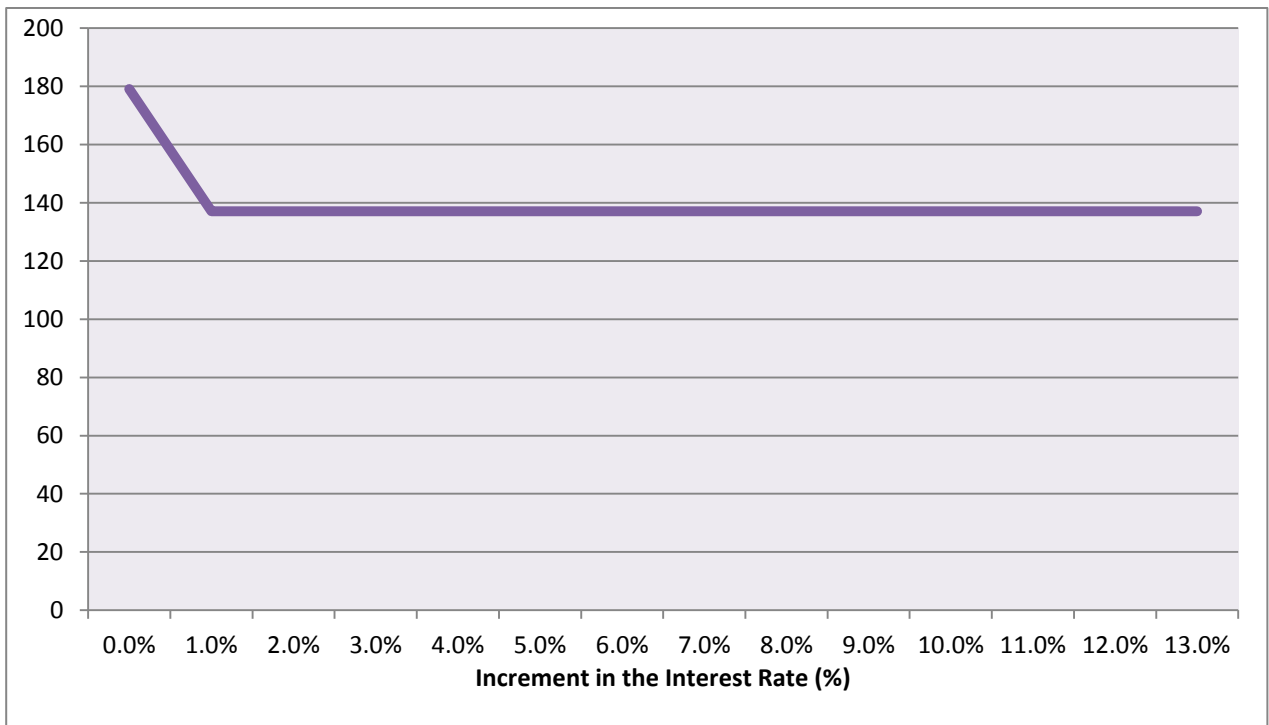


Figure 2.37: Income of the Bottom 20% of the Population - Thailand (billions of bath)

Our main task is to investigate the poverty incidence as a result of this shock.

From Figure 2.38:

$$\text{Price Index} = 0.2639 * \text{RGDP} - 720.3344$$

From Figure 2.39, we have:

$$\text{Price Index} = 1.1397 * \text{PovertyLine} - 139.6201$$

From Figure 2.40, we have:

$$Y^{\text{Poor}}_{\text{steep}} = 2.4732 * \text{RGDP}_{\text{steep}} - 15905.2560$$

$$Y^{\text{Poor}}_{\text{flat}} = 137.1184$$

As the interest rate increases by 100 basis points (1 percent), the RGDP decreases. A decrease by \$1 billion in RGDP leads to a decline in Price Index by 0.2639 and income of the bottom 20% of the population (Y^{Poor}) to decrease by \$2.4732 billion of bath for the steeper part of the graph in Figure 2.40 and a decline to \$137 billion of bath which is a drop by \$42 billion bath for the flatter part of the same graph. A decline in Price Index by 0.2639 leads to a decline in Poverty Line by 0.2315. Due to this, we conclude that the poverty incidence worsens since the bottom 20% of the population will lose significant amount of income compares relatively to a small number of people that will be above the poverty line.

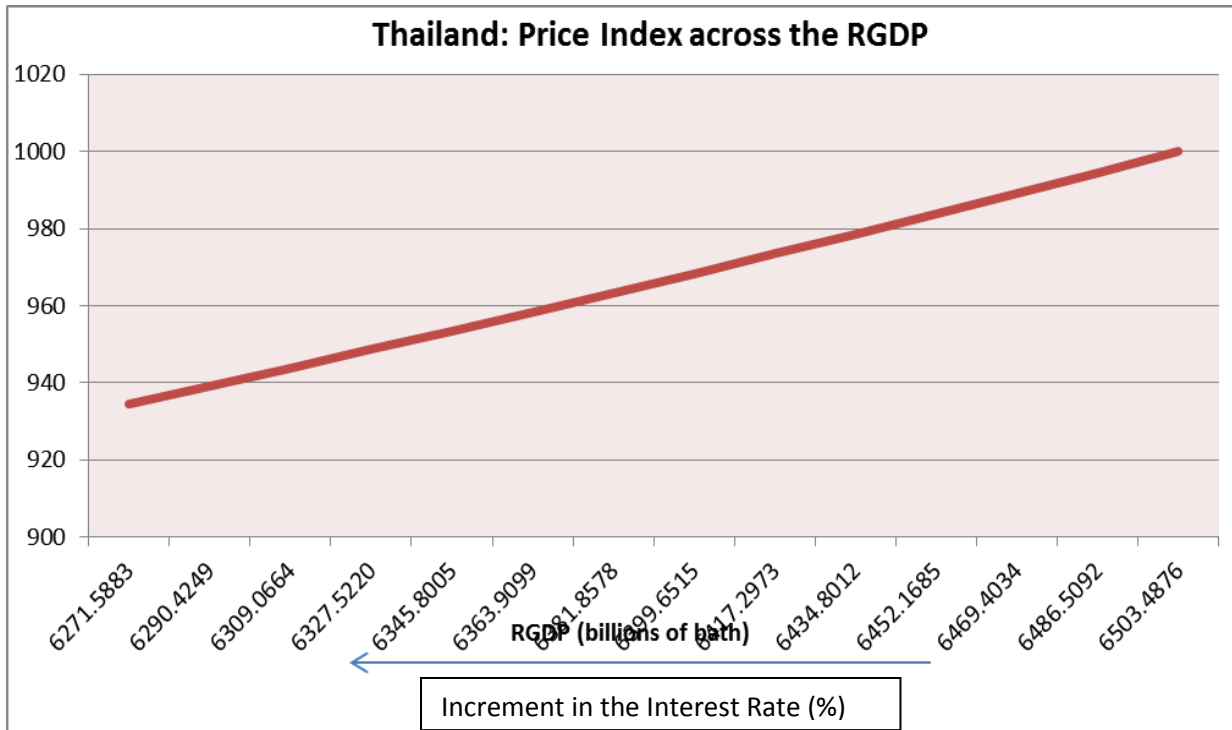


Figure 2.38: Price Index across the RGDP – Thailand

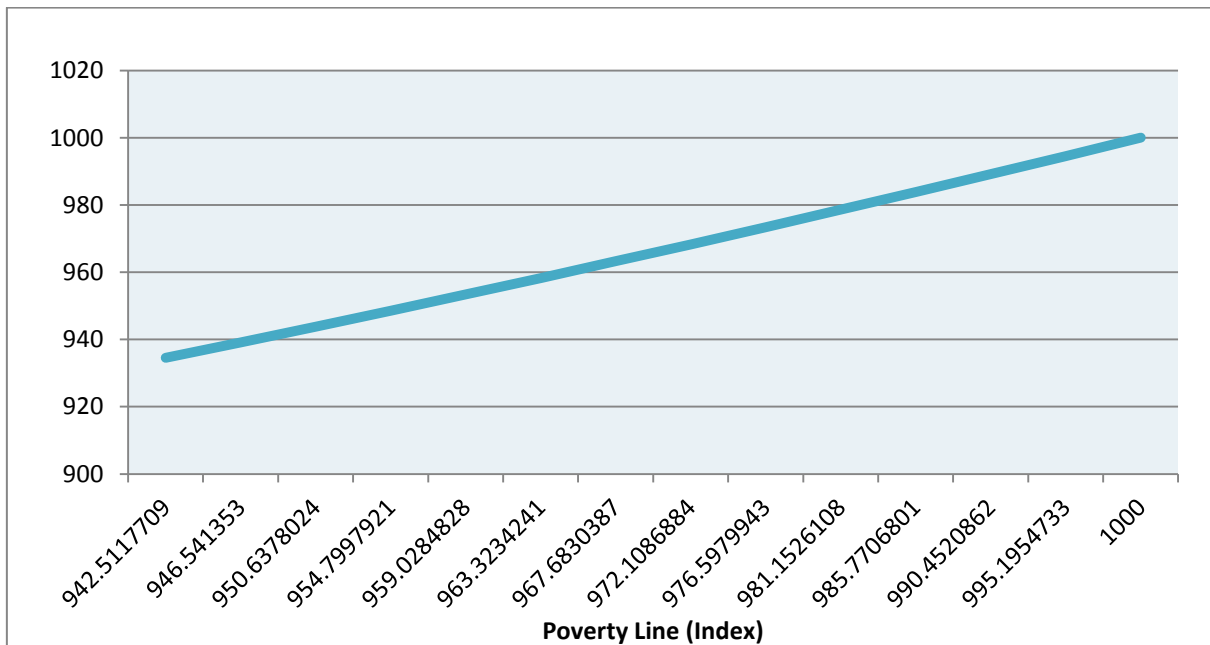


Figure 2.39: (Construction of Quadrant – 2) Price Index across the Poverty Line – Thailand

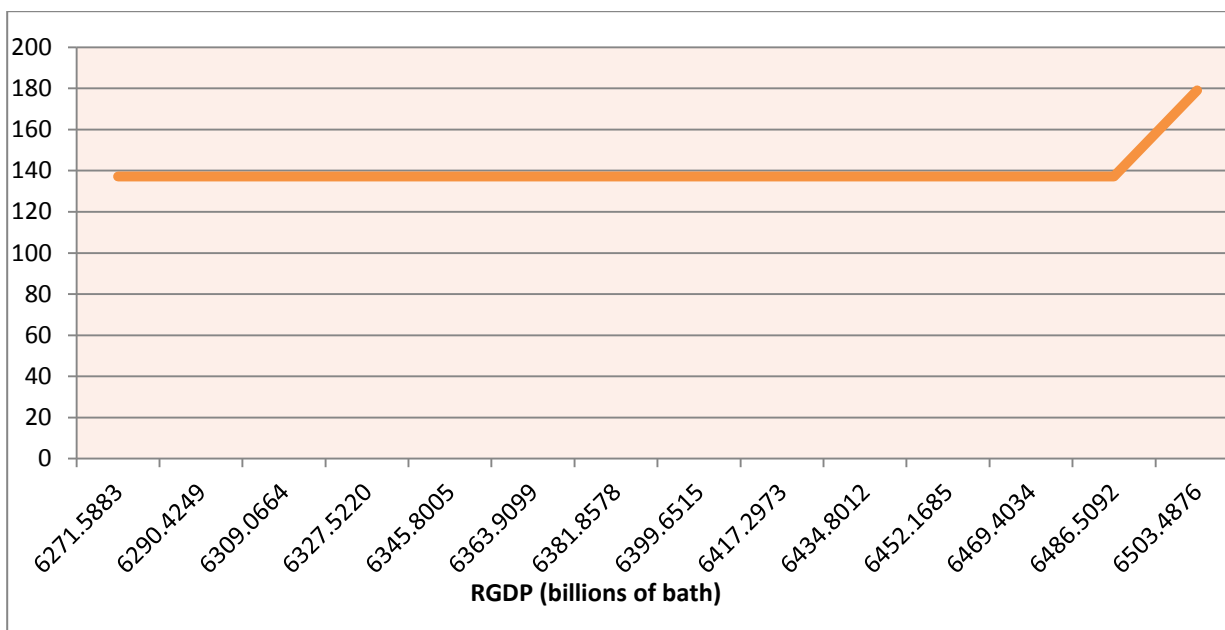


Figure 2.40: (Construction of Quadrant – 4) Income of the Bottom 20% of the Population across RGDP - Thailand (billions of bath)

In our model, any changes in the level of targeted interest rate (RRN “ Lo ”) would affect the amount of money supply ($M2$) in the economy defined in Equations (118) and (122). The amount of money (SOF_SCH_BOT in Equation (122)) coming from Bank of Thailand (BoT) declines and hence $M2$ will also decline. In addition, the loan interest rate also affects the amount of bank loans that households and enterprises could borrow from the banks defined in Equations (54) and (65). Since the interest rate is rising, the demand for bank loans declines and the deposit interest rate also increases (Equation (140)) due to the fixed interest spread that we have set in our model. The relative return from investing in other financial assets will decrease since the deposit interest rate increases (Equations (141) to (145)). The exchange rate appreciates (Equation (139)) but the demand for Thai’s loan from the rest of the world will decline (Equation (129)). At the same time, the changes in the interest rate would also determine the households and enterprises’ decisions to invest in the fixed assets (Equations

(61) and (63)) and the net return that they will obtain from their investment across different financial assets (Equations (56) and (96)). Since the compositions of their portfolio have changed, the total amount invested in the real sector has also changed (Equation (138)). The share distribution of investing in these real sectors is defined in Equation (29) and the effect on the prices and the quantities are defined in Equations (7) and (31). Finally, these changes will affect the RGDP in Equation (37) and the value added GDP in Equation (36).

Furthermore, we have assumed that the wages are fixed but the labor supply is unlimited due to migration. However, the rent is an endogenous variable but it is operating at full capacity. As described earlier, the increase in interest rate affects the prices and the quantities of goods in the economy. The total output for each sector (X_i) and the prices declines (Equation (7)) causing the labor supply ($FDSC$) and the rent to decrease ($WF_{capital}$) in Equation (9). The decrease in the rent causes the income of the enterprises to decrease (Equation (17)). As income of the enterprises is reduced, its transfer ($DTRANS$) to households and government is reduced as well. The reduction in the transfer from enterprises, the lower cost of capital and the lower labor supply causes the income of the households to reduce as well (Equation (17)). Since the effect of this reduction depends on the share parameter of each household ($FSHARE$), some households would have more impact than others, explaining the income distribution between the two groups of households.

Finally, it is to be noted that similar to the previous two shocks, the highest impact arises at the beginning of the shocks (first 1%) due to endogeneizing certain variables that we have initially exogenized in the baseline model. Furthermore, the effect exhibits diminishing marginal return as the shock continues consistent with the economic theory and Azis's framework.

6.4. Shock 4: Decrease in Interest Rate

In this shock, we are looking at one of the expansionary monetary tools, decreasing the interest rate. One would expect that when the level targeted interest rate decreases, the aggregate demand curve will shift to the right (upward) resulting in an increase in the price index and GDP. In Figure 2.41, the poverty line is increasing as the interest rate decreases since the poverty line is defined as an increasing function of price. The income distribution improves when interest rate decreases up until 150 basis points before declining and eventually level out when the interest rate reaches 250 basis points. The income of the bottom 20% of the population follows the similar pattern of income distribution. This intuitively suggests that decreasing the interest rate while does improve the income distribution in an economy will eventually have diminishing effect as the shock continues.

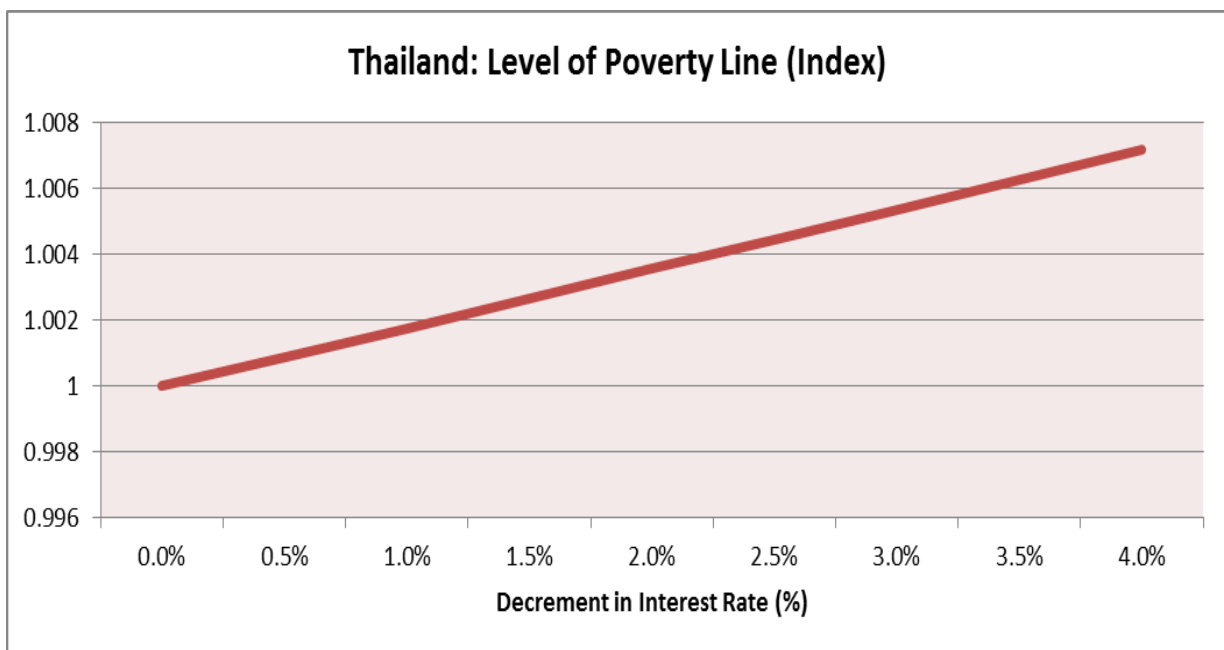


Figure 2.41: Level of Poverty Line (Index) in Thailand

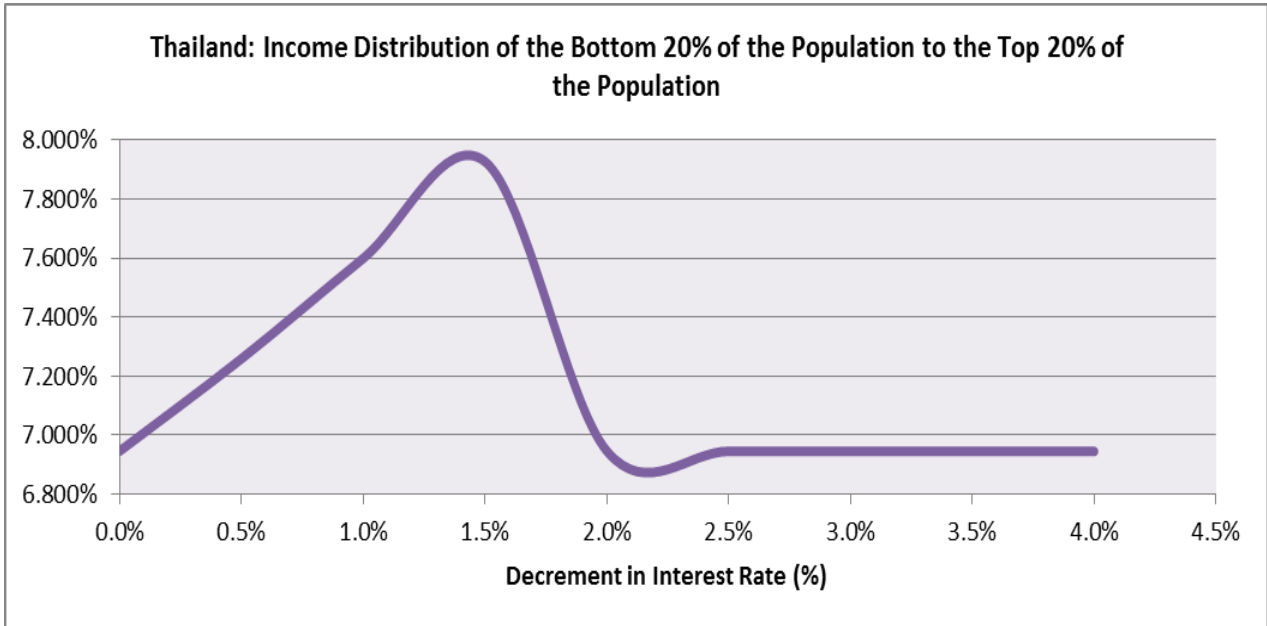


Figure 2.42: Income Distribution of the Bottom 20% of the Population to the Top 20% of the Population - Thailand (%)

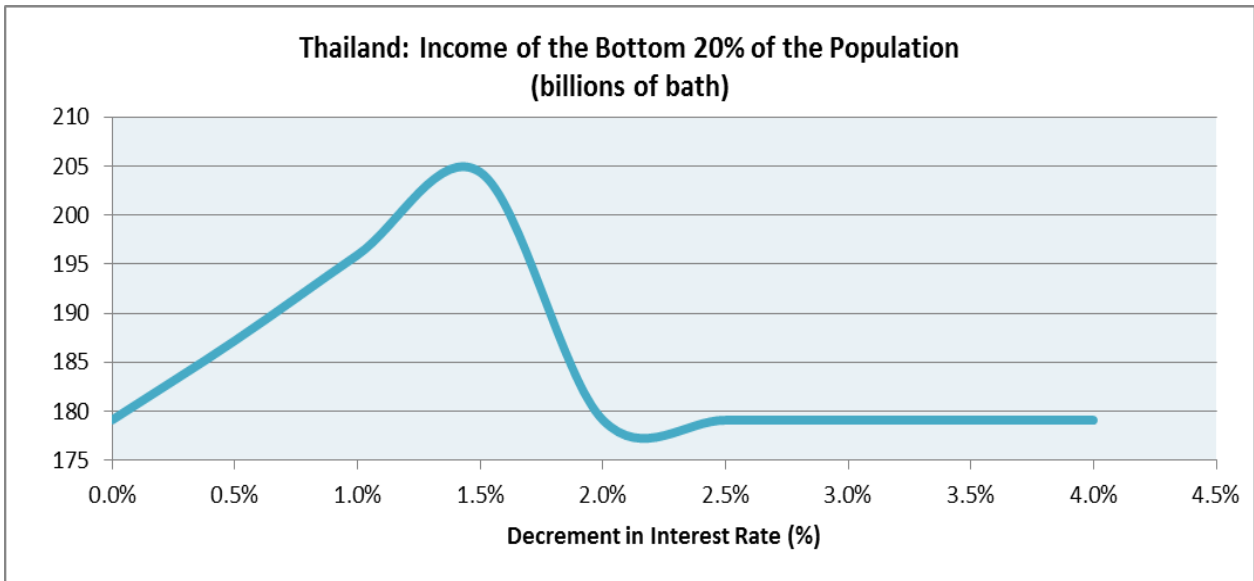


Figure 2.43: Income of the Bottom 20% of the Population - Thailand (billions of bath)

Our next task is to calculate the impact on poverty incidence as a result of this shock.

From Figure 2.44, we have:

$$\text{Price Index} = 0.2578 * \text{RGDP} - 676.5786$$

From Figure 2.45, we have:

$$\text{Price Index} = 1.1748 * \text{PovertyLine} - 174.8355$$

From Figure 2.46, we have:

$$Y^{\text{Poor}}_{\text{increasing}} = 2.0977 * \text{RGDP}_{\text{increasing}} - 13463.558$$

$$Y^{\text{Poor}}_{\text{decreasing}} = -6.2458 * \text{RGDP}_{\text{flat}} + 40899.3485$$

$$Y^{\text{Poor}}_{\text{level}} = 179.080$$

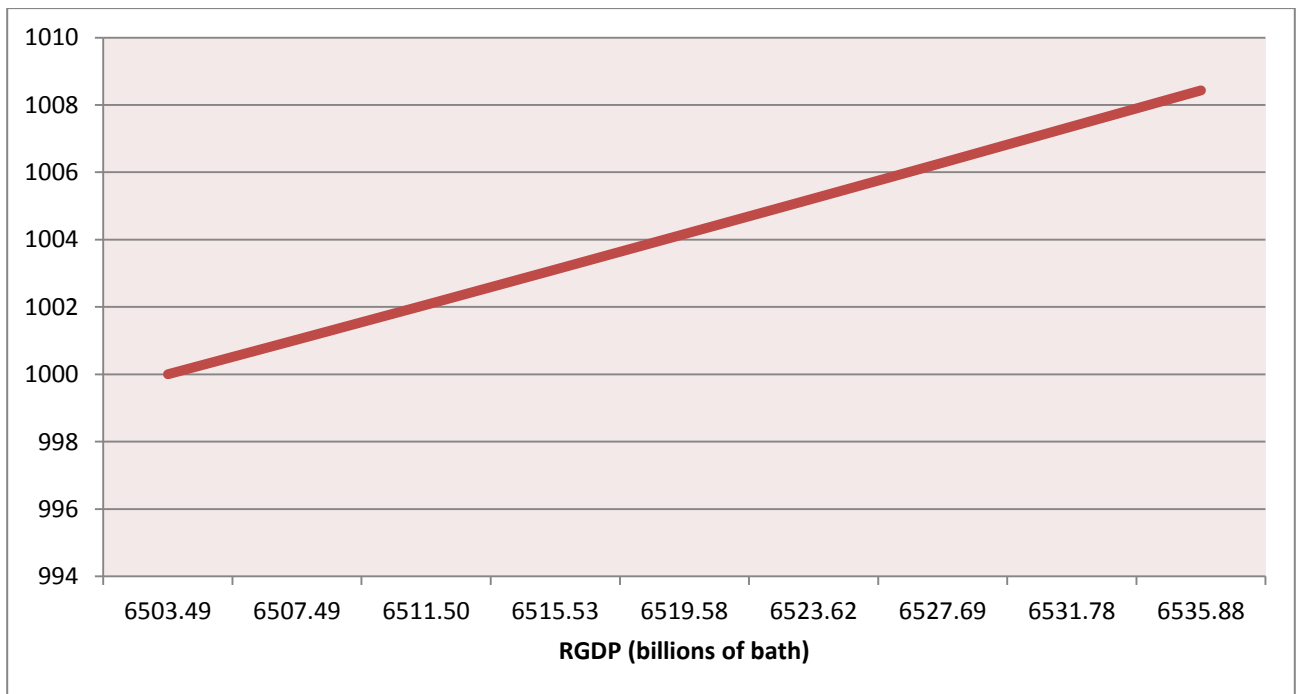


Figure 2.44: Price Index across the RGDP – Thailand

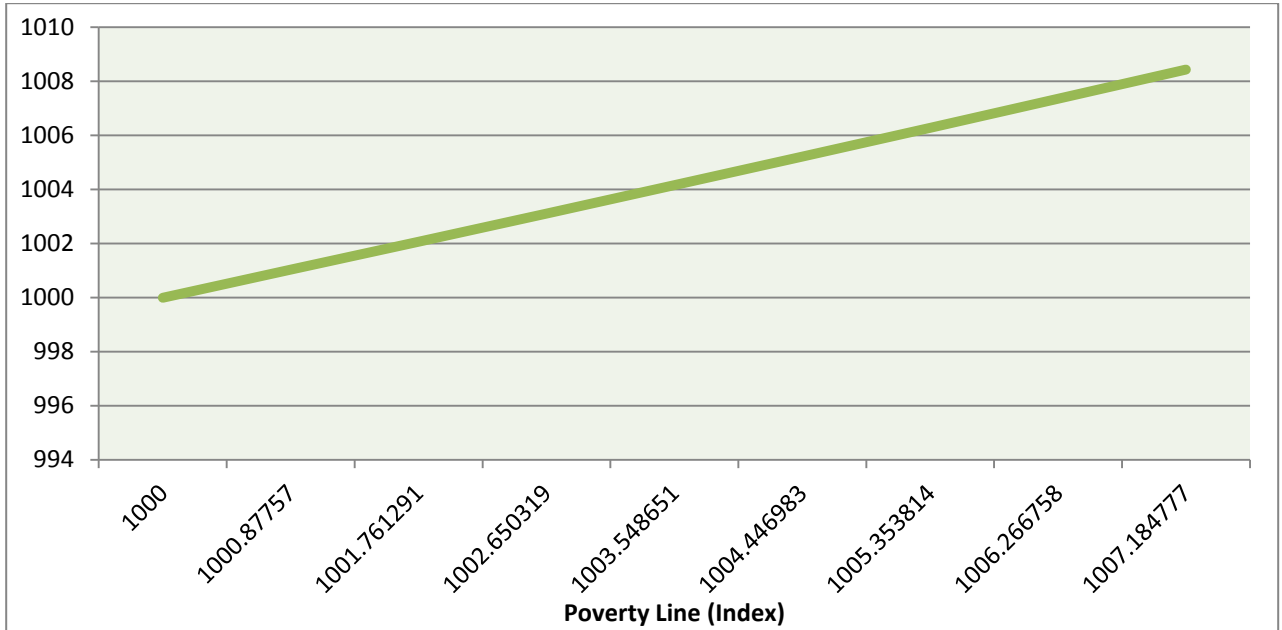


Figure 2.45: (Construction of Quadrant – 2) Price Index across the Poverty Line – Thailand

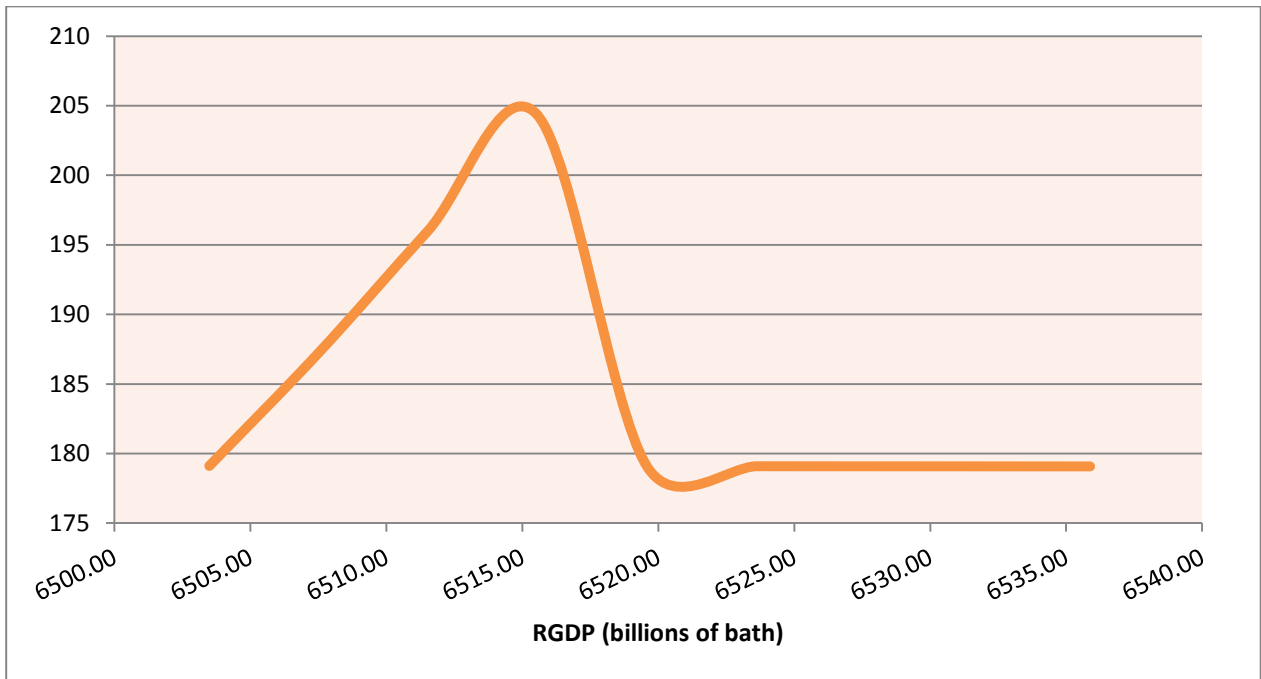


Figure 2.46: (Construction of Quadrant – 4) Income of the Bottom 20% of the Population across RGDP - Thailand (billions of bath)

Analysis I: Increasing part of the Graph in Figure 2.46

We assume that the interest rate decreases only up to 150 basis points. A \$1 billion increase in RGDP leads to Price Index increases by 0.2578 and income of the bottom 20% of the population to increase by \$2.0977 billion bath. The increase in the Price Index by 0.2578 leads to an increase in the Poverty Line by 0.2194.

Analysis II: Decreasing part of the Graph in Figure 2.46

We assume that the interest rate continues to decrease more than 150 basis points. A \$1 billion increase in RGDP leads to a decline in Price Index by 0.2578 and income of the poor (Y^{Poor}) decreases by \$6.2458 billion bath.

Analysis III: Level Part of the Graph in Figure 2.46

Now we assume that the interest rate continues to decrease above 250 basis points. The only change here is the drop in the income of the bottom 20% of the population to a level \$179.080 billion bath, which is its initial level prior to the shocks.

In our model, when the level of targeted interest rate decline, it increases the amount of Bank of Thailand money supply in Equations (121) and (122). It also increases the amount of loan demand by enterprise in Equation (65) and by households in Equation (54). At the same time, the amount of investment in the fixed assets will increase (Equations (61) and (63)). Since the fixed assets is defined as the investment in agricultural, manufacturing and services sectors, Equation (138) relates this changes in financial market to the real sector. Equation (30) shows the impact of an increase in fixed investment to the composite prices in the economy and since the interest rate is lower, there is a higher demand for Thai's export and a decline in

their import which subsequently will affect the real GDP in Equation (37) and value-added GDP in Equation (36). The rise in investment leads to higher transfer from enterprises to households. As the interest rate continues to decrease, the cost of borrowing becomes cheaper for enterprises (Equation (65)) and for households (Equation (54)) and there will be a continuous rise in the demand for fixed assets. However, since we have defined in our model that the capital is utilized at its maximum capacity (Equation (63)), the decline in the interest rate will be offset by the decline in the fixed assets investment by the enterprise due to the crowding out effects. Up until 150 basis points, the income of the bottom 20% of the population is increasing because of an increase in the labor supply and the cost of capital along with higher transfers from the enterprises (Equation (9)). However, as the interest rate continues to decline beyond 150 basis points, the decline in the fixed assets investment causes the labor supply to decrease and the income of the bottom 20% of the population to decrease as well until eventually it converges to an equilibrium level which is the level before the shocks.

6.5. Shock 5: Increase in Reserve Requirement

One of the contractionary monetary tools that we tested in our model was an increased in the reserve requirement. An increase in reserve requirement shifts the aggregate demand curve leftward, resulting in a decrease in price index and real GDP. As mentioned in our earlier analysis, the poverty line will decrease since it is a function of price index (Figure 2.47). The income distribution improves gradually (Figure 2.48) although there is no change in the income of the bottom 20% of the population (Figure 2.49). This is because the income of the

top 20% of the population is declining while the income of the bottom 20% of the population is unchanged.

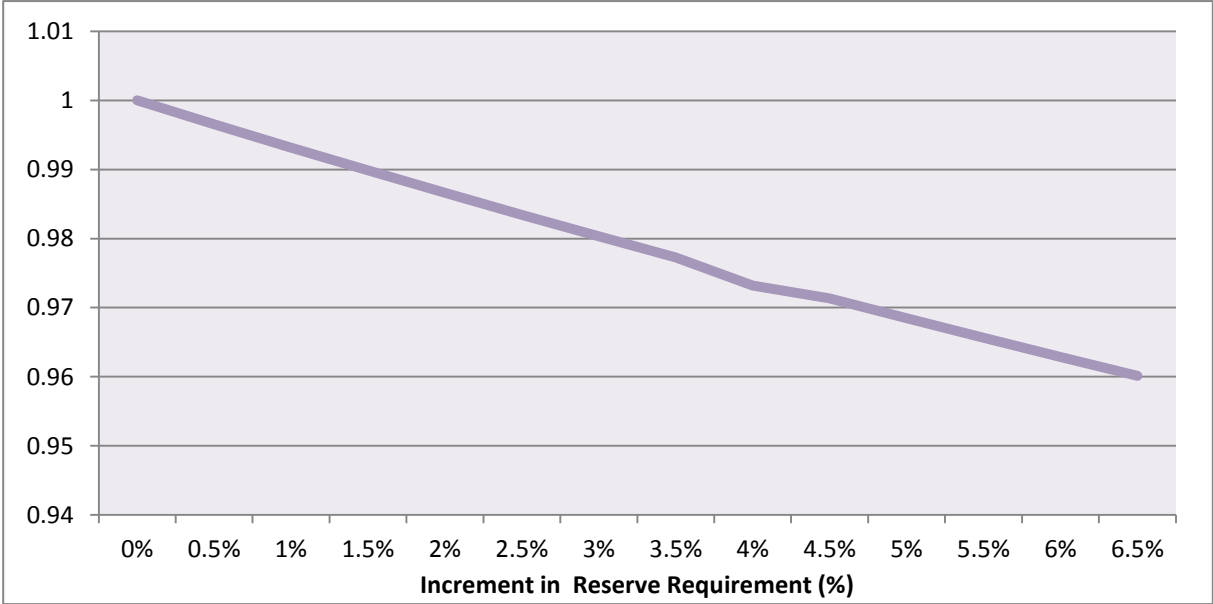


Figure 2.47: Level of Poverty Line (Index) in Thailand

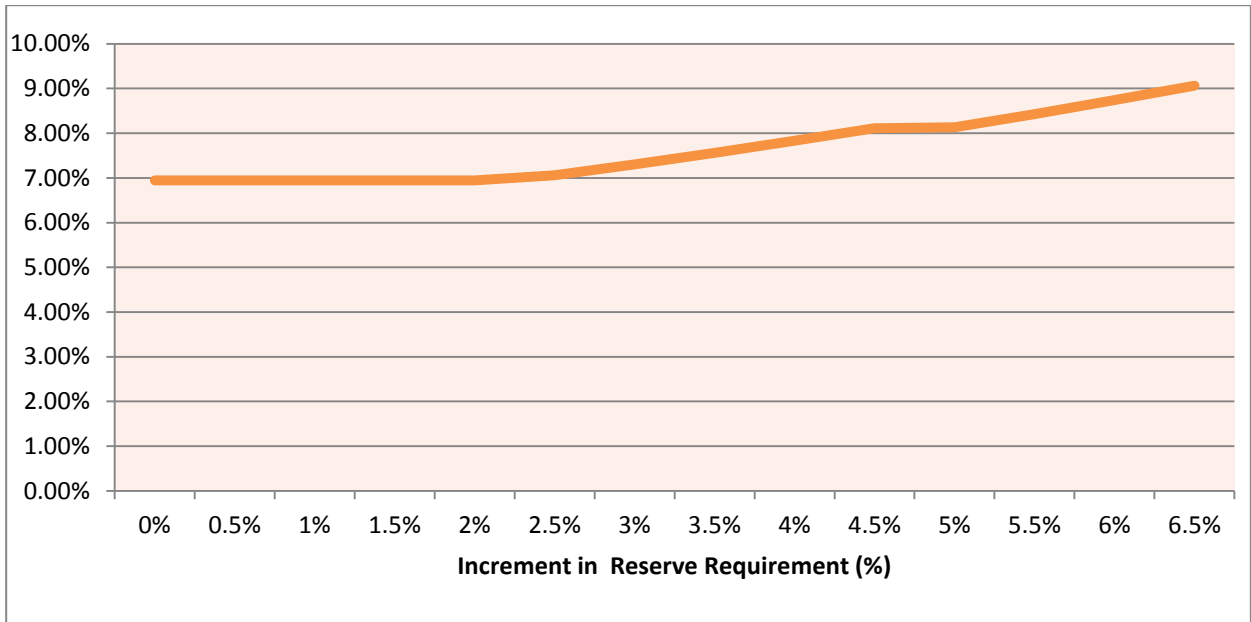


Figure 2.48: Income Distribution of the Bottom 20% of the Population to the Top 20% of the Population - Thailand (%)

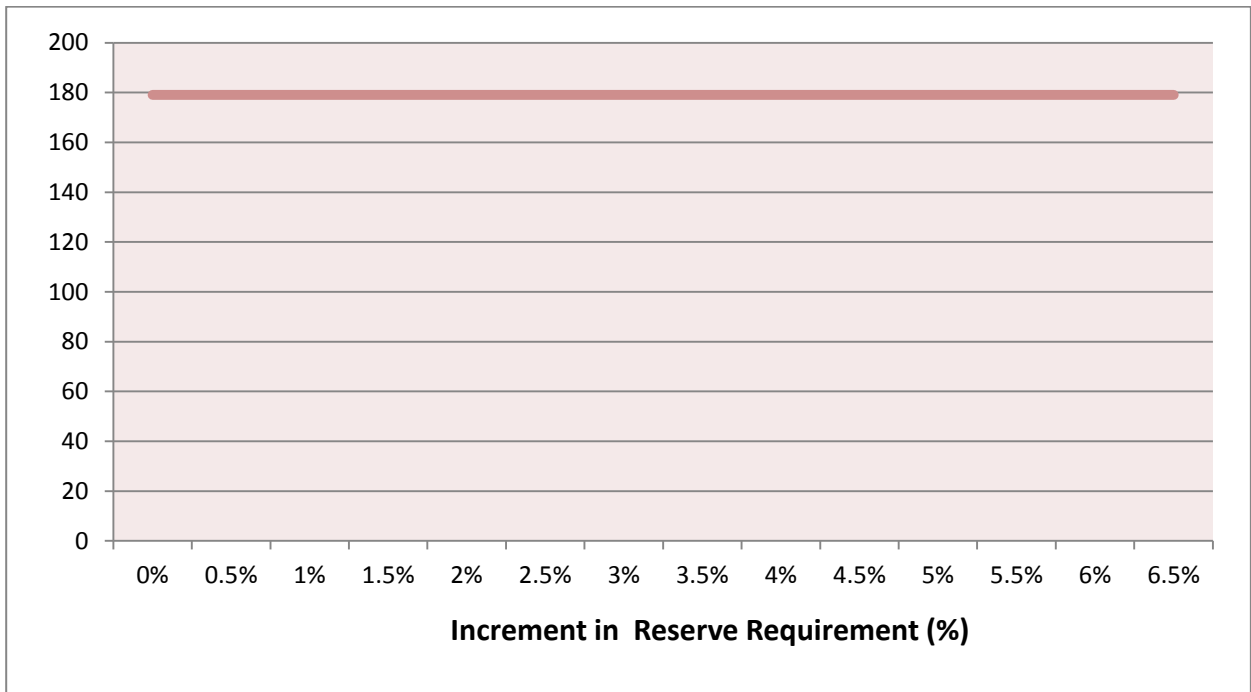


Figure 2.49: Income of the Bottom 20% of the Population - Thailand (billions of bath)

Following our earlier approach, our next task now is to calculate the impact of this shock on poverty incidence.

From Figure 2.50, we have:

$$\text{Price Index} = 0.2516 * \text{RGDP} - 636.4624$$

From Figure 2.51, we have:

$$\text{Price Index} = 1.15 * \text{PovertyLine} - 150.0949$$

From Figure 2.52, we have:

$$Y^{\text{Poor}} = 179.109093$$

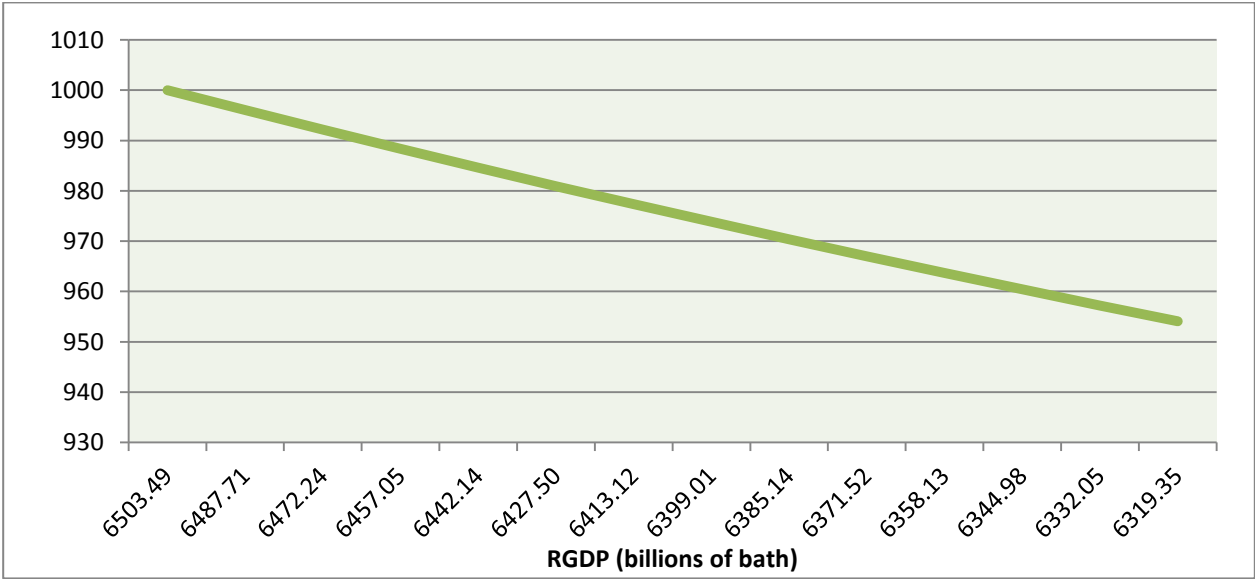


Figure 2.50: Price Index across the RGDP – Thailand

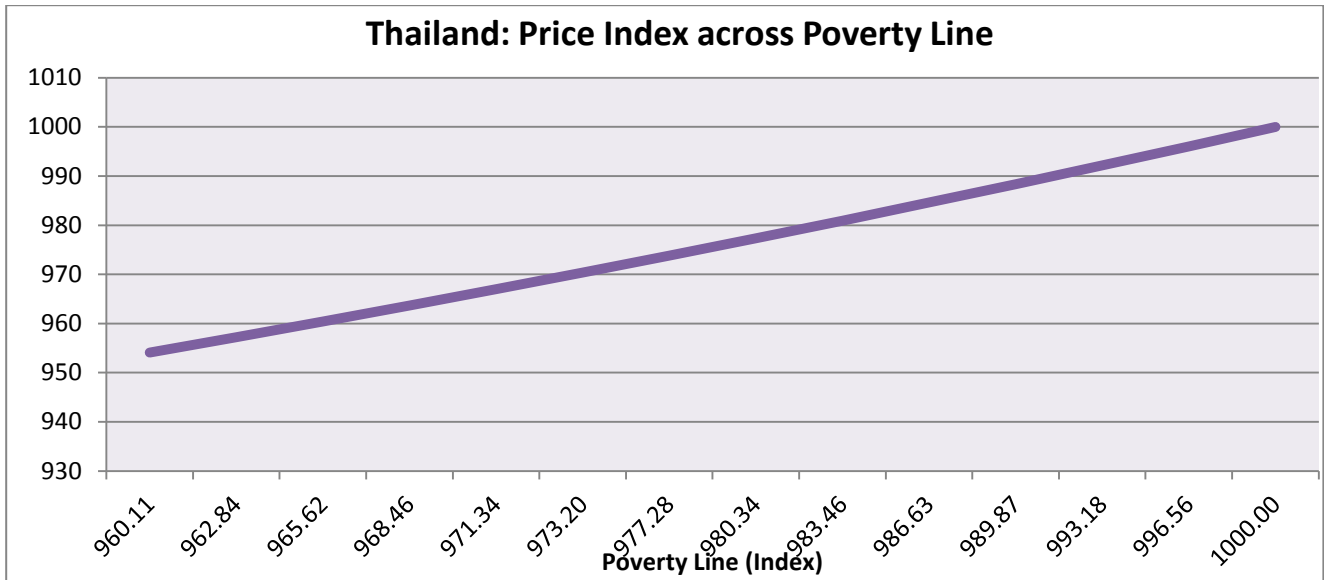


Figure 2.51: (Construction of Quadrant – 2) Price Index across the Poverty Line – Thailand

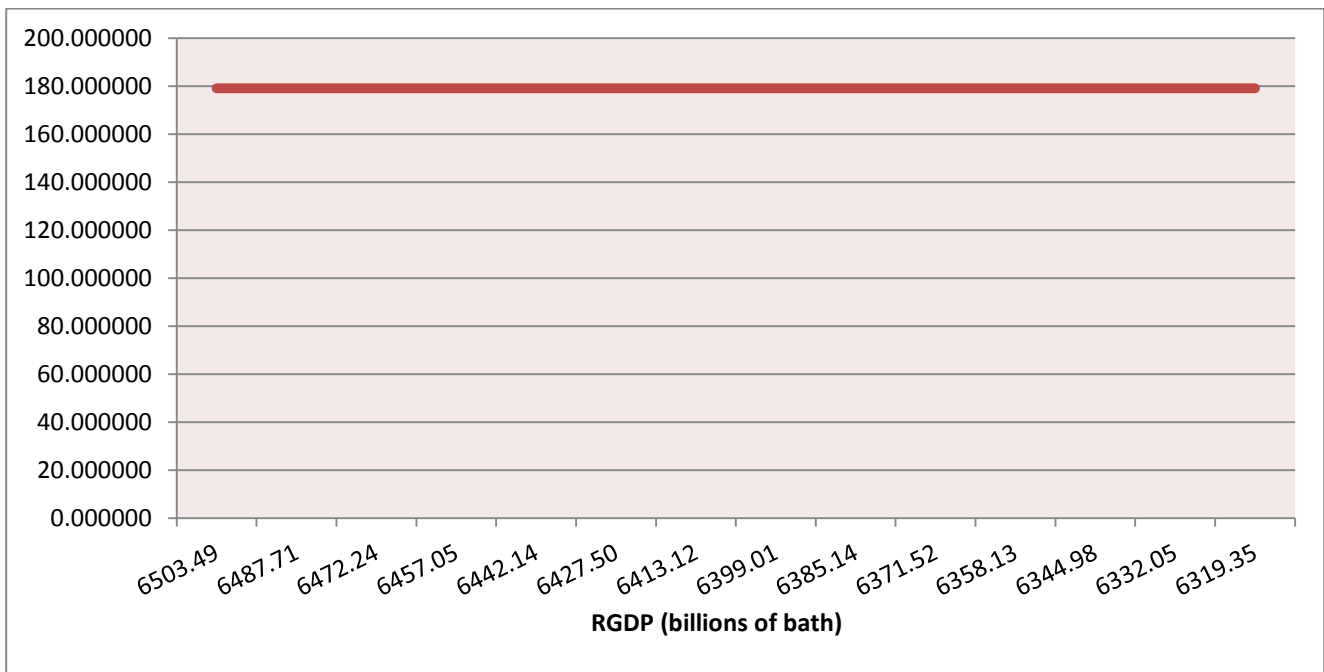


Figure 2.52: (Construction of Quadrant – 4) Income of the Bottom 20% of the Population across RGDP - Thailand (billions of bath)

Our model has shown that a decrease by \$1 billion bath of RGDP leads to a decline in Price Index by 0.2516 and no impact on the income of the bottom 20% of the population. Since the Price Index declines by 0.2516, the Poverty Line will decline by 0.21881, implying that the improvement is too small that in our conclusion for this shock, the impact on poverty incidence is negligible.

When the reserve requirement is increased, the deposit by banks ($Uof_{F_{DE,BANK}}$) with BOT will increase but the source of deposit ($Sof_{F_{DE,BANK}}$) with the banks will decrease (Equation (153)). It also affects the amount of money supply in Equations (119) to (120). Since the amount of deposit with BOT by banks has increased in Equation (116), this leads to a decline in the loans available for households and enterprises (Equations (54) and (65)). From Equation (137), the used of flows of assets must equals to the source of the flows of assets and the aggregated saving. Hence, the change in the composition of these sources flows due to lower sources of loans ($SOF_{S_{LO}}$) will also change the amount invested in the fixed assets (Equation (138)). The amount invested in the fixed assets will then affect the volume of investment by sector of destination (DK) and the prices of capital goods (PK) by sector of destination in Equation (30). These effects will further impact the amount of capital goods in each sector used for investment (ID) and the prices of composite goods (PQ) before reaching the value added GDP in Equation (36) and real GDP in Equation (37).

Although the income of other groups of households decline, the income of the bottom 20% of the population is unchanged (Figure 2.49) because the increase in the transfer from enterprises to households 1 offsets the decline in the labor supply and the cost of capital in Equation (9). One possible explanation for the increase in the transfer from enterprises to households 1 is

that there is an increase in the domestically produced goods from agricultural sector (labor intensive) and manufacturing sector (capital intensive) while the services sector shows a significant drop. Since the agricultural and manufacturing sectors employed mostly households 1, we can see a greater transfer from enterprises to this group but a drop in the services sector output lead to a decline in the labor demand for this group resulting in the unchanged of households 1 level of income.

6.6. Shock 6: Decrease in Reserve Requirement

Another shock that we have tested in this model is to decrease the reserve requirement. Since this is an expansionary monetary policy, a decrease in reserve requirement will shift the aggregate demand rightward and increase the money supply. In Figure 2.53, we have the level of poverty line that is increasing as the reserve requirement decreases since poverty line is a function of price index. In Figure 2.54, it shows the income distribution declines as the reserve requirement continues to decrease and gradually converges to a lower level. Although the income of the bottom 20% of the population is unchanged due to the shock (Figure 2.55), the increase in the income of the top 20% of the population causes the income distribution to declines to a level where the marginal effect diminishes.

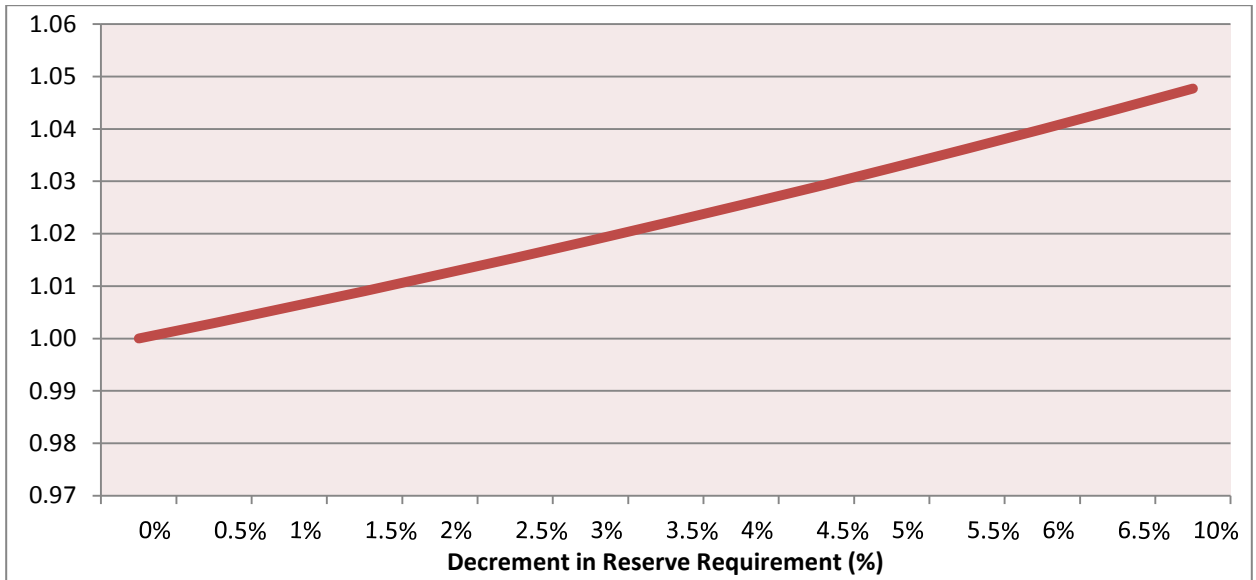


Figure 2.53: Level of Poverty Line (Index) in Thailand

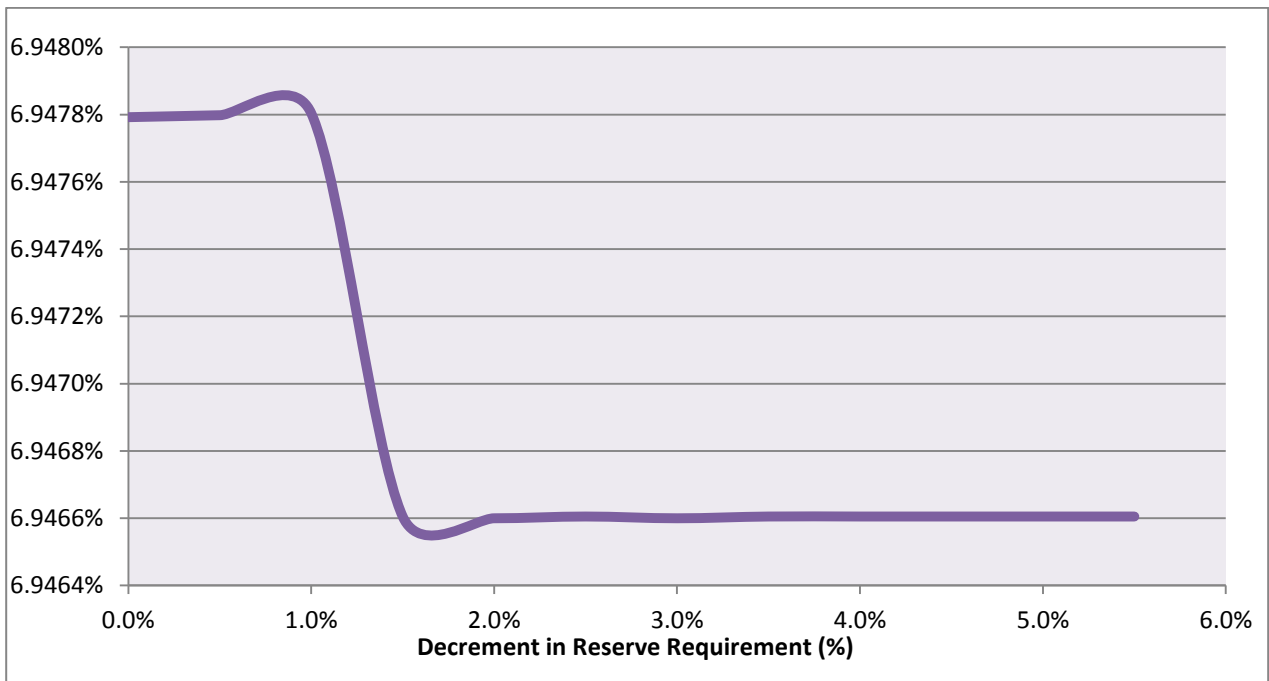


Figure 2.54: Income Distribution of the Bottom 20% of the Population to the Top 20% of the Population - Thailand (%)

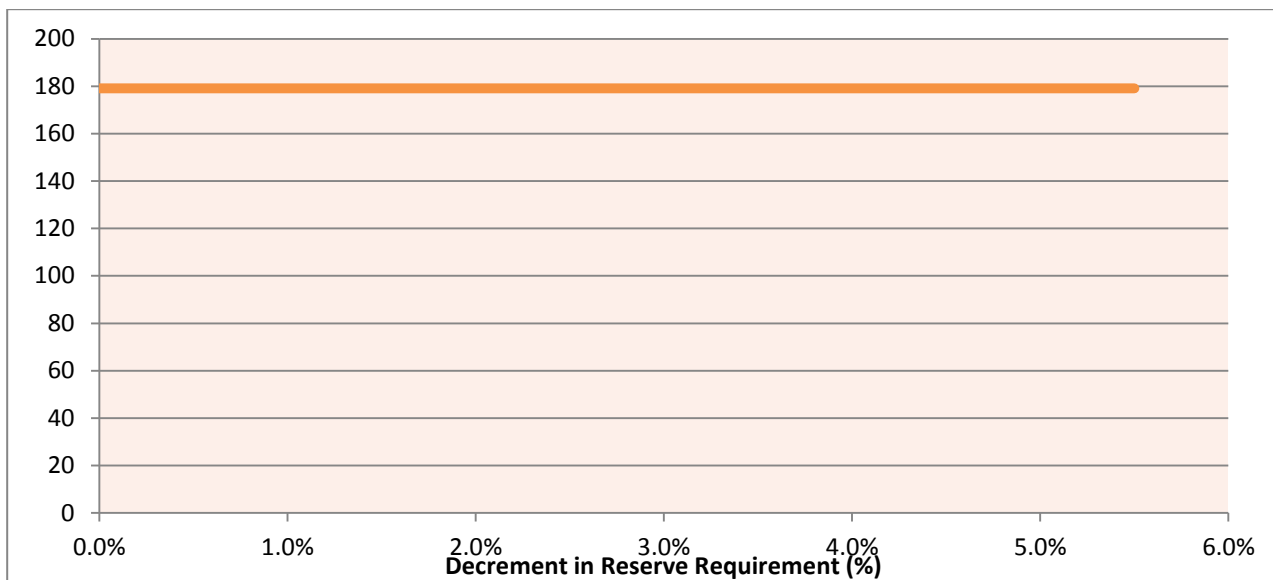


Figure 2.55: Income of the Bottom 20% of the Population - Thailand (billions of bath)

In calculating the impact of these shocks on poverty incidence, we have the following equations:

From Figure 2.56:

$$\text{Price Index} = 0.2160 * \text{RGDP} - 404.8279$$

From Figure 2.57:

$$\text{Price Index} = 1.1672 * \text{PovertyLine} - 167.1982$$

From Figure 2.58:

$$Y^{\text{Poor}} = 179.10916$$

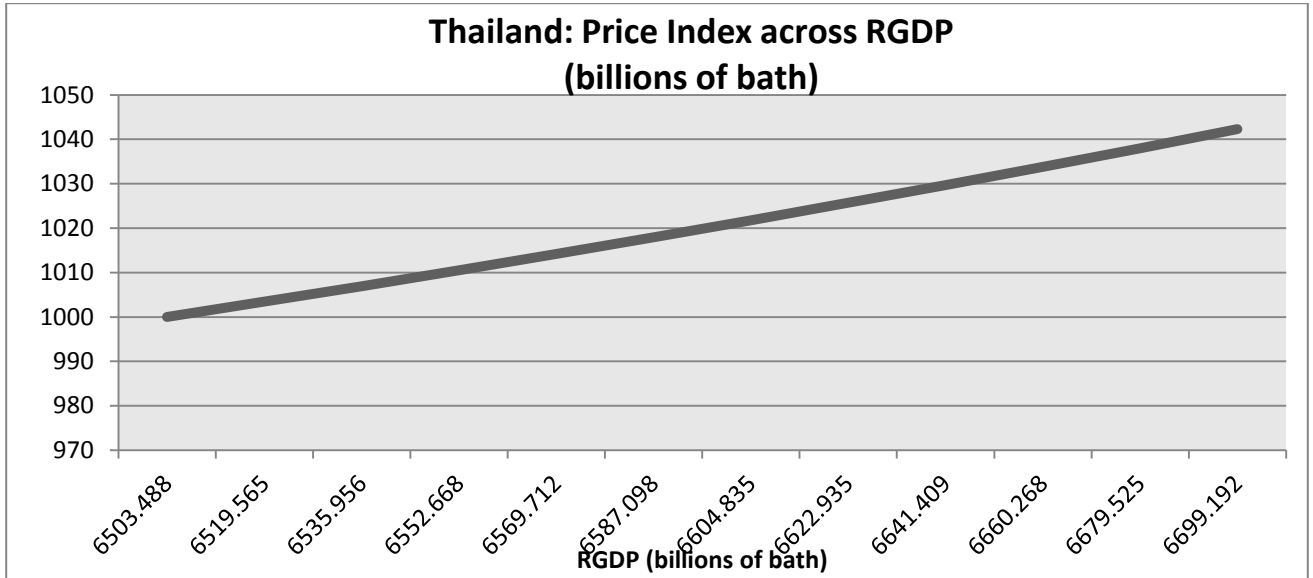


Figure 2.56: Price Index across the RGDP – Thailand

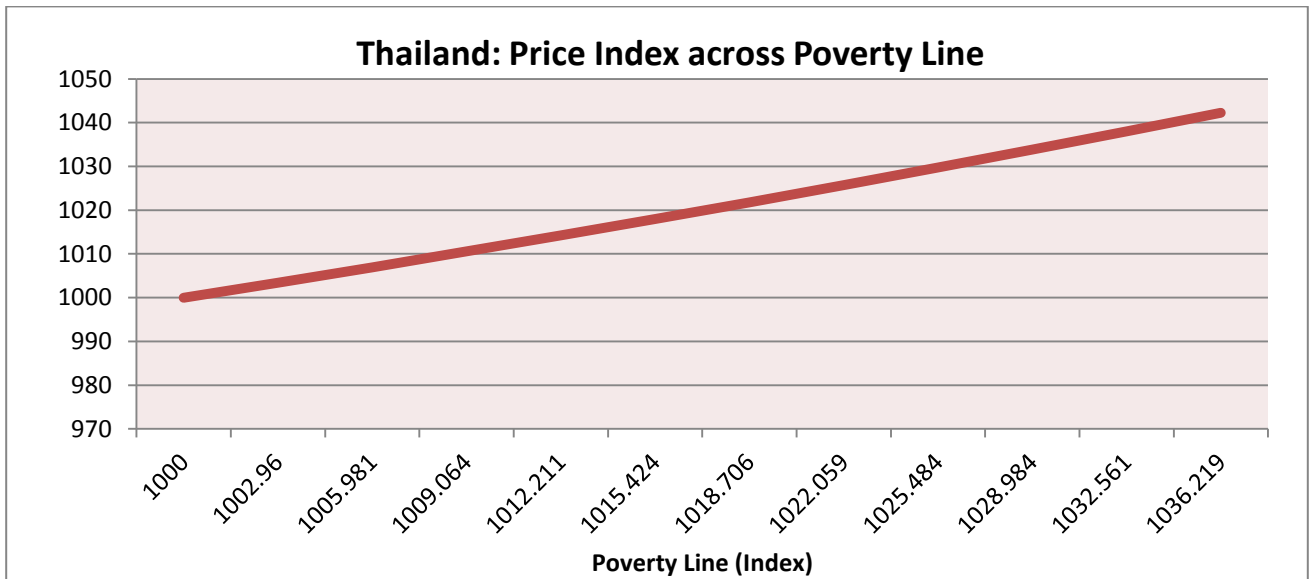


Figure 2.57: (Construction of Quadrant – 2) Price Index across the Poverty Line – Thailand

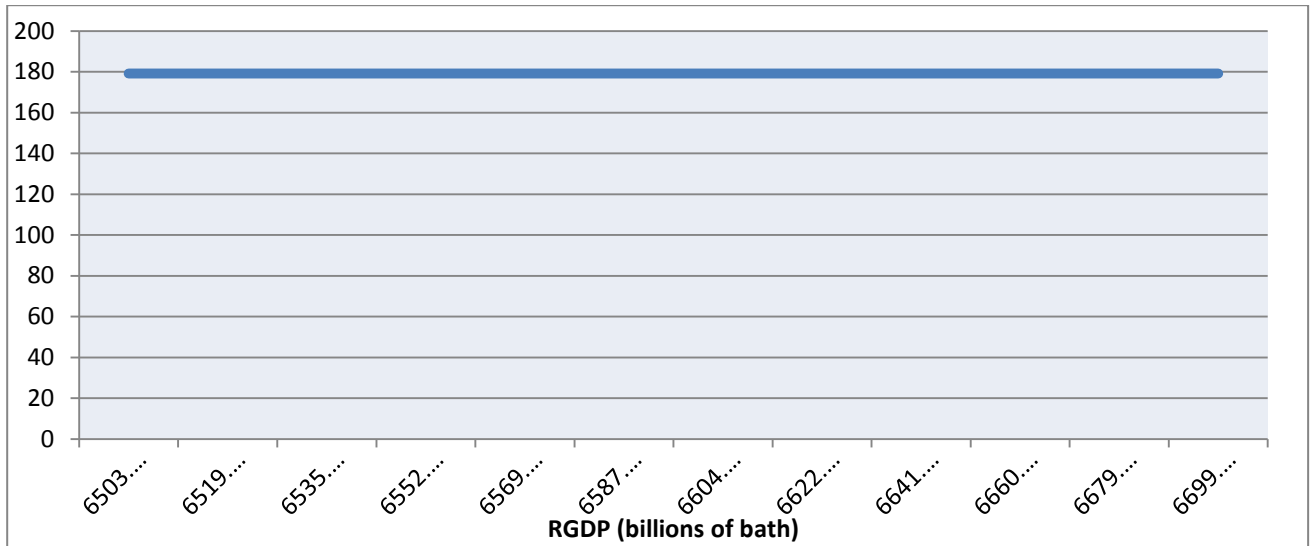


Figure 2.58: (Construction of Quadrant – 4) Income of the Bottom 20% of the Population across RGDP - Thailand (billions of bath)

From this model, a \$1 billion increase in the RGDP leads to an increase in Price Index by 0.216 and an unchanged amount in the income of the bottom 20% of the population. An increase in the Price Index by 0.216 leads to an increase in the Poverty Line by 0.1851. In our point of view, the impact on poverty incidence is significantly very small that it is almost negligible.

In this model, when we decrease the reserve requirements, the deposits by banks ($Uof_{F_{DE,BANK}}$) with BOT will decrease and the source of deposits ($Sof_{F_{DE,BANK}}$) with the banks will increase (Equation (153)). The amount of money supply will also be affected as defined in Equations (118) to (121). Since the amount of required deposits with BOT by banks has declined in Equation (116), the amount of loans supply to the households and enterprises will increase (Equations (54) and (65)). The higher increase in the amount of loans available will affect the investment in the fixed assets (Equation (138)). The amount invested

in the fixed assets will then affect the volume of investment by sector of destination (DK) and the prices of capital goods (PK) by sector of destination in Equation (30). These effects will further impact the amount of capital goods in each sector used for investment (ID) and the prices of composite goods (PQ) before reaching the value added GDP in Equation (36) and real GDP in Equation (37).

In Figure 2.55, we have the income of the bottom 20% of the population that is unchanged. This is because the decrease in the transfer from enterprises to households offsets the increase in the labor supply and the cost of capital in Equation (9). Unlike the increase in reserve requirement that shows an increase in the domestic consumption of agricultural and manufacturing sectors, the decrease in reserve requirements on the other hands shows an increase in domestic output (X) of services sectors. This increase include an increase in domestic sales and exports of services products (Equation (4)) which least employed the bottom 20% of the population. Hence, the transfers from enterprises to this group of households in agricultural and manufacturing sectors decline but the rise of labor supply in services sectors (since the wages is fixed) and the rise of cost of capital due to the higher demand for investment in the fixed assets will offset one another.

7. Conclusion

7.1 Concluding Remarks

We started this paper with a claim that growth is not necessarily good for economic development especially when taking into account the poverty incidence. Our definition of poverty incidence looks at two factors: income inequality and poverty line. Motivated by Azis (2009) framework in dealing with such issues, we have taken two approaches to validate our claim. The first approach was to construct the four quadrants of the framework using Blanchard-Quah Decomposition for quadrant-1 and direct plot of the graphs using available data for Quadrant -2 and Quadrant -3. Our result using this first approach revealed that the poverty line is an increasing function of price while income of the poor is negatively related to the output from 1994 to 1997 and positively related to the output from 1997 to 2000. Furthermore, the elasticity of prices to poverty is lower than the elasticity of income to demand, meaning that any changes in the output will lead to higher changes in the income of the poor relative to the changes in poverty line.

Our second approach is to extend the FCGE model developed by Puttanapong (2008) by introducing different group of households in the economy and defining new equations that will capture the poverty line and income distribution. The choice of using FCGE over CGE is more realistic in depicting the current economy in which any changes in the financial sector will have significant impact on the real sector. The FCGE can be used to analyze the interactions between real sectors and financial sectors via saving-investment linkages, for e.g. how monetary policy affects the behavioral of different economic agents while CGE only look at the interactions within the real sectors.

Next, we shocked our FCGE model with government and central bank policies to analyze the poverty incidence in the economy. Specifically, we looked at government spending (fiscal policy), interest rate and reserve requirement (monetary policies). Our results have shown that the impact on the poverty line as a function of price is as expected – when there are contractionary policies that reduce the price, the poverty line will also be reduced, and vice versa. However, the poverty line is relatively insensitive to the price suggesting that the magnitude of the effect is little. This is as expected since the effect on the prices take effect in the long run as a result of short run stabilization policies (Calmfors, 1982).

The increase in government expenditure (expansionary fiscal policy) will improve both the income of the bottom 20% of the population and the income distribution in Thai's economy. The result is as expected since many recent and earlier studies have argued that government investments contribute to poverty reduction. Fan et.al (2004) research on government spending and poverty reduction in Vietnam has shown that government investment in agricultural research followed by roads and education has the largest poverty reduction. The same conclusion was reached for rural Uganda by Fan et.al (2004). We concluded that an increase in government spending policy would improve the poverty incidence since it contributed additional \$3 billion baths to the income of the bottom 20% of the population while the response of poverty line to price was almost negligible in our model, suggesting that the additional number of people that fall below the poverty line is insignificant.

On the other hand, it is interesting to note that decreasing the government spending (contractionary fiscal policy) do not have the reverse effect to increasing the government spending. Both the effect on poverty line and income of the bottom 20% of the population are

very small that it is negligible. The income distribution does improve due to the fact that income of the top 20% of the population is declining more than the income of the bottom 20% of the population. Since the impact on income and poverty line are relatively very small, we conclude that the impact on poverty incidence is inconclusive. In our model, we have shocked the aggregated government expenditure while according to Buiters (1988), distinguishing between the government cuts in different activities would have different repercussions on deficit.

Now, in investigating the two monetary policies, we found that decreasing the interest rate up to 150 basis points would improve the income distribution and income of the bottom 20% of the population. However, continuous shock beyond 150 basis points would cause the positive impact to decline and eventually converge to the baseline level. Hence, decreasing interest rate only up to a certain level would improve the poverty incidence but eventually it will worsen the welfare in an economy. On the other hand, increasing the interest rate as expected would worsen the income of the bottom 20% of the population and also widen the income distribution as higher interest rate would most likely benefit those that have financial assets. Under the shock of increasing the interest rate, we conclude that the poverty incidence worsens.

Another monetary policy that we have shocked in our model is decreasing the reserve requirement which has no effect on income of the bottom 20% of the population but income distribution widens after 100 basis points due to an increase in the income of the top 20% of the population. On the other hand, increasing the reserve requirement would gradually

improve the income distribution despite no impact on the income of the bottom 20% of the population.

In looking at the monetary policy, Romer & Romer (1998) have argued that its effect on output, unemployment and inflation are temporary and although expansionary monetary policy will lead to temporary boom and temporary reduction in poverty and income distribution, this effect will be reversible as the inflation continues to rise or unemployment returning to its natural rate of unemployment. They suggested that comprehensive monetary policy that aims at low inflation and stable aggregate demand will most likely improve the conditions of the poor in long run. Some theories that have make comparison between the effectiveness of fiscal policies and monetary policies would argue in favor of one over the other in affecting the aggregate demand. The standard theory of Keynesian model argued that fiscal policy is more effective regardless of the exchange rate regime while Mundell-Fleming model that integrated flexible exchange rate into multi-market equilibrium argued in favor of monetary policy. A recent study by Weeks (2008) using empirical evidence of trade shares and interest rate differentials showed that fiscal policy is more effective than monetary policy for most countries in affecting aggregate demand. Weeks (2008) assumed flexible exchange rate but unlike Mundell and Fleming model, he included the price effect. Another support for this is Yao (2010) that argued on the effectiveness of fiscal policy than monetary policy in stimulating the economy as a response to the current financial crisis.

Hence, in concluding our results, we have to ask ourselves “Which policy-making is effective in improving the poverty incidence?” Admittedly, it is risky to derive an implications of each policy based solely on this model, but nevertheless we believe that three conclusions about the

interaction between the fiscal and monetary policies with poverty incidence is warranted. Ideally, we would want to narrow the gap between the top 20% of the population and the bottom 20% of the population while improving the level of income for the bottom 20% of the population and ensuring that the number of people that falls below the poverty line is at acceptable level.

First, we conclude that in a short run the expansionary fiscal policy (increase in government spending) is more effective than the expansionary monetary policy in narrowing the income distribution and improving the income of the bottom 20% of the population. As mentioned by Weeks (2008), the effectiveness of monetary policy depends on the trade elasticity and interest rate differentials under the assumption of perfect capital mobility. Unfortunately, our result in Chapter 1 for Feldstein-Horioka regression has shown that there is no such perfect capital mobility in influencing the corporation investment despite the flexible exchange rate assumption in our model. Using expansionary monetary policy such as decreasing the interest rate or the reserve requirement in the hope that easy credit will entice businesses to invest in human capital will no longer work due to the alternatives that businesses have such as investment in financial instruments that we have shown in Chapter 1.

Secondly, using expansionary monetary policies in a short run would improve the income distribution and income of the bottom 20% of the population only until certain threshold before the effects are reversible. We have suggested one possible explanation for this reversible effect in our model is due to disproportionate transfer to agricultural, manufacturing and services sectors that would affect the income distribution. Romer & Romer (1998) agreed that the expansionary monetary policy improved the conditions of the poor in the short run

due to the temporary cyclical boom but this effect is not permanent. In the long run, monetary policy that aimed at low inflation and stable aggregate demand would permanently improve their conditions. Although our model provides only short run equilibrium, it is to note that excessive expansionary monetary policy shocks is detrimental to the welfare of the bottom 20% of the population.

Finally, our analysis suggests that if monetary policy were to be pursued for instance in curbing the inflation, it should be accompanied by other policies that ensure the effect to the bottom 20% of the population is not worsens. For instance, although the interest rate is increased, the government effectiveness in terms of its investment in the sectors that targeted the poor or investment in human capital will narrow the income distribution.

APPENDIX

Appendix 1

Let: $y_t = \text{Real GDP growth } [\ln(\text{RGDP}_t) - \ln(\text{RGD}_{t-1})]$

$\Pi_t = \text{Inflation } [\ln(\text{CPI}_t) - \ln(\text{CPI}_{t-1})]$

1. Define the following econometric equations:

$$y_t = \alpha_{10} + \alpha_{11}y_{t-1} + \alpha_{12}\pi_{t-1} + \varepsilon_{1t} \quad (1.1)$$

$$\pi_t = \lambda_{10} + \lambda_{21}y_{t-1} + \lambda_{22}\pi_{t-1} + \varepsilon_{2t} \quad (1.2)$$

2. This can be represented in matrix form as:

$$\begin{bmatrix} y_t \\ \pi_t \end{bmatrix} = \begin{bmatrix} \alpha_0 \\ \beta_0 \end{bmatrix} + \begin{bmatrix} \alpha_1 & \alpha_2 \\ \beta_1 & \beta_2 \end{bmatrix} \begin{bmatrix} y_{t-1} \\ \pi_{t-1} \end{bmatrix} + \begin{bmatrix} \varepsilon_{1t} \\ \varepsilon_{2t} \end{bmatrix}$$

3. Rearranging the terms:

$$\begin{bmatrix} y_t \\ \pi_t \end{bmatrix} - \begin{bmatrix} \alpha_1 & \alpha_2 \\ \beta_1 & \beta_2 \end{bmatrix} \begin{bmatrix} y_{t-1} \\ \pi_{t-1} \end{bmatrix} = \begin{bmatrix} \alpha_0 \\ \beta_0 \end{bmatrix} + \begin{bmatrix} \varepsilon_{1t} \\ \varepsilon_{2t} \end{bmatrix}$$

$$\begin{bmatrix} 1 & 0 \\ 0 & 1 \end{bmatrix} \begin{bmatrix} y_t \\ \pi_t \end{bmatrix} - \begin{bmatrix} \alpha_1 & \alpha_2 \\ \beta_1 & \beta_2 \end{bmatrix} \begin{bmatrix} y_{t-1} \\ \pi_{t-1} \end{bmatrix} = \begin{bmatrix} \alpha_0 \\ \beta_0 \end{bmatrix} + \begin{bmatrix} \varepsilon_{1t} \\ \varepsilon_{2t} \end{bmatrix}$$

4. Introduce lag operator

$$\left(\begin{bmatrix} 1 & 0 \\ 0 & 1 \end{bmatrix} - \begin{bmatrix} \alpha_1 L & \alpha_2 L \\ \beta_1 L & \beta_2 L \end{bmatrix} \right) \begin{bmatrix} y_t \\ \pi_t \end{bmatrix} = \begin{bmatrix} \alpha_0 \\ \beta_0 \end{bmatrix} + \begin{bmatrix} \varepsilon_{1t} \\ \varepsilon_{2t} \end{bmatrix}$$

5. Define Identity matrix $I = \begin{bmatrix} 1 & 0 \\ 0 & 1 \end{bmatrix} = \mathbf{I}$ and $B = \begin{bmatrix} \alpha_1 L & \alpha_2 L \\ \beta_1 L & \beta_2 L \end{bmatrix}$, we have

$$(I - A) \begin{bmatrix} y_t \\ \pi_t \end{bmatrix} = \begin{bmatrix} \alpha_0 \\ \beta_0 \end{bmatrix} + \begin{bmatrix} \varepsilon_{1t} \\ \varepsilon_{2t} \end{bmatrix}$$

6. Transforming into moving average representation:
$$\begin{bmatrix} y_t \\ \pi_t \end{bmatrix} = (I - A)^{-1} \begin{bmatrix} \alpha_0 \\ \beta_0 \end{bmatrix} + (I - A)^{-1} \begin{bmatrix} \varepsilon_{1t} \\ \varepsilon_{2t} \end{bmatrix}$$
 (1.3)

7. Now, we need to satisfy economic conditions and econometric property for (1.3).

Economic Condition: There is contemporaneous effect of output on price but not price on output.

$y_t \rightarrow \pi_t$ But not $\pi_t \rightarrow y_t$

Econometric Condition: The residuals should be orthogonal to each other.

8. In order to satisfy the orthogonality condition for residuals, let's suppose we have the following residual matrix, \mathbf{e} . Then,

$$\text{variance-covariance matrix} = (\mathbf{e})(\mathbf{e}') = \begin{pmatrix} e_1 \\ e_2 \\ e_3 \\ e_4 \end{pmatrix} (e_1 \ e_2 \ e_3 \ e_4) = \begin{pmatrix} e_1^2 & e_1 e_2 & e_1 e_3 & e_1 e_4 \\ e_2 e_1 & e_2^2 & e_2 e_3 & e_2 e_4 \\ e_3 e_1 & e_3 e_2 & e_3^2 & e_3 e_4 \\ e_4 e_1 & e_4 e_2 & e_4 e_3 & e_4^2 \end{pmatrix}$$
 (1.4)

In order to satisfy orthogonality condition, we need:

$$(\mathbf{e})(\mathbf{e}') = \begin{pmatrix} 1 & 0 & 0 & 0 \\ 0 & 1 & 0 & 0 \\ 0 & 0 & 1 & 0 \\ 0 & 0 & 0 & 1 \end{pmatrix}$$

9. Next, premultiply (1.3) with lower triangular matrix, $\mathbf{B} = \begin{pmatrix} b_{11} & 0 \\ b_{21} & b_{22} \end{pmatrix}$.

$$\begin{pmatrix} b_{11} & 0 \\ b_{21} & b_{22} \end{pmatrix} \begin{pmatrix} y_t \\ \pi_t \end{pmatrix} = (I - A)^{-1} \begin{pmatrix} b_{11} & 0 \\ b_{21} & b_{22} \end{pmatrix} \begin{pmatrix} \alpha_0 \\ \beta_0 \end{pmatrix} + (I - A)^{-1} \begin{pmatrix} b_{11} & 0 \\ b_{21} & b_{22} \end{pmatrix} \begin{pmatrix} \varepsilon_{1t} \\ \varepsilon_{2t} \end{pmatrix} \quad (1.5)$$

Equation (1.5) implies that both economic condition and econometric condition for (7) hold:

- Economic condition: From the left hand side, this implies that there is no contemporaneous effect of price on output.

$$b_{11}y_t \text{ and } b_{21}y_t + b_{22}\pi_t$$

In other words, there is no effect on y_t (output) at time t by π_t (price level) but y_t (output) can affect π_t (price level) at time t .

- Econometric condition: from the right hand side, we have $\begin{pmatrix} b_{11} & 0 \\ b_{21} & b_{22} \end{pmatrix} \begin{pmatrix} \varepsilon_{1t} \\ \varepsilon_{2t} \end{pmatrix}$

$$\text{Define } \boldsymbol{\varepsilon} = \begin{pmatrix} \varepsilon_{1t} \\ \varepsilon_{2t} \end{pmatrix} \text{ such that } \mathbf{B} \boldsymbol{\varepsilon} = \begin{pmatrix} b_{11} & 0 \\ b_{21} & b_{22} \end{pmatrix} \begin{pmatrix} \varepsilon_{1t} \\ \varepsilon_{2t} \end{pmatrix}$$

To satisfy orthogonality property, we need:

$(\mathbf{B} \boldsymbol{\varepsilon}) (\mathbf{B} \boldsymbol{\varepsilon})' = \begin{pmatrix} 1 & 0 \\ 0 & 1 \end{pmatrix}$. Now we can set up Choleski Matrix Decomposition to satisfy the orthogonality condition.

An example of Choleski Matrix Decomposition application is to decompose matrix $\boldsymbol{\Omega}$ into 3 matrices as follow:

$$\boldsymbol{\Omega} = \mathbf{P} \boldsymbol{\Lambda} \mathbf{P}' , \text{ or } \begin{pmatrix} \omega_{11} & \omega_{12} \\ \omega_{21} & \omega_{22} \end{pmatrix} = \begin{pmatrix} p_{11} & 0 \\ p_{21} & p_{22} \end{pmatrix} \begin{pmatrix} 1 & 0 \\ 0 & 1 \end{pmatrix} \begin{pmatrix} p_{11} & 0 \\ p_{21} & p_{22} \end{pmatrix}'$$

where \mathbf{P} = Lower Triangular Matrix

$\boldsymbol{\Lambda}$ = Identity Matrix

To see how $(\mathbf{B} \boldsymbol{\varepsilon}) (\mathbf{B} \boldsymbol{\varepsilon})' = \begin{pmatrix} 1 & 0 \\ 0 & 1 \end{pmatrix}$ matches the Choleski Decomposition, let us define $\boldsymbol{\Omega} = \boldsymbol{\varepsilon} \boldsymbol{\varepsilon}'$.

We have:

$$\boldsymbol{\Omega} = \boldsymbol{\varepsilon} \boldsymbol{\varepsilon}' = \mathbf{D} \boldsymbol{\Lambda} \mathbf{D}'$$

Moving \mathbf{D} to the left hand side gives:

$$\mathbf{D}^{-1} \boldsymbol{\varepsilon} \boldsymbol{\varepsilon}' = \boldsymbol{\Lambda} \mathbf{D}'$$

Again moving \mathbf{D}' to the left hand side yields:

$$\mathbf{D}^{-1} \boldsymbol{\varepsilon} \boldsymbol{\varepsilon}' (\mathbf{D}')^{-1} = \boldsymbol{\Lambda} = \begin{pmatrix} 1 & 0 \\ 0 & 1 \end{pmatrix}$$

Define $\mathbf{D}^{-1} = \mathbf{B}$ (recall that $\mathbf{B} = \begin{pmatrix} b_{11} & 0 \\ b_{21} & b_{22} \end{pmatrix}$) such that

$$\mathbf{B}\boldsymbol{\varepsilon}\boldsymbol{\varepsilon}'\mathbf{B}' = \boldsymbol{\Lambda} = \begin{pmatrix} 1 & 0 \\ 0 & 1 \end{pmatrix}$$

$$\left(\begin{bmatrix} b_{11} & 0 \\ b_{21} & b_{22} \end{bmatrix} \begin{bmatrix} \varepsilon_1 \\ \varepsilon_2 \end{bmatrix} \right) \left(\begin{bmatrix} \varepsilon_1 \\ \varepsilon_2 \end{bmatrix} \begin{bmatrix} b_{11} & 0 \\ b_{21} & b_{22} \end{bmatrix} \right)' = \begin{pmatrix} 1 & 0 \\ 0 & 1 \end{pmatrix} \quad (1.6)$$

We want to solve for b_{11} , b_{21} and b_{22} . But from (1.6) we have only two equations. Hence, we need to form another equation. Applying macro-economic concept, in the long run the demand shock affects only price, but not output (because output will revert back to its natural level). Then, from (1.5),

$$\begin{pmatrix} b_{11} & 0 \\ b_{21} & b_{22} \end{pmatrix} \begin{pmatrix} y_t \\ \pi_t \end{pmatrix} = (\mathbf{I} - \mathbf{A})^{-1} \begin{pmatrix} b_{11} & 0 \\ b_{21} & b_{22} \end{pmatrix} \begin{pmatrix} \alpha_0 \\ \beta_0 \end{pmatrix} + (\mathbf{I} - \mathbf{A})^{-1} \begin{pmatrix} b_{11} & 0 \\ b_{21} & b_{22} \end{pmatrix} \begin{pmatrix} \varepsilon_{1t} \\ \varepsilon_{2t} \end{pmatrix}$$

Define $\mathbf{C} = (\mathbf{I} - \mathbf{A})^{-1}$ and $\mathbf{C} = \begin{pmatrix} c_{11} & c_{12} \\ c_{21} & c_{22} \end{pmatrix}$

$$\begin{pmatrix} b_{11} & 0 \\ b_{21} & b_{22} \end{pmatrix} \begin{pmatrix} y_t \\ \pi_t \end{pmatrix} = \begin{pmatrix} c_{11} & c_{12} \\ c_{21} & c_{22} \end{pmatrix} \begin{pmatrix} b_{11} & 0 \\ b_{21} & b_{22} \end{pmatrix} \begin{pmatrix} \alpha_0 \\ \beta_0 \end{pmatrix} + \begin{pmatrix} c_{11} & c_{12} \\ c_{21} & c_{22} \end{pmatrix} \begin{pmatrix} b_{11} & 0 \\ b_{21} & b_{22} \end{pmatrix} \begin{pmatrix} \varepsilon_{1t} \\ \varepsilon_{2t} \end{pmatrix} \quad (1.7)$$

$$= \begin{pmatrix} c_{11} & c_{12} \\ c_{21} & c_{22} \end{pmatrix} \begin{pmatrix} b_{11}\alpha_0 \\ b_{21}\alpha_0 + b_{22}\beta_0 \end{pmatrix} + \begin{pmatrix} c_{11} & c_{12} \\ c_{21} & c_{22} \end{pmatrix} \begin{pmatrix} b_{11}\varepsilon_{1t} \\ b_{21}\varepsilon_{1t} + b_{22}\varepsilon_{2t} \end{pmatrix}$$

Thus, there are 4 components that affect y_t :

$$b_{11} y_t = c_{11} b_{11} \alpha_0 + c_{12} (b_{21} \alpha_0 + b_{22} \beta_0) + c_{11} b_{11} \varepsilon_{1t} + c_{12} (b_{21} \varepsilon_{1t} + b_{22} \varepsilon_{2t}) \quad (1.8)$$

Since AD shock does not affect output in the long run, the sum of coefficients of ε_{2t} is set to zero.

$$c_{12} (b_{22} \varepsilon_{2t}) = 0 \quad (1.9)$$

Thus, this is the third equation that we are looking for. Considering equations (1.6) and (1.8), we can now solve for b_{11} , b_{21} and b_{22} .

After obtaining values of b_{11} , b_{21} and b_{22} , we can regenerate output by using each shock.

Case 1: Time series of output and price driven by aggregate supply shock are computed from:

$$\begin{pmatrix} b_{11} & 0 \\ b_{21} & b_{22} \end{pmatrix} \begin{pmatrix} y_t \\ \pi_t \end{pmatrix} = \begin{pmatrix} c_{11} & c_{12} \\ c_{21} & c_{22} \end{pmatrix} \begin{pmatrix} b_{11} & 0 \\ b_{21} & b_{22} \end{pmatrix} \begin{pmatrix} \alpha_0 \\ \beta_0 \end{pmatrix} + \begin{pmatrix} c_{11} & c_{12} \\ c_{21} & c_{22} \end{pmatrix} \begin{pmatrix} b_{11} & 0 \\ b_{21} & b_{22} \end{pmatrix} \begin{pmatrix} \varepsilon_{1t} \\ 0 \end{pmatrix},$$

which sets series of aggregate demand shock, ε_{2t} , to zero.

Case 2: Time series of output and price driven by aggregate demand shock are computed from:

$$\begin{pmatrix} b_{11} & 0 \\ b_{21} & b_{22} \end{pmatrix} \begin{pmatrix} y_t \\ \pi_t \end{pmatrix} = \begin{pmatrix} c_{11} & c_{12} \\ c_{21} & c_{22} \end{pmatrix} \begin{pmatrix} b_{11} & 0 \\ b_{21} & b_{22} \end{pmatrix} \begin{pmatrix} \alpha_0 \\ \beta_0 \end{pmatrix} + \begin{pmatrix} c_{11} & c_{12} \\ c_{21} & c_{22} \end{pmatrix} \begin{pmatrix} b_{11} & 0 \\ b_{21} & b_{22} \end{pmatrix} \begin{pmatrix} 0 \\ \varepsilon_{2t} \end{pmatrix},$$

which sets series of aggregate supply shock, ε_{1t} , to zero.

Appendix 2

The model is an extension from Azis (2002), Manopiniwes (2005) and Puttanapong (2008); hence most of the notations and equations used are similar. This model contributes to the existing model by introducing poverty index and income distribution involving different categories of households.

I. Set of Notations

Core CGE module

Set of Production Sectors (i)

$$i = \{AGRI, MANU, SERVICE\}$$

AGRI: Agriculture

MANU: Manufacturing

SERVICE: Service sectors

Set of Factors of Production (f)

$$f = \{labor, cap\}$$

labor: Labor

cap: Capital

Set of Domestic Institutions ($dinst$)

$$dinst = \{HHH1, HHH2, HHH3, HHH4, HHH5, ENTP, GOV\}$$

HHH1: Households in the lowest income quintile (the lowest 20% of the economy)

HHH2: Households in the second lowest income quintile (the second lowest 20% of the economy)

HHH3: Households in the third lowest income quintile (the third lowest 20% of the

economy)

HHH4: Households in the second highest income quintile (the second highest 20% of the economy)

HHH5: Households in the highest income quintile (the top 20% of the economy)

ENTP: Enterprise (including state-owned enterprise)

Gov: Government

Subset of *dinst*

$dprivt = \{HHH, HHH2, HHH3, HHH4, HHH5, ENTP\} \in dinst$

dprivt: Domestic private institutions

$HHH = \{HHH, HHH2, HHH3, HHH4, HHH5\} \in dinst$

HHH: Households institutions

Set of Foreign Institution (*finst*)

$finst = \{ROW\}$

Financial module

Set of Institutions (*inst*)

$dinst = \{BOT, Bank, HHH1, HHH2, HHH3, HHH4, HHH5, ENTP, GOV, ROW\}$

HHH1: Households in the lowest income quintile (the lowest 20% of the economy)

HHH2: Households in the second lowest income quintile (the second lowest 20% of the economy)

HHH3: Households in the third lowest income quintile (the third lowest 20% of the economy)

HHH4: Households in the second highest income quintile (the second highest 20% of the economy)

HHH5: Households in the highest income quintile (the top 20% of the economy)

ENTP: Enterprise (including state-owned enterprise)

Gov: Government

Subset of *inst*

dominst {*BOT*, *Bank*, *HHH1*, *HHH2*, *HHH3*, *HHH4*, *HHH5*, *ENTP*, *GOV*} \in *inst*

dominst: Domestic institutions

Set of Assets (*asset*)

asset = {*CH*, *LO*, *DE*, *RP*, *GB*, *BOTB*, *FIDFB*, *SOEB*, *CBOND*, *EQL*, *FA*, *OTH*, *EQNL*, *FIXED*}

CH: Cash

LO: Loan

DE: Deposit

RP: Bond-repurchased market

GB: Government bond

BOTB: Bank of Thailand bond

FIDFB: Financial Institution Development Fund bond

SOEB: State-owned enterprise bond

CBOND: Corporate bond

EQL: Listed equity

FA: Foreign asset

OTH: Other asset

EQNL: Non-listed equity

FIXED: Fixed asset

Subset of *asset*

$$asset_a = \{CH, LO, DE, RP, GB, BOTB, FIDFB, SOEB, CBOND, EQL, OTH, FIXED\} \in asset$$

asset_a: A set of assets for equation (132)

$$asset_l = \{CH, LO, DE, RP, GB, BOTB, FIDFB, SOEB, CBOND, EQL, OTH\} \in asset$$

asset_l: A set of assets for equation (133)

$$asset_{nf} = \{CH, LO, DE, RP, FA, EQL, OTH\} \in asset$$

asset_nf: A set of assets for equation (134)

II. List of Coefficients

Core CGE model

$a_{i,j}$	IO table coefficients
ac_i	Armington function shift parameter
ad_i	Production function shift parameter
$\alpha_{i,f}$	Factor share parameter-production function
at_i	CET function shift parameter
δ_i	Armington function share parameter
$econ_i$	Export demand constant
γ_i	CET function parameter
$fshare_{dinst,f}$	Share of each type of factor
$cles_{i,dprivt}$	Private consumption share
$dstr_i$	Ratio of inventory investment to gross output
η_i	Export demand price elasticity
$gles_i$	Government consumption shares
$kshr_i$	Shares of investment by sector of destination

ρ_{ci}	Armington function exponent
ρ_{ti}	CET function exponent
te_i	Export tax rate
th_{dprivt}	Household tax rate
tm_i	Tariff rates on imports
$b_{i,j}$	Capital share
tx_i	Indirect tax rate
mps_{dprivt}	Marginal propensity to consume
alphapov	Poverty share

Financial Module

τ_{h1}	Household's share of composite asset [level 1]
τ_{h2}	Household's share of composite asset [level 2]
τ_{h3}	Household's share of composite asset [level 3]
τ_{h4}	Household's share of composite asset [level 4]
τ_{h5}	Household's share of composite asset [level 5]
σ_{h1}	Household's elasticity of composite asset [level 1]
σ_{h2}	Household's elasticity of composite asset [level 2]
σ_{h3}	Household's elasticity of composite asset [level 3]
σ_{h4}	Household's elasticity of composite asset [level 4]
σ_{h5}	Household's elasticity of composite asset [level 5]
$ph0$	Shift parameter (household's demand for loan)
$ph1$	Elasticity to bank's total deposit (household's demand for loan)
$ph2$	Elasticity to loan interest rate (household's demand for loan)

<i>fh0</i>	Shift parameter (household's demand for fixed asset)
<i>fh1</i>	Elasticity to loan interest rate (household's demand for fixed asset)
<i>ch0</i>	Shift parameter (household's demand for cash)
<i>ch1</i>	Elasticity to saving (household's demand for cash)
<i>ch2</i>	Elasticity to deposit interest rate (household's demand for cash)
<i>fahh0</i>	Shift parameter (household's demand for foreign asset)
<i>fahh1</i>	Elasticity to interest rate differential (household's demand for foreign asset)
<i>fahh2</i>	Elasticity to real GDP (household's demand for foreign asset)
<i>pf0</i>	Shift parameter (enterprise's demand for fixed asset)
<i>pf1</i>	Elasticity to interest rate differential (household's demand fixed asset)
<i>pf2</i>	Elasticity to real GDP (household's demand fixed asset)
<i>de0</i>	Shift parameter (enterprise's demand for deposit)
<i>de1</i>	Elasticity to saving (enterprise's demand for deposit)
<i>pp0</i>	Shift parameter (enterprise's demand for loan)
<i>pp1</i>	Elasticity to bank's total deposit (enterprise's demand for loan)
<i>pp2</i>	Elasticity to loan interest rate (enterprise's demand for loan)
<i>ce0</i>	Shift parameter (enterprise's demand for cash)
<i>ce1</i>	Elasticity to saving (enterprise's demand for loan)
<i>ce2</i>	Elasticity to deposit interest rate (enterprise's demand for loan)
<i>faent0</i>	Shift parameter (enterprise's demand for foreign asset)
<i>faent1</i>	Elasticity to interest rate differential (enterprise's demand for foreign asset)
<i>faent2</i>	Elasticity to real GDP (enterprise's demand for foreign asset)
τ_{b1}	Bank's share of composite asset [level 1]
τ_{b2}	Bank's share of composite asset [level 2]

τ_{b3}	Bank's share of composite asset [level 3]
τ_{b4}	Bank's share of composite asset [level 4]
τ_{b5}	Bank's share of composite asset [level 5]
σ_{b1}	Bank's elasticity of composite asset [level 1]
σ_{b2}	Bank's elasticity of composite asset [level 2]
σ_{b3}	Bank's elasticity of composite asset [level 3]
σ_{b4}	Bank's elasticity of composite asset [level 4]
σ_{b5}	Bank's elasticity of composite asset [level 5]
$fabnk0$	Shift parameter (Bank's demand for foreign asset)
$fabnk1$	Elasticity to interest rate differential (Bank's demand for foreign asset)
$fabnk2$	Elasticity to real GDP (Bank's demand for foreign asset)
$govch$	Fixed ratio of government's cash
$fabot0$	Shift parameter (BOT's demand for foreign asset)
$fabot1$	Elasticity to interest rate differential (BOT's demand for foreign asset)
$fabot2$	Elasticity to real GDP (BOT's demand for foreign asset)
$botdeoth$	Deposit at BOT - which is a not a reserve requirement
$rratio$	Ratio of reserve requirement to total deposit
$cratio$	Ratio of cash to total deposit
$botc0$	Shift parameter (BOT's demand for cash)
$botc1$	Elasticity to interest rate (BOT's demand for cash)
$botc2$	Elasticity to real GDP (BOT's demand for cash)
$rwde0$	Shift parameter (ROW's demand for deposit)
$rwde1$	Elasticity to interest rate differential (ROW's demand for deposit)
$rwde2$	Elasticity to expected exchange rate (ROW's demand for deposit)

<i>rwlo0</i>	Shift parameter (ROW's preference to lend to Thai institution)
<i>rwlo1</i>	Elasticity to interest rate differential (ROW's preference to lend to Thai institution)
<i>rwlo2</i>	Elasticity to expected exchange rate (ROW's preference to lend to Thai institution)
<i>rwgb0</i>	Shift parameter (ROW's demand for Thai government bond)
<i>rwgb1</i>	Elasticity to interest rate differential (ROW's demand for Thai government bond)
<i>rwgb2</i>	Elasticity to expected exchange rate (ROW's demand for Thai government bond)
<i>rwcbond0</i>	Shift parameter (ROW's demand for Thai government bond)
<i>rwcbond1</i>	Elasticity to interest rate differential (ROW's demand for Thai government bond)
<i>rwcbond2</i>	Elasticity to expected exchange rate (ROW's demand for Thai government bond)
<i>rweql0</i>	Shift parameter (ROW's demand for equity listed in Thai stock market)
<i>rweql1</i>	Elasticity to interest rate differential (ROW's demand for equity listed in Thai stock market)
<i>rweql2</i>	Elasticity to expected exchange rate (ROW's demand for equity listed in Thai stock market)

III. List of Variables

Endogenous variables

X_i	Total output of sector i
INT_i	Sector i 's demand for intermediate inputs
D_i	Domestically produced good
Q_i	Domestic Good Supply (Composite Good)

E_i	Exports
M_i	Imports
$PINDEX$	Price index (GDP deflator)
$GDPVA$	Value-added (in market price) GDP
$RGDP$	Real GDP
PX_i	Price of output
PD_i	Price of domestic good
PQ_i	Price of composite good
PE_i	Domestic price of export
PM_i	Domestic price of import
PV_i	Price of Value-Added
PWE_{ie}	World export price (in US\$)
PK_i	Price of capital goods by sector of destination
WF_{cap}	Return on capital
YH_{dprivt}	Total income of $dprivt$
$YFCTR_f$	Total factor income rewarded from employing f
$FDSC_{i,f}$	Sector i 's demand for factor f
GR	Government's total revenue
$PRIVSAV$	Saving of private sector
$DIRTAX$	Total direct tax
$TARIFF$	Total amount of tariff
$INDTAX$	Total indirect tax
$GOVSAV$	Government saving
$FSAV$	Foreign saving

<i>EXR</i>	Exchange rate
<i>SAVING</i>	Total saving
<i>CD_i</i>	Household's consumption on good <i>i</i>
<i>GD_i</i>	Government's consumption on good <i>i</i>
<i>ID_i</i>	Capital good <i>i</i> used for investment
<i>GOVSAV</i>	Government saving
<i>DST_i</i>	Inventory investment
<i>DK_i</i>	Volume of investment by sector of destination
<i>FXDINV</i>	Fixed capital investment
<i>INVEST</i>	Total investment
<i>FS_{labor}</i>	Total labor employed
<i>WALRAS</i>	Slack variable for Walras's law
<i>HHPORTS</i>	Household's portfolio of bonds and listed-equity
<i>UoF_{S_{asset,inst}}</i>	Stock of <i>asset</i> which is a use of fund of <i>inst</i>
<i>SoF_{S_{asset,inst}}</i>	Stock of <i>asset</i> which is a source of fund of <i>inst</i>
<i>UoF_{F_{asset,inst}}</i>	Flow of <i>asset</i> which is a use of fund of <i>inst</i>
<i>SoF_{F_{asset,inst}}</i>	Flow of <i>asset</i> which is a source of fund of <i>inst</i>
<i>RRH1</i>	Weighted average return of assets in level 1 (Household's portfolio decision)
<i>RRH2</i>	Weighted average return of assets in level 2 (Household's portfolio decision)
<i>RRH3</i>	Weighted average return of assets in level 3 (Household's portfolio decision)
<i>RRH4</i>	Weighted average return of assets in level 4 (Household's portfolio decision)
<i>GHI</i>	Proportion of equity in household's portfolio

<i>GH2</i>	Proportion of government bond in household's portfolio
<i>GH3</i>	Proportion of BOT bond in household's portfolio
<i>GH4</i>	Proportion of FIDF bond in household's portfolio
<i>GH5</i>	Proportion of SOE bond in household's portfolio
<i>RRN_{DE}</i>	Deposit interest rate
<i>RRN_{GB}</i>	Gap between the return of government bond and deposit interest rate
<i>RRN_{BOTB}</i>	Gap between the return of BOT bond and deposit interest rate
<i>RRN_{FIDFB}</i>	Gap between the return of FIDF bond and deposit interest rate
<i>RRN_{SOEB}</i>	Gap between the return of SOE bond and deposit interest rate
<i>RRN_{CBOND}</i>	Gap between the return of corporate bond and deposit interest rate
<i>UOF_F_D_{inst}</i>	Flow of foreign asset demanded by <i>inst</i>
<i>SAV_{inst}</i>	Saving of <i>inst</i>
<i>EXRADJ_{inst}</i>	Adjustment in net worth of <i>inst</i> due to a change in exchange rate
<i>INTEXPADJ_{inst}</i>	Adjustment of net interest income due to a change in interest rate
<i>PEQ</i>	Price index of listed equity
<i>PGB</i>	Price index of government bond
<i>PBOTB</i>	Price index of BOT bond
<i>PSOEB</i>	Price index of SOE bond
<i>PCBOND</i>	Price index of Corporate bond
<i>BANKPORTS</i>	Bank's portfolio of bonds and listed-equity
<i>RRB1</i>	Weighted average return of assets in level 1 (Bank's portfolio decision)
<i>RRB2</i>	Weighted average return of assets in level 2 (Bank's portfolio decision)
<i>RRB3</i>	Weighted average return of assets in level 3 (Bank's portfolio decision)
<i>RRB4</i>	Weighted average return of assets in level 4 (Bank's portfolio decision)

<i>GB1</i>	Proportion of equity in bank's portfolio
<i>GB2</i>	Proportion of government bond in bank's portfolio
<i>GB3</i>	Proportion of BOT bond in bank's portfolio
<i>GB4</i>	Proportion of FIDF bond in bank's portfolio
<i>GB5</i>	Proportion of SOE bond in bank's portfolio
<i>BM</i>	Base money (or high-power money)
<i>M2</i>	Broad money supply
<i>EXPEXR</i>	Expected exchange (i.e. the forward rate)
<i>PDAVG</i>	Average price of domestic goods
<i>RSRVRQRM</i>	Reserve Requirement

Exogenous variables

<i>WFDIST_i</i>	Sector <i>i</i> 's distortion on return on factor <i>f</i>
<i>WF_{labor}</i>	Average wage
<i>PWSE_i</i>	World price of export substitute
<i>PWM_{im}</i>	World import price (inUS\$)
<i>DTRANS_{dinst,dinst1}</i>	Domestic transfers (from <i>dinst1</i> to <i>dinst</i>)
<i>FTRANS_{dinst,finst}</i>	Foreign transfers (from <i>finst</i> to <i>dinst</i>)
<i>CAPUTILZT</i>	Capacity utilization
<i>RNF</i>	Return on foreign asset (the Fed Fund rate)
<i>RRN_{LO}</i>	Loan interest rate
<i>INTSPREAD</i>	Spread between the deposit interest rate and the loan rate
<i>POVLINE</i>	Poverty Line
<i>INCDIST</i>	Income distribution

IV. List of Equations

Core CGE model

Price block

$$PM_{im} = PWM_{im} \cdot EXR \cdot (1 + tm_{im}) \quad (1)$$

$$PE_{ie} = PWE_{ie} \cdot EXR \cdot (1 + te_{ie}) \quad (2)$$

$$PQ_i \cdot Q_i = PD_i \cdot D_i + PM_i \cdot M_i \quad (3)$$

$$PX_i \cdot X_i = PD_i \cdot D_i + PE_i \cdot E_i \quad (4)$$

$$PV_i = PX_i \cdot (1.0 - tx_i) - \sum_j a_{i,j} \cdot PQ_j \quad (5)$$

$$PINDEX = \frac{GDPVA}{RGDP} \quad (6)$$

$$PK_i = \sum_j b_{i,j} \cdot PQ_j \quad (7)$$

Production block

$$X_i = ad_i \prod_f FDSC_{i,f}^{\alpha_{i,f}} \quad (8)$$

$$WF_f \cdot WFDIST_{i,f} = (X_i \cdot PV_i \cdot \alpha_{i,f}) / FDSC_{i,f} \quad (9)$$

$$INT_i = \sum_j a_{i,j} X_j \quad (10)$$

$$X_{ie} = at_{ie} \left(\gamma_{ie} E_{ie}^{\rho_{ie}'} + (1 - \gamma_{ie}) D_{ie}^{\rho_{ie}'} \right)^{1/(\rho_{ie}' - 1)} \quad (11)$$

$$\frac{E_{ie}}{D_{ie}} = \left(\frac{PE_{ie}}{PD_{ie}} \right) \left(\frac{1 - \gamma_{ie}}{\gamma_{ie}} \right)^{1/(\rho_{ie}' - 1)} \quad (12)$$

$$E_{ie} = econ_{ie} \left(\frac{PWE_{ie}}{PWSE_{ie}} \right)^{(-\eta_{ie})} \quad (13)$$

$$Q_{im} = ac_{im} \left(\delta_{im} M_{im}^{-\rho_{im}^c} + (1 - \delta_{im}) D_{im}^{-\rho_{im}^c} \right)^{-1/\rho_{im}^c} \quad (14)$$

$$\frac{M_{im}}{D_{im}} = \left(\frac{PD_{im}}{PM_{im}} \right) \left(\frac{\delta_{im}}{1 - \delta_{im}} \right)^{1/(1 + \rho_{im}^c)} \quad (15)$$

Income block

$$YFCTR_f = \sum_i WF_f \cdot WFDIST_{i,f} \cdot FDSC_{i,f} \quad (16)$$

$$YH_{dprivt} = \sum_f fshare_{dprivt,f} YFCTR_f + \sum_{dinst} DTRANS_{dprivt,dinst} + \sum_{finst} FTRANS_{dprivt,finst} \quad (17)$$

$$TARIFF = \sum_{im} (tm_{im} M_{im} PWM_{im} EXR) \quad (18)$$

$$INDTAX = \sum_i (tx_i PX_i X_i) \quad (19)$$

$$DIRTAX = \sum_{dprivt} th_{dprivt} YH_{dprivt} \quad (20)$$

$$PRIVSAV = \sum_{dprivt} mps_{dprivt} YH_{dprivt} (1 - th_{dprivt}) \quad (21)$$

$$GR = TARIFF + INDTAX + DIRTAX + \sum_{dinst} DTRANS_{gov,dinst} + \sum_{finst} FTRANS_{gov,finst} \quad (22)$$

$$+ fshare_{gov,capital} YFCTR_{capital}$$

$$SAVING = PRIVSAV + GOVSAV - FSAV \cdot EXR \quad (23)$$

Expenditure block

$$PQ_i \cdot CD_i = \sum_{dprivt} cles_{i,dprivt} (1 - mps_{dprivt}) (1 - th_{dprivt}) YH_{dprivt} \quad (24)$$

$$YH_{dprivt} = \sum_i cles_{i,dprivt}(1 - mps_{dprivt})(1 - th_{dprivt})YH_{dprivt} + mps_{dprivt}YH_{dprivt} + th_{dprivt}YH_{dprivt} \quad (25)$$

$$+ \sum_{dinst} DTRANS_{dinst,dprivt} + \sum_{finst} FTRANS_{finst,dprivt}$$

$$GD_i = gles_i \cdot GDTOT \quad (26)$$

$$GR = \sum_i PQ_i GD_i + GOVSAV + \sum_{dinst} DTRANS_{dinst,gov} \quad (27)$$

$$DST_i = dstr_i \cdot X_i \quad (28)$$

$$FXDINV = INVEST - \sum_i DST_i \cdot PQ_i \quad (29)$$

$$PK_i \cdot DK_i = kshr_i \cdot FXDINV \quad (30)$$

$$ID_i = \sum_j b_{i,j} \cdot DK_j \quad (31)$$

System constraints

$$Q_i = INT_i + CD_i + GD_i + ID_i + DST_i \quad (32)$$

$$FS_f = \sum_i FDSC_{i,f} \quad (33)$$

$$\sum_{im} PWM_{im} M_{im} = \sum_{ie} PWE_{ie} E_{ie} + \sum_{finst} \sum_{dinst} FTRANS_{dinst,finst} - FSAV \quad (34)$$

$$SAVING = \sum_i ID_i \cdot PQ_i + WALRAS \quad (35)$$

$$GDPVA = \sum_i PV_i X_i + IND TAX + TARIFF \quad (36)$$

$$RGDP = \sum_i (CD_i + DST_i + ID_i + GD_i) + \sum_{ie} E_{ie} - \sum_{im} (1 - TMREAL_{im}) M_{im} \quad (37)$$

Financial Module

Household's behavior equations

$$\begin{aligned}
 HHPORTS = & UOF_S_{EQL,HH} + UOF_S_{GB,HH} + UOF_S_{BOTB,HH} + UOF_S_{FIDFB,HH} + UOF_S_{SOEB,HH} \\
 & + UOF_S_{CBOND,HH}
 \end{aligned} \tag{38}$$

$$\begin{aligned}
 RRH1 = & (RRN_{GB} \cdot UOF_S_{GB,HH} + RRN_{BOTB} \cdot UOF_S_{BOTB,HH} + RRN_{FIDFB} \cdot UOF_S_{FIDFB,HH} \\
 & + RRN_{SOEB} \cdot UOF_S_{SOEB,HH} + RRN_{CBOND} \cdot UOF_S_{CBOND,HH}) / (UOF_S_{GB,HH} + UOF_S_{BOTB,HH} \\
 & + UOF_S_{FIDFB,HH} + UOF_S_{SOEB,HH} + UOF_S_{CBOND,HH})
 \end{aligned} \tag{39}$$

$$\begin{aligned}
 RRH2 = & (RRN_{BOTB} \cdot UOF_S_{BOTB,HH} + RRN_{FIDFB} \cdot UOF_S_{FIDFB,HH} + RRN_{SOEB} \cdot UOF_S_{SOEB,HH} \\
 & + RRN_{CBOND} \cdot UOF_S_{CBOND,HH}) / (UOF_S_{BOTB,HH} + UOF_S_{FIDFB,HH} + UOF_S_{SOEB,HH} + UOF_S_{CBOND,HH})
 \end{aligned} \tag{40}$$

$$\begin{aligned}
 RRH3 = & (RRN_{FIDFB} \cdot UOF_S_{FIDFB,HH} + RRN_{SOEB} \cdot UOF_S_{SOEB,HH} \\
 & + RRN_{CBOND} \cdot UOF_S_{CBOND,HH}) / (UOF_S_{FIDFB,HH} + UOF_S_{SOEB,HH} + UOF_S_{CBOND,HH})
 \end{aligned} \tag{41}$$

$$\begin{aligned}
 RRH4 = & (RRN_{SOEB} \cdot UOF_S_{SOEB,HH} + RRN_{CBOND} \cdot UOF_S_{CBOND,HH}) \\
 & / (UOF_S_{SOEB,HH} + UOF_S_{CBOND,HH})
 \end{aligned} \tag{42}$$

$$GH1 = \frac{\tau_{h1} \cdot \left(\frac{1 + RRN_{EQL}}{1 + RRH1} \right)^{\sigma_{h1}}}{1 + \left(\tau_{h1} \cdot \left(\frac{1 + RRN_{EQL}}{1 + RRH1} \right)^{\sigma_{h1}} \right)} \tag{43}$$

$$GH2 = \frac{\tau_{h2} \cdot \left(\frac{1 + RRN_{GB}}{1 + RRH2} \right)^{\sigma_{h2}}}{1 + \left(\tau_{h2} \cdot \left(\frac{1 + RRN_{GB}}{1 + RRH2} \right)^{\sigma_{h2}} \right)} \tag{44}$$

$$GH3 = \frac{\tau_{h3} \cdot \left(\frac{1 + RRN_{BOTB}}{1 + RRH3} \right)^{\sigma_{h3}}}{1 + \left(\tau_{h3} \cdot \left(\frac{1 + RRN_{BOTB}}{1 + RRH3} \right)^{\sigma_{h3}} \right)} \tag{45}$$

$$GH4 = \frac{\tau_{h4} \cdot \left(\frac{1 + RRN_{FIDFB}}{1 + RRH4} \right)^{\sigma_{h4}}}{1 + \left(\tau_{h4} \cdot \left(\frac{1 + RRN_{FIDFB}}{1 + RRH4} \right)^{\sigma_{h4}} \right)} \quad (46)$$

$$GH5 = \frac{\tau_{h5} \cdot \left(\frac{1 + RRN_{SOEB}}{1 + RRN_{CBOND}} \right)^{\sigma_{h5}}}{1 + \left(\tau_{h5} \cdot \left(\frac{1 + RRN_{SOEB}}{1 + RRN_{CBOND}} \right)^{\sigma_{h5}} \right)} \quad (47)$$

$$UOF_{S_{EQL,HH}} = GH1 \cdot HHPORTS \quad (48)$$

$$UOF_{S_{GB,HH}} = GH2 \cdot (1 - GH1) \cdot HHPORTS \quad (49)$$

$$UOF_{S_{BOTB,HH}} = GH3 \cdot (1 - GH2) \cdot (1 - GH1) \cdot HHPORTS \quad (50)$$

$$UOF_{S_{FIDFB,HH}} = GH4 \cdot (1 - GH3) \cdot (1 - GH2) \cdot (1 - GH1) \cdot HHPORTS \quad (51)$$

$$UOF_{S_{SOEB,HH}} = GH5 \cdot (1 - GH4) \cdot (1 - GH3) \cdot (1 - GH2) \cdot (1 - GH1) \cdot HHPORTS \quad (52)$$

$$UOF_{S_{CBOND,HH}} = (1 - GH5) \cdot (1 - GH4) \cdot (1 - GH3) \cdot (1 - GH2) \cdot (1 - GH1) \cdot HHPORTS \quad (53)$$

$$SOF_{S_{LO,HH}} = ph0 \cdot (SOF_{S_{DE,BANK}})^{ph1} \cdot (RRN_{LO})^{ph2} \quad (54)$$

$$SOF_{S_{EQL,HH}} = sof_{slag_{EQL,HH}} + SOF_{F_{EQL,HH}} + SAV_{HH} + EXRADJ_{HH} + INTEXPADJ_{HH} \quad (55)$$

$$INTEXPADJ_{HH} = \left(\sum_{asset_int} (RRN_{asset_int} - rrrn0_{asset_int}) \cdot uof_{s0_{asset_int,HH}} \right) - \left(\sum_{asset_int} (RRN_{asset_int} - rrrn0_{asset_int}) \cdot sof_{s0_{asset_int,HH}} \right) \quad (56)$$

$$EXRADJ_{HH} = (EXR - exr0) \cdot uof_{sl_d0_{HH}} \quad (57)$$

$$UOF_{S_{FA,HH}} = (uof_{sl_d0_{HH}} + UOF_{F_{D_{HH}}}) \cdot EXR \quad (58)$$

$$UOF_{F_{FA,HH}} = UOF_{F_{D_{HH}}} \cdot EXR \quad (59)$$

$$UOF_F_D_{HH} = fahh0 \cdot (1 + \overline{RNF} - RRN("DE"))^{fahh1} \cdot RGDP^{fahh2} \cdot EXR \quad (60)$$

$$UOF_F_{FIXED,HH} = fh0 \cdot (RRN_{LO})^{fh1} \quad (61)$$

$$UOF_F_{CH,HH} = ch0_{HH} * sav_{HH} * RRN("DE")^{cho} + INTEXPADJ_{HH} + CHADJ_{HH} \quad (62)$$

Enterprise's behavior equations

$$UOF_S_{FIXED,ENTP} = pf0 \cdot (RRN_{LO})^{pf1} \cdot (\overline{CAPUTILZT})^{pf2} \quad (63)$$

$$UOF_F_{DE,ENTP} = de0 \cdot (SAV_{ENTP})^{del} \quad (64)$$

$$SOF_S_{LO,ENTP} = pp0 \cdot (SOF_S_{DE,BANK})^{pp1} \cdot (RRN_{LO})^{pp2} \quad (65)$$

$$SOF_S_{EQL,ENTP} = \sum_{inst} UOF_S_{EQL,inst} \quad (66)$$

$$PEQ \cdot sof_s0_{EQL,ENTP} = SOF_S_{EQL,ENTP} \quad (67)$$

$$SOF_S_{SOEB,ENTP} = \sum_{inst} UOF_S_{SOEB,inst} \quad (68)$$

$$PSOEB \cdot sof_s0_{SOEB,ENTP} = SOF_S_{SOEB,ENTP} \quad (69)$$

$$SOF_S_{CBOND,ENTP} = \sum_{inst} UOF_S_{CBOND,inst} \quad (70)$$

$$PCBOND \cdot sof_s0_{CBOND,ENTP} = SOF_S_{CBOND,ENTP} \quad (71)$$

$$SOF_S_{EQNL,ENTP} = sof_slag_{EQNL,ENTP} + SOF_F_{EQNL,ENTP} + SAV_{ENTP} + EXRADJ_{ENTP} + INTEXPADJ_{ENTP} \quad (72)$$

$$INTEXPADJ_{ENTP} = \left(\sum_{asset_int} (RRN_{asset_int} - rrrn0_{asset_int}) \cdot uof_s0_{asset_int,ENTP} \right) - \left(\sum_{asset_int} (RRN_{asset_int} - rrrn0_{asset_int}) \cdot sof_s0_{asset_int,ENTP} \right) \quad (73)$$

$$EXRADJ_{ENTP} = (EXR - exr0) \cdot uof_sl_d0_{ENTP} \quad (74)$$

$$UOF_S_{FA,ENTP} = (uof_sl_d0_{ENTP} + UOF_F_D_{ENTP}) \cdot EXR \quad (75)$$

$$UOF_F_{FA,ENTP} = UOF_F_D_{ENTP} \cdot EXR \quad (76)$$

$$UOF_F_D_{ENTP} = faent0 \cdot (1 + \overline{RNF} - RRN("DE"))^{faent1} \cdot RGDP^{faent2} \cdot EXR \quad (77)$$

$$UOF_F_{CH,ENTP} = ce0 \cdot (SAV_{ENTP})^{ce1} \cdot (RRN_{DE})^{ce2} + INTEXPADJ_{ENTP} \quad (78)$$

Banks' behavior equations

$$\begin{aligned} BANKPORTS = & UOF_S_{EQL,BANK} + UOF_S_{GB,BANK} + UOF_S_{BOTB,BANK} \\ & + UOF_S_{FIDFB,BANK} + UOF_S_{SOEB,BANK} + UOF_S_{CBOND,BANK} \end{aligned} \quad (79)$$

$$\begin{aligned} RRB1 = & (RRN_{GB} \cdot UOF_S_{GB,BANK} + RRN_{BOTB} \cdot UOF_S_{BOTB,BANK} + RRN_{FIDFB} \cdot UOF_S_{FIDFB,BANK} \\ & + RRN_{SOEB} \cdot UOF_S_{SOEB,BANK} + RRN_{CBOND} \cdot UOF_S_{CBOND,BANK}) / (UOF_S_{GB,BANK} + UOF_S_{BOTB,BANK} \\ & + UOF_S_{FIDFB,BANK} + UOF_S_{SOEB,BANK} + UOF_S_{CBOND,BANK}) \end{aligned} \quad (80)$$

$$\begin{aligned} RRB2 = & (RRN_{BOTB} \cdot UOF_S_{BOTB,BANK} + RRN_{FIDFB} \cdot UOF_S_{FIDFB,BANK} + RRN_{SOEB} \cdot UOF_S_{SOEB,BANK} \\ & + RRN_{CBOND} \cdot UOF_S_{CBOND,BANK}) / (UOF_S_{BOTB,BANK} + UOF_S_{FIDFB,BANK} \\ & + UOF_S_{SOEB,BANK} + UOF_S_{CBOND,BANK}) \end{aligned} \quad (81)$$

$$\begin{aligned} RRB3 = & (RRN_{FIDFB} \cdot UOF_S_{FIDFB,BANK} + RRN_{SOEB} \cdot UOF_S_{SOEB,BANK} + RRN_{CBOND} \cdot UOF_S_{CBOND,BANK}) \\ & / (UOF_S_{FIDFB,BANK} + UOF_S_{SOEB,BANK} + UOF_S_{CBOND,BANK}) \end{aligned} \quad (82)$$

$$\begin{aligned} RRB4 = & (RRN_{SOEB} \cdot UOF_S_{SOEB,BANK} + RRN_{CBOND} \cdot UOF_S_{CBOND,BANK}) / (UOF_S_{SOEB,BANK} \\ & + UOF_S_{CBOND,BANK}) \end{aligned} \quad (83)$$

$$GB1 = \frac{\tau_{b1} \cdot \left(\frac{1 + RRN_{EQL}}{1 + RRB1} \right)^{\sigma_{b1}}}{1 + \left(\tau_{b1} \cdot \left(\frac{1 + RRN_{EQL}}{1 + RRB1} \right)^{\sigma_{b1}} \right)} \quad (84)$$

$$GB2 = \frac{\tau_{b2} \cdot \left(\frac{1 + RRN_{GB}}{1 + RRB2} \right)^{\sigma_{b2}}}{1 + \left(\tau_{b2} \cdot \left(\frac{1 + RRN_{GB}}{1 + RRB2} \right)^{\sigma_{b2}} \right)} \quad (85)$$

$$GB3 = \frac{\tau_{b3} \cdot \left(\frac{1 + RRN_{BOTB}}{1 + RRB3} \right)^{\sigma_{b3}}}{1 + \left(\tau_{b3} \cdot \left(\frac{1 + RRN_{BOTB}}{1 + RRB3} \right)^{\sigma_{b3}} \right)} \quad (86)$$

$$GB4 = \frac{\tau_{b4} \cdot \left(\frac{1 + RRN_{FIDFB}}{1 + RRB4} \right)^{\sigma_{b4}}}{1 + \left(\tau_{b4} \cdot \left(\frac{1 + RRN_{FIDFB}}{1 + RRB4} \right)^{\sigma_{b4}} \right)} \quad (87)$$

$$GB5 = \frac{\tau_{b5} \cdot \left(\frac{1 + RRN_{SOEB}}{1 + RRN_{CBOND}} \right)^{\sigma_{b5}}}{1 + \left(\tau_{b5} \cdot \left(\frac{1 + RRN_{SOEB}}{1 + RRN_{CBOND}} \right)^{\sigma_{b5}} \right)} \quad (88)$$

$$UOF_{-S_{EQL,BANK}} = GB1 \cdot HHBANKS \quad (89)$$

$$UOF_{-S_{GB,BANK}} = GB2 \cdot (1 - GB1) \cdot HHBANKS \quad (90)$$

$$UOF_{-S_{BOTB,BANK}} = GB3 \cdot (1 - GB2) \cdot (1 - GB1) \cdot HHBANKS \quad (91)$$

$$UOF_{-S_{FIDFB,BANK}} = GB4 \cdot (1 - GB3) \cdot (1 - GB2) \cdot (1 - GB1) \cdot HHBANKS \quad (92)$$

$$UOF_{-S_{SOEB,BANK}} = GB5 \cdot (1 - GB4) \cdot (1 - GB3) \cdot (1 - GB2) \cdot (1 - GB1) \cdot HHBANKS \quad (93)$$

$$UOF_{-S_{CBOND,BANK}} = (1 - GB5) \cdot (1 - GB4) \cdot (1 - GB3) \cdot (1 - GB2) \cdot (1 - GB1) \cdot HHBANKS \quad (94)$$

$$SOF_{-S_{EQL,BANK}} = sof_{-slag_{EQL,BANK}} + SOF_{-F_{EQL,BANK}} + SAV_{BANK} + EXRADJ_{BANK} + INTEXPADJ_{BANK} \quad (95)$$

$$\begin{aligned}
INTEXPADJ_{BANK} &= \left(\sum_{asset_int} (RRN_{asset_int} - rrrn0_{asset_int}) \cdot uof_s0_{asset_int,BANK} \right) \\
&- \left(\sum_{asset_int} (RRN_{asset_int} - rrrn0_{asset_int}) \cdot sof_s0_{asset_int,BANK} \right)
\end{aligned} \tag{96}$$

$$EXRADJ_{BANK} = (EXR - exr0) \cdot uof_sl_d0_{BANK} \tag{97}$$

$$UOF_S_{FA,BANK} = (uof_dl_do_{BANK} + UOF_F_D_{BANK}) \cdot EXR \tag{98}$$

$$UOF_F_{FA,BANK} = UOF_F_D_{BANK} \cdot EXR \tag{99}$$

$$UOF_F_D_{BANK} = fabnk0 \cdot (1 + \overline{RNF} - RRN("DE"))^{fabnk1} \cdot RGDP^{fabnk2} \cdot EXR \tag{100}$$

Government's behavior equations

$$SOF_S_{GB,GOV} = \sum_{inst} UOF_S_{GB,inst} \tag{101}$$

$$PGB \cdot sof_s0_{GB,GOV} = SOF_S_{GB,GOV} \tag{102}$$

$$SOF_S_{FIDFB,GOV} + SOF_S_{FIDFB,BOT} = \sum_{inst} UOF_S_{FIDFB,inst} \tag{103}$$

$$\begin{aligned}
PFIDFB \cdot (sof_s0_{FIDFB,GOV} + sof_0_{FIDFB,BOT}) &= SOF_S_{FIDFB,GOV} \\
+ SOF_S_{FIDFB,BOT}
\end{aligned} \tag{104}$$

$$\begin{aligned}
SOF_S_{EQNL,GOV} &= sof_slag_{EQNL,GOV} + SOF_F_{EQNL,GOV} \\
+ SAV_{GOV} + EXRADJ_{GOV} + INTEXPADJ_{GOV}
\end{aligned} \tag{105}$$

$$\begin{aligned}
INTEXPADJ_{GOV} &= \left(\sum_{asset_int} (RRN_{asset_int} - rrrn0_{asset_int}) \cdot uof_s0_{asset_int,GOV} \right) \\
&- \left(\sum_{asset_int} (RRN_{asset_int} - rrrn0_{asset_int}) \cdot sof_s0_{asset_int,GOV} \right)
\end{aligned} \tag{106}$$

$$UOF_F_{CH,GOV} = govch \cdot SAV_{GOV} + INTEXPADJ_{GOV} \tag{107}$$

Bank of Thailand (BOT)'s behavior equations

$$SOF_S_{BOTB,BOT} = \sum_{inst} UOF_S_{BOTB,inst} \quad (108)$$

$$PBOTB \cdot (sof_s0_{BOTB,BOT}) = SOF_S_{BOTB,BOT} \quad (109)$$

$$SOF_S_{EQNL,BOT} = sof_slag_{EQNL,BOT} + SOF_F_{EQNL,BOT} + EXRADJ_{BOT} + INTEXPADJ_{BOT} \quad (110)$$

$$INTEXPADJ_{BOT} = \left(\sum_{asset_int} (RRN_{asset_int} - rrrn0_{asset_int}) \cdot uof_s0_{asset_int,BOT} \right) - \left(\sum_{asset_int} (RRN_{asset_int} - rrrn0_{asset_int}) \cdot sof_s0_{asset_int,BOT} \right) \quad (111)$$

$$EXRADJ_{BOT} = (EXR - exr0) \cdot uof_sl_d0_{BOT} \quad (112)$$

$$UOF_S_{FA,BOT} = (uof_sl_d0_{BOT} + UOF_F_D_{BOT}) \cdot EXR \quad (113)$$

$$UOF_F_{FA,BOT} = (UOF_F_D_{BOT}) \cdot EXR \quad (114)$$

$$UOF_F_D_{BOT} = fabot0 \cdot (1 + \overline{RNF} - RRN("DE"))^{fabot1} \cdot RGDP^{fabot2} \cdot EXR \quad (115)$$

$$SOF_S_{DE,BOT} = UOF_S_{DE,BANK} + botdeoth \quad (116)$$

$$BM = SOF_S_{CH,BOT} + UOF_S_{DE,BANK} \quad (117)$$

$$M2 = SOF_S_{CH,BOT} + SOF_S_{DE,BANK} \quad (118)$$

$$rratio = UOF_S_{DE,BANK} / SOF_S_{DE,BANK} \quad (119)$$

$$cratio = SOF_S_{CH,BOT} / SOF_S_{DE,BANK} \quad (120)$$

$$M2 = \left(\frac{1 + cratio}{cratio + rratio} \right) \cdot BM \quad (121)$$

$$SOF_S_{CH,BOT} = botc0 \cdot (RRN_{LO})^{botc1} \cdot (RGDP)^{botc2} \quad (122)$$

$$SOF_F_{RP,BOT} - sof_f_{RP,BOT} = (SOF_F_{CH,BOT} - sof_f_{ch,BOT}) \cdot (-1) \quad (123)$$

Rest of the world (ROW)'s behavior equations

$$UOF_F_{LO,ROW} = rwl0 \cdot \left(RRN_{LO} - \overline{RNF} \right)^{rwl01} \cdot \left(\overline{EXPEXR} \right)^{rwl02} \quad (124)$$

$$UOF_F_{DE,ROW} = rwde0 \cdot \left(RRN_{DE} - \overline{RNF} \right)^{rwde1} \cdot \left(\overline{EXPEXR} \right)^{rwde2} \quad (125)$$

$$UOF_F_{GB,ROW} = rwgb0 \cdot \left(rn_{GB} - \overline{RNF} \right)^{rwgb1} \cdot \left(\overline{EXPEXR} \right)^{rwgb2} \quad (126)$$

$$UOF_F_{CBOND,ROW} = rwcbond0 \cdot \left(rn_{CBOND} - \overline{RNF} \right)^{rwcbond1} \cdot \left(\overline{EXPEXR} \right)^{rwcbond2} \quad (127)$$

$$UOF_F_{EQL,ROW} = rweql0 \cdot \left(rn_{EQL} - \overline{RNF} \right)^{rweql1} \cdot \left(\overline{EXPEXR} \right)^{rweql2} \quad (128)$$

$$UOF_S_{LO,ROW} = UOF_F_{LO,ROW} + uof_slag_{LO,ROW} \quad (129)$$

$$UOF_S_{DE,ROW} = UOF_F_{DE,ROW} + uof_slag_{DE,ROW} \quad (130)$$

$$UOF_S_{GB,ROW} = UOF_F_{GB,ROW} + uof_slag_{GB,ROW} \quad (131)$$

$$UOF_S_{CBOND,ROW} = UOF_F_{CBOND,ROW} + uof_slag_{CBOND,ROW} \quad (132)$$

$$UOF_S_{EQL,ROW} = UOF_F_{EQL,ROW} + uof_slag_{EQL,ROW} \quad (133)$$

System constraints

$$UOF_S_{asset_a,domain\ st} = UOF_F_{asset_a,domain\ st} + uof_slag_{asset_a,domain\ st} \quad (134)$$

$$SOF_S_{asset_l,domain\ st} = SOF_F_{asset_l,domain\ st} + sof_slag_{asset_l,domain\ st} \quad (135)$$

$$\sum_{inst} UOF_F_{assetNF,inst} = \sum_{inst} SOF_F_{assetNF,inst} \quad (136)$$

$$\sum_{asset} UOF_F_{asset,inst} = \sum_{asset} SOF_F_{asset,inst} + SAV_{inst} \quad (137)$$

$$INVEST = \sum_{inst} UOF_F_{FIXED,inst} \quad (138)$$

$$RRN_{LO} - \overline{RNF} = \left(\frac{EXPEXR}{EXR} - 1 \right) \quad (139)$$

$$RRN_{LO} = RRN_{DE} + \overline{INTSPREAD} \quad (140)$$

$$RRN_{GB} = rn_{GB} - RRN_{DE} \quad (141)$$

$$RRN_{BOTB} = rn_{BOTB} - RRN_{DE} \quad (142)$$

$$RRN_{FIDFB} = rn_{FIDFB} - RRN_{DE} \quad (143)$$

$$RRN_{SOEB} = rn_{SOEB} - RRN_{DE} \quad (144)$$

$$RRN_{EQL} = rn_{EQL} - RRN_{DE} \quad (145)$$

$$SAV_{HH} = mps_{HH} \cdot YH_{HH} \cdot (1 - th_{HH}) \quad (146)$$

$$SAV_{ENTP} = mps_{ENTP} \cdot YH_{ENTP} \cdot (1 - th_{ENTP}) \quad (147)$$

$$SAV_{GOV} = GOVSAV \quad (148)$$

$$SAV_{ROW} = EXR \cdot (-FSAV) \quad (149)$$

Poverty block

$$PDAVG = \left(\sum_i PD_i * D_i \right) / \sum_i D_i \quad (150)$$

$$POVLINE = PINDEX / PDAVG \cdot alphapov \cdot \sum_i PD_i \quad (151)$$

$$INCDIST = YH_{HHH1} / YH_{HHH5} \quad (152)$$

$$RSRVRQRM = UOF - F_{DE,BANK} / SOF - F_{DE,BANK} \quad (153)$$

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CHAPTER 3

THE ECONOMICS OF GROUP LENDING: ITS IMPACT, SUSTAINABILITY AND GROWTH – CASE STUDY OF KWPGBM IN LOMBOK, INDONESIA

1. Introduction

Does everything in this world need government supervision or intervention to work? Is there anything that can be self-regulated and work without external interference? In other words, can an organization or institution survive on its own without aid from government or NGOs? In answering these questions, most critics often believe that government intervention is necessary in ensuring a success of an institution. Nevertheless, this upholds Keynes theory that advocates government intervention in the economy to be the only method of ensuring economic growth and stability.

Due to this argument, our research brings a unique case study of one microfinance institution in Lombok, Indonesia that has survived for more than 20 years without any government interference or donors' funds. This microfinance institution is Koperasi Wanita Pengerajin Gerabah Banyu Mulek (KWPGBM) that consists of a group of 72 women whose main source of income is making pottery. Furthermore, despite the fact that its clients are poor households with no credit history, low income, low education and no collateral, it has maintain a non-performing loan of zero percent using its unique group lending mechanism. Due to this, our research will focus on the group lending it has adapted that we perceived as an essential tool in its success and survivorship.

Although there are many theoretical and empirical study on group lending that have been done, none to the knowledge of the author that shows an existence of group lending mechanism in the microfinance institutions that is *very flexible, self-organized, unsubsidized or independent from governments' funds or donors' funds and manage to be sustainable for more than two decades*. Even some of the most well-known microfinance institutions like Grameen Bank in Bangladesh took more than 30 years before they can be self-sufficient through savings mobilization without government's subsidy to cover the high cost of operation. Hence, the exploration of KWPGBM provides evidence that it is possible for a group of villagers to establish their own lending group to help each other financially and socially. As in any other study on group lending in MFIs, our research will show the net impact of KWPGBM on its borrowers, its sustainability in the future and its attempt to grow and outreach to potential borrowers from outside villages/ districts that in our opinion risk the possibility of failure.

1.1.Problem Statement and Hypotheses

There are three hypotheses that we are testing in this research paper:

1. KWPGBM provides positive net impact on its borrowers
2. KWPGBM is a sustainable institution in the long run
3. KWPGBM should not grow or outreach under certain circumstances due to possibility of failures

We will test the first two hypotheses empirically using Analytical Hierarchy Process (AHP) and the third hypothesis using standard optimization method. The third hypothesis will then be supported empirically using the data we have collected.

For our research purpose, we find that it is important to evaluate the above research hypotheses. Although KWPGBM is the only MFI that exists in its district which give it advantage to operate, it is relevant for us to see and understand from its borrowers' point of view the impact and change it has brought to their life throughout its 20 years of operation. This is to provide support that just like any other MFIs whose main objective is to eradicate poverty; our hope is that their existence has improved the well-being of their clients economically. Our next research question on its financial sustainability in the long run is crucial in concluding whether their savings mobilization and interest rate charged is sufficient to cover their operational costs and lending without receiving any outside grants. In most cases, there are high doubts that such MFIs will survive long without external financial aid and most studies have underlined the importance of savings mobilization in microfinance. Due to this, their clients' opinion in terms of the interest rate charge and KWPGBM savings facilities play an imminent role to assess its sustainability. Our final hypothesis that investigates the potential risks of growth and outreach for such small scale MFIs like KWPGBM is important in identifying whether this could be the end to its 20 years of survivorship. Their decision to expand without proper guidance and technology could increase the potential problem of moral hazard, domino effect, free riding, collusion and etc.

1.2. Literature Review

The development of MFIs worldwide have gained growing research interest in understanding the financial lending and borrowing to the poor households in what is perceived as one of the most effective way to eradicate poverty. To better understand this, many studies have analyzed the various measures of impact of MFIs to its clients and evaluate its financial sustainability in the long run. Some have attributed the success of MFIs to its group lending mechanism that impose social sanction without any sizeable collateral requirement while others claim that microfinance is beyond group lending.

Robinson (2001) covers extensively on the impact of microfinance that has help economically active poor to expand and diversify their enterprises and increase their income by drawing examples from countries like Indonesia, Philippines, Uganda, Kenya, Honduras, Nicaragua and Senegal. She argued that microfinance has increased the options and the self confidence of poor households, improve the quality of their lives and create job opportunity in the face of unemployment and underemployment. Fuglesang and Chandler (1987), Hossain (1988), Auwal and Singhal (1992), Rahman (2001) are among many researchers that have looked at various aspects of Grameen Bank including its positive impact in alleviation of rural poverty, empowerment of women and creation of formidable knowledge based and expertise in Bangladesh society. On the other hand, a recent study from Calles (2005) draws an example of a new microfinance institution in Bangladesh, SafeSave that works in quite different way than Grameen Bank but can reach the poor in a better way through its more flexible services than traditional MFIs. However, unlike Grameen Bank and other traditional MFIs in Bangladesh, SafeSave concentrate on urban areas, targeting clients of both men and women.

From these standard literatures, we have gained further insight into the various measures of net impact of MFIs around the world that were established and designed differently based on their targeted clients. As a result, this helps us in making comparison with our research on KWPGBM.

Other studies have focused on financial sustainability of MFIs defined by Havers (1996) as the income receivables from fees and interest charged that is able to cover the costs of funds, operating costs, loan write-offs and inflation. In addition, he claimed that very few organizations working with the poor have achieved such standard. Adongo and Stork (2005) reiterated the definition of financial sustainability as the ability to cover costs independent of external subsidies from donors or government. They tested empirically for factors that influenced the financial sustainability of selected MFIs in Namibia and concluded that there was a high degree of financial unsustainability for multipurpose co-operatives providing microfinance but a positive correlation of donor involvement in providing start-up funds for the loan portfolio and financial sustainability. Khankher, Khalily and Khan (1994, pg.8) study instead looks at sustainability not only from financial and economic viabilities but argues that its management and decision making system is equally important to Grameen Bank's sustainability. Hulme and Mosley (1996) as quoted in FOCUS further correlate the financial sustainability with recognized 'best practise' design features such as high interest rate, the availability of voluntary savings facilities, the frequency of loan collection, and the existence of material incentives to borrowers and lending staffs to maximize repayment. These characteristics discussed present information for us in assessing the sustainability of MFIs that help us in better designing our survey questions for KWPGBM so as to meet with the standard requirements of sustainability.

Further research then started to look at the mechanisms to achieve these characteristics and one distinct mechanism which MFIs implement that conventional lending institutions lack of, is group lending. Many have argued that this is one of the most common and effective tools in lending to the poor without any collateral requirement. Stiglitz (1990) and Varian (1990) showed the informational advantages of group lending through peer monitoring that would reduce moral hazards among borrowers. Both have shown through models that the cost of monitoring could be delegated to the group members and hence lead to lower cost of borrowing: lower interest rate (Varian, 1990) or larger amount of loan and higher repayment rates (Stiglitz, 1990). From the work of Besley and Coate (1993) we get further insight of the role of group lending that influence repayment rates which improve when there exists social sanction. In their famous game theory repayment setting (Figure 3.1 below), they have shown that without social sanction one borrower would free ride on his partner and let the other borrower repay the entire loan. In this setting, although the non-defaulting borrower is capable of repaying the loan, he will most likely not repay the entire group loan. In their second game theory setting (Figure 3.2 below) in which they introduce social sanction, they have concluded that when a sufficiently severe social sanction is imposed on each borrower, then the only equilibrium is where both borrowers contribute their shares. The existence of sufficiently severe penalty makes it less likely that an individual with a higher project return will have to repay the entire loan. Armendariz and Morduch (2005) however claimed that group lending can be both costly and beneficial. Among the disadvantages of group lending are the high cost of monitoring group members especially when they live far from each other, costly to implement, collusion among borrowers against the banks may exist and loan terms that are limited to what the group feels it can jointly guarantee. In addition, they highlighted

Montgomery example of social sanction and strong pressure in group lending that can lead to exclusion of clients that fail to repay due to out-of-control problems and are forced to give their personal belongings. In light of this information, it is obvious that in the quest for MFIs' sustainability through group lending, there are consequences that will affect individual borrowers and should not be overlooked. Therefore, we have used these as guidance in our research survey to take into account both the pros and cons of KWPGBM in determining its net impact and sustainability through group lending.

Our final hypothesis that KWPGBM should not grow or outreach under certain circumstances due to possibility of failures have brought us into literatures on public goods and theory of groups by Olson (1960). Olson has argued that the collective good will be provided if the cost of the collective good at the optimal point for any individual in the group is so small in relation to the gain of the group as a whole from that collective good. In other words, the total gain exceeds the total cost by as much as or more than the gain to the group exceeds the gain to the individual (pg. 25). He had shown that as individual's value as a fraction of the group's value diminishes, the less the individual would want to contribute in providing the collective good. Following in line to his method in the context of group lending in MFI, we take the public good to be the total amount of loan to the group in which its costs and benefits will increase as the number of group members increase.

Our research contributes to the existing literature on microfinance by providing coverage and exploration of a small scale MFI in rural area of Indonesia that possess many of the characteristics typically display by large MFI. Almost all studies that we have found focus on well-known and well established MFI, but KWPGBM has proven that it is possible for a

small institution to operate for more than 20 years without government intervention and donor's subsidy. From the literatures above, we have discussed on savings mobilization, interest rate charged, management, etc. as important elements for any MFIs' sustainability and success, yet KWPGBM managed by a group of women with little education have implemented these elements since the very beginning of its establishment in 1988. This conclude that it is possible to establish independent MFIs in rural areas to reach the poorest of the poor but its structure has to differ based on the environment, main source of income within the area, targeted clients etc. Due to this, we further contribute another methodology that can be applied in research on microfinance and that is Analytical Hierarchy Process (AHP) and a simple optimization method on MFI growth based on Theory of Groups.

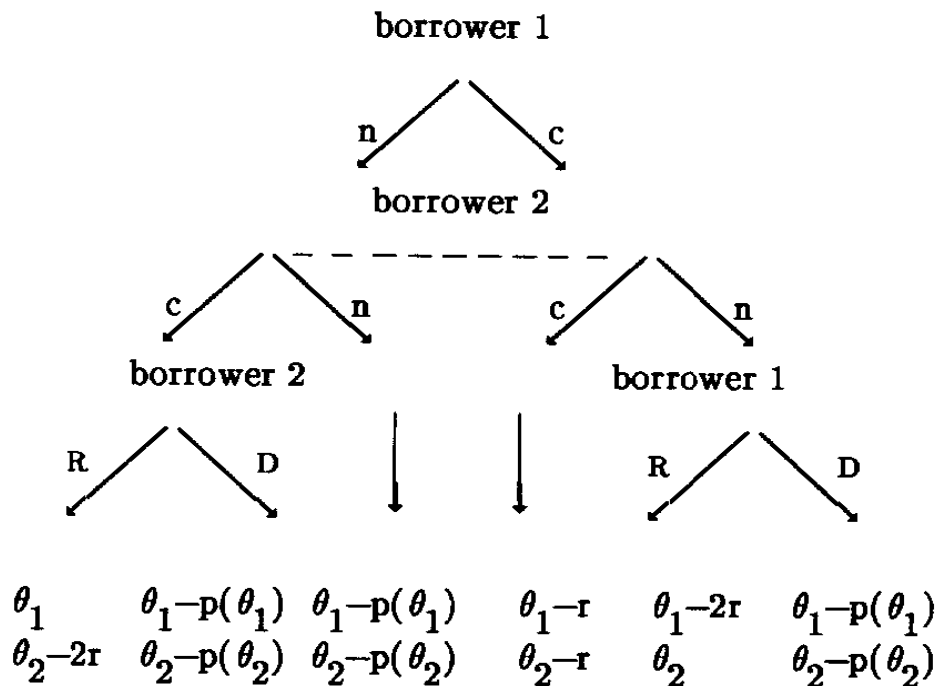


Figure 3.1: Besley and Coate Repayment Game Model

where c = borrower will make her payment of r

n = borrower will not make her payment and hence will incur a penalty of $P(\theta_i)$

R = borrower decides to pay on behalf of her group member who is defaulting on her loan

D = borrower decides not to pay on behalf of her group member hence defaulting on the entire group

$P(\theta_i)$ = penalty for player i , $i=1, 2$

θ_i = payoff for player i , $i=1,2$

r = amount of loan to pay for each player

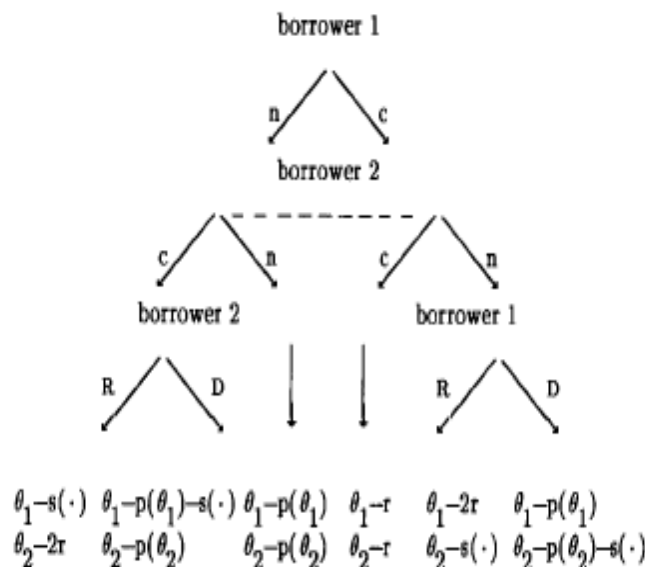


Fig. 2. Note: When the strategy pair is $\{n, (c, R)\}$, $s(\cdot) = s(r, \theta_1)$; when it is $\{(c, R), n\}$, $s(\cdot) = s(r, \theta_2)$; when it is $\{(c, D), n\}$, $s(\cdot) = s(p(\theta_1) - r, \theta_2)$, and when it is $\{n, (c, D)\}$, $s(\cdot) = s(p(\theta_2) - r, \theta_1)$.

Figure 3.2: Besley and Coate Repayment Game (With Social Sanction)

where c = borrower will make her payment of r

n = borrower will not make her payment and hence will incur a penalty of $P(\theta_i)$

R = borrower decides to pay on behalf of her group member who is defaulting on her loan

D = borrower decides not to pay on behalf of her group member hence defaulting on the entire group

$P(\theta_i)$ = penalty for player i , $i=1, 2$

θ_i = payoff for player i , $i=1,2$

r = amount of loan to pay for each player

$s()$ = social sanction imposed by the group members upon failure to pay the loan

2. Overview of KWPGBM

KWPGBM was established in 1988 by a group of 72 women in a village called Banyu Mulek in Lombok, Indonesia⁵³. During that time, the primary source of income for these women was making ‘gerabah’ (earthenware vessel). These ‘gerabah’ would either be exported overseas or sold locally. Traditionally, this pottery was used in the village households to store rice, water, salt and spices. The process of making ‘gerabah’ from clay is described below and is usually dominated by women⁵⁴ (Appendix1).

Since they depended heavily on the making of ‘gerabah’ as their main source of income, they often faced with financial difficulty in buying the fire woods to burn the ‘gerabah’ as described in ‘Burning the Gerabah’ process in Appendix 1. This led them to form seven groups consisting of these 72 women with their main objective of helping any group member that have financial difficulty in buying the fire woods. Minimum number of participants in a group was seven people and maximum number of people in a group was eleven people. Each group elected its own leader from among the group members as the representative of the

⁵³ The name ‘KWPGBM’ was given only in 2003 and prior to that, they didn’t have any specific name to their organization as this was established on mutual understanding among the group members.

⁵⁴ Source: Promotes the culture of pottery life in Bayat, Klaten, Central Java of Indonesia.
http://budiatijavapottery.biz/new/index.php?option=com_content&task=view&id=12&Itemid=26

group in the monthly meeting with the management. The management consists of eight women who were typically relatives to some of these 72 women.

These women were trained on variety of ‘gerabah’ designs that they could create by representatives from New Zealand as part of the joint program between the Indonesian government and the New Zealand government⁵⁵. The training lasted from 1988 after these groups have been formed until 1999 when the joint training program ended. When these representatives left, they had recognized the success of these groups in producing world class exquisite pottery and rewarded them with some financial amount. The total amount of their savings and the reward given as of today is Rp 91 250 000 (USD9617.41).

2.1. Lending Mechanism of KWPGBM:

1. In 1988, each group was assigned its own fund and each member in the group had to make compulsory contribution of Rp1000 (USD0.105) per month. This was considered as their compulsory savings. In addition to this compulsory savings, the members could also make voluntary contributions and this was considered as their voluntary savings.
2. The management then collected the money from these seven funds and managed them on behalf of the members. There were eight members on the management board that supervised these seven groups: Chairman, Secretary, Treasurer, Supervisor, two Board Members, and two Debt Collectors.

⁵⁵ Only three districts that was chosen for the training program: Banyu Mulek (West Lombok), Masbagik (East Lombok) and Penujah (Central Lombok).

3. If any of the members needs to borrow the money to buy the fire woods, she could take out a loan from the pooled fund upon approval from the management. The minimum amount of loan was Rp25000 (USD2.6539) and the maximum amount of loan was Rp50000 (USD5.3079). The principle was that, those members with extra cash could help those members who were in need of cash to buy the fire woods. The interest rate charged on the loan was set upon agreement by the management and the groups using the bank loan rate as their benchmark.

4. There were no stated rules and regulations, no joint liability or collateral requirement for each group. In other words, the mechanism of group lending by KWPGBM was very flexibly self-regulated. This was the uniqueness of KWPGBM; the practice of such group lending that was unlike the simultaneous group lending by BancoSol or sequential group lending by Grameen Bank yet their non-performing loan was 0% throughout their practice of this group lending from 1988 until 2003⁵⁶.

5. Aside from managing the savings and loans from group members, the organizer also helped to market the 'gerabah' produced on behalf of the group members. These 'gerabah' were send to local buyers in Sriwijaya who would then either sell them locally or internationally. The amount of money received from this sale would be distributed to the group members accordingly. However, for those members who have any outstanding loan, the proceeds from the sale of their 'gerabah' will be deducted and the balance will be returned to them. The incomes from the sales of this 'gerabah' were used to support their daily consumption, the

⁵⁶ In 2003, they have changed their operation into registered cooperative so that they can expand their outreach and get assistantship from the government agency overlooking the cooperative's operation. They are still operating until today.

children's education and other necessities. Any extra cash would be kept as part of their voluntary savings with the management.

6. There were no specific problems such as defaulting on their loans and etc. that have risen among these 72 members throughout their participation in this group lending mechanism. Even up until today, these 72 women are still members of KWPGBM. Furthermore, the non performing loan (NPL) of this organization has always been maintained at 0% all these while.

In 2003, the organization had chosen to register itself with 'Dinas Koperasi' or Department of Cooperative. This move would enable them to get financial assistance from the government agency and training needed in order for them to move forward. The group lending mechanism that was in practice before had been abandoned and being an absolute cooperative body, the membership is now open to anyone⁵⁷ on an individual basis. Furthermore, KWPGBM has divided its membership into members and non-members. As of 2009, there are 303 members⁵⁸ and 600 non-members in KWPGBM. Furthermore, the reason for taking a loan now is no longer for buying the fire woods but totally up to the borrowers. When the cooperative was first formally established in 2003, the startup capital was Rp7 million (USD743). In 2004, the net profit was Rp16 million (USD1698.51), in 2005 the net profit increased to Rp48 million (USD5095.54) and in 2006 it increased further to Rp92 million (USD9766.45). The cooperative is no longer marketing any products of new members except for the initial 72 members that produce the 'gerabah'.

⁵⁷ Anyone here is referring to both man and woman. As of 2009, there are 90% female borrowers and 10% male borrowers.

⁵⁸ The membership is currently closed to only 303 members.

For members joining KWPGBM, they are required to have ‘simpanan pokok’⁵⁹ or initial savings, ‘simpanan bulanan’ or monthly savings and ‘simpanan sukarela’ or voluntary savings. For ‘simpanan pokok’, it is obligatory for members to deposit certain amount of money every month with the co-op whereas for ‘simpanan sukarela’, the amount is optional⁶⁰. The members also participate in the co-op annual meeting ‘Rapat Anggota Tahunan (RAT)’, has a voting right and their say in the management of the cooperative, entitle to receive a dividend and selecting the cooperative management board (the chairman, the secretary and etc.). In other words, they own the co-op as much as the shareholder of a company would.

On the other hand, non-members are only allowed to have ‘simpanan sukarela’ or voluntary saving and are not entitled to other benefits or obligations like the members do. Both members and non-members are allowed to take loans from the co-op but with one condition; that is they need to provide any tangible assets as collateral whereby the value of this collateral should be higher than the amount of loan that they take. The interest charge on this loan is fixed at 2.5% (in 2009) while to set the dividend payout, the management uses the conventional banks’ dividend as the bench mark and would set the dividend that is higher than what the banks would typically offer.

When a familiar known borrower applies for a loan, it typically takes up to 3 business days to access the profile and evaluate the credibility of this borrower. Once the loan is approved, the borrower is then required to put either his/her land certificate, motorcycle or anything else that

⁵⁹ ‘simpanan pokok’ or initial saving is required at the beginning when one decides to join the cooperative. This fixed amount is the same for every member and cannot be withdrawn as long as he is still a member of the coop.

⁶⁰ Just like the initial savings, the members are not allowed to withdraw any money as well from their monthly savings as long as he is still a member of the co-op. Members can only withdraw money from their voluntary savings at anytime.

is of higher value than the value of the loan s/he has applied for with the co-op. The collateral needs to be brought to the co-op and remain there until the entire loan is paid. The interest rate is fixed at 2.5% per month and the term of the loan is set based on the amount of loan s/he has requested. In addition to the collateral requirement, 2.75% of the loan amount will be deducted for the administrative costs. The maximum duration of any loan is two years. The minimum amount of the loan is Rp100 000 and the maximum amount of loan is Rp8 million. The borrower then needs to fill up a paper work and name another person as his guarantor. The guarantor is usually his spouse or his parents. On the other hand, if the borrower is somebody unfamiliar to the management, for instance a potential borrower from other districts or villages, then the assessment process could take up to two weeks. The chairman and her assistance would travel down to that borrower's house and conduct an interview with his/her neighbors and family members to access on his/her credit history, potential of defaulting and etc. If the loan is approved, then s/he has to fulfill the collateral and guarantor's requirements.

The management board members would routinely go to both the members and non-members house on daily basis to collect any money for either savings purpose or paying up their loan. This provides convenience for depositors and borrowers of this co-op. When there are more borrowers than savers, the management board would raise the interest rate charge on the loan. After three days past the due date, the borrowers will receive notification on their due payment and any late payment after one month from the due date will be charged 7.5% penalty on the outstanding loan balance. Any withdrawal of membership from the cooperative requires one week advance notification.

There are currently eight members in the management board that manage about 1000 members and non-members (in 2009). The management are still operating using manual book in recording any transactions and do not have any computer skills to do so. Furthermore, any expansion and outreach outside their village would be very costly for the management since it involves high transportation costs. The requirement for any collateral would mean that this co-op is unable to reach the poorest of the community since the poorest people usually do not have any assets to begin with. The initial 72 members are still registered with the co-op until today but have withdrawn Rp92 million of their money that had been saved since the co-op was established. The co-operative fund is now short of this big amount due to the withdrawal that prompted the management for the first time to seek a loan of Rp100 million from 'Dinas Koperasi' or Co-op Ministry at interest rate of 0.3% per month. However, the amount granted was only Rp30 million. The move by the co-op to take external funding for the first time after their existence of 15 years motivates the research on the future survivorship of KWPGBM.

It is to be emphasized here that our research is focusing on their group lending mechanism that was introduced in 1988 and lasted until 2003 when they decided to register as co-op. From 2003 onwards, there doesn't exist anymore their group lending practice, but for the sake of our research hypotheses above, we will hypothetically assume that it still exists until today. In other words, our methodology in testing KWPGBM impact, sustainability and growth is based on their unique group lending practice that we hypothetically assume still in practice.

3. Data and Methodology

3.1 Analytical Hierarchy Process (AHP) in General:

In order to test the hypothesis for this research paper, I will be using a modeling technique called Analytical Hierarchy Process (AHP). AHP was developed by Prof. Thomas Saaty and is often referred to as Saaty's Method. It is widely used and very popular especially in the military analysis although its application can be applied in any decision making problems. Furthermore, it is one of the famous multi criteria decision making (MCDM) that chooses the best of a discrete set of alternatives. The usage of AHP allows the participants to express their own opinion, judgment and experiences by giving them freedom to rank their intangible preferences in the survey questions that are handed out. A general form of AHP structure is shown in Figure 3.3:

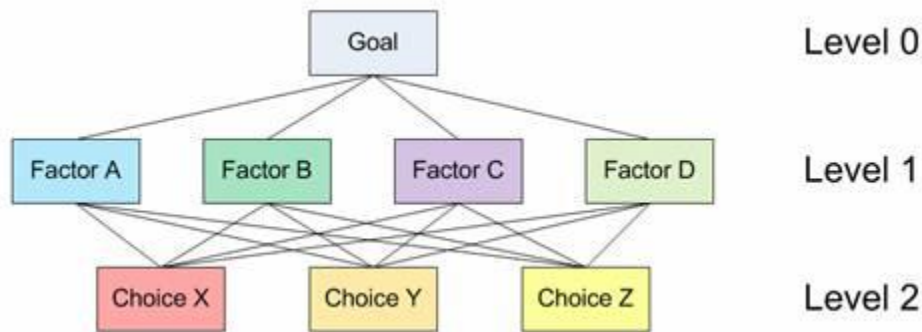


Figure 3.3: A General Structure of AHP⁶¹

Level 0 describes the goal of our decision making problem, Level 1 gives the multi criteria to achieve the goal and it consists of several choices and Level 2 is the alternatives choices. The lines connecting these levels indicate the relation between them. At Level 1, respondents will

⁶¹ Source: <http://people.revoledu.com/kardi/tutorial/AHP/AHP-Example.htm>

make pair wise comparison between the four factors with respect to the goal and hence we have four by four matrixes here. At Level 2, we have three choices with respect to each factor, so there will be four pair wise comparison matrix of size three by three. In other words, with respect to each factor, what is the relative preference of respondents (Between Choice X and Choice Y, Choice X and Choice Z, Choice Y and Choice Z).

The respondents will first make pair wise comparisons in the survey questions that are given to them and their evaluation will be inputted into the pair wise comparison matrix (or reciprocal matrix) in AHP. They will use the scale from one to nine to rank their preferences as shown in Appendix 1. One of the most important elements of pair wise comparison is consistency, meaning that respondents' choices need to satisfy the transitivity conditions. The transitivity condition states that if $B \succ A$ and $A \succ C$ then $B \succ C$. In the AHP pair wise comparison matrix, this is represented by $a_{ij}a_{jk} = a_{ik}$ for all i, j and k . Furthermore, AHP will provide the consistency index that shows how much of these transitivity conditions in the survey questions that have been violated and in general, the acceptable level of inconsistency is less than 0.1. The inconsistency index is calculated from the principal Eigen value. Finally, the pair wise comparison matrix will calculate the normalized Eigen vector and gives the priority vector. This priority vector represents the ranking of individual's preferences.

We illustrate the application of AHP calculation in one of our questionnaires (Questionnaire 3). In this questionnaire, we are asking a group of respondents about the sustainability of KWPGBM since this is one of our hypotheses. The sustainable period is for 10 years and we consider KWPGBM as a sustainable institution if this group of 20 borrowers would use the services from KWPGBM for more than 10 years and vice versa. In AHP, we need to specify

our goal and the choices we have. In selecting our choices to achieve the goal, we have several criteria that we have to weight. These criteria are chosen based on our discussed literatures above that we think meet the situation of KWPGBM. Hence, the general framework of AHP for Questionnaire 3 is in Figure 3.4:

In Figure 3.4, we specified the goal as *sustainability* of KWPGBM and the choices are between using their services for more than 10 years (*>10years*) or less than 10 years (*<10 years*). We classified the criteria to decide into two main criteria: *Loan Characteristics* and *Growth*. This is a simple model setting since our respondents were a group of women from rural area in Lombok with minimal education level. Under the loan characteristics, the group has to rank among *loan interest rate*, *loan size*, *loan procedure* and *loan duration*. Similarly under the growth of KWPGBM, the group has to rank which of the services of KWPGBM that they think are the most important to the very least importance. The elements of growth criteria are *deposit facilities*, *promotion or marketing of their products* and *co-op management*. Finally, with respect to each element in these two criteria, they have to decide whether to stay for more than 10 years or less than 10 years.

After we have constructed our AHP framework, we asked the respondents to complete Questionnaire 3 (Appendix 3) and use the scale specified in Appendix 1 as their guideline.

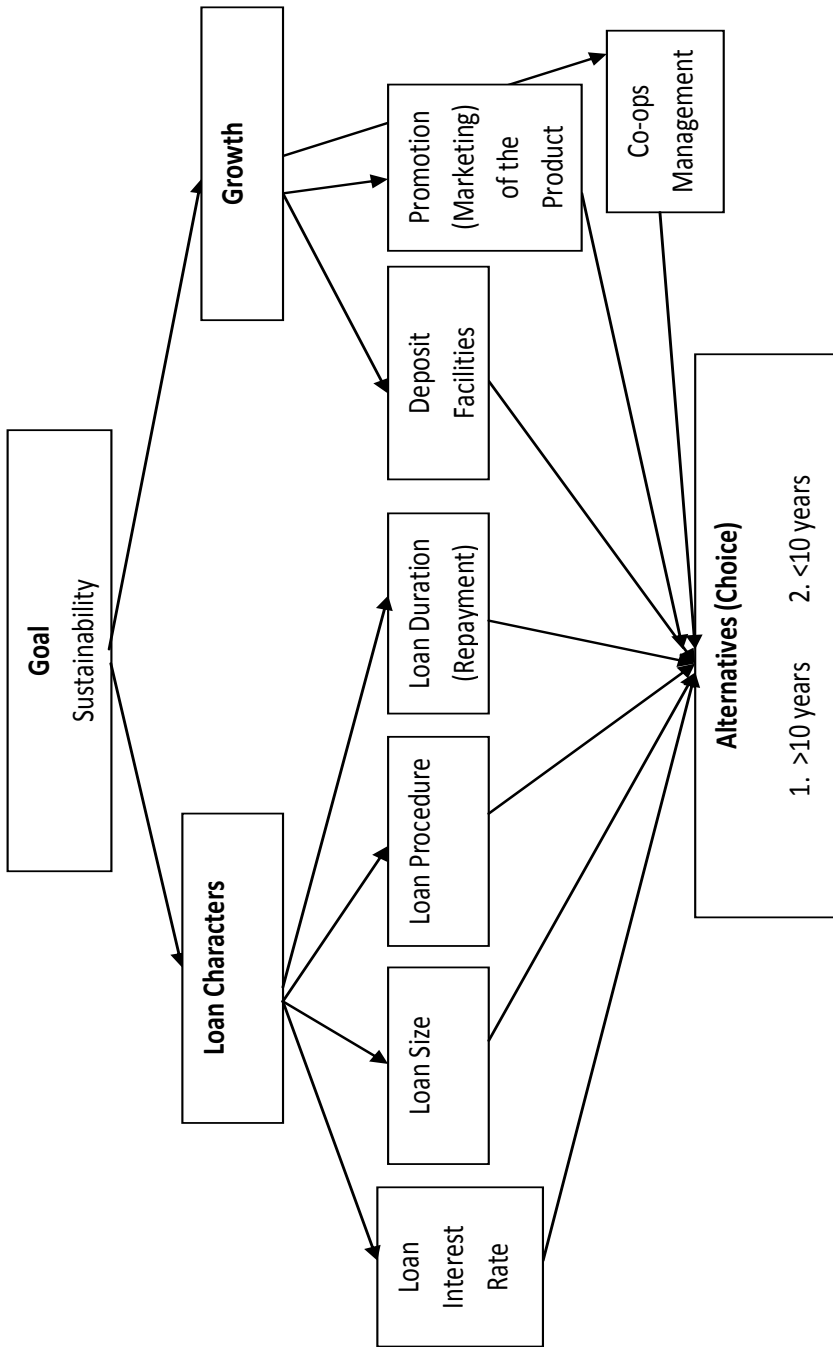
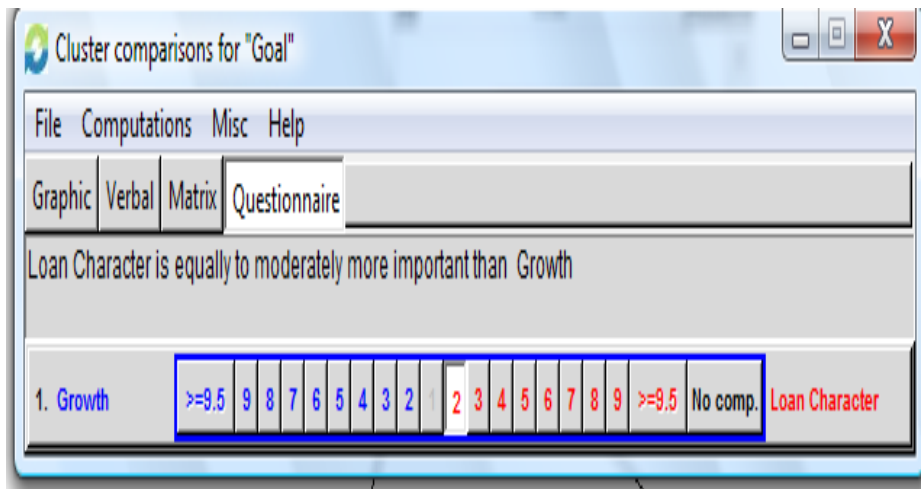


Figure 3.4: AHP framework for Questionnaire 3

The step by step process of AHP calculation is as follow:

- A. With respect to our goal of sustainability of KWPBGM, which is more important to you, loan characteristics or growth? Next, by how much it is important? The group choice is as follow:

Table 3.1: Loan Characteristics versus Growth



From this, we can see that the group chooses loan character to be more important than growth in determining the sustainability of KWPGBM. However, they rated it as moderately more important than growth.

Next, we will transform this into reciprocal matrix form as shown below.

Step 1:
Reciprocal Matrix

	Growth	Loan Character
Growth	1	1/2
Loan Character	2	1
Sum:	1 1/2	3

The importance of growth to growth and loan character to loan character is 1. However, the group has specified that loan character is more important than growth by 2. The matrix is symmetric; loan character is two times more important than growth implying that growth is $\frac{1}{2}$ times more important than loan character. Next, we sum across the columns.

In step 2 below, we will normalize each element with the column sum such that the sum across column is 1.

Step 2:		Growth	Loan Character
Normalized each element with the column sum	Growth	1/3	1/3
	Loan Character	2/3	2/3
	Sum:	1	1

Finally, we will average across the row and obtain the relative weight that the group has chosen. This weight is called the normalized principal eigen vector or priority vector as shown below.

Step 3:		
Average across the row. This is the normalized principal eigen vector or priority vector.	Growth	$(1/2)*(2/3) = 1/3^{62}$
	Loan Character	$(1/2)*(4/3) = 2/3$

B. Next, we will ask the group, with respect to growth of KWPGBM, what is their relative preference of the importance of deposit facilities, marketing or promotion of

⁶² These results are shown in Results for Questionnaire 3 below.

their product and co-op's management. The answers that the group has chosen are as follow:

Table 3.2: Comparison of Characteristics with respect to Sustainability node in Growth Cluster

Item 1	Item 2	Item 3	Item 4	Item 5	Item 6	Item 7	Item 8	Item 9	Item 10	Item 11	Item 12	Item 13	Item 14	Item 15	Item 16	Item 17	Item 18	Item 19	Item 20		
1. BMGL's Management	>=9.5	9	8	7	6	5	4	3	2	1	2	3	4	5	6	7	8	9	>=9.5	No comp.	Deposit Facilities
2. BMGL's Management	>=9.5	9	8	7	6	5	4	3	2	1	2	3	4	5	6	7	8	9	>=9.5	No comp.	Promotion or Marketing of the Pr-
3. Deposit Facilities	>=9.5	9	8	7	6	5	4	3	2	1	2	3	4	5	6	7	8	9	>=9.5	No comp.	Promotion or Marketing of the Pr-

From Table 3.2 above, we can see that the group thinks KWPGBM's *management is* four times more important than *deposit facilities* and six times more important than *promotion or marketing of their product* in determining the growth of KWPGBM. When comparing between *deposit facilities* and *promotion or marketing of their product*, the group thinks that deposit facilities are moderately important. We can see that the group put highest priority on the co-op's management in determining its growth for sustainability. Following Step 1 until Step 3 above, we have:

Step 1:		KWPGBM's	Deposit	Promotion
Reciprocal		Management	Facilities	/Marketing
Matrix				of Product
With				
respect to				
growth				
	KWPGBM's	1	4	6
	Management			
	Deposit Facilities	1/4	1	2
	Promotion/Marketing			
	of Product	1/6	1/2	1
	Sum:	1 3/7	5 1/2	9
				Promotion
				/Marketing
				of Product
Step 2:		KWPGBM's	Deposit	Promotion
Normalized		Management	Facilities	/Marketing
each element				of Product
with the column				
sum				
	KWPGBM's	12/17	8/11	2/3
	Management			
	Deposit Facilities	3/17	2/11	2/9
	Promotion/Marketing			
	of Product	2/17	1/11	1/9
	Sum:	1	1	1
Step 3:		KWPGBM's		
Average across the row.		Management	7/10	0.700
This is the normalized		Deposit Facilities	6/31	0.194
principal eigen vector or		Promotion/Marketing	5/47	0.107
priority vector.		Sum:	1	1

The final values that we have obtained above are the un-weighted values. If we were to take into account the priority between *growth* (0.333) and *loan character* (0.667) that we have done earlier, we would multiply each of this with 0.333 since these are choices in *growth* category. Here, we will take another step in calculating the consistency ratio. As mentioned, in AHP, it is very important that transitivity condition holds to ensure the consistency of the result. However, AHP allows for 10% level of inconsistency ratio and if it's above this, we

might need to ask the respondents to evaluate their preferences. In order to obtain the inconsistency ratio, we first need to calculate the inconsistency index. To do this, we have to calculate the principal eigen value and this is obtained from the product of normalized principal eigen vector and sum across column of reciprocal matrix.

$$\lambda_{\max} = (10/7)*(0.700) + (11/2)*(0.194) + (9)*(0.107) = 3.03$$

Prof. Saaty in his book⁶³ has proven that the largest eigen value is equals to the size of the reciprocal matrix in order to obtain a consistent reciprocal matrix, $\lambda_{\max} = n$. Next, we calculate the consistency index as a deviation using the following formula:

$$\text{Consistency Index} = (\lambda_{\max} - n) / (n-1) = (3.03 - 3) / (2) = 0.015$$

Then, we will compare this value with Random Consistency (RI) Index Table which is generated using sample size 500 matrices⁶⁴. The Random Consistency Index is considered as the most appropriate index for comparison to the consistency index that has been obtained.

The table is shown below:

Table 3.3: Random Consistency Index Table (RI)

n	1	2	3	4	5	6	7	8	9	10
RI	0	0	0.58	0.9	1.12	1.24	1.32	1.41	1.45	1.49

⁶³ Theory and Applications of the Analytic Network Process: Decision Making with Benefits, Opportunities, Costs, and Risks

⁶⁴ The table is given in Prof. Saaty's book.

Finally, we'll calculate the Consistency Ratio = Consistency Index / Random Consistency Index

= 0.015/0.58 = 0.0258 < 0.1 implying that the choices made by the group is consistent.

C. Similar to above, we will now ask the group on their preferences in *Loan Characteristics* category. Their rating is shown below in Table 3.4.

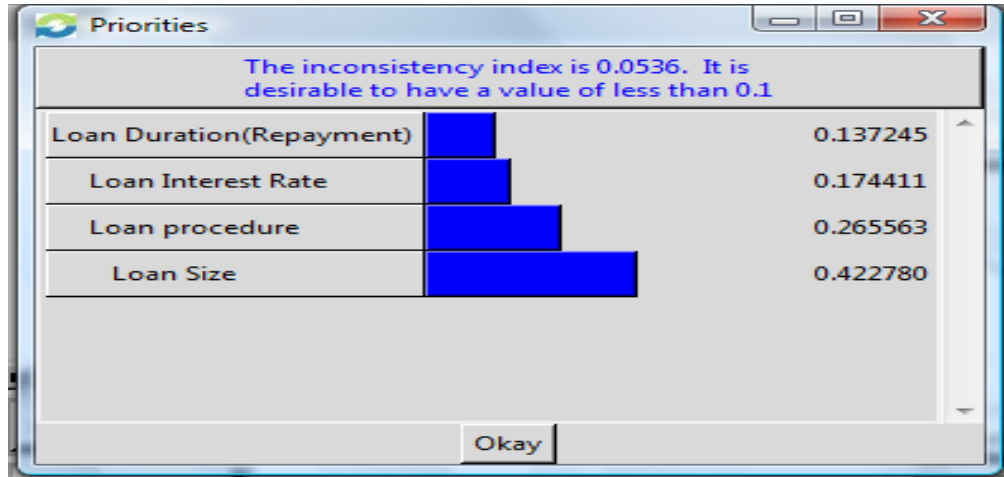
Table 3.4: Comparison with respect to Sustainability node in Loan Character Cluster

Comparisons wrt "Sustainability" node in "Loan Character" cluster													
File Computations Misc Help													
Graphic Verbal Matrix Questionnaire													
Comparisons wrt "Sustainability" node in "Loan Character" cluster													
Loan Interest Rate is equally to moderately more important than Loan Duration(Repayment)													
1. Loan Duration(Repayment)	>=9.5	9	8	7	6	5	4	3	2	2	3 4 5 6 7 8 9 >=9.5	No comp.	Loan Interest Rate
2. Loan Duration(Repayment)	>=9.5	9	8	7	6	5	4	3	2	2	3 4 5 6 7 8 9 >=9.5	No comp.	Loan procedure
3. Loan Duration(Repayment)	>=9.5	9	8	7	6	5	4	3	2	2	3 4 5 6 7 8 9 >=9.5	No comp.	Loan Size
4. Loan Interest Rate	>=9.5	9	8	7	6	5	4	3	2	2	3 4 5 6 7 8 9 >=9.5	No comp.	Loan procedure
5. Loan Interest Rate	>=9.5	9	8	7	6	5	4	3	2	2	3 4 5 6 7 8 9 >=9.5	No comp.	Loan Size
6. Loan procedure	>=9.5	9	8	7	6	5	4	3	2	2	3 4 5 6 7 8 9 >=9.5	No comp.	Loan Size

With respect to the group preference rating above, we can see that they don't have any strong preference of one over the other. The group most likely thinks that these are all important elements of the loan characteristics that they will equally to moderately emphasize in ensuring the sustainability of KWPGBM. The calculation on the priorities and consistency index as described earlier will be given out by AHP software below (Table 3.5). As we can see, the inconsistency index is 0.0536 < 0.1, which implies that the preferences are consistent.

Furthermore, from Table 3.4, we can conclude that under the *loan character* category, the group thinks that the most important is *loan size*, then *loan procedure*, *loan interest rate* and *loan duration*.

Table 3.5: Inconsistency Index with respect to Loan Characteristics



D. Next, we will ask the group to make pair wise comparison of their alternatives with respect to each criterion that we have mentioned. For instance, in *growth* category, we have *deposit facilities*, *KWPGBM's management* and *promotion or marketing of their product* while in loan characteristics category, we have *loan interest rate*, *loan size*, *loan procedure* and *loan duration*. For each element in each category, they will answer the following question, with respect to *deposit facilities*; will they use KWPGBM for less than 10 years or more than 10 years? The question impose is the same for all other elements. The calculation is the same as Step 1 to Step 3 described above.

The results are shown below:

- With respect to *KWPGBM's management* (Table 3.6): It shows that on a scale of five, the group will use KWPGBM for *more than 10 years* because of its *management*. In Table 3.7, it shows that our consistency index is satisfied and the priority vector is 0.8333 for more than 10 years and 0.16667 for less than 10 years

Table 3.6: Comparison with respect to KWBGGM's Management on its Sustainability

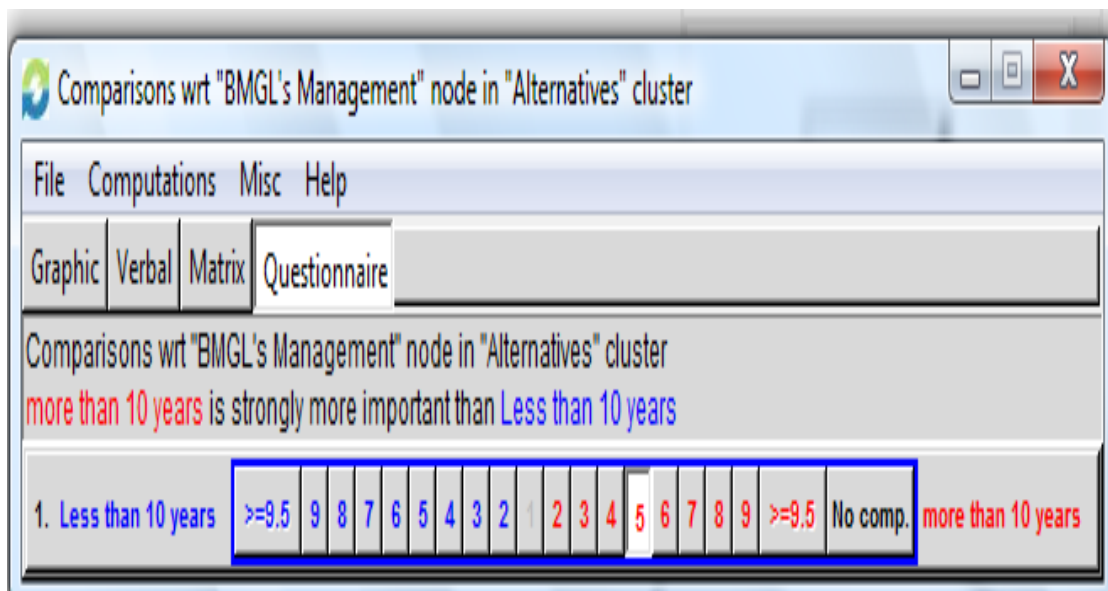
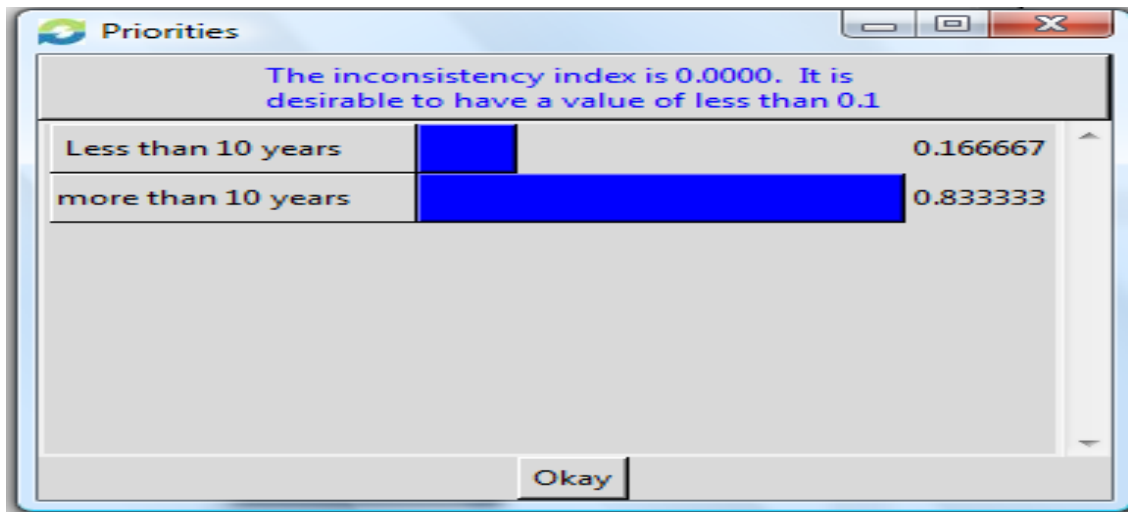


Table 3.7: Inconsistency Index with respect to KWPGBM’s Management



- With respect to *deposit facilities* (Table 3.8): It shows that on a scale of seven, the group will use KWPGBM for more than 10 years because of its *deposit facilities*. In Table 3.9, it shows that our consistency index is satisfied and the priority vector is 0.875 for more than 10 years and 0.125 for less than 10 years.

Table 3.8: Comparison with respect to KWPGM’s Deposit Facility on its Sustainability

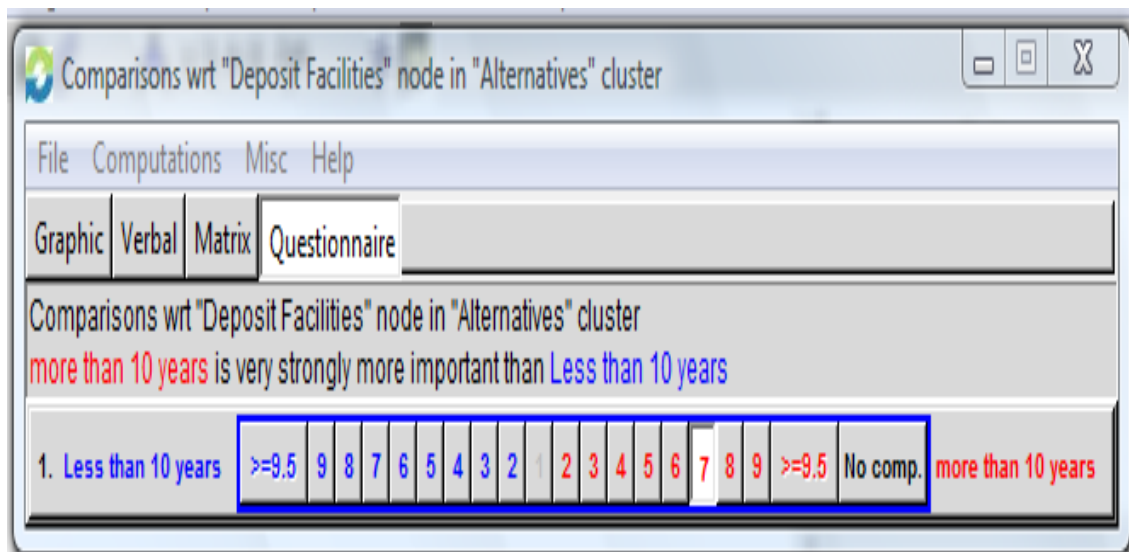
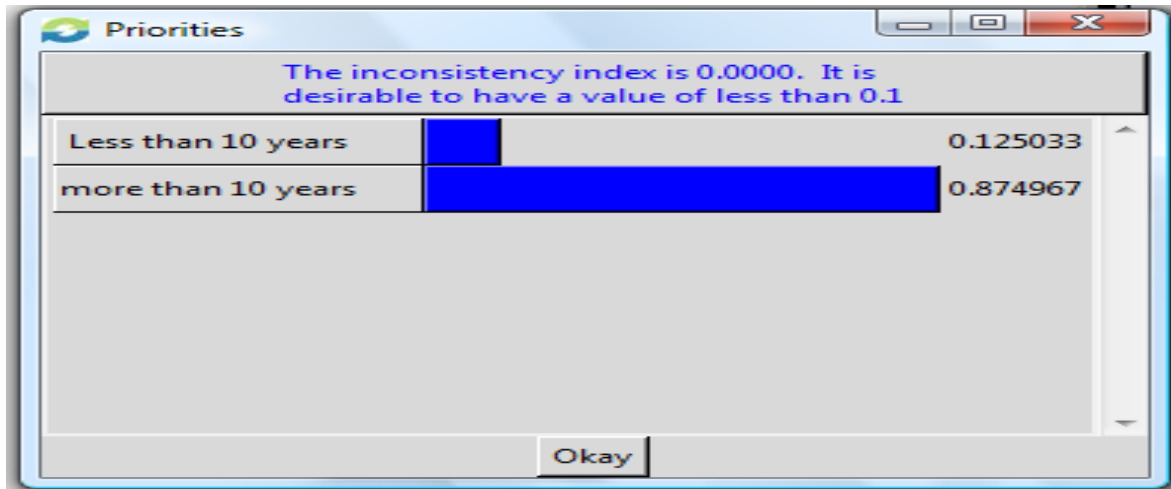


Table 3.9: Inconsistency Index with respect to KWPGBM's Management



- With respect to *promotion or marketing of the products* (Table 3.10): It shows that on a scale of two, the group will use KWPGBM for more than 10 years because of its services to *promote or market their products*. In Table 3.11, it shows that our consistency index is satisfied and the priority vector is 0.6667 for more than 10 years and 0.3333 for less than 10 years

Table 3.10: Comparison with respect to KWPGM's Marketing Facility on its Sustainability

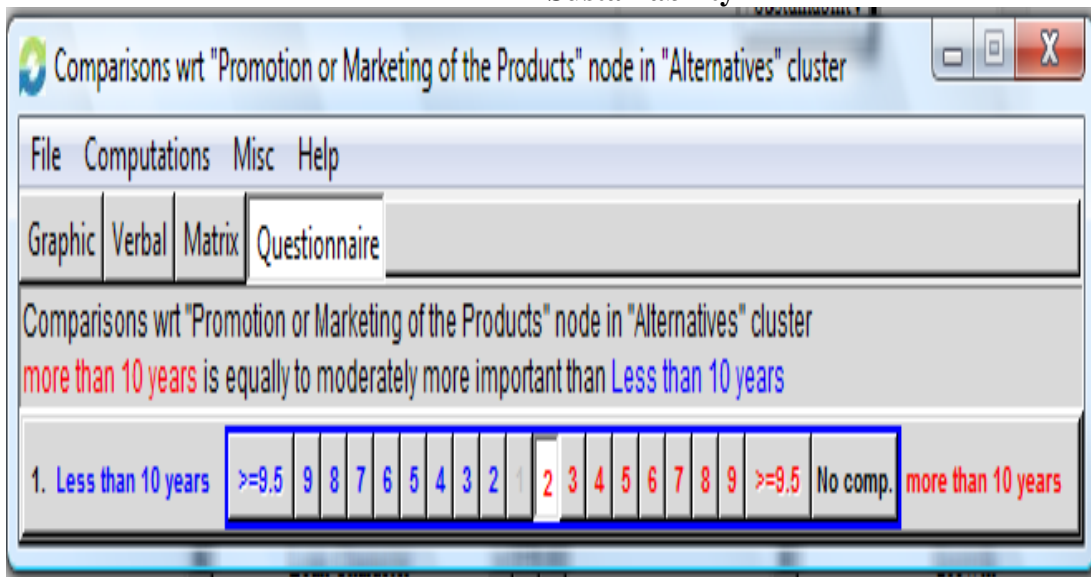
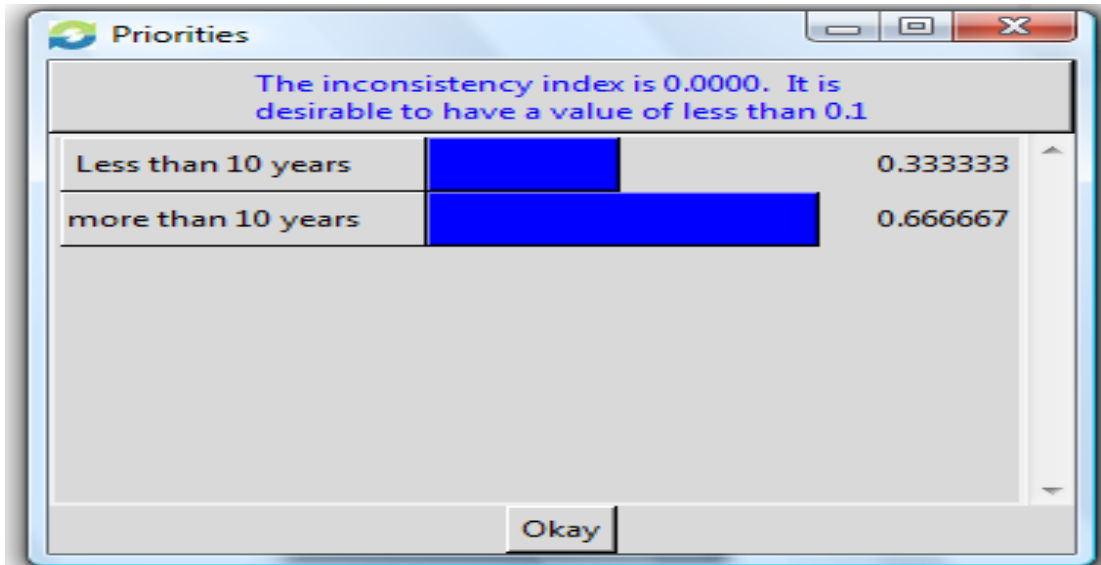


Table 3.11: Inconsistency Index with respect to KWPGBM's Marketing Facility



- With respect to *loan duration or repayment schedule* (Table 3.12): It shows that on a scale of seven, the group will use KWPGBM for more than 10 years because of its *loan duration*. In Table 3.13, it shows that our consistency index is satisfied and the priority vector is 0.875 for more than 10 years and 0.125 for less than 10 years.

Table 3.12: Comparison with respect to KWPGM's Loan Duration on its Sustainability

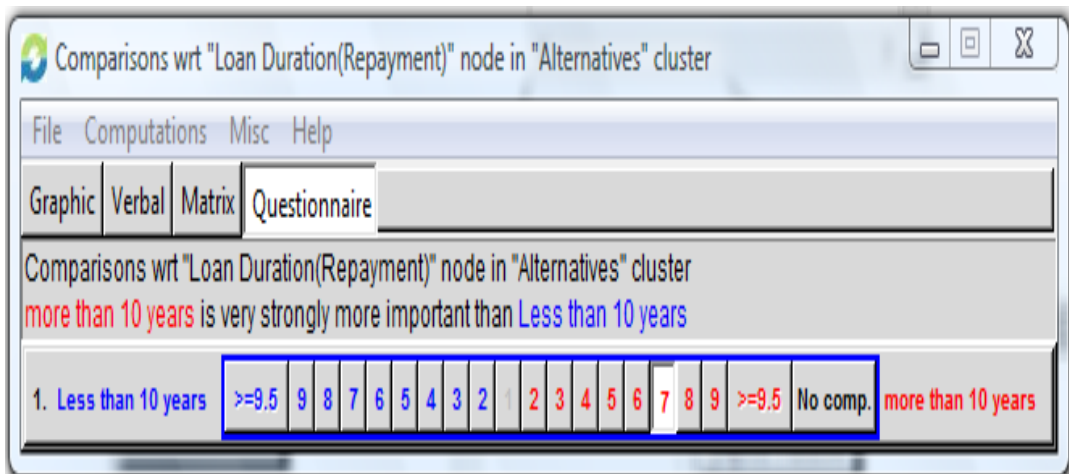
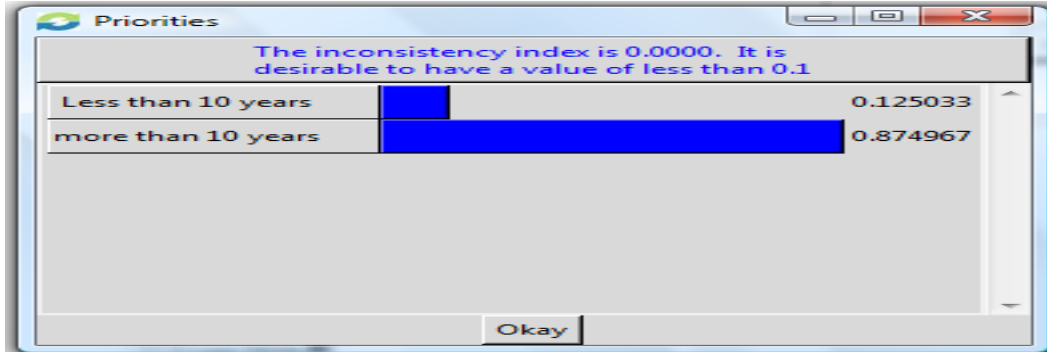


Table 3.13: Inconsistency Index with respect to KWPGBM's Loan Duration



- With respect to *loan interest rate* (Table 3.14): It shows that on a scale of four, the group will use KWPGBM for more than 10 years because of *interest rate* charged. In Table 3.15, it shows that our consistency index is satisfied and the priority vector is 0.8 for more than 10 years and 0.2 for less than 10 years

Table 3.14: Comparison with respect to KWPGM's Loan Interest Rate on its Sustainability

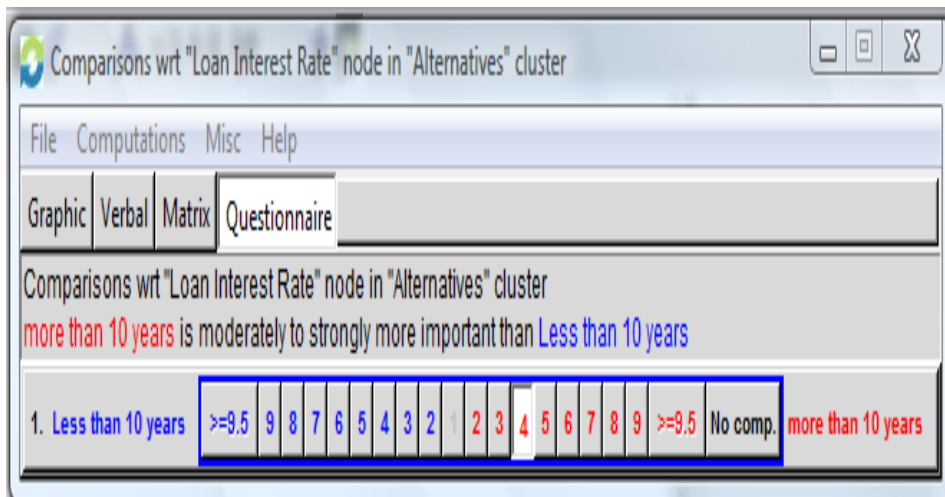
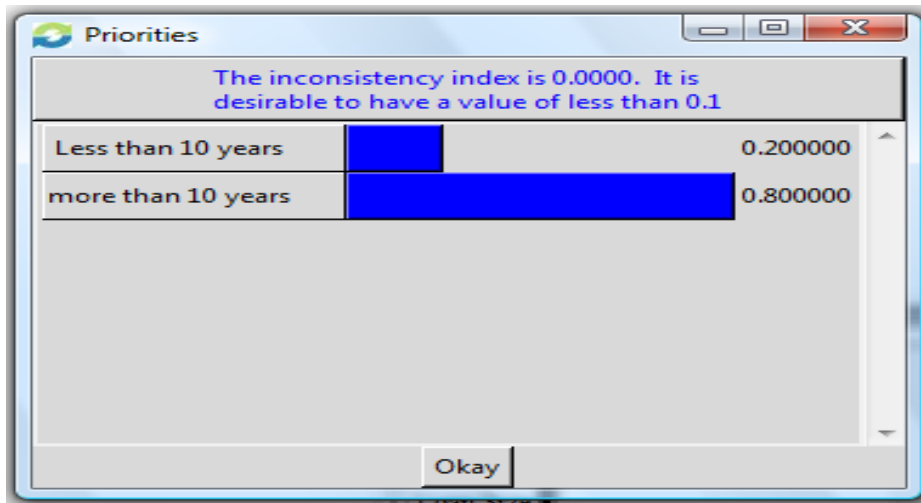


Table 3.15: Inconsistency Index with respect to KWPGBM's Loan Interest Rate



- With respect to *loan procedure* (Table 3.16): It shows that on a scale of six, the group will use KWPGBM for more than 10 years because of its *loan procedure*. In Table 3.17, it shows that our consistency index is satisfied and the priority vector is 0.8571 for more than 10 years and 0.1429 for less than 10 years

Table 3.16: Comparison with respect to KWPGM's Loan Procedure on its Sustainability

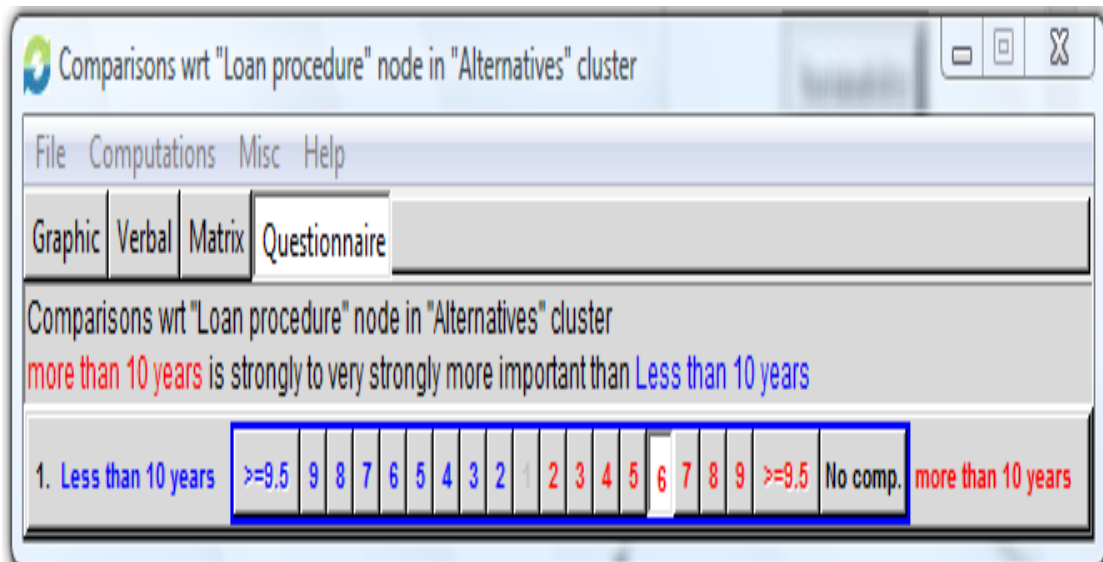
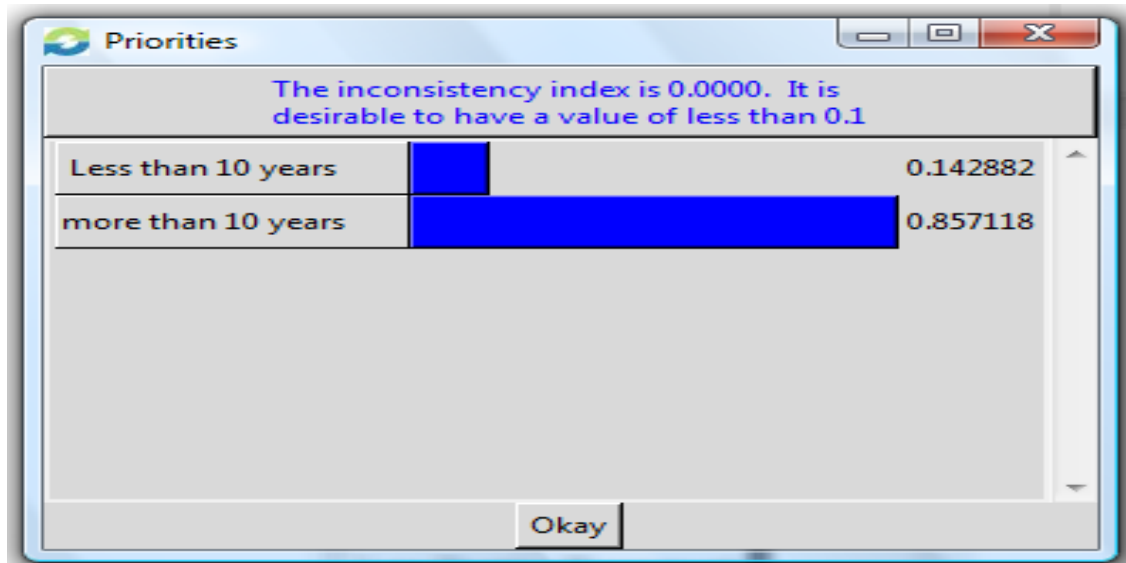


Table 3.17: Inconsistency Index with respect to KWPGBM's Loan Procedure



- With respect to *loan size* (Table 3.18): It shows that on a scale of six, the group will use KWPGBM for more than 10 years because of the *loan size*. In Table 3.19, it shows that our consistency index is satisfied and the priority vector is 0.8571 for more than 10 years and 0.1429 for less than 10 years

Table 3.18: Comparison with respect to KWPGM's Loan Size on its Sustainability

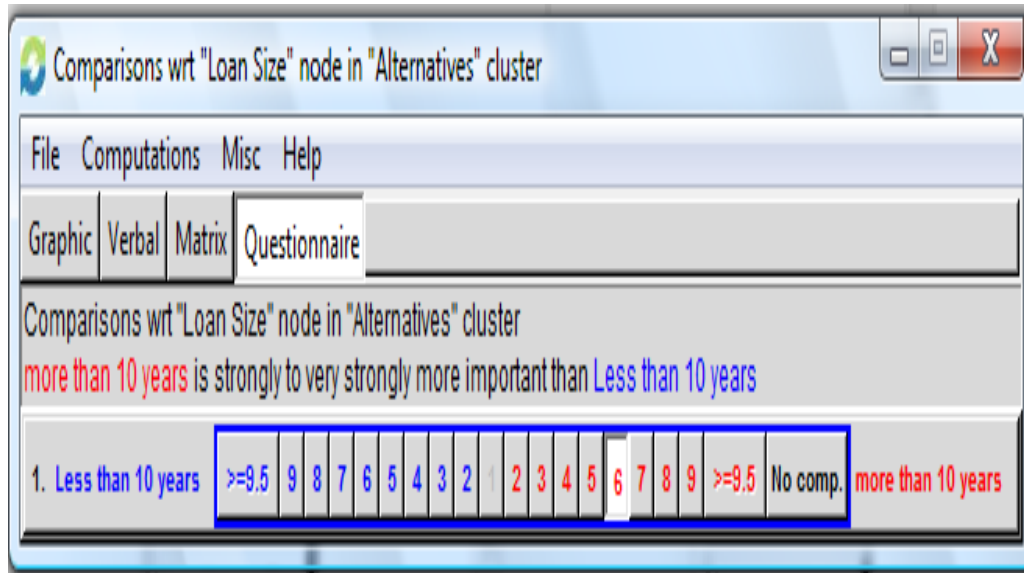
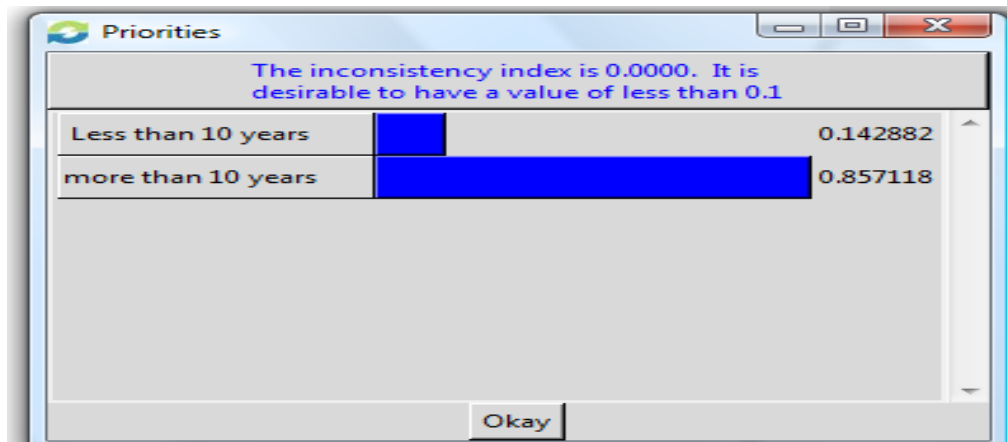


Table 3.19: Inconsistency Index with respect to KWPGM's Loan Size



E. Finally, we will calculate the overall ranking of our alternatives, *less than 10 years* or *more than 10 years* for the sustainability of KWPGM. That is taken into account the weight for each category, *growth* and *loan characteristics* along with the weight for each element in the category, we obtained the final rating.

	Loan Characteristics = 0.667				Growth = 0.3333		
Priority Vector	Loan Interest Rate	Loan Size	Loan Procedure	Loan Duration	Deposit Facilities	Promotion of Product	Co-op's management
< 10 Years	0.174	0.423	0.266	0.137	0.193	0.106	0.701
> 10 Years	0.2	0.143	0.147	0.125	0.125	0.333	0.167
	0.8	0.857	0.857	0.875	0.875	0.667	0.833

Final Rating:

$$\begin{aligned} < 10 \text{ Years} = & 0.667*(0.174*0.2+0.423*0.143+0.266*0.147+0.137*0.125) \\ & + 0.333*(0.193*0.125+0.106*0.333+0.701*0.167) = \mathbf{0.159} \end{aligned}$$

$$\begin{aligned} > 10 \text{ Years} = & 0.667*(0.174*0.8+0.423*0.857+0.266*0.857+0.137*0.875) \\ & + 0.333*(0.193*0.875+0.106*0.667+0.701*0.833) = \mathbf{0.841} \end{aligned}$$

3.2. Analytical Hierarchy Process (AHP) in KWPGBM Framework:

There are two hypotheses that I am testing in this framework::

1. KWPGBM provides positive net impact to its borrowers
2. KWPGBM is a sustainable institution in the long run

Firstly, fifteen borrowers of KWPGBM were given three set of questionnaires and were asked to make pair wise comparison using a relative scale from 1 to 9 (Appendix 1). To ease their understanding in completing the questionnaires, we asked them to keep in mind these two questions when they answer each of the survey questions: 1) Which is more important, A or B and 2) By how much it is more important? Based on their judgment, experiences and how they feel, they would rank one over the other.

Next, in testing the hypothesis that KWPGBM has improved the well-being of its borrowers, we gave the respondents two sets of questionnaires (Appendix 2 and Appendix 3). The first set of questionnaires (Questionnaire 1) allowed them to rank the benefits and positive impact of KWPGBM on themselves, their family and environment while the second set of questionnaires (Questionnaire 2) focused on the costs and negative impact of KWPGBM that could potentially arise from either themselves or KWPGBM itself. From these two set of questionnaires, we will apply the benefit cost ratio to analyze the net impact of KWPGM on their borrowers.

The questionnaires were designed as simple as possible with only main choices or factors that in our opinion affect these borrowers. This is important in order to obtain a consistent result and to ease the understanding of the respondents. After they have completed these questionnaires, there are two approaches that we can precede. First approach is to calculate the geometric mean from the group evaluation for each question and use this geometric mean as the representative of the group preferences and input this geometric mean in AHP pair wise comparison matrix. The second approach is to input individual's preferences in AHP pair wise comparison matrix and calculate the geometric mean from each individual priority vectors. In this framework, we will use the first approach.

After we have inputted the group's geometric mean in AHP pair wise comparison matrix, the results will then show the priority vectors for their preferences and the inconsistency index. Figure 3.5 showed the group ranking in terms of the *positive impact* of KWPGBM while Figure 3.6 showed the group ranking in terms of the *negative impact* of KWPGBM. Finally,

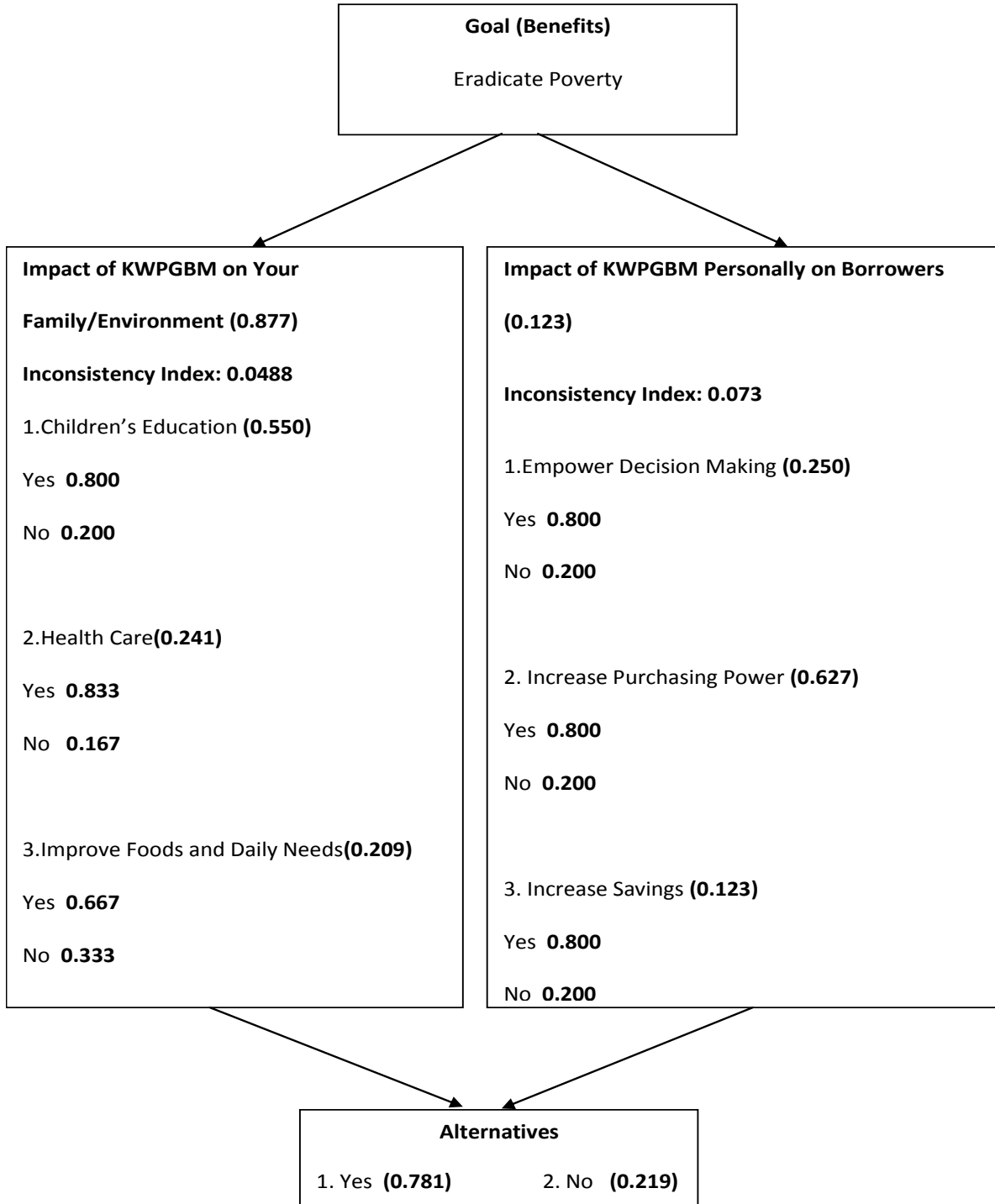
in order to calculate the net impact of KWPGBM, we will apply the Benefits/Costs ratio analysis.

Next, in testing the second hypothesis that KWPGBM is a *sustainable institution*, the same group of respondents was given another set of questionnaires (Appendix 4) that focus on borrowers' opinion of KWPGBM future growth. The benchmark used is 10 years and KWPGBM is considered as a sustainable institution if its borrowers choose to use its services for *more than 10 years* (long run) and is not sustainable if its borrowers choose its services for *less than 10 years* (short run). The results are shown in Figure 3.7.

4. Results and Analysis

4.1. Results for Hypothesis 1: KWPGBM improves the wellbeing of its borrowers

Figure 3.5: The Positive Impact and Benefits of KWPGBM on its Borrowers (Questionnaire 1)



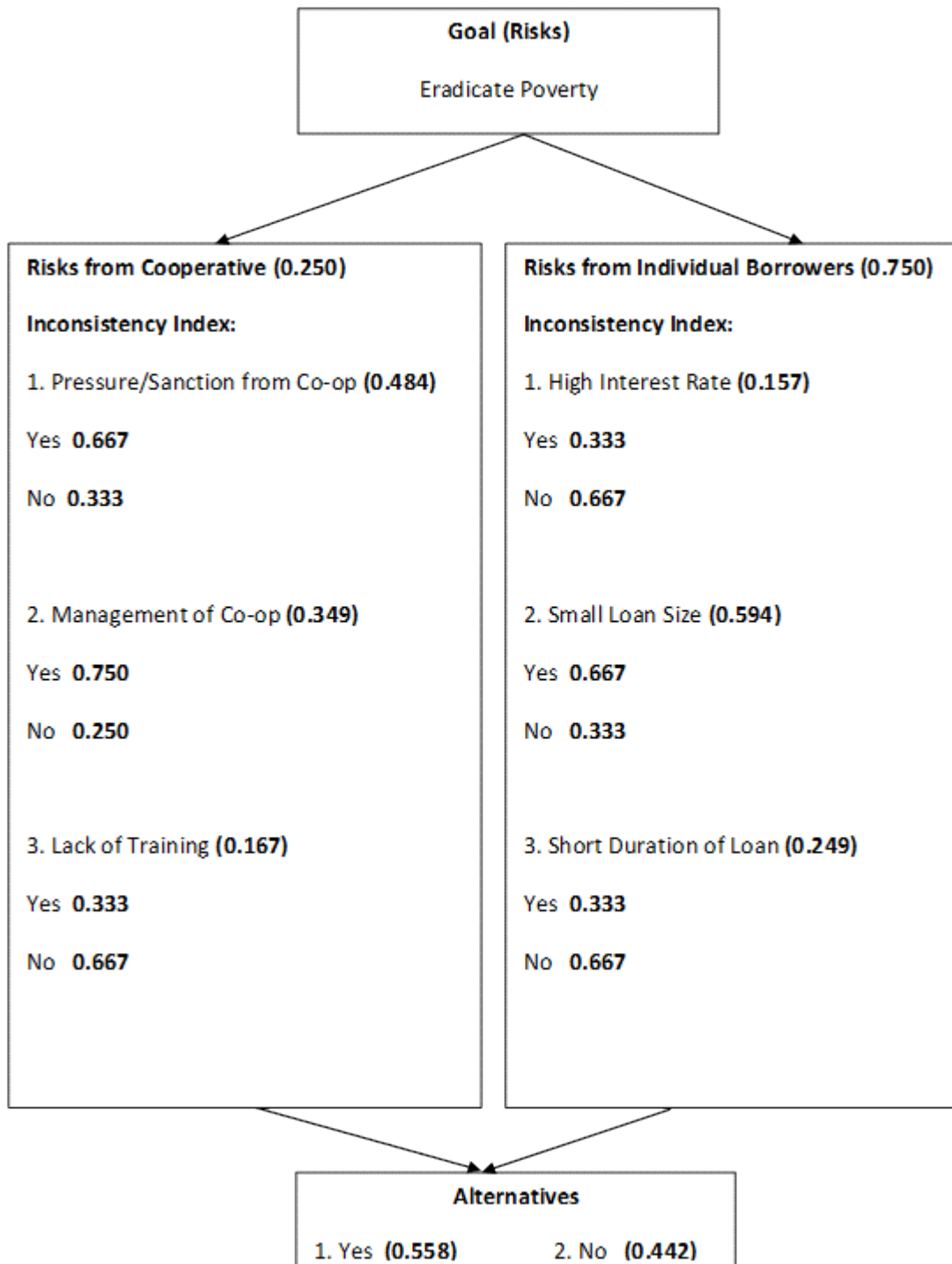
The objective of the first set of questionnaire was to evaluate the borrowers' perspectives of the positive impact (benefits) of KWPGBM on their family/environment and on themselves individually. Figure 3.5 showed the AHP results for Questionnaire 1. We have classified the positive impact of KWPGBM on its borrowers into two categories: Firstly, the *benefits on their family/environment* and secondly the *benefits on them personally*. In the first category that was the *benefits on their family and environment*, we have narrowed down the choices to three: *children's education*, *health care* and *improvement of food consumption and daily needs*. On the other hand, in the second category, that was the *benefits to the borrowers themselves*, we have listed the main choices as *empowering the borrowers' decision making*, *increasing her purchasing power* and *increasing her savings*. From the results, we can conclude that the impact to the *borrowers' family/environment* (0.877) is more important than the impact to *themselves* (0.123).

In the first category, the borrowers ranked the *children's education* as their top priority (0.555) followed by *health care* (0.241) and *consumption of daily food and needs* (0.209). In addition to these, the borrowers agree (*yes*) that the loans and services obtained from KWPGBM have helped them in improving their social welfare in these three factors: *children's education*, *health care* and *consumption of daily food and needs*. This was supported with results from other MFIs that children's education has always been top priority for borrowers. In the case of KWPGBM, it is possible that consumption of daily food and needs is the least important because Lombok itself is an agricultural area and some of these borrowers produce their own vegetables and raise poultry. In the second category, *increasing the purchasing power* (0.627) was the most important factor to these borrowers followed by *empowerment of decision making* (0.250) and *increasing saving* (0.123). From these choices,

we can conclude that increasing purchasing power was the most important factor for their clients since this usually would boost one's confidence and status in society. *Increasing saving* through KWPGBM is not the most important factor perhaps because they already have obligatory savings with KWPGBM that they have to make on weekly basis and the extra income is usually converted into assets like buying a house or a motorcycle, spending on children's education and etc. Similarly as in the first category, the borrowers strongly agree (*yes*) that they have made significant improvement in each of this factor through the opportunity of obtaining loans and services from KWPGBM. Since KWPGBM, is the only MFI available within the district, these long time borrowers depend heavily in obtaining loans from them.

The inconsistency index for each category is less than 0.1, indicating that overall the transitivity condition is satisfying. The final ranking shows that the borrowers agree that KWPGBM do provide positive impact to themselves and their family or environment. In their judgment, the positive impact is four times ($0.781/0.219 = 3.56 \sim 4$) more than the non-positive impact.

Figure 3.6: The Negative Impact and Costs of KWPGBM on its Borrowers (Questionnaire 2)



The objective of Questionnaire 2 was to evaluate the negative impact (costs) of KWPGBM's loans and services to its borrowers that could arise either from the *institution itself* or from the *individual borrower*. The risks under the first category that is *institution itself* include *pressure or sanction from the cooperative, management of co-op* and *lack of training from co-op*. In our point of view, these are among the most common factors that could potentially affect the borrowers negatively as we have discussed in the literature review section. For instance, *management of co-op* refers to *lack of efficient management* by the co-op such as longer duration to process a loan, lack of technology to access the borrowers' repayment history, etc. could eventually lead to a decline in the number of customers and could increase the likelihood of bankruptcy to such co-op. Aside from this factor, *lack of training* especially to new borrowers could potentially lead to mismanagement of money and increase the default rate. Hence, we asked the borrowers of KWPGBM to consider whether they have obtained sufficient amount of training from the co-op to manage their money and businesses. One last factor in this category that Armendariz and Morduch (2005) have argued is *pressure or sanction from co-op* that can be seen as imposing negative reactions to borrowers who might be late in making their payment. The sanction by the co-op can lead to social sanction and isolation from other group members in the village which could potentially cause the late-payment borrowers to migrate elsewhere in order to avoid the humiliation and embarrassment.

In the second category that is the risks that could potentially arise from the *individual borrower* herself include *high interest rate, small size of loan* and *short duration of loan*. These factors are determined by the co-op and the borrowers have to accept them. However, it is possible that these factors are too stringent that could lead to borrowers defaulting on their loan. For example, if the *interest rate charged is high*, then some borrowers who hardly make

enough income or have seasonal income can be in deeper debt situation. Since the interest charged will be accumulated over time if they are unable to meet their loan payment as scheduled, then this could potentially lead to borrowers defaulting on their debt. Another factor that is, *small size of loan* could be attributed to a situation when borrowers find themselves unable to expand their businesses due to lack of business capital. Consequently, this could lead the current customers to shift to other MFIs that could offer them greater amount of loan. The last factor that we consider could be risky is *short duration of loan* in which the borrowers are unable to meet their scheduled payment in time and hence might shift to different MFIs or defaulting on their loans.

From the result in Figure 3.6, we could see that the respondents believe that the *risks from individual borrower* are three times more important than the *risks from co-operative* itself. Under this category of *risks from individual borrowers*, the most important factor is the *size of the loan that is small* (0.594), followed by the *short duration of loan* (0.249) and the *high interest rate* charged (0.157). These independent risk factors could influence the borrowers to act negatively such as defaulting on their loans, late in meeting their payment schedule, shifting to different type of money lender, etc. However, out of these three elements, both *short duration* and *high interest rate* are considered not big risk factors to them. Their answer of *no* to these factors is 0.667. On the other hand, they think that *small size of loan* is a very big risk, 0.667 for *yes* and 0.333 for *no*. This could be the fact that interest rate charged is about the same as the market rate and that for entrepreneurs, the immediate need of sizeable loans are more important for them in order to roll over their businesses.

In the second category of *risks from co-operative* itself, the respondents think that *pressure or sanction from co-op* (0.484) and *management of co-op* (0.349) are the biggest risks that will create negative impact on them. They believe the *lack of training* from KWPGBM to be the very least threat. This supports the argument by Montgomery that *penalty from co-op* that could lead to social sanction from other group members is the biggest concern for KWPGBM clients. In addition, they don't think that they need further training from KWPGBM in managing their businesses since they have been operating them for many years. The *management* of KWPGBM is their second main concern as they vote for trustworthy management board yearly.

Overall, the respondents do agree that there are some factors within KWPGBM that create negative impact on them by 0.558 for *yes* and 0.442 for *no*. Since in the first questionnaires, we have asked the respondents about the positive impact of KWPGBM and in the second questionnaires we are looking at the respondents' view of the negative impact of KWPGBM, we will now determine the net impact of KWPGBM on its borrowers. The method proposed in AHP methodology is to calculate the benefits and costs ratio to conclude which is the most dominant impact.

Results= Benefits/ Costs

Yes: $0.781/0.558 = 1.4$ (Normalized value: 0.74)

No: $0.219/0.442 = 0.5$ (Normalized value: 0.26)

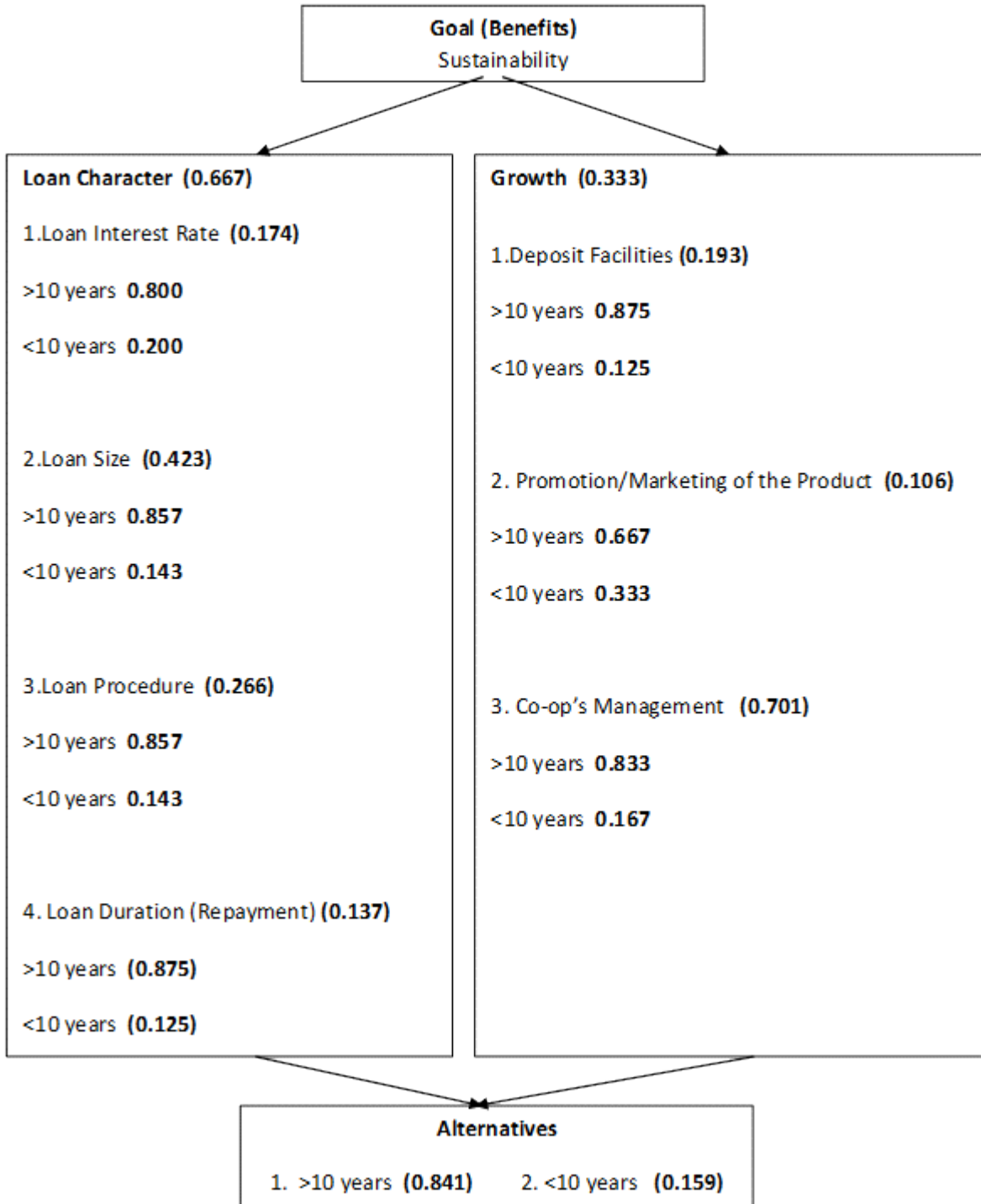
From the calculation above, we can conclude that by comparing these two questionnaires, the group still believes that KWPGBM provides positive impact to themselves and their

environment or family three times more important than the negative impact it creates. This answers our first hypothesis that KWPGBM improves the wellbeing of its borrowers.

Next, in testing our second hypothesis that KWPGBM will be a *sustainable institution* in the long run, we will use Questionnaire 3 in Appendix 4. In determining its *sustainability*, we have used two main factors: *loan characteristics* and *growth*. For *loan characteristics*, the elements listed are *loan interest rate, loan size, loan duration* and *loan procedure* while for *growth*, we have *deposit facilities, promotion or marketing of their product* and *co-op's management*. From our opinion and the literatures discussed above, the loan characteristics would determine if the borrowers will be loyal to KWPGBM and remain to use their services in the long run. Similarly, the growth of KWPGBM in terms of mobilizing savings through *deposit facilities, helping in marketing of the clients' products* and *the efficiency of its management* will determine whether KWPGBM is a sustainable institution in the long run. The benchmark for duration of sustainability that we've used is 10 years and we consider KWPGBM is a sustainable institution if the borrowers would want to use its services for more than 10 years and vice versa. The result is shown in Figure 3.7 below:

4.2. Results for hypothesis 2: KWPGBM is a sustainable institution in the long run

Figure 3.7: The Sustainability of KWPGBM in the Long Run (Questionnaire 3)



In comparing between the *loan characteristics* and the *growth* as determining factors for sustainability, the group thinks that the *loan characteristics* (0.666) is twice more important than *growth* (0.333). In the *loan characteristics* category, the most important element is *loan size* (0.423), followed by *loan procedure* (0.266), *loan interest rate* (0.174) and finally *loan duration* (0.137). Moreover, with each of these factors, the group will still use the services from KWPGBM for *more than 10 years*. In the *growth* category, the ranking is as follow: *Co-op's management* (0.701), *deposit facilities* (0.193) and finally *promotion or marketing of clients' products* (0.106). The group puts very much emphasize on the *co-ops' management* for sustainability and the *promotion of the products* is the least important because not all borrowers rely solely on KWPGBM services to market their products. Similarly, in this category, the group will still use KWPGBM services for *more than 10 years* for each factor.

Overall, the respondents will use KWPGBM's services for *more than 10 years* (0.841) as compared to *less than 10 years* (0.159) which shows that KWPGBM is a sustainable institution in the long run from its borrowers' point of view. As discussed earlier, *loan size* is still the factor that matters most to KWPGBM clients. In terms of *growth*, they feel that the co-op's management is the most important factor in ensuring the *sustainability* of KWPGBM.

4.3. KWPGBM should not Grow or Outreach under Certain Circumstances due to Possibility of Failures

We will show using simple optimization method⁶⁵ that an independent small scale microfinance institution such as KWPGBM should maintain small number of borrowers than to increase it by extending its membership to borrowers from outside villages in order for it to be more sustainable. We are not determining the optimal size of group since this varies depending on the structural organization of each MFI: Garmeen Bank and BancoSol each requires five members per group while KSBW requires a minimum of 11 members up to a maximum of 25 members per group and KGPWBM has its groups ranging from seven to eleven members. Furthermore, a lot of studies have discussed on the optimal group size which to the author's knowledge have shown different results.

KWPGBM can grow in terms of its members through:

- 1) admitting new groups into its institution
- 2) the existing group admitting new members.

Here, we will prove theoretically for Case 2 and the proof still applies for Case 1:

Let $Vg = \text{Value to the group}$

$Vi = \text{Value to individual } i, \text{ for } i = 1, 2, 3 \dots$

$N = \text{Number of borrowers in a group}$

$L = \text{Total loan amount}$

$Fi = \text{Fraction of the value to the group that individual } i \text{ will get, } i = 1, 2, 3 \dots N$

$C = \text{Total cost to the group}$

⁶⁵ The set-up of our optimization problem is inspired by Mancur Olson (1965) approach in public goods and theory of groups.

$A_i = \text{Net value to individual } i, \text{ for } i = 1, 2, 3 \dots N$

$$V_g = V(N, L)$$

$$V_i = F_i V_g$$

$$C = C(N, L)$$

Assumptions:

1. $V(N, L) > 0$ for $N > 0$ and $L > 0$
2. $V(N, L)$ is linear in N
3. $V(0, L) = 0$ for $N = 0$
4. $C(N, L) > 0$ for $N > 0$ and $L > 0$
5. $C(N, L) = 0$ for $N = 0$
6. $C(N, L)$ can be a concave function, $\frac{\partial^2 y}{\partial x^2} \leq 0$ or a convex function, $\frac{\partial^2 y}{\partial x^2} \geq 0$

$$\text{Max}_{N \in \mathbb{R}^+} A_i = V_i - C \text{ such that}$$

$$V_i = F_i V_g = F_i V(N, L)$$

$$C = C(N, L)$$

$$N = \text{argmax } A_i = F_i V(N, L) - C(N, L)$$

The first order condition for this maximization problem is:

$$\frac{\partial A_i}{\partial N} = F_i \frac{\partial V(N, L)}{\partial N} - \frac{\partial C(N, L)}{\partial N}$$

The marginal net value to individual i , $\frac{\partial A_i}{\partial N}$ can be negative under these different scenarios:

Scenario 1:

$$F_i \frac{\partial V(N, L)}{\partial N} > 0$$

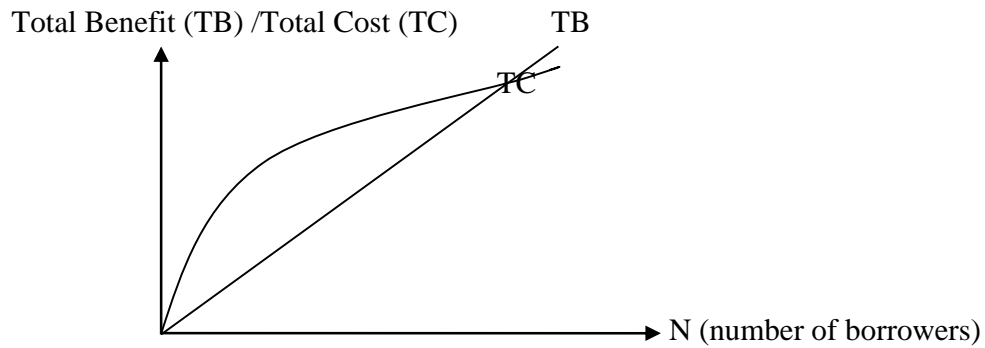
$$\frac{\partial C(N, L)}{\partial N} > 0$$

$$\frac{\partial^2 C(N, L)}{\partial N^2} \leq 0$$

$$\text{but } F_i \frac{\partial V(N, L)}{\partial N} - \frac{\partial C(N, L)}{\partial N} < 0 \text{ implying}$$

$$\frac{\partial Ai}{\partial N} < 0 \text{ in other words marginal benefit}$$

for individual i in accepting new member is less than its marginal cost for accepting new member.



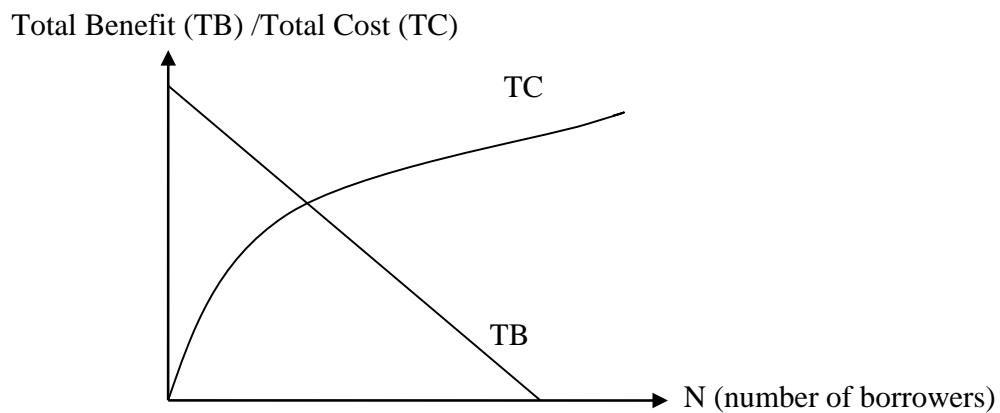
Scenario 2:

$$Fi \frac{\partial V(N, L)}{\partial N} < 0$$

$$\frac{\partial C(N, L)}{\partial N} > 0$$

$$\frac{\partial^2 C(N, L)}{\partial N^2} \leq 0$$

$$\text{but } Fi \frac{\partial V(N, L)}{\partial N} - \frac{\partial C(N, L)}{\partial N} < 0 \text{ implying } \frac{\partial Ai}{\partial N} < 0$$



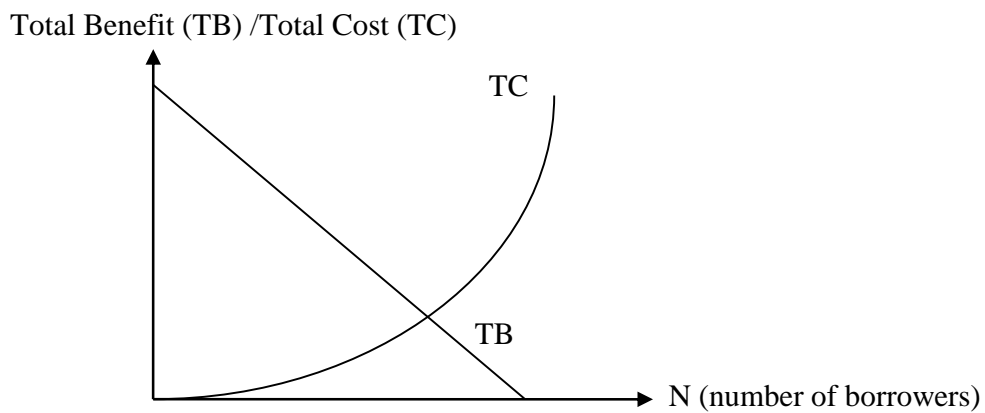
Scenario 3:

$$Fi \frac{\partial V(N, L)}{\partial N} < 0$$

$$\frac{\partial C(N, L)}{\partial N} > 0$$

$$\frac{\partial^2 C(N, L)}{\partial N^2} \geq 0$$

$$\text{but } Fi \frac{\partial V(N, L)}{\partial N} - \frac{\partial C(N, L)}{\partial N} < 0 \text{ implying } \frac{\partial Ai}{\partial N} < 0$$



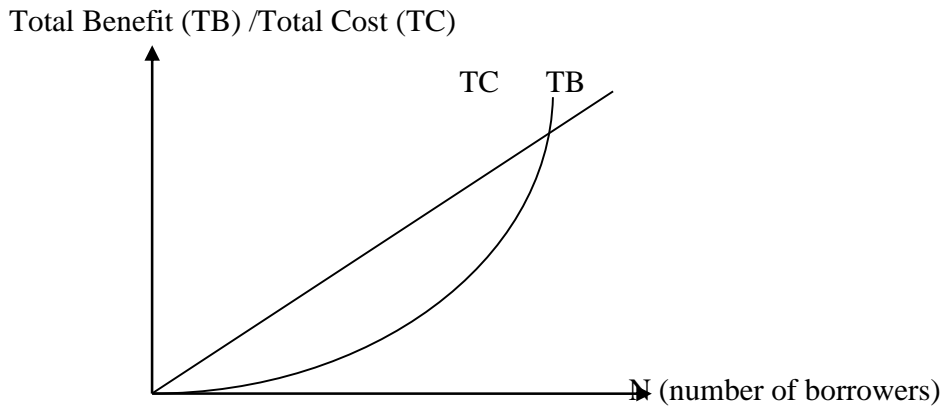
Scenario 4:

$$Fi \frac{\partial V(N, L)}{\partial N} > 0$$

$$\frac{\partial C(N, L)}{\partial N} > 0$$

$$\frac{\partial^2 C(N, L)}{\partial N^2} \geq 0$$

$$\text{but } Fi \frac{\partial V(N, L)}{\partial N} - \frac{\partial C(N, L)}{\partial N} < 0 \text{ implying } \frac{\partial Ai}{\partial N} < 0$$



From this proof that we have shown, we will use the data collected from KWPGBM's borrowers and its balance sheet in determining whether the total costs will exceed the total benefits as the number of borrowers increases. The data that we've used were from Questionnaire 2 and Questionnaire 3 where we compared the benefits and the costs of KWPGBM to its borrowers. Our first approach here was to directly plot the graphs of the accumulated benefits and the accumulated costs as the number of borrowers in a group increases. In Figure 3.8, we can conclude that from the borrowers' perspectives, the benefits will continue to out weight the costs as more and more members join in the group. This is not surprising given the fact that we are using the information that come from KWPGBM members who do not have an alternative to other sources of funding. In

order to eliminate this biasness, our second approach was to use their balance sheet to access the financial strength of this institution. The financial ratios used are in Appendix 6 and acting as an external evaluator, we will incorporate these financial ratios to our AHP costs structure developed earlier (Appendix 9). Similarly, we did the pairwise comparison except that the risks now not only coming from the individual borrower and the cooperative itself but could arise from liquidity ratios, solvency ratios and profitability ratios. We repeated our comparison selection in AHP three times using ratios from 2006 to 2008 and our results in Figure 3.9 showed that the benefits/costs ratio was declining as the number of borrowers increased over these three year period.

Hence, we conclude that although the borrowers feel the benefits of more new members joining in would out weight the costs, we found otherwise when the AHP costs/benefits structure incorporated the financial ratios that were calculated from KWPGBM's balance sheet.

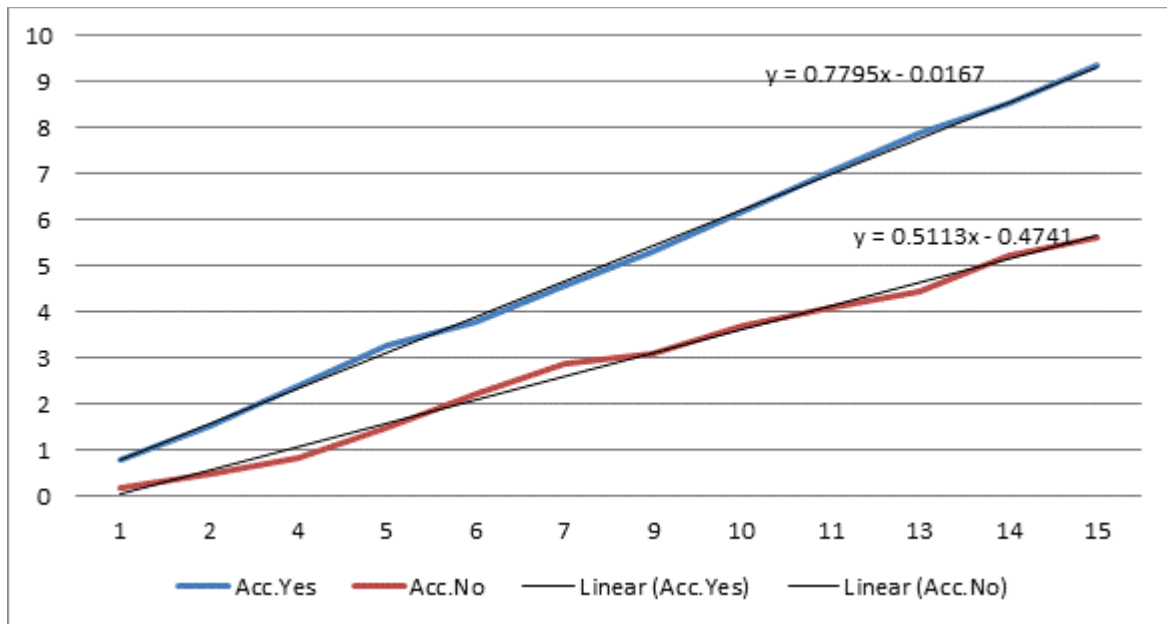


Figure 3.8: The Benefits and the Costs across the Number of Borrowers in a Group

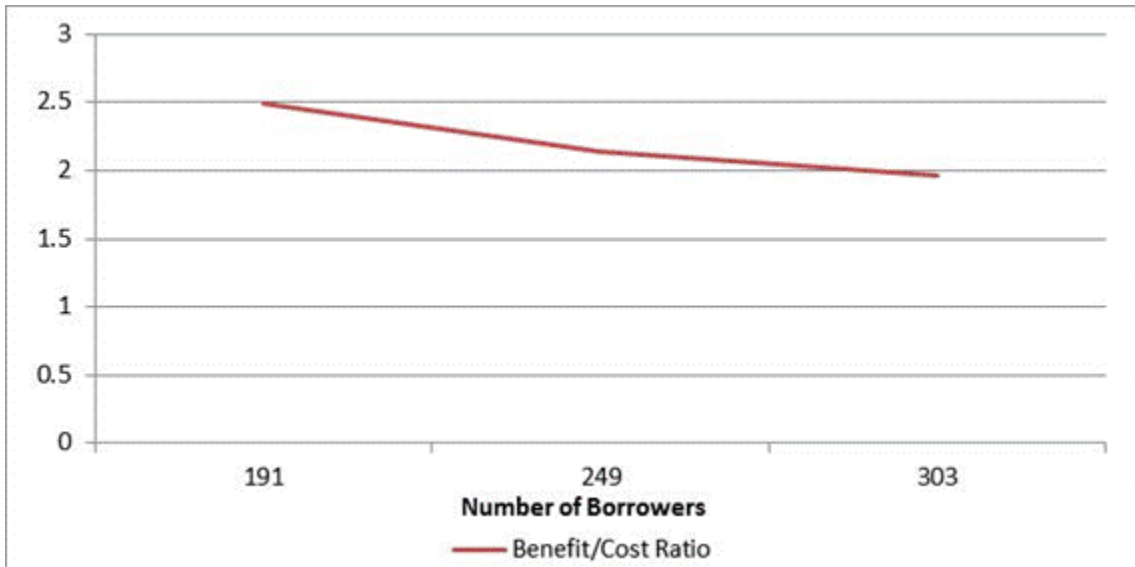


Figure 3.9: The Benefits Cost Ratio across the Number of Borrowers in KWPGBM (2006 – 2008)

7. Conclusion

7.1. Concluding Remark

The main objective of our research paper is to investigate some of the characteristics and mechanisms that are prevalent within KWPGBM as a small scale microfinance institution in Lombok Indonesia. The uniqueness of KWPGBM is its survivorship for more than 20 years without government's funds or donors' aid and the very flexible group lending mechanism that it adopts. From the results that we have obtained above, we can conclude that KWPGBM has provided net positive impact on its borrowers' life especially to their family and environment. In regards to its benefits to the clients' environment and family, the most significant impact is on their *children's education*, followed by *health care* then *food and daily consumption*. The benefits to the borrowers themselves include *increasing their purchasing power*, *empowering their decision making* and finally *increasing their savings*. From these ranking, we can see that the clients' top priority of the loans and services they obtain from KWPGBM confirms with other research studies that the loan typically will be used to improve their family well-being especially the children's education. It is important to note that increasing their savings through deposit facilities at KWPGBM is not their main priority when in fact mobilizing savings is one of the necessary elements for MFIs' sustainability. This could perhaps due to the fact that they already have the obligatory savings with KWPGBM in which they have to deposit some amount every week and do not feel the need to prioritize on savings.

“Savings is the main funding source for sustainable growth because it is less costly than loans which many MFIs rely on, stable source of funding, and improves public image and confidence,” Kimantu Mutu⁶⁶, (2011).

For the negative impact of KWPGBM, the borrowers think that the pressure or *social sanction* is the main drawback to them than *management of the co-op* or *lack of training* from the co-op. Although this is a concern to them, the clients feel that higher risk will likely arise from their own mistakes or problems rather than from the co-op itself, implying that they have high trust in the management of KWPGBM. The most likely problem that borrowers will face is *small amount of loan* that makes them unable to expand or roll over their businesses which eventually could lead to bankruptcy. The *interest rate* charged is not of main concern to them since it is set at the competitive level with the market interest rate. In terms of KWPGBM’s sustainability, the clients conclude that they will almost surely use the services from KWPGBM in the long run but express highest concern for the *loan size* they can make.

In our opinion, although the *social sanctions* and the *small size* of loans are unfavorable to the borrowers, these could potentially be the main reasons for their successful performance all these years: e.g. zero non-performing loans (NPL) of KWPGBM for over twenty years in operation. Many literatures including Besley and Coate (1993), Stiglitz and Weiss (1981) and Bond and Rai (2002) supported the argument that *social sanctions* or peer pressure aid in repayment rates and hence although these factors were perceived as privately negative to the borrowers, they were essentially socially beneficial. Furthermore, the *small size of loan* typically will increase contingent on the satisfactory repayment of previous loan installments

⁶⁶ Mr. Kimantu Mutu is an Associate of the Alliance for Financial Inclusion and founder of K-Rep Bank Limited in Kenya

from the borrowers. Besley and Coate (1995) and Hulme and Mosley (1996) viewed such approach as ‘dynamic incentives’ in securing high repayment rates and it is referred to as ‘step lending’ in ACCION⁶⁷ network (Murdoch, 1999). Since KWPGBM had never obtained any subsidies or loans from the government or donors, they relied on the deposited savings by their clients in issuing credit/loans. Unfortunately, as mentioned in our findings earlier, *increasing saving through deposit facilities* at KWPGBM is the last ranking in the borrowers’ priority and due to this, KWPGBM might find itself short of money to give out larger loan amounts. Even though they are facing the shortages of savings to mobilize, it doesn’t deter them from expanding the number of members and non-members registered which in our opinion is a very risky move. The increase number of borrowers could create ‘crowding out’ effect on the available credit, increase the cost of monitoring (Armendariz and Morduch, 2005) and the fixed costs since small size of loans⁶⁸ do not dilute the fixed costs of the cash transactions (Schreiner, 2001). Hence, we have expected that such move will lower their profit margins, earning power and return on net worth ratios (Appendix 6). This is in support to our finding for the third hypothesis in which we have concluded that the benefits-costs ratio will decline as the number of borrowers’ increases. To top it all, for the first time after their over 20 years of operation, they have taken a loan from ‘Dinas Koperasi’ or Co-op Ministry to support the increasing need for larger loan amounts and the increasing demand from new members. Our main concern is that such move will lead KWPGBM to be a subsidy/loan-dependent institution and hence, in our opinion, KWPGBM should instead encourage greater voluntary saving deposits from its members to meet the demand for larger loans. Gonzalez

⁶⁷ ACCION is an acronym for US Agency for International Development

⁶⁸ KWPGBM extends small size of loans not only to its current members but also to its new members which will increase its fixed costs.

and Meyer (2009) have provided two primary arguments in support of voluntary deposit mobilization among MFIs: voluntary deposit mobilization helps MFIs to be independent from donors and investors especially during the period of liquidity constraints and the access to deposit mechanisms benefit the poor households greatly than those derived from access to credit.

Overall, the exposure of KWPGBM existence serves as a good example of a microfinance institution that had survived for more than 20 years without relying on external financial assistantship. This was possible due to the uniqueness of their group lending practice that has successfully brought positive net impact to their clients. In addition, it is important to realize that for small scale MFIs especially those operating in rural areas; the lending mechanism is not homogenous⁶⁹ and should be tailored in such that it will incorporate the socio-economy of the community. For instance, in our case study we have found that KWPGBM not only extended the credit but acted as an intermediary in marketing the clients' products in which they would take the proceed from the sales for the repayment of the clients' loans before disbursing the balance. Unfortunately, during the year that this research was conducted (2009) we discovered that KWPGBM has implemented many new changes such as receiving the financial assistance from 'Dinas Koperasi' or Co-op Ministry which means that it would be interesting for further research in making comparisons between its previous and current lending practices. Finally, a better comprehensive survey that takes into account the perception of KWPGBM non-borrowers would provide further insights into its advantages and disadvantages in drawing more accurate conclusions for our hypotheses.

⁶⁹ Not homogeneous here means that there is no one standardized common lending practice for all small scale MFIs. It could be that KWPGBM group lending mechanism meets the demand of its borrowers but may not work in other community.

APPENDIX

Appendix 1

1. Collecting the Clay – The brown or brownish white clay which is considered as the good quality clay is directly excavated from the soil.

2. Preparing the Clay – These clays are washed with water and dried for a day or two. Then they are grind so that they will be sticky and tough. There are two ways of grinding the clay, manual grinding or mechanical grinding. Manual grinding is by stepping on the clay until it is soft and tough evenly while mechanical grinding is by using the grinding machine.

3. Shaping the Clay – The clay is now ready to be shaped into various designs and shapes according to the order from the seller. The length of time and the amount of clay needed depends on its shapes, design and size. The pottery maker uses both hands to shape the clay and both legs to turn the pottery wheel (perbot). This requires great uniformity of movement and concentration.

4. Drying the Gerabah – After the clay is shaped accordingly, it is placed under the sun until it completely dries and hardened. The clay is now has formed into a ‘gerabah’ or earthenware vessel.

5. Burning the Gerabah – Now that the ‘gerabah’ is completely dried, it is burned in either the ‘burning furnace’ or at the ‘burning site’ in order to hardened it further so that it won’t break easily. These ‘gerabah’ is burned for three to four hours using the fuel made of dry straw, dry coconut leaves or firewood.

6.Decorating the Gerabah – The burning process finishes when the ‘gerabah’ has turned into dark brown color. The ‘gerabah’ is now being polished and ready to be decorated by carving it with certain designs, or using glued shells, banana leaves, white sand and etc.

Appendix 2

The Fundamental Scale for Pairwise Comparisons		
Intensity of Importance	Definition	Explanation
1	Equal importance	Two elements contribute equally to the objective
3	Moderate importance	Experience and judgment slightly favor one element over another
5	Strong importance	Experience and judgment strongly favor one element over another
7	Very strong importance	One element is favored very strongly over another; its dominance is demonstrated in practice
9	Extreme importance	The evidence favoring one element over another is of the highest possible order of affirmation
Intensities of 2, 4, 6, and 8 can be used to express intermediate values. Intensities 1.1, 1.2, 1.3, etc. can be used for elements that are very close in importance.		

Appendix 3

A1. With Respect to Goal of BMGL: To Eradicate Poverty																		
	9	8	7	6	5	4	3	2	2	3	4	5	6	7	8	9		
Impact of BMGL on Your Family/Environment																	Impact of BMGL Personally on You	
A2. With respect to Impact of BMGL on Your Family/Environment																		
	9	8	7	6	5	4	3	2	2	3	4	5	6	7	8	9		
Children's Education																	Health Care	
Children's Education																	Improve Food and Daily Needs	
Children's Education																	Provide Employment Opportunities	
Health Care																	Improve Food and Daily Needs	
Health Care																	Provide Employment Opportunities	
Improve Food and Daily Needs																	Provide Employment Opportunities	
A3. With respect to Impact of BMGL Personally on You																		
	9	8	7	6	5	4	3	2	2	3	4	5	6	7	8	9		
Empower Decision Making																	Increase Purchasing Power	
Empower Decision Making																	Increase Saving	
Increase Purchasing Power																	Increase Saving	
A4. With Respect to Children's Education																		
	9	8	7	6	5	4	3	2	2	3	4	5	6	7	8	9		
Yes																	No	
A5. With Respect to Health Care																		
	9	8	7	6	5	4	3	2	2	3	4	5	6	7	8	9		
Yes																	No	
A6. With Respect to Improve Food and Daily Needs																		
	9	8	7	6	5	4	3	2	2	3	4	5	6	7	8	9		
Yes																	No	

A7. With Respect to Provide Employment Opportunities																		
	9	8	7	6	5	4	3	2	2	3	4	5	6	7	8	9		
Yes																		No
A8. With Respect to Empower Decision Making																		
	9	8	7	6	5	4	3	2	2	3	4	5	6	7	8	9		
Yes																		No
A9. With Respect to Increase Purchasing Power																		No
Yes																		
A10. With Respect to Increase Saving																		
	9	8	7	6	5	4	3	2	2	3	4	5	6	7	8	9		
Yes																		No

Appendix 4

B1. With Respect to BMGL Goal: To Eradicate Poverty																		
	9	8	7	6	5	4	3	2	2	3	4	5	6	7	8	9		
Microenterprise/Business																	Group	
B2. With Respect to Microenterprise/Business																		
	9	8	7	6	5	4	3	2	2	3	4	5	6	7	8	9		
High Cost of Borrowing																	Lack of Training	
High Cost of Borrowing																	Small Size of Loan	
Lack of Training																	Small Size of Loan	
B3. With Respect to Group																		
	9	8	7	6	5	4	3	2	2	3	4	5	6	7	8	9		
Group Pressure/Internal Punishment																	High Cost of Monitoring	
Group Pressure/Internal Punishment																	Joint Liability	
High Cost of Monitoring																	Joint Liability	
B4. With Respect to High Cost of Borrowing																		
	9	8	7	6	5	4	3	2	2	3	4	5	6	7	8	9		
Yes																	No	
B5. With Respect to Lack of Training																		
	9	8	7	6	5	4	3	2	2	3	4	5	6	7	8	9		
Yes																	No	
B6. With Respect to Small Size of Loan																		
	9	8	7	6	5	4	3	2	2	3	4	5	6	7	8	9		
Yes																	No	
B7. With Respect to Group Pressure/Internal Punishment																		
	9	8	7	6	5	4	3	2	2	3	4	5	6	7	8	9		
Yes																	No	
B8. With Respect to High Cost of																		

Monitoring																		
	9	8	7	6	5	4	3	2	2	3	4	5	6	7	8	9		
Yes																	No	
B9. With Respect to Joint Liability																		
	9	8	7	6	5	4	3	2	2	3	4	5	6	7	8	9		
Yes																	No	

Appendix 5

C1. With Respect to Goal: Sustainability of BMGL																		
	9	8	7	6	5	4	3	2	2	3	4	5	6	7	8	9		
Loan Character																	Growth	
C2. With Respect to Growth																		
	9	8	7	6	5	4	3	2	2	3	4	5	6	7	8	9		
BMGL's Management																	Deposit Facilities	
BMGL's Management																	Promotion or Marketing Products	
Deposit Facilities																	Promotion or Marketing Products	
C3. With Respect to Loan Character																		
	9	8	7	6	5	4	3	2	2	3	4	5	6	7	8	9		
Loan Duration/Repayment																	Loan Interest Rate	
Loan Duration/Repayment																	Loan Procedure	
Loan Duration/Repayment																	Loan Size	
Loan Interest Rate																	Loan Procedure	
Loan Interest Rate																	Loan Size	
Loan Procedure																	Loan Size	
C4. With Respect to BMGL's Management																		
	9	8	7	6	5	4	3	2	2	3	4	5	6	7	8	9		
Less Than 10 years																	More Than 10 Years	
C5. With Respect to Deposit Facilities																		
	9	8	7	6	5	4	3	2	2	3	4	5	6	7	8	9		
Less Than 10 years																	More Than 10 Years	
C6. With Respect to Promotion or Marketing Products																		
	9	8	7	6	5	4	3	2	2	3	4	5	6	7	8	9		
Less Than 10 years																	More Than 10 Years	
C7. With Respect to Loan Duration or Repayment																		
	9	8	7	6	5	4	3	2	2	3	4	5	6	7	8	9		
Less Than 10 years																	More Than 10 Years	

C8. With Respect to Loan Interest Rate																		
	9	8	7	6	5	4	3	2	2	3	4	5	6	7	8	9		
Less Than 10 years																		More Than 10 Years
C9. With Respect to Loan Procedure																		
	9	8	7	6	5	4	3	2	2	3	4	5	6	7	8	9		
Less Than 10 years																		More Than 10 Years
C10. With Respect to Loan Size																		
	9	8	7	6	5	4	3	2	2	3	4	5	6	7	8	9		
Less Than 10 years																		More Than 10 Years

Appendix 6

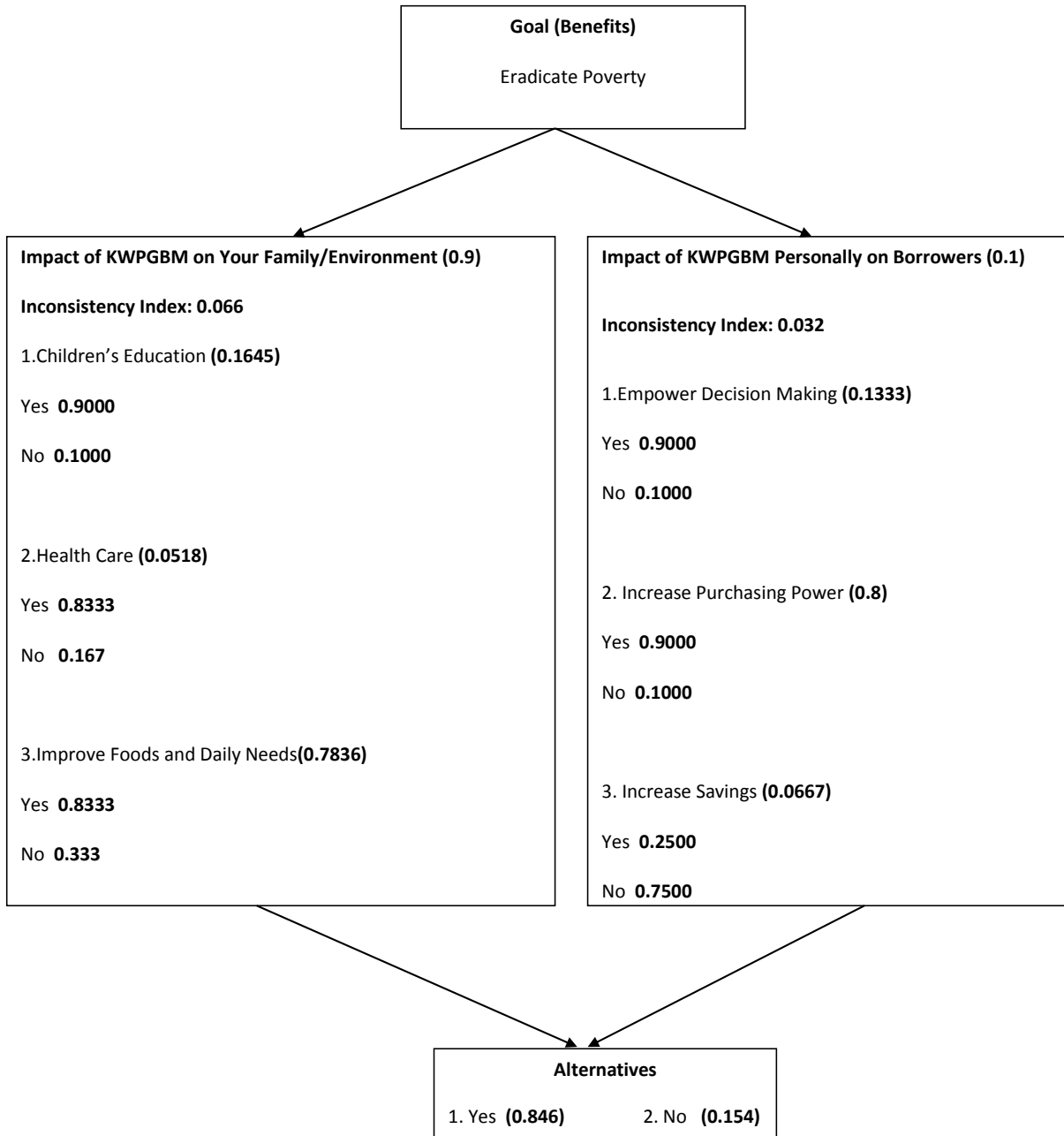
	Liquidity Ratio		Solvency Ratio		Profitability Ratio		
	Current Ratio	Quick Ratio	Total Asset to Total Debt Ratio	Worth to Total	Profit Margin	Earning Power	Return on Net
2006	137.2%	139%	119%	50%	70%	22%	55%
2007	155%	155%	156%	56%	66%	18%	50%
2008	157%	154%	159%	59%	46%	14%	37%

Appendix 7

Balance Sheet of KWPGBM as of 31st December 2008					
Assets	10/31/2008	10/31/2007	Liabilities	10/31/2008	10/31/2007
Cash	\$ 117,489,329.00	\$ 59,788,241.00	Voluntary Savings	\$ 339,163,511.00	\$ 224,508,111.00
Bank	\$ 13,042,146.00	\$ 45,024,134.00	Capital Funds	\$ 9,178,894.00	\$ 4,216,402.00
Outstanding Balance	\$ 526,257,350.00	\$ 400,780,050.00	Loans to Members	\$ 69,887,150.00	\$ 91,250,000.00
Assets Balance	\$ 737,400.00		Other Liabilities	\$ 7,500,000.00	\$ 6,000,000.00
Other Assets	\$ 12,156,563.00				
Inventories	\$ 11,440,000.00	\$ 7,252,500.00	Total	\$ 425,729,555.00	\$ 325,974,513.00
Depreciation	\$ (4,835,500.00)	\$ (3,565,000.00)			
			Equities		
			Initial Saving	\$ 30,300,000.00	\$ 23,989,000.00
			Compulsary Saving	\$ 28,972,000.00	\$ 18,378,900.00
			Co-Op Charges	\$ 61,157,157.00	\$ 34,291,307.00
			Risk Charges	\$ 9,158,110.00	\$ 3,109,610.00
			Donation	\$ 12,710,000.00	\$ 12,710,000.00
			Other Saving	\$ 16,000,000.00	
			Working Capital	\$ 92,260,466.00	\$ 90,826,595.00
			Total	\$ 250,557,733.00	\$ 183,305,412.00
Total Assets	\$ 676,287,288.00	\$ 509,279,925.00	Total Liabilities and Equities	\$ 676,287,288.00	\$ 509,279,925.00

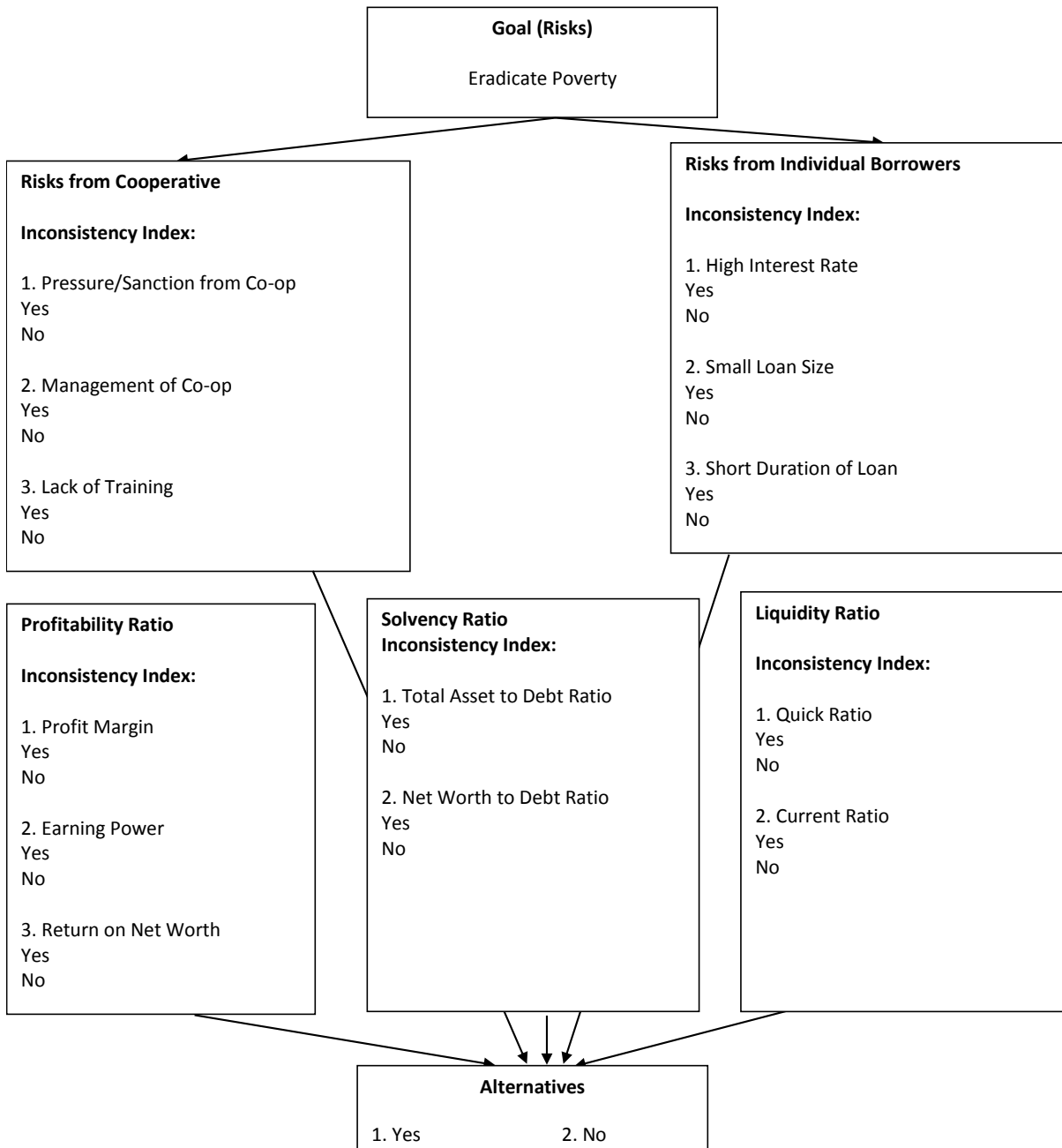
Appendix 8

The Positive Impact and Benefits of KWPGBM on its Borrowers from External Perspectives



Appendix 9

The Negative Impact and Costs/Risks of KWPGBM on its Borrowers from External Perspectives



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