EC902 Econometrics A

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Analysis of the Determinants of Push and Pull Factors on Capital Flows in Thailand amid the Global Uncertainty

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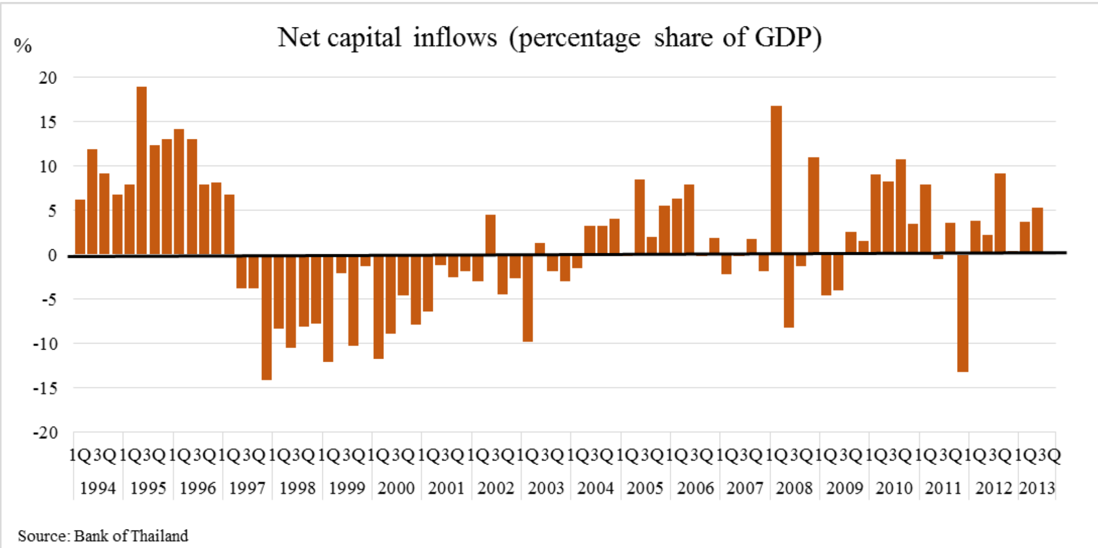
Abstract

The main purpose of this paper is to study how the unwinding of the unconventional monetary policy in Advanced Economies explains the capital flows reversal from Thailand. This analysis is achieved by determining the factors that contribute to the movement in Thailand capital inflows using the push and pull factors for the period of 1994 to 2013.

I. Introduction

Thailand has experienced large capital inflows since the beginning of 2010 until the first half of 2013 (figure 1). Large capital inflows has caused the interest rate to be lower, and contributed to rapid growth of asset prices. In 2012, the stock market index raised asset prices by 35 percent and a further 12 percent during January. Property prices have also risen prominently (IMF 2013). One of the reason that explains the large inflows was the resiliency of Asian economies which have attracted more capital inflows while most advanced economies suffered from the impact of global financial crisis. However, the more pronouncing factors that explain the capital flows to Thailand is the external conditions. The unconventional monetary policy for crisis resolution in advanced economies has created massive global liquidity and excessive capital inflows to emerging market economies including Thailand. Recently in 2013, as the US economy has started to gain some traction, the Federal Reserve announced its plan to scale back its large scale asset purchase program (LSAP) and ultimately ending its highly accommodative monetary policy (Nechio 2014). This resulted in a sharp capital reversal of Thailand capital inflows and the trend is likely to continue through the year.

Figure 1: Thailand net capital inflows (1Q1994:3Q2013)



In light of the impacts from external risk on Thailand’s capital flows vulnerability, this paper aims to examine the factors that contribute to the movement in Thailand capital inflows by separating the possible determinant into external and internal factors. The paper employs time series ordinary least square method for the period of 1994 to 2013.

II. Determinants of capital flows and Econometric model

Most empirical research identifies the determinant of capital inflows focusing on many countries using panel data econometrics method (Kim et al 2013). In order to capture the impact of Global volatility on Thailand capital flows, this paper focuses on one country using ordinary least square method to examine the determinants of the capital inflows’ pattern over time. The existing literature explores capital flows to Thailand in limited time period, only up to year 2007 which does not cover the period of the global financial crisis and large capital inflows resulting from unconventional monetary policy in advanced economies (Sitthihul and Ananchotikul 2008). To identify the determinants of capital inflows, many recent literatures has been focusing on the impact of capital inflows from two main perspectives, push factor and pull factors, and try to evaluate the relative importance of each (Ghosh et al 2012). This analysis builds on this approach to examine the impact from fluctuation in global economy on Thailand capital inflows. The push factors refer to the external or global factors that impact the capital inflows from developed economies to developing economies while pull factor is domestic factors that attract international capital inflows (culha 2006). The regression model is specified as follows:

$$NCF_t = \alpha + \beta X_t + \delta Z_t + \varepsilon_t$$

The model defines dependent variable, net capital flows (NCF), over time (t) as a function of pull factors (X) and push factors (Z). The model based on quarterly time series data from the first quarter of 1994 until the third quarter of 2013. The list of variables used in this model and summary statistics for each variable is shown in the table 1.

Table 1: List of variable and summary statistics

Variable	Description	Expected Impact	Mean	Std.Dev	Min	Max
Net Capital Inflows	Net capital flows (% share of GDP) Source: Bank of Thailand		1.22	7.37	-14.9	18.92
Pull factor						
thgdp (real)	Real GDP growth rate (%change year on year) Source: NESDB	+	3.81	5.42	-13.9	19.13
setgr	SET stock index growth (% change year on year) Source: Stock Exchange Thailand	+	7.4	33.58	-57.1	90.77
dep (real)^	Real deposit rate (%) Source: IMF IFS	+	11.78	4.8	3.49	25.54
bahtapp	Exchange rate growth agaist US dollars (% change year on year) Note: higher rate indicates baht appreciation over year Source: Bank of Thailand	+	-1.85	15.37	-80.8	20.68
cagdp	Current account balance (% of GDP) Source: Bank of Thailand	-	1.75	6.35	-12.9	16.26
Push factor						
lending (real)^	World real lending rate using US real lending rare as a proxy (%) Source: IMF IFS	-/+	8.55	2.83	1.63	12.93
usgdp (real)	World real GDP growth rate using US real GDP growth rate as a proxy (% change year on year) Source: Bureau of Economic Analysis	+	2.58	1.92	-4.09	5.27
lnvix	Log level of Chicago Board Options Exchange Market Volatility index (%), Higher value indicates higher risk aversion Source: Bloomberg	-	2.98	0.35	2.43	3.79

Note: 1. The table shows the list of variables used for the determinant of Thailand capital inflows
2. ^ real lending and deposit rate computed from $r_t = \frac{1+i_t}{t+\pi_{t+1}} - 1$

For the capital inflows data, it is reasonable to use net capital inflows, collected from financial account in the Balance of payment, as net flows share similar pattern with gross flows and are observed to be more relevant for exchange rate appreciation and overheating concerns (Ahmed and Zlate 2013). However, there are some problems concerning the shift in balance of payment data collected from Bank of Thailand, from year 2005 onward. The net capital inflows data covered in this model has a slight change from the adjustment in their computing methodology[1]. I will also identify the effect of this adjustment in the next section of this paper.

In the components of the push factors, world GDP is expected to be a major driving factor for capital inflows to emerging market economies. The stronger world GDP growth implies more fund available to invest globally and especially to higher-return emerging economies, including Thailand (Felices and Orskaug 2008). Apart from the world GDP, higher interest rates in advanced economy can also generate effects on capital inflows to Thailand but the relationship could be positive or negative (Forbes and Warnock 2011). The higher world interest rate may lead to higher cost of borrowing and hence lower capital flows to Thailand, or it can lead to higher return to creditors and hence the opposite direction of flows.

Measuring risk in global economy, studies related to international flows of capital generally use Volatility Index (VIX) computed by Chicago Board Options as a proxy to reflect investors' global risk appetite. The higher VIX index indicates the higher risk aversion when investors are likely to move their capital out of risky assets and hold them in safer assets. I use log of VIX index to capture the increase or decrease in investors' risk appetite relative to the previous period.

Turning to pulling factors, they includes, first, Domestic GDP growth which reflects the possibility that the investors can gain from investing in the economy. This especially true for the fast growing emerging market economies, including Thailand. Theoretically, the production in these economies yield higher productivity which can generate higher return to those foreign investors in richer economies (Ghosh et al 2012). Second, higher domestic interest rates will also attract more capital inflow. According to interest parity condition (Mishkin 2003) which implies no arbitrage of interest rates across countries, when there is

[1] The shift in BOP series is according to the change in Balance of Payment methodology under the sixth Balance of Payment Manual (BPM) from BPM5 by IMF Statistics Department (STA). The Bank of Thailand has complied to such adjustment but only reported BOP data under BPM6 from 1Q2005

possible gain to interest rate differentials, the country attracts more capital inflows and hence exchange rate appreciation.

Third, focusing on capital market, an increased development in equity market not only induces more capital inflows (Montiel and Reinhart 1999), also it reflects the investor anticipation about the market boom and political uncertainty which has become a chronic issue for Thailand (Thaicharoen and Ananchotikul 2008). Therefore, I includes the growth of Thailand stock index in this model. The higher the growth in stock index over year should implies the more capital inflows from international investors net capital outflows from local investors. The fourth factor concerns the exchange rate appreciation. Although country under fixed exchange rate regime is more likely to have capital inflows via the absent of exchange rate risk (Lopez-Mejia 1999), the recent appreciation trend in East Asian currency has also presented significant impact in attracting more inflows to their economies including Thailand.

Finally, current account balance also explains inflows to economies. According to the inter-temporal optimizing model of the current account (Ghosh 1995) which can be shown as following

$$CA_t^* = -\sum_{i=1}^{\infty} \frac{\Delta(Q_{t+i} - I_{t+i} - G_{t+i})}{(1+r)^i}$$

Current account (CA_t^*) is a function of the discounted sum of future change in output(Q_{t+i}), investment (I_{t+i}), and government spending(G_{t+i}). The consumption smoothing model implies that a country requires external financing need when the output is temporarily low or government consumption and investment is temporarily high. The capital flows in this model, therefore, should correspond inversely to the current account balance.

During Asian financial crisis and Global financial crisis, Thailand capital flows was affected severely during the wake of crisis. In order to isolate such effects, I introduce Dummy variables for crisis periods, 3Q1997:4Q1998 and 2Q2008:1Q2009 (Yiu et al 2010). In addition to the crisis, I also incorporate dummy variable for the fourth quarter of 2011 to reflect the period when Thai economy suffered from devastated flood which resulted in supply chain disruption, economic slowdown, and massive capital outflows during the period.

III. Estimation result and Robustness checks

A. Unit root test and model specification

Time series data, in analysing macroeconomic variables, often times have to encounter the problem when there are trends exist in each time series variable. Applying Ordinary Least Square regression on these non-stationary variable can give misleading estimation of parameters which is spurious regression (Mahadeva and Robinson 2004). The Spurious regression occurs in the problem when the variables appears to be related as both trends grow through time when there is no actual relationship.

To get around this problem, the test for trend stationary is commonly used, so called unit root test. I firstly test for the presence of unit root using Augmented Dickey Fuller test (ADF test). The selection of lag order p of autoregression follows Schwarz's Bayesian information criterion (SBIC) given that it is more accurate in acquiring the lag of order p with smaller sample size[2] (Ivanov and Kilian 2001). The results of unit root test using ADF test are shown in the table2

Table 2: Results of unit root tests

		Test for Unit root						First difference			
variable	Lags	ADF			PP			Lags	ADF		
		T-Stat		Unit root^	T-Stat		Unit root^		T-Stat		Unit root^
NCFGDP	2	-2.335		YES	-4.701	***	NO	1	-9.518	***	NO
THGDP	1	-3.631	***	NO	-3.724	***	NO	4	-4.583	***	NO
SETGR	2	-4.281	***	NO	-3.544	***	NO	4	-5.031	***	NO
DEP	3	-1.747		YES	-2.006		YES	4	-4.346	***	NO
CAGDP	1	-3.147	**	NO	-3.54	***	NO	1	-9.411	***	NO
BAHTAPP	2	-4.362	***	NO	-3.464	***	NO	3	-5.582	***	NO
USGDP	2	-3.197	**	NO	-2.388		YES	4	-4.826	***	NO
LENDING	2	-2.178		YES	-1.698		YES	1	-4.824	***	NO
LNVIX	1	-2.802	*	YES	-3.602	***	NO	1	-8.471	***	NO

Note: ^Presence of unit root at 5% level of significance. ***, **,* indicate significance at 1, 5, and 10 percent levels, respectively.

[2] Schwarz Information Criterion (SIC) is more accurate for quarterly VAR models with sample sizes smaller than 120 (Ivanov and Kilian 2001)

For THGDP, SETGR, CAGDP, BAHTAPP, and USGDP, the test rejected the null hypothesis at 5% significant level. It implies that these variables are trend stationary. For NCFGDP and LNVIX, the null hypothesis is rejected under Phillip Perron[3] unit root test and also implies trend stationary. However, both tests does not the reject null hypothesis for DEP and LENDING. These variables appear to have unit root of an I(1) process. Solving the problems by taking the first difference, both variables became stationary of an I(0) process.

The models are modified accordingly as follows:

Model 1: $[NCFGDP]_t = \alpha + [\beta_1 THGDP_{t-1} + \beta_2 SETGR_t + \beta_3 \Delta(DEP)_t + \beta_4 CAGDP_t + \beta_5 BAHTAPP_t] + [\gamma_1 USGDP_t + \gamma_2 \Delta(LENDING)_t + \gamma_3 \Delta log(VIX)_t] + \delta_3 FLOOD_t + \varepsilon_t$

Model 2: $[NCFGDP]_{t_t} = \alpha + [\beta_1 THGDP_{t-1} + \beta_2 SETGR_t + \beta_3 \Delta(DEP)_t + \beta_4 CAGDP_t + \beta_5 BAHTAPP_t] + [\gamma_1 USGDP_t + \gamma_2 \Delta(LENDING)_t + \gamma_3 \Delta log(VIX)_t] + \delta_1 CRISIS1_t + \delta_2 CRISIS2_t + \delta_3 FLOOD_t + \varepsilon_t$

In addition, to address the problem of the change in Balance of payment methodology from version 5 to version 6 since 1Q2005, I include 2 dummies variable for period 1Q1994-4Q2004 and 1Q2005-3Q2014. The intercept is dropped in this model to avoid dummy variable trap (Stock, Watson, 2011) in model 3 as follow:

Model 3: $[NCFGDP]_t = [\beta_1 THGDP_{t-1} + \beta_2 SETGR_t + \beta_3 \Delta(DEP)_t + \beta_4 CAGDP_t + \beta_5 BAHTAPP_t] + [\gamma_1 USGDP_t + \gamma_2 \Delta(LENDING)_t + \gamma_3 \Delta log(VIX)_t] + \delta_1 CRISIS1_t + \delta_2 CRISIS2_t + \delta_3 FLOOD_t + \delta_4 NCF1_t + \delta_5 NCF2_t + \varepsilon_t$

B. Estimation of results

This section reports the regression results of push and pull variables on the capital inflows. Model 2 includes the dummies of 2 crisis periods and model 3 also includes the dummies separating the series into 2 periods before 2005 and after 2005.

[3] Phillips and Perron (1988) have suggested an alternative to the augmented Dickey–Fuller tests. The test follows the original Dickey–Fuller regressions, but adjust the DF-statistics to take into account the (potential) autocorrelation pattern in the errors. (Verbeek 2004)

Table3: Determinants of Thailand capital inflows

Dependent Variables: Net capital inflows to GDP	Model 1		Model 2		Model 3	
Pull factor						
Thailand GDP growth (L1.thgdp)	0.132		0.220		0.243	
	(0.347)		(0.173)		(0.137)	
SET index (setgr)	0.032		0.031		0.0276	
	(0.152)		(0.169)		(0.219)	
Deposit rate_D1 (depD1)	-0.162		-0.314		-0.400	
	(0.736)		(0.545)		(0.449)	
Exchange rate appreciation (bahtapp)	0.003		0.026		0.009	
	(0.959)		(0.685)		(0.889)	
Current account to GDP (cagdp)	-0.698	***	-0.717	***	-0.720	***
	(0.000)		(0.000)		(0.000)	
Dummy_Flood (flood)	-10.405		-10.483		-11.471	
	(0.860)		(0.039)		(0.027)	
Push factor						
World Lending rate_D1 (lendingD1)	0.147		0.097		0.132	
	(0.860)		(0.907)		(0.875)	
World GDP growth (usgdp)	-0.859	**	-1.137	**	-0.956	**
	(0.013)		(0.007)		(0.037)	
Change in VIX (lnvix)	-2.970		-2.569		-1.836	
	(0.157)		(0.236)		(0.422)	
Dummy_Asian Crisis (Crisis1)			3.210		2.678	
			(0.415)		(0.500)	
Dummy_GFC (Crisis2)			-3.014		-3.970	
			(0.395)		(0.280)	
Dummy_NCF 1994:2004 (NCF1)					8.739	
					(0.238)	
Dummy_NCF 2005:2013 (NCF2)					10.208	
					(0.138)	
Constant	12.879		12.044			
	(0.049)		(0.070)			
observations	78		78		78	
R-square	0.6217		0.6298		0.6442	

Note: This table presents the regression results of relationship between the push and pull factors and the net capital inflows to GDP. The independent variables are Thailand GDP growth with one period lag, growth in SET index, first different of domestic real deposit rate, growth in exchange rate appreciation, current account balance to GDP, first different of world real lending rate using US lending rate, world GDP growth rate using US GDP growth, change in implied volatility (VIX) to reflect the higher risk aversion, and dummy for flood period in 4Q2011. Model 2 also includes the dummy variables for Asian currency crisis and Global financial crisis. Model 3 also includes Dummy variables separating period to 1Q1994:4Q2004 and 1Q2005:3Q2013.

***, **,* indicate significance at 1, 5, and 10 percent levels, respectively. p-value in parenthesis

The estimated regression models show that there are some push and pull variables that significantly affect the movement of capital inflows. The current account balance is the only variable in pull factors that is statistically significant at 1% level. According to Model 2, the increase in current account to GDP by 1 percentage point is estimated to correlate with the reduction of net capital flows to GDP by 0.72 percentage point. This result coincides with the fact that the worsening current account deficit implies the higher capital is needed to finance the deficit (Kim et al 2013). For the push factors, the World GDP growth significantly correspond to the movement of net capital inflows (at 5% significant level) with the coefficient of -1.14. The resulted relationship appears to be conflicted with the expected relationship. The increase in world GDP of 1% (yoy) leads to the reduction of Thailand net capital flows by 1.14 percentage point of GDP. Though the effect appears to be small, result confirms the controversial views that the economic recovery in advanced economy resulted in the scaling back in their LSAP can leads to the capital outflows from Thai economy. Additionally, using Granger Causality test (table 6), according to Stock and Watson (2011), the result shows that world GDP is a useful predictor of net capital flows given other variables in regression.

Although other variables are not significant explanatory variables to the capital inflows, the sign of the relationship is investigated. Most of the variables explain the direction of net capital inflows on the right signs (expected signs shown in table 1). Thailand GDP, SET index, exchange rate appreciation, and world lending rate are positively correlated with net capital flows, while the model gives a negative relationship between the change in VIX and the net capital flows. However, there is an exception for the deposit rate. The negative relationship between deposit rate and capital inflows could be explained by the fact that the increase in policy interest rate also signal the possible overheating condition in financial market or the risk of inflation. This makes investing in domestic capital market become less attractive (Pakko, 2000) and hence less net capital inflows to Thai economy.

Model 3 compares the dummy variables of the two separating time periods, before and after year 2005 when the Balance of payment methodology was changed. The results are not statistically significant and I cannot say that the coefficients for both periods differ from zero.

C. Robustness check

Apart from the (i) unit root test shown earlier in this section, I perform necessary robustness checks for the time series OLS estimation including the tests for (ii) autocorrelation (iii) multicorlinearity and (iv) Granger Causality test. Autocorrelation occurs when two or more consecutive error terms are correlated, and it tells that the error term is subject to serial correlation, or $V\{\varepsilon\} = \sigma^2$, is violated. With this problem, OLS remains unbiased, but it becomes inefficient and its standard errors are estimated in the wrong way (Verbeek 2004). To test for this problem, first, I ran Durbin-Watson test which uses the least squares residuals and consider only the first-order autocorrelation of the residuals (Greene 2012). Second, I employs Breusch (1978)–Godfrey (1978) test which is a Lagrange multiplier test, $LM = TR^2$. The test examines the covariance of the residuals with p lagged values. The result is presented in table 4.

Table 4: Tests for autocorrelation

Durbin's alternative test for autocorrelation						
	Model1		Model2		Model3	
Lag	Chi2	P-Value	Chi2	P-Value	Chi2	P-Value
1	0.111	0.739	0.162	0.687	0.113	0.737
Breusch-Godfrey LM test for autocorrelation						
1	0.129	0.719	0.194	0.660	0.137	0.711
2	1.161	0.560	1.112	0.574	0.816	0.665
3	1.468	0.690	1.365	0.714	1.113	0.774
4	4.391	0.356	4.911	0.297	4.801	0.308

The table shows that all models fail to reject null hypothesis indicating that the model has no autocorrelation under the test from both Durbin-Watson and Breusch–Godfrey from lag one to four.

The correlation amongst independent variables does not present any obvious relationship with multicolinearity that can leads to imprecise estimation of OLS regression (Stock, Watson, 2011). However, to rule out the multicolinearity problem, I use the Variance Inflation Factor (VIF) measure computed by $VIF = 1/(1 - R_{k}^{2}.)$ for each coefficient in a regression. The VIF result for a variable shows the increase in $Var[b\_k]$ can be attributable to the fact that this variable is not orthogonal to the other variables in the model (Greene, 2012). The results are presented on table 5.

Table 5: Variance Inflation Factor (VIF)

Variable	VIF Model1	VIF Model2
L1.thgdp	1.89	2.47
setgr	1.76	1.77
depD1	1.91	2.21
bahtapp	1.89	3.08
cagdp	1.73	1.79
usgdp	1.39	2.03
lendingD1	2.06	2.07
lnvix	1.72	1.83
d3	1.02	1.03
d1		3.58
d2		1.98
Mean VIF	1.71	2.17

According to Marquardt (1980), the paper suggests that a variance inflation factor greater than 10 indicates the presence of strong multicollinearity. The results from both model suggests that the VIFs are much lower than 10 for all variables. Therefore, the multicolinearity problem is ruled out.

To test for whether an independent variable have predictability on net capital flow to GDP. I use the Granger Causality test which is F-statistics testing given that the null hypothesis implies independent variables have no predictive content for dependent variable (Stock and Watson, 2011). The rejection of null hypothesis indicates that independent variable granger-cause capital flows to GDP. The results are summarized on table 6.

Table 6: Granger Causality test

Granger Causality Wald test H0: independent variable does not Granger-cause NCFGDP				
Dependent Variable	Independent variable	Chi2		p-value
NCFGDP	THGDP	3.598		0.165
	SETGR	1.249		0.535
	depD1	2.703		0.259
	bahtapp	2.885		0.236
	cagdp	1.205		0.547
	lendingD1	8.191	**	0.017
	usgdp	7.001	**	0.030
	lnvixD1	9.380	***	0.009

Note: ***, **,* indicate significance at 1, 5, and 10 percent levels, respectively.

The test rejects the null hypothesis for real world lending rate, world GDP, and log of VIX, which means these variables Granger-cause net capital flows to GDP. For other variables, I fail to reject that the coefficients on all lags of these variables are zero.

IV. Conclusion

The paper examine the drivers of capital inflows to Thailand and tries to capture the effect of external factors on such flows that might affect the capital reversal during the period of economic recovery in advanced economies. The analysis is done by using time series OLS regression of different variables which are separated into push and pull factors on Thailand net capital inflows covering the past 20 years.

The estimated results show a controversial estimation that investors respond to the external factor such that the increase in world economic growth leads capital to flows out of Thai economy back to advanced economies. This is explained by the fact that in respond to the recovery in advanced economy, the policy makers scale back their LSAP under Quantitative Easing policy and leads to the capital reversal from Thai economy. The capital inflows also correspond negatively to the current account balance. The worsening current account deficit implies the higher capital is needed to finance the deficit and therefore more capital flows to Thai economy. For other push and pull variables in this analysis, the results show no statistically significance but the sign of the relationship coincide with expectation except for the domestic deposit rate.

There are some limitations to this research. First, there is a constraint on time periods used in this model which cover only the past 20 years. Second, the model does not directly capture the impact of the scaling back of quantitative easing in advanced economies on Thailand capital flows. As pattern of capital flows in Thailand is coincide with the regional capital flows, the panel data analysis of the impact of the unwinding of unconventional monetary policy in advanced economies on Asian economies should be able to capture the applicable result. This further study on such issue will be able to contribute to the future policy recommendation of how should Thai policy maker tackles reversal of capital flows amid the recovery in advanced economies.

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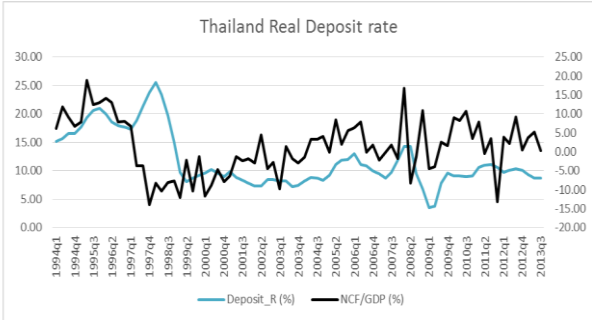
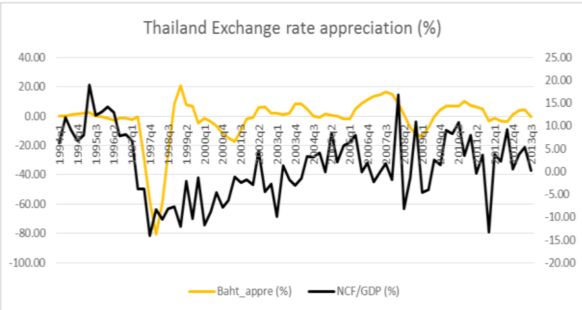
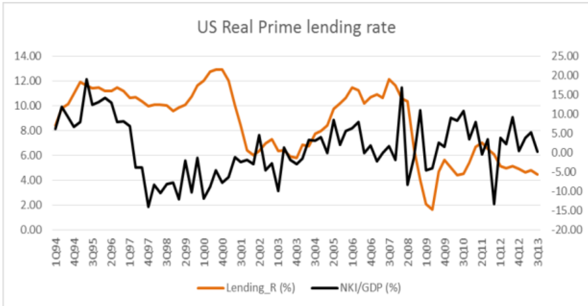
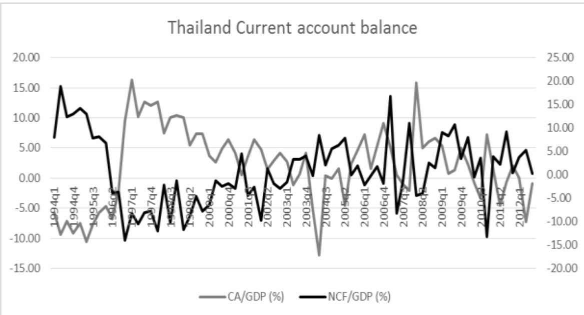
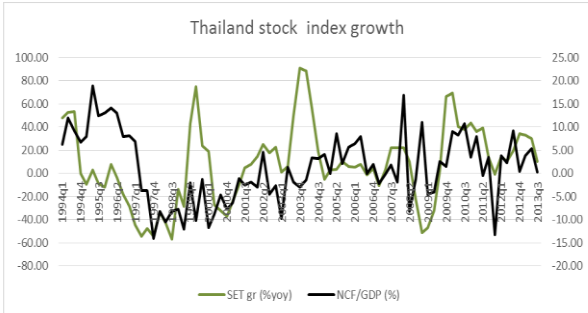
Appendix I

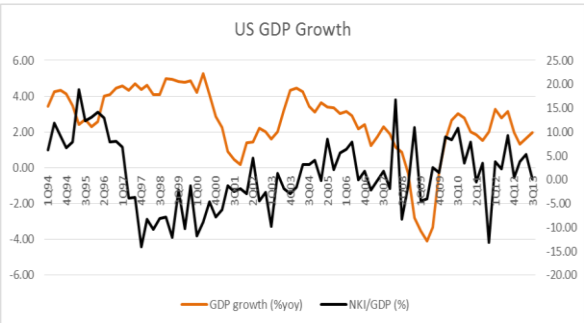


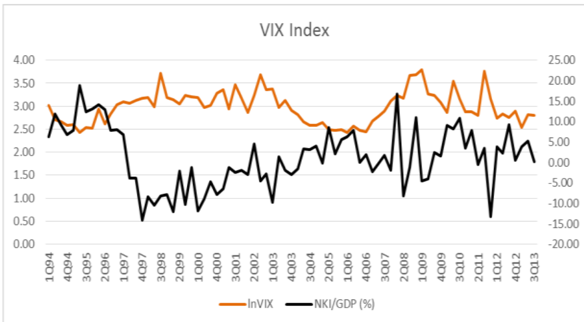












Source: Bank of Thailand, IMF, Bloomberg, and NESDB

Appendix II

```
//Model1

. regress ncfgdp L1.thgdp setgr depD1 bahtapp cagdp lendingD1 usgdp lnvix d3

      Source |       SS       df       MS              Number of obs =      78
-------------+------------------------------           F(  9,    68) =   12.42
       Model |  2621.03492     9  291.226102           Prob > F      =  0.0000
    Residual |  1595.09194    68  23.4572344           R-squared     =  0.6217
-------------+------------------------------           Adj R-squared =  0.5716
       Total |  4216.12686    77  54.7548943           Root MSE      =  4.8433

------------------------------------------------------------------------------
      ncfgdp |      Coef.   Std. Err.      t    P>|t|     [95% Conf. Interval]
-------------+----------------------------------------------------------------
       thgdp |
         L1. |   .1322636   .1395538     0.95   0.347    -.1462117    .4107389
             |
       setgr |    .031718   .0218694     1.45   0.152    -.0119217    .0753576
       depD1 |  -.1620578   .4789661    -0.34   0.736     -1.11782    .7937041
     bahtapp |   .0025356   .0491023     0.05   0.959    -.0954465    .1005177
       cagdp |   -.698356   .1148923    -6.08   0.000    -.9276201    -.469092
   lendingD1 |   .1471388   .8288895     0.18   0.860    -1.506884    1.801162
       usgdp |  -.8591165   .3360865    -2.56   0.013    -1.529767   -.1884663
       lnvix |   -2.96955   2.072874    -1.43   0.157    -7.105905    1.166806
          d3 |  -10.40455   4.916613    -2.12   0.038     -20.2155   -.5936018
       _cons |   12.87948   6.419042     2.01   0.049     .0704778    25.68848
------------------------------------------------------------------------------
```

```
//Model2

 regress ncfgdp L1.thgdp setgr depD1 bahtapp cagdp lendingD1 usgdp lnvix d1 d2 d3

      Source |       SS       df       MS              Number of obs =      78
-------------+------------------------------           F( 11,    66) =   10.21
       Model |   2655.4967    11  241.408791           Prob > F      =  0.0000
    Residual |  1560.63016    66  23.6459115           R-squared     =  0.6298
-------------+------------------------------           Adj R-squared =  0.5681
       Total |  4216.12686    77  54.7548943           Root MSE      =  4.8627

------------------------------------------------------------------------------
      ncfgdp |      Coef.   Std. Err.      t    P>|t|     [95% Conf. Interval]
-------------+----------------------------------------------------------------
       thgdp |
         L1. |   .2199169   .1597487     1.38   0.173    -.0990317    .5388656
             |
       setgr |   .0305707   .0219974     1.39   0.169    -.0133484    .0744898
      depD1m |  -.3144675   .5174798    -0.61   0.545    -1.347649    .7187143
     bahtapp |   .0256348   .0628672     0.41   0.685    -.0998836    .1511531
       cagdp |  -.7169371   .1163864    -6.16   0.000    -.9493101   -.4845641
   lendingD1 |   .0972837   .8335374     0.12   0.907    -1.566927    1.761495
       usgdp |  -1.137485   .4087495    -2.78   0.007    -1.953579   -.3213898
       lnvix |  -2.569307    2.14791    -1.20   0.236    -6.857749    1.719134
          d1 |   3.209906   3.910205     0.82   0.415    -4.597071    11.01688
          d2 |  -3.013538    3.51652    -0.86   0.395    -10.0345      4.00742
          d3 |  -10.48262   4.967603    -2.11   0.039    -20.40076    -.564484
       _cons |   12.04404   6.535637     1.84   0.070    -1.004786    25.09286
------------------------------------------------------------------------------
```

```
//Model3
. regress ncfgdp L1.thgdp setgr depD1 bahtapp cagdp lendingD1 usgdp lnvix d1 d2 d3 Dpre05 Dpost05, noconstant

      Source |       SS       df       MS              Number of obs =      78
-------------+------------------------------           F( 13,    65) =    9.05
       Model |  2782.98965    13  214.076127           Prob > F      =  0.0000
    Residual |  1537.37604    65  23.6519391           R-squared     =  0.6442
-------------+------------------------------           Adj R-squared =  0.5730
       Total |  4320.36569    78  55.3893037           Root MSE      =  4.8633

------------------------------------------------------------------------------
      ncfgdp |      Coef.   Std. Err.      t    P>|t|     [95% Conf. Interval]
-------------+----------------------------------------------------------------
       thgdp |
         L1. |   .2431985   .1614852     1.51   0.137    -.0793097    .5657067
             |
       setgr |   .0275869    .022205     1.24   0.219    -.0167595    .0719334
       depD1 |  -.3996952   .5246348    -0.76   0.449    -1.447463    .6480729
     bahtapp |   .0091378   .0650392     0.14   0.889    -.1207543      .13903
       cagdp |  -.7199851   .1164418    -6.18   0.000    -.9525355   -.4874346
   lendingD1 |   .1318745   .8343732     0.16   0.875    -1.534484    1.798233
       usgdp |  -.9561782   .4478316    -2.14   0.037     -1.85056   -.0617967
       lnvix |  -1.836021   2.271916    -0.81   0.422     -6.37335    2.701309
          d1 |   2.677663    3.94737     0.68   0.500     -5.20578    10.56111
          d2 |  -3.970336   3.646942    -1.09   0.280    -11.25378     3.31311
          d3 |  -11.47078   5.067202    -2.26   0.027    -21.59069   -1.350883
      Dpre05 |    8.73942    7.33708     1.19   0.238    -5.913741    23.39258
     Dpost05 |    10.2081   6.793657     1.50   0.138    -3.359771    23.77597
------------------------------------------------------------------------------
```