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An Analysis of the Monetary Transmission Mechanism in East Asia

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Introduction

There has been substantial progress in estimating the extent to which monetary policy actions affect economic activity particularly in developed countries (Christiano et al. 1999; Bayoumi and Morsink 1999; Bernanke and Mihov 1998; Ramaswamy and Sloek 1997; Sims 1992). For instance, Bernanke and Gertler (1995) estimate that a positive one standard deviation shock to the Federal funds rate causes it to increase to about 50 basis points that result to a decline in US real GDP of about 0.19 percent. In Japan, Bayoumi and Morsink (1999) estimated an implied interest rate multiplier of about minus 0.6 in GDP. There is far less consensus, however, on how monetary policy actions operate in the economies of developing countries such as the Asian countries. With their recent experience in the 1997 crisis and the International Monetary Fund (IMF)-supported monetary policy stance that spurred discussions on monetary policy transmission mechanism, understanding the process by which monetary policy actions are transmitted into their economy is worth undertaking.

The research study by Ghosh and Philips (1999) provides initial estimates of the impact of a monetary contraction on real GDP growth in Indonesia, Korea, Malaysia, the Philippines, and Thailand. They find

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that a 10 percentage point decrease in the growth of real money is estimated to lower the current real GDP growth rate by about 1 percentage point in Thailand and the Philippines, by 1.5 percentage points in Malaysia, and by 3 percentage points in Korea. The impact in Indonesia occurs with a one-year lag falling by 1 percentage point. The study used real money growth as a measure of monetary policy stance and the estimates were based on annual data from 1972 to 1996.[1] This study, however, can be criticized on two grounds. First, the use of money growth as an indicator of monetary policy stance poses some problems. Recent financial innovation, deregulation, and other factors made secular changes in the velocity of moneymaking it inadequate to be a measure of the direction of policy. In addition, growth rates of monetary aggregates are being affected by a variety of nonpolicy influences (Bernanke and Mihov 1998).[2] Second, the study does not provide further analysis on the transmission mechanism of monetary policy in these countries.

This paper approaches the issue on monetary transmission mechanism in Korea, the Philippines, and Thailand from a different perspective. Also, it uses a short-term interest rate as an indicator of monetary policy stance as opposed to a monetary aggregate. In addition, it attempts to provide a more detailed analysis of the monetary transmission mechanism in these countries. In this regard, it poses three questions. First, to what extent does, say, monetary policy tightening affect economic activity? Second, which components of GDP are greatly affected by this monetary policy tightening? Finally, how do other economic variables respond to such monetary policy action? Do credit market conditions play a role in the propagation of these shocks?

This paper seeks to shed light on these questions using a series of vector autoregression (VAR) models. The following section explains the methodology and data used in the analysis. The succeeding section proceeds with the discussion of the results of this exercise. A summary of the main findings and some policy implications are provided in the concluding section.

Methodology and data

This paper examines the transmission mechanism of monetary policy

[1] Quarterly data for the same period were likewise utilized but only for Korea and the Philippines.

[2] For other problems on the use of monetary aggregates to identify policy shocks, see Sims 1980; Litterman and Weiss 1985; Reichenstein 1987; Leeper and Gordon 1992; Bernanke and Blinder 1992; and Strongin 1995.

to the economy using the VAR framework (Sims 1992; Bernanke and Blinder 1992; Leeper et al. 1996; Christiano et al. 1996 and 1999; Bernanke and Mihov 1998). Through this methodology, one can analyze the effects of monetary policy with only a minimum of identifying assumptions to yield reliable information on the transmission mechanism. Endogenous policy actions, which respond to developments in the economy, must be separated from exogenous policy actions. The response of variables to exogenous policy actions must be examined to gauge the effects of monetary policy. Exogenous policy actions refer to the random unsystematic component of the central bank's actions represented by policy reaction functions (Christiano et al. 1996). The VAR methodology also provides a good framework for making crosscountry comparisons by using the same reduced form of equations for estimating the response of macroeconomic variables to monetary shocks.

In this context, this paper develops a simple macroeconomic model that captures the overall mechanism of monetary policy shocks to the economy. It represents the economy by the following economic structures:

$$Y_t = \sum_{i=0}^{k} B_i Y_{t-i} + \sum_{i=0}^{k} C_i p_{t-i} + u_t \qquad (1)$$

$$p_t = \sum_{i=0}^{k} D_i Y_{t-i} + \sum_{i=1}^{k} g_i p_{t-i} + v_t \qquad (2)$$

where Y is a vector of macroeconomic variables, p is a variable indicating the stance of monetary policy, which is represented in this study in terms of short-term interest rates; u and v are orthogonal disturbances. Equation (2) therefore refers to the central bank's policy reaction function. The Y vector is defined to include real GDP, the GDP, deflator and the exchange rate.[3] This system serves as the baseline model.

To identify the system, this paper follows Bernanke and Blinder (1992) in assuming that policy shocks do not affect the given macro-

[3] Sims (1992) proposes the inclusion of an exchange rate or a commodity price variable to avoid the occurrence of the "price puzzle." These variables determine the future course of inflation. In this study, the inclusion of a commodity price index, the oil spot price index, does not resolve the puzzle in these economies. When the exchange rate is included instead of the commodity price index, the price puzzle is reduced or resolved.

economic variables within the current period, i.e. C_0=0. In this case, p comes last in the VAR ordering. The ordering of variables in the system implies that current shocks to the policy stance measure are asthe other variables in the system. The resulting system is then estimated by standard VAR methods followed by a Choleski decomposition of the covariance matrix. This yields an estimated series for the exogenous policy shock v_t, and impulse response functions for all the variables in the system with respect to the policy shock v_t can be calculated and interpreted as the true structural responses to policy shocks.

The baseline model is then extended in a number of directions so one can further examine the transmission mechanism of monetary policy shocks. First, the real output variable is replaced by its major components. By doing so, one identifies which components are greatly affected by, say, monetary policy tightening. Initially, the response of private consumption and fixed capital investment were examined. The analysis is then extended through a look at their components. For private consumption, we consider the responses of durable and nondurable consumption. For fixed capital investment, construction investment and equipment investment are analyzed.

Second, monetary aggregates and indicators of credit market conditions are included in the baseline VAR. The lending rate and a proxy variable for the external finance premium (EFP) are used as indicators of credit market conditions. The EFP reflects imperfections in the credit markets that drive a wedge between the expected return received by lenders and the costs faced by potential borrowers (Bernanke and Gertler 1995). The variable, therefore, is a risk indicator and may signal difficulty in obtaining credit. In this study, EFP is proxied by the difference between lending rates and deposit rates[4] (Bernanke and Gertler 1995).

An issue relating to the estimation of the VAR model is the specification of variables in the system, that is, whether the variables are to be specified in its stationary form or not. A system specified in differences (to make it stationary) when the time series are nonstationary will generate efficient estimates. However, the true process may not be a VAR in differences. In this case, the system is misspecified. On the

[4] In the Philippines, the difference between the deposit and lending rate may not be a good indicator of the external risk premium, because deposit rates are usually set by oligopolistic forces and have been artificially low for a very long time. However, the absence of long time series data for other proxy variables limits the study to the above variables.

other hand, in a VAR system specified in levels, parameters are estimated consistently and have the same asymptotic distribution as would estimates be on differenced data. This is also true even if the true model is a VAR in differences (Hamilton 1994). Lutkepohl (1991) and Doan (1996) provide additional arguments why specification in levels is more appropriate than specification in differences. For these reasons, the empirical literature on monetary transmission mechanism has specified the variables in its level form (Bernanke and Blinder 1992; Christiano et al. 1996; Leeper et al. 1996). This study likewise follows this specification.

This study chose the countries where quarterly national accounts data are available. Hence the inclusion of Korea, the Philippines, and Thailand. The sample period runs from the first quarter of 1981 to the third quarter of 2000 for Korea and the Philippines and from the first quarter of 1993 to the third quarter of 2000 for Thailand. The policy stance measure is represented by the money market rate for Korea, Treasury bill rate for the Philippines, and the overnight lending rate for Thailand. These short-term interest rates have continued to play a significant role in the conduct of monetary policy in Korea, the Philippines and Thailand (Van't Dack 1999). Except for the interest rates and the exchange rate, all variables in the system are in real values and are seasonally adjusted via the US Bureau of Census X-11 methods.[5]

Results

In the succeeding analyses, the study applies a positive one standard deviation shock to the policy stance equation, and this is interpreted as a monetary tightening. The plots of the impulse response functions reflect the movements of the macroeconomic variables in the baseline model to this positive shock. As output and its components are measured in logs, the responses can be interpreted as proportions of baseline levels. The baseline VAR model is estimated with the following ordering of variables: real GDP, GDP deflator, the exchange rate, and the policy rate.[6] For all countries, the SBC information criterion (Lutkepohl 1991; Hamilton 1994) chooses a 1-lag order for the VAR system. Results are discussed below.

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[5] See data appendix for details.

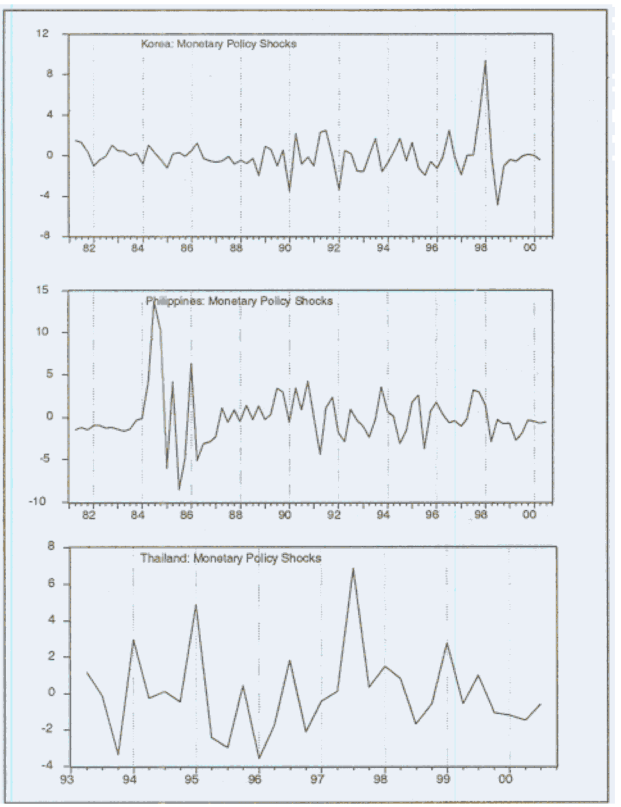
[6] Impulse Response Functions derived from different orderings of variables in the VAR system and different sample periods generated qualitatively similar results.

Monetary policy shocks

This paper first looks at the monetary policy shocks derived from the baseline models in Korea, the Philippines, and Thailand. These monetary policy shocks may be used to characterize the monetary policy conditions in these countries. It is considered "tight" or "contractionary" when the policy shock is positive, and "loose" or "expansionary" when the shock is negative. Figure 1 plots the behavior of these monetary policy shocks.

For the whole sample period, monetary policy shocks appear to be most idiosyncratic in the Philippines than in Korea based on their standard deviations. The monetary policy shocks in the Philippines have a standard deviation of 3.16 while policy shocks in Korea have a standard deviation of 1.73. The high standard deviation of monetary policy shocks in the Philippines is likely influenced by the high variance of these shocks during the crisis that hit the country in 1984.

Figure 1. Monetary policy shocks



However, we see a different picture when we focus the observation only for the period 1993-2000. The standard deviation for the Philippines reduces to 1.85. This is now lower compared to Korea and Thailand which have 1.97 and 2.29, respectively, corresponding to the standard deviation of their monetary policy shocks.

Taking a closer look at the behaviors of these policy shocks during the recent crisis period, monetary policy conditions in the three countries appear to be relatively "tight" or "contractionary" (very tight, in fact, at least for Korea and Thailand) compared to other periods in the '90s. Korea reached the peak of its policy shocks sometime toward the end of the last quarter of 1997 and Thailand, sometime between the second and third quarters of 1997. In terms of the short-term interest rates, Korea experienced the most abrupt increase on its interest rate from 16.44 percent in the fourth quarter of 1997 to 23.93 percent in the first quarter of 1998 while the Philippines and Thailand had a high of 17.83 percent and 20.64 percent, respectively during the first quarter of 1998. Figure 2 plots the movements of these short-term interest rates.

For Korea and Thailand, the periods of high monetary policy shocks and policy rates during the crisis period coincide with the time when these countries began their stabilization programs with the IMF.[7]

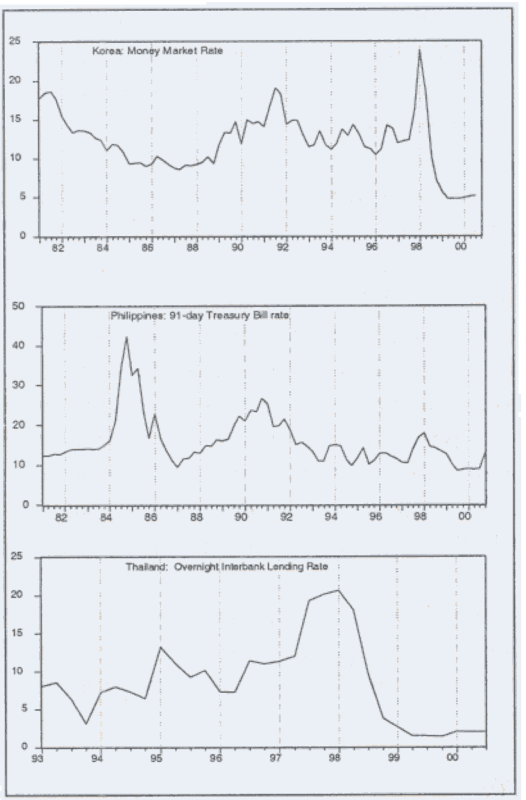
Country case results

Korea (1981-2000)

Figure 3a plots the impulse response functions of the baseline model in Korea. The positive one standard deviation shock to the policy stance equation causes the money market rate to increase to 1.29 percent immediately following the policy shock. The increase persists for some time and returns to its initial value only after about nine quarters. This monetary tightening results in a statistically significant decline in the country's real GDP. To make it comparable to the results of the other countries in this study, this paper states this effect in terms of the implied interest rate multiplier. The implied interest rate multiplier is computed as the ratio of the maximum decline in real output to the increase in the policy rate. This can be interpreted as the proportional decline in real output per one percentage point increase in the policy rate. The resulting implied multiplier for Korea is -0.77. This decline

[7] IMF-supported stabilization programs began in August 1997 in Thailand and December 1997 in Korea. See Lane et al. (1999) for a summary.

Figure 2. Short-term interest rates

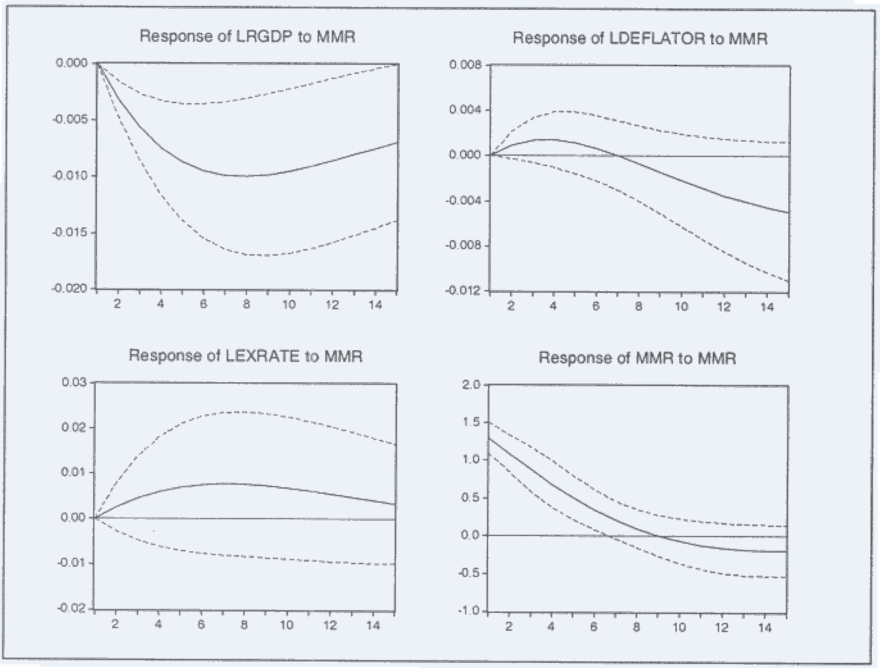


in real GDP reaches its maximum value eight quarters after the policy shock and recovers thereafter.

On the other hand, the price deflator remains inert for about seven to eight quarters before finally declining. In terms of the effect on the country's exchange rate, there is a puzzling exchange rate depreciation after the monetary contraction. Efforts were made to replace the exchange rate by its real value but results are qualitatively similar. This finding should therefore be taken with caution. While it may be suggestive, it should not be construed as evidence demonstrating the depreciating effects of monetary tightening to the country's exchange rate. This thorough analysis of the interest rate-exchange rate nexus is best left to future research.

This paper then examines the impact on various components of GDP. These components are inputted to the baseline model one at a

Figure 3a. Korea: baseline VAR (response to one S.D. innovations ± 2 S.E.)

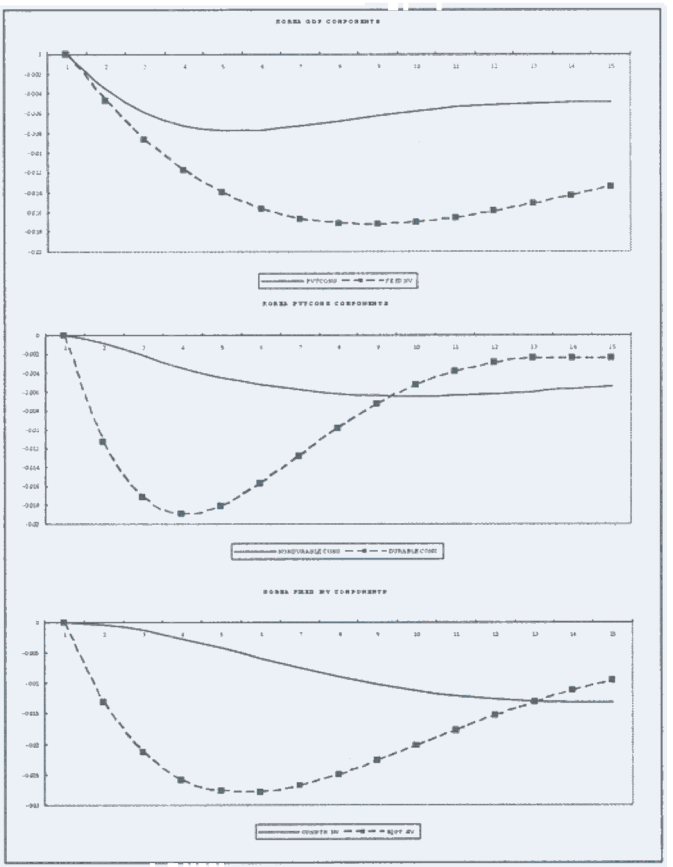


time. For each component, the VAR is estimated with the following ordering: real GDP less the component of interest, the real GDP component of interest, prices, and the policy rate. Figure 3b plots the impulse response functions of these variables to the same positive one standard deviation shock to the monetary policy stance equation. Results are also stated in terms of the implied interest rate multiplier.

Both components of real GDP exhibit a decline after the monetary policy tightening. However, the decline is more severe in the fixed capital investment component. Real fixed capital investment declines by 1.4 percent while private consumption declines only by 0.6 percent. While this decline in fixed capital investment persists longer, the decline in private consumption expenditure bottoms out faster. This happens about five quarters after the policy shock. Fixed capital investment bottoms out after about nine quarters and remains low for quite some time.

In terms of the components of private consumption expenditure and fixed capital investment, the monetary policy tightening has its most severe effect on private durable consumption. This private con-

Figure 3b. Korea: GDP components



sumption expenditure component also reacts much faster and bottoms out after four quarters compared to private nondurable consumption. On the other hand, equipment investment is more sensitive to monetary policy actions relative to the construction investment.

Next, this paper proceed to the analysis of various monetary aggregates and indicators of credit market conditions in Korea. These variables are also added one at a time to the baseline model. When a monetary aggregate is included in the baseline model, it is included after the policy rate. Other variables, when included in the baseline VAR model, are placed before the policy rate. Figures 3c and 3d show

Figure 3c. Korea: monetary aggregates

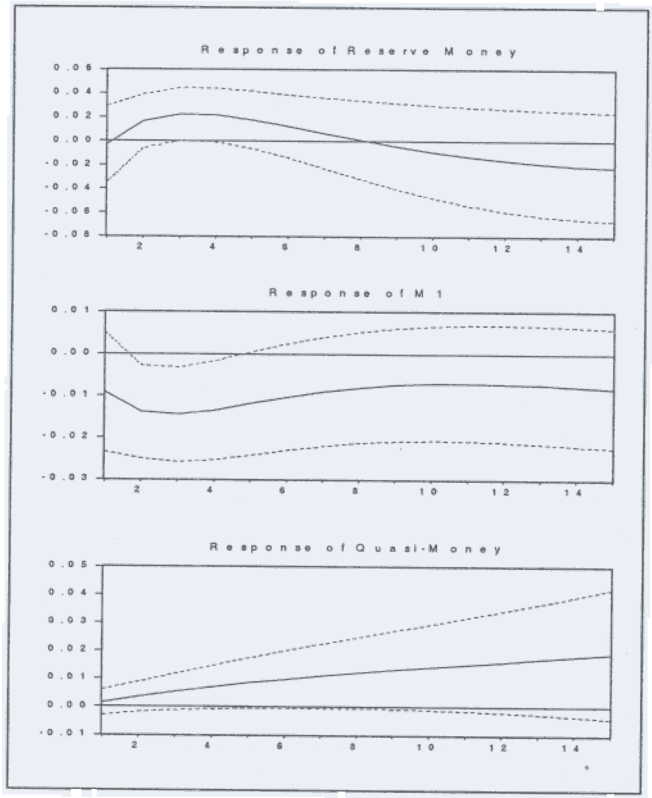
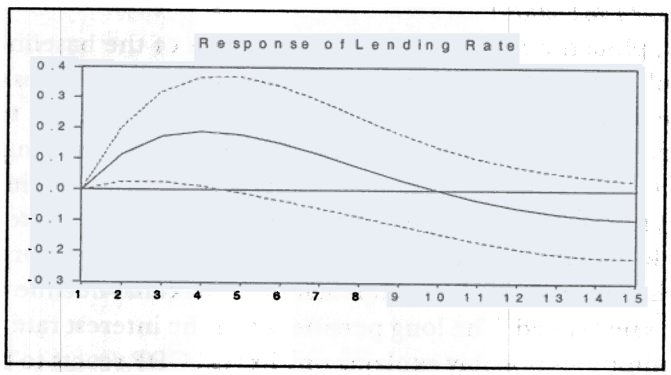


Figure 3d. Korea: credit market conditions



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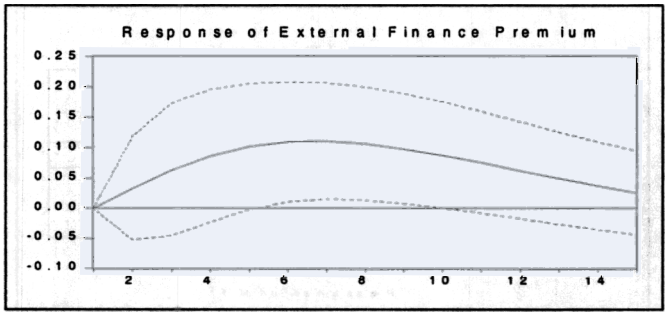


the movements of these variables in response to the same positive one standard deviation shock to the policy rate.

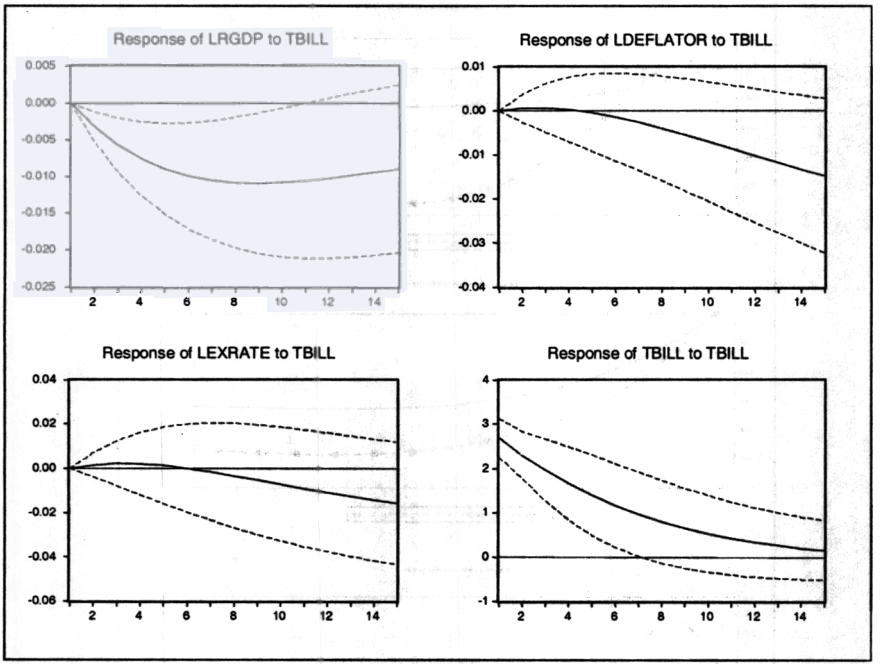
Monetary policy tightening results in a lower level of money in circulation, or M1, and this response persists for some time. However, the opposite response is observed in the case of quasimoney. This increase in the quasimoney in Korea may reflect the attractiveness of financial deposits as a result of higher deposit rates after the monetary tightening. Bank reserves also increase in light of the monetary contraction.

Finally, indicators of credit market conditions reveal a tight credit market situation after the policy shock. The lending rate increases in Korea and reaches its peak in the fourth quarter after the shock. The external finance premium also increases and is very persistent, lasting for more quarters than the lending rate.

Philippines (1981-2000)

Figure 4a plots the impulse response functions of the baseline model in the Philippines. Results show that the Treasury bill rate rises to about 2.7 percent after the monetary policy shock and this seems to persist even after 14 quarters. This increase is higher and lasts longer compared to the interest rate response in Korea. In terms of the impact on real GDP, the estimated implied multiplier for the interest rate is about minus 0.40 and is only half of the estimated multiplier in Korea. However, both countries' real output reach their maximal decline at a relatively the same speed. The long persistence of the interest rate increase in the Philippines possibly explains why its real GDP reacts to the monetary tightening at a relatively the same rate with that of Korea despite the fact that the implied multiplier is higher in Korea.

Figure 4a. Philippines: baseline VAR (response to one S.D. innovations ± 2 S.E.)

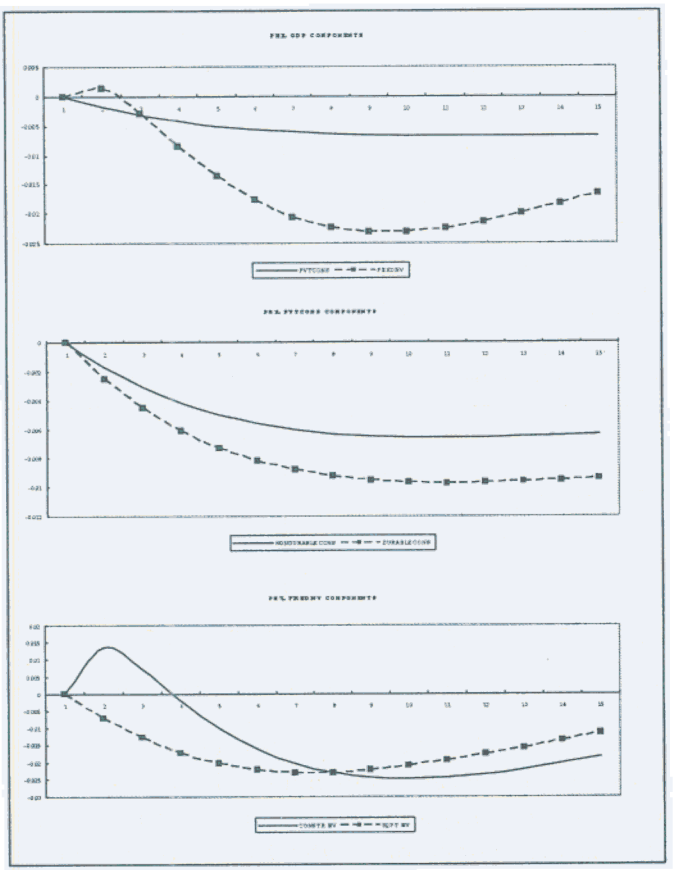


The price deflator in the Philippines remains relatively flat for about four to five quarters after which it declines. On the other hand, the currency of the country appreciates although this currency appreciation happens after a delay of roughly five to six quarters.

The reaction pattern of the different components of real GDP to monetary policy tightening in the Philippines is qualitatively similar to those found in Korea. Figure 4b plots the impulse response functions of these different components of real GDP. Both private consumption expenditure and fixed capital investment decline after the policy shock, with the latter reacting severely to the policy shock albeit with some delay of about two to three quarters. The implied interest rate multiplier on fixed capital investment is estimated to be about minus 0.9 and reaches its maximal decline after nine quarters.

Monetary policy tightening also has its most severe effect on private durable consumption in the Philippines. Results also show that this decline persists longer in the Philippines than in Korea. It reaches its bottom after 11 quarters in the former but only after four quarters in the latter. In terms of the components of fixed capital investment,

Figure 4b. Philippines: GDP components



the impulse response shows that construction investment reacts slower than equipment investment. Construction investment initially increases but eventually declines after three to four quarters.

Figures 4c and 4d show the movements of the other macroeconomic variables in the Philippines. All monetary aggregates generally decrease after the monetary policy shock and these reactions happen quickly. Indicators of credit market conditions also reveal tighter credit situations. Both lending rates and the external finance premium increase as a result of monetary tightening. These responses also appear to be persistent.

Figure 4c. Philippines: monetary aggregates

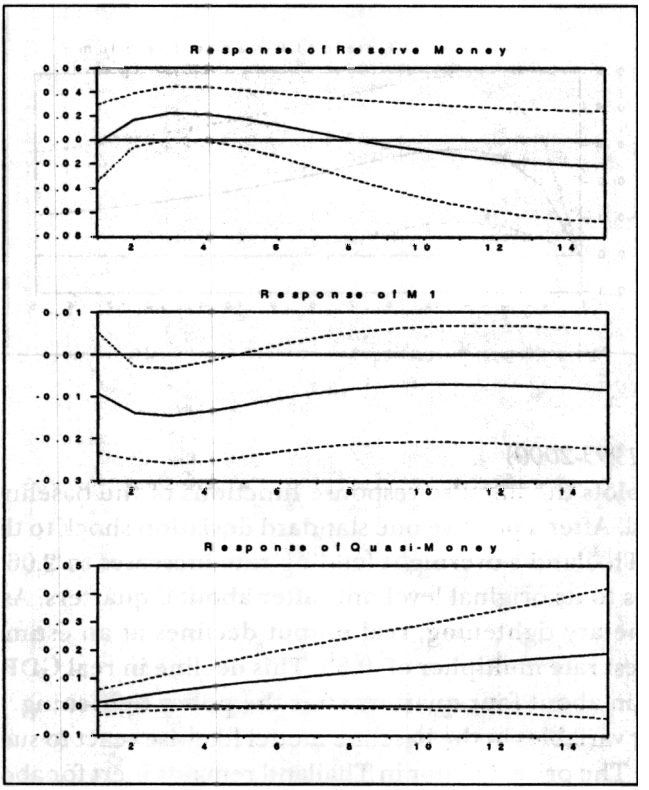
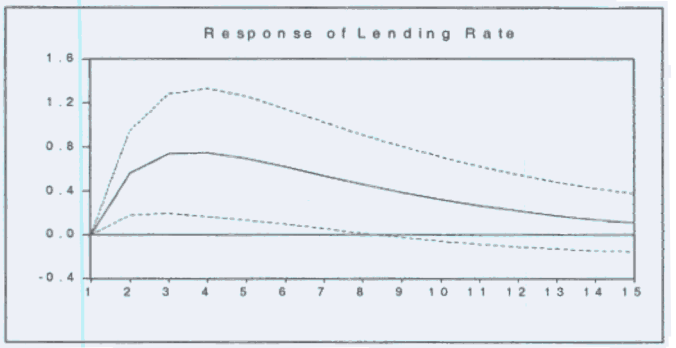


Figure 4d. Philippines: credit market conditions



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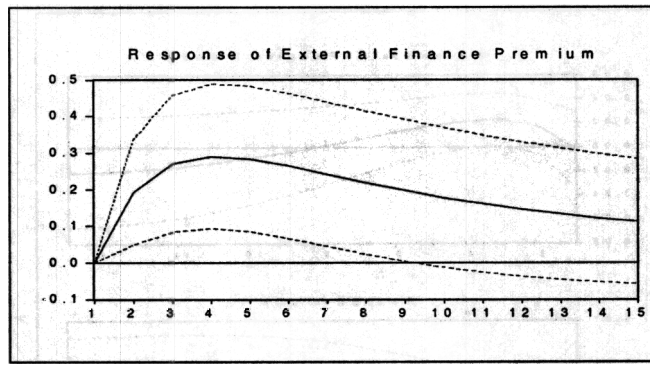


Thailand (1993-2000)

Figure 5a plots the impulse response functions of the baseline model in Thailand. After a positive one standard deviation shock to the policy equation, Thailand's overnight lending rate increases to 2.06 percent and returns to its original level only after about 6 quarters. As a result of the monetary tightening, real output declines at an estimated implied interest rate multiplier of -0.33. This decline in real GDP reaches its bottom in about four quarters after the policy tightening.

Other variables in the baseline model likewise react to such policy tightening. The price deflator in Thailand remains inert for about three to four quarters before finally declining while the country's exchange rate appreciates although this happens after a delay of roughly three to four quarters.

In terms of the components of real output, results show that the decline in fixed capital investment is more severe compared to the decline in private consumption expenditure. It reaches its maximal decline four to five quarters after the monetary policy shock while private consumption expenditure bottoms out three to four quarter after. Based on the responses of the components of private consumption expenditure and fixed capital investment, the most severe impacts are in private durable consumption and equipment investment, respectively. Figure 5b shows the impulse response functions of these different components of real output to a monetary policy shock in Thailand.

Figure 5a. Thailand: baseline VAR (response to one S.D. innovations ± 2 S.E.)

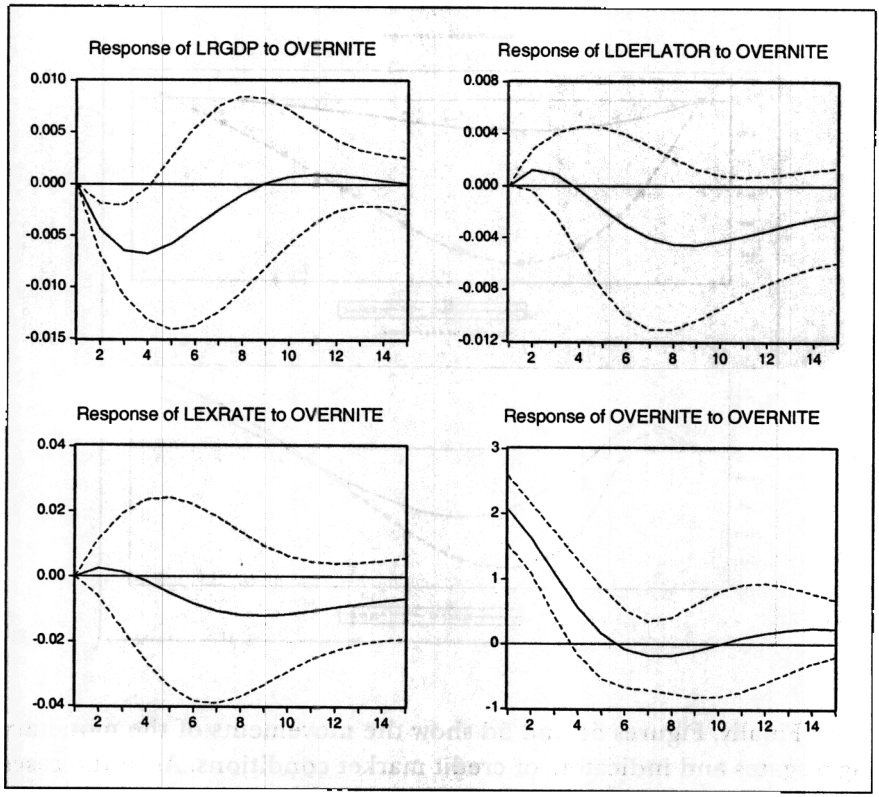
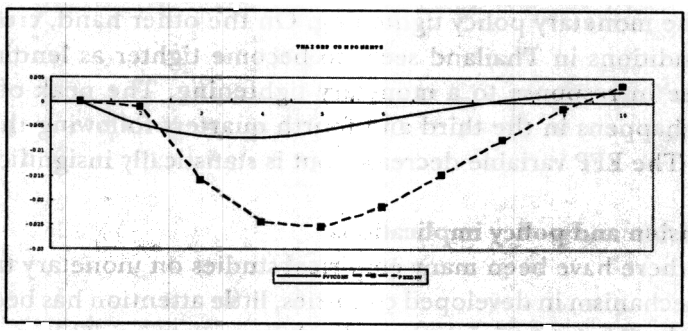


Figure 5b. Thailand: GDP components



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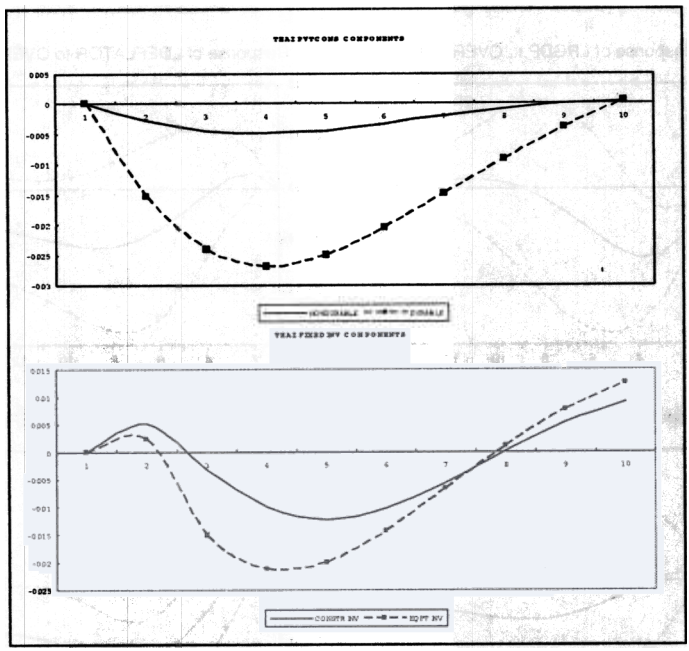


Finally, Figures 5c and 5d show the movements of the monetary aggregates and indicators of credit market conditions. As in the cases of Korea and the Philippines, a strong liquidity effect is observed as indicated by the persistent decrease in the level of narrow money. There is likewise a contemporaneous decrease in the level of quasi-money after the monetary policy tightening. On the other hand, credit market conditions in Thailand seem to become tighter as lending rates increase in response to a monetary tightening. The peak of the increase happens in the third and fourth quarters following the policy shock. The EFP variable decreases but is statistically insignificant.

Conclusion and policy implications

While there have been many empirical studies on monetary transmission mechanism in developed countries, little attention has been given to developing countries such as the Asian countries. This study is an

Figure 5c. Thailand: monetary aggregates

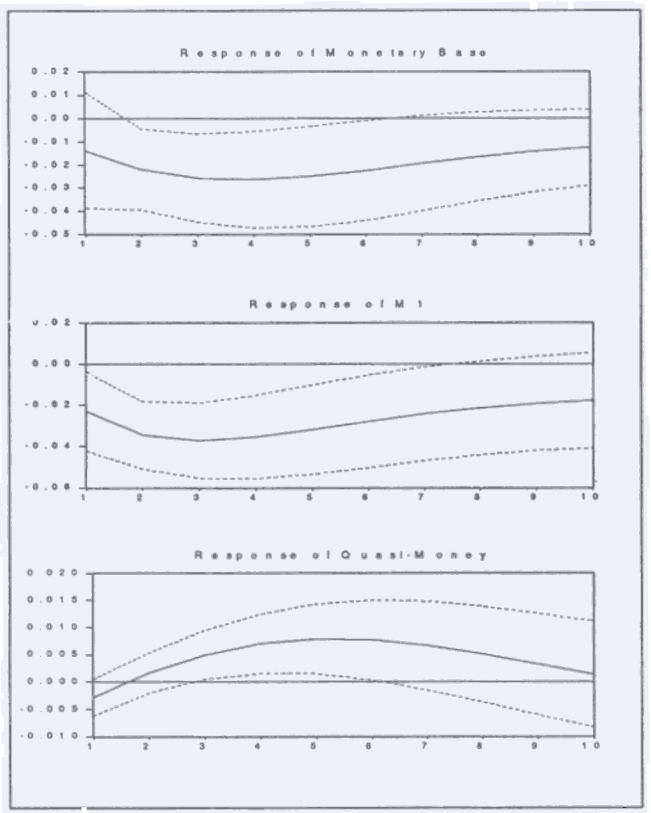
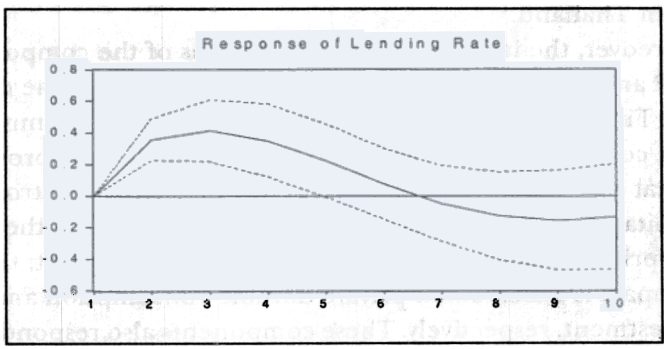


Figure 5d. Thailand: credit market conditions



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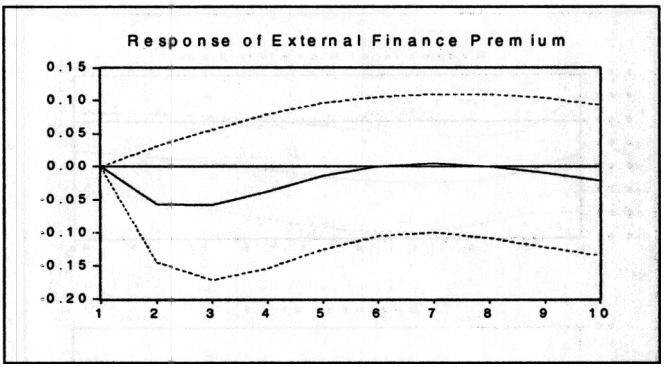

attempt to fill this gap. It explores the monetary transmission mechanism in Korea, the Philippines and Thailand using a series of VAR models. Starting from a baseline model that captures the overall mechanism of a monetary policy shock to the economy, the role of the different components of real GDP, monetary aggregates and indicators of credit market conditions are also examined. Qualitatively, there is generally an increase in interest rates and a 'hump-shape' response of real GDP following a monetary tightening. Quantitatively, results indicate that a positive one standard deviation shock to the country's policy rate causes the interest rates to increase to 1.29 percent, 2.7 percent and 2.06 percent in Korea, the Philippines and Thailand, respectively. The corresponding implied interest rate multipliers on real output are -0.77 percent in Korea, -0.40 percent in the Philippines, and -0.33 percent in Thailand.

Moreover, the impulse response functions of the components of real GDP and various macroeconomic variables reveal some common patterns. First is the magnitude effect of the policy tightening to the different components of real GDP. Results of this study provide evidence that the impact of monetary policy tightening is stronger on fixed capital investment than on private consumption. Of the components of private consumption and fixed capital investment, the more severe impact is observed on private durable consumption and equipment investment, respectively. These components also respond quickly to the policy tightening. This pattern is quite robust across the three economies included in the study. However, in terms of the speed of

reaction to a monetary policy tightening, the components of real GDP in the three countries exhibit different patterns of movement. In Korea, private consumption spending bottoms out faster than fixed capital investment but in the Philippines, the reverse is true. In Thailand, both private consumption and fixed capital investment bottom out at relatively the same time.

Second, there is a delay in the response of some GDP components to the monetary policy tightening. That is, the bulk of the response of some GDP components occurs after most of the interest rate effect is already past. For instance, the interest rate increases due to the policy shock are virtually back to their trend after nine quarters in Korea, about 14 quarters in the Philippines, and six quarters in Thailand. However, fixed capital investment reaches its maximal decline only after nine quarters in Korea, nine quarters in the Philippines and five quarters in Thailand.

Third, monetary policy tightening is followed by tighter conditions in the credit market. Lending rates in the three economies increase in response to the contractionary policy shock. The peak of the increase on the lending rate in Korea, the Philippines, and Thailand happens roughly in the third and fourth quarters following the policy shock. The external finance premium variable also increases in Korea and in the Philippines. The behavior of the external finance premium variable in Korea and in the Philippines is very persistent, lasting for more quarters than the lending rate. These findings suggest that monetary policy may be transmitted to the economy other than the usual interest rate effects. The significant response of the external finance premium to the policy shock suggests that risk perception by banks plays a crucial role in influencing their willingness to supply credit. The interest rate alone cannot explain the generally observed delay in the response of some GDP components, resulting in a poor correspondence in timing between interest rate changes and movements in the components of GDP. However, this poor correspondence may be explained by the persistence of "tight" credit conditions, as indicated by the external finance premium variable even after the interest rate has fallen back to its original level. It is interesting to note that this "tight" credit conditions coincide with the periods when the bulk of the response of some GDP components occurs. This mechanism, in conjunction with the usual interest channel, may serve as a "financial accelerator" in amplifying the shocks to the economy (Bernanke et al. 1999).

This finding points out to the significant contribution of the banking system in transmission process.

Finally, this study found differences in terms of the magnitude and speed of reaction to a monetary policy shock across the three economies. For instance, the response of GDP components to a monetary policy tightening is generally faster and more severe in Korea than in the Philippines. While differences in the economic environment are suspected contribute to this observation, investigating these differences and its relation to monetary transmission mechanism would be an important avenue for further research.

Based on the foregoing findings, the role of the IMF-prescribed high-interest-rate policy or monetary policy tightening in the 1997 Asian crisis can hardly be ignored. Monetary policy was assigned the role of countering the downward pressure on the already weakening currencies of the region. However, tight monetary policy was implemented in an environment where high debt-equity ratios in the corporate sectors as well as structural problems made the financial sector more vulnerable to increases in the interest rates. As a result, there was an overwhelming depression in aggregate demand in the Asian economies.

Moreover, in the aftermath of the 1997 crisis, credit slowdown was apparent across all the Asian economies. This may not only be true for the demand side but also for the supply side. With deteriorated corporate balance sheets, it appears that banks may have resorted to quantitative restrictions in loan provision. Thus, economic recovery in the region has not been supported by recoveries of bank credits. In fact, the so-called V-shaped recoveries of East Asian economies after the crisis were not achieved by the resurgence of endogenous private demands, such as consumption and investment, but barely supported by that of exogenous demands (i.e., exports and fiscal stimulus). Even as late as 2002, there was no observable significant resurgence of domestic credits to the private sector, particularly in the case of Malaysia and Thailand. Hence, it is difficult to claim that the 1997 monetary policy tightening has little to do with the persistent slowdown of domestic investment, credit supply and output in these economies. There seems to be reason to believe the credit crunch hypothesis and that the recovery of credit supply are indispensable tools for the autonomous recovery of these economies.

Data Appendix

All variables used in this study are quarterly time series. The sample period covers the first quarter of 1981 through the third quarter of 2000 for Korea and the Philippines, and the first quarter of 1993 through the third quarter of 2000 for Thailand. The shorter sample used for Thailand is primarily due to data availability. Thailand started to publish its quarterly national accounts data only in 1993. Except for the interest rates, all variables are expressed in logs and are seasonally adjusted. Sources and definitions of the variables are discussed below.

Data were obtained from the International Financial Statistics (IFS) of the International Monetary Fund, from the homepages of the Bank of Korea (*http://www.bok.or.kr*) and the Bank of Thailand (*http://www.bot.or.th*), and from the National Accounts of the Philippines published by the National Statistical Coordination Board.

The series on short-term interest rate is the money market rate for Korea and the 91-day Treasury bill rate for the Philippines. Both series are obtained from the IFS data, lines 60B and 60C, respectively. The interest rate for Thailand is the overnight interbank lending rates (average) downloaded from the Bank of Thailand's homepage. The nominal exchange rate is in terms of national currency per US dollar obtained from the IFS; line RF for each national series. Real GDP and its components are obtained from the country's respective central bank database and publications. The output series is in terms of 1995 prices for Korea, 1985 prices for the Philippines, and 1988 prices for Thailand. The components examined in this study are real private consumption and fixed capital investment. Private durable and nondurable consumption components of the former and construction investment and equipment investment components of the latter are also examined. However, the presentation of the GDP components is not uniform across the three countries so these components are transformed to limit the analysis to the above variables. In the Philippines and Thailand, private nondurable consumption includes expenditure on food, beverages, tobacco, clothing and footwear, and fuel, light, and water. Private durable consumption includes spending on equipment and furnishings. In Korea, private consumption components are disaggregated into nondurable, durable, semidurable and services. In this study, private durable consumption includes both durable and semidurable consumption. Other than this, no other transformation is made for Korea. The presentation on the components of fixed capital investment is less problematic. Definition is generally similar across

the three countries. The implicit price deflator is computed as the ratio of the nominal GDP to real GDP (both seasonally adjusted), and then multiplied by 100.

Monetary aggregates for all countries are obtained from the IFS. The series on bank reserve for Korea is from line 20 while the series on monetary base is from line 14. Narrow money and quasimoney are from lines 34 and 35, respectively.

Finally, deposit and lending rates are likewise obtained from the IFS. In particular, these rates refer to the one-year time deposit rate at Deposit Money Banks (DMBs), and minimum lending rates on DMBs for Korea and the 61-90 day deposit rate and average lending rate for the Philippines. The series on deposit rate is from line 60L while the series on the lending rate is from line 60P for each country.

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