

The Role of Exchange Rate in Inflation Targeting

Takatoshi Ito^{*}
University of Tokyo

Post-Conference Version
Final, May 2007

Abstract. Issues related to compatibility of inflation targeting with managed exchange rate regime are examined. The inflation targeting regimes in Asia are reviewed. The correlation between the inflation rate and the exchange rate movement is reviewed. It is argued that monetary policy actions in order to keep the inflation rate stable in response to an inflation shock will also offset the impact on the exchange rate from the inflation shock. Similarly, an exchange rate shock may be countered by monetary policy that will keep both the exchange rate and the inflation rate stable. Therefore, under usual circumstances, inflation targeting and the exchange rate management are not inconsistent, especially when both targets have reasonably wide ranges.

JEL: E31, E52, F31

Keywords: inflation targeting; managed exchange rate; monetary policy; central banking

^{*} Professor, Graduate School of Economics and Graduate School of Public Policy, University of Tokyo. Views and Opinions expressed in this paper is the author's and they do not necessarily represent those of the official institutions that the author has been affiliated with in the past and present. The original version of this paper was prepared for the conference "Challenges to Inflation Targeting in Emerging Countries," at the Bank of Thailand on November 13, 2006. The author is grateful to Drs. Khor Hoe Eee, Claudio Borio, Hans Genberg, Bandid Nijathaworn, Adam Posen, and Pichit Patrawimolpon and other participants of the conference for their valuable comments.

1. Introduction

The exchange rate is an important variable for policy decisions, especially in a small open economy. Prior to the Asian currency crisis, many central banks in East Asia, and other emerging market economies, had maintained the fixed exchange rate regime with a belief that exchange rate stability is essential for promoting trade and investment. However, the fixed exchange rate regime had become difficult to maintain when the capital accounts were liberalized. Some emerging market economies, including Mexico and Thailand, first received large capital inflows followed by large outflows. When the central bank, faced with massive outflows, tried to maintain the fixed exchange rate and exhausted the foreign exchange, the currency crisis resulted.

The fixed exchange rate with capital mobility meant the loss of control in monetary policy. The impossibility of having capital mobility, the fixed exchange rate, and independent monetary policy, is often called “impossible trinity.” After the Asian crisis, the “two-corner solution” was advocated by the IMF and the United States. It says that the stable exchange rate regime is either the hard peg (currency board or dollarization) or free float. The intermediate regimes, such as the managed float or the fixed exchange rate regime without a currency board arrangement, were regarded as inherently unstable. (See Fischer (2001) for such a view.) However, free floating may result in the loss of nominal anchor, or a guidance of monetary policy. Since 1998, the IMF has recommended to emerging market economies in addition to advanced countries a combination of free float and inflation targeting in order to lessen the probability of a currency crisis with stability of domestic prices.

The “two-corner solution” has become not so popular since the collapse of the currency board in Argentina. Even the currency board was not immune from the currency crisis, because the domestic adjustment to avoid a currency crisis was not as automatic as theory of currency board presumed.

Although one corner became not so popular, the other corner, the free float regime, seemed to have gained more popularity, and so has inflation targeting. In East Asia, Korea, Thailand, the Philippines, and Indonesia adopted inflation targeting since 1998. Many emerging market economies have adopted, with or without recommendation of IMF, the inflation targeting framework since 1998, some have not necessarily given up on intervention in the foreign exchange market.

Time to time, the monetary authorities have intervened in the foreign exchange market, and have attempted to influence the exchange rate movement. Inferring from the changes in the foreign reserves, interventions have been rather large for some emerging market countries.

Many inflation-targeting central banks of emerging market economies are believed to have managed the exchange rate in an attempt to lessen the volatility of the exchange rate.¹ This raises a question whether the managed exchange rate regime is compatible with inflation targeting. A purist view is that an inflation targeting central bank should not attempt to manage the exchange rate. The central bank should not pursue two objectives. However, a more pragmatic view is that a managed exchange rate regime and inflation targeting are compatible with each other most of the time. Those central banks that practice both inflation targeting and substantial intervention are practicing a pragmatic view.

Inflation targeting is a framework that the inflation rate is to be contained within an announced range in the medium term. A fluctuation within the range is allowed according to a shock to the economy. The demand or supply shock is partially accommodated with a commitment that the inflation rate in the future will be kept or brought back to the target range. With the medium term commitment to price stability, expected future inflation rate would not change even with some shocks.

Suppose that both the inflation targeting and the exchange rate targeting aim at being inside a range, and not pursuing a point. The question is how serious the defect is to pursue two loose targets by one instrument. If responding to a shock in one variable also contributes to keep the other variable stable, then pursuing two objectives is compatible with each other.

The exchange rate fluctuations are one of the shocks to the economy. If it can be established that a natural response to the exchange rate shock may not jeopardize inflation targeting, or even contribute to stabilizing prices, then pursuing the two targets with one instrument may not be so bad. When the exchange rate appreciates, it tends to have effects of lowering the inflation rate through two channels, lowering the cost of

¹ See Brash (2002) for the inflation targeting experiences of New Zealand, the first inflation targeting country. It had a brief period of a mistake in paying too much attention to the exchange rate by putting too large a weight on the exchange rate in the rule of the interest rate response to the various economic conditions (the so-called Monetary Condition Index).

imports and dampening the output by discouraging exports. Lowering the interest rate to stimulate the economy is an appropriate reaction in such a circumstance, unless the inflation rate is too high to begin with.

Of course, excessive intervention to fix the exchange rate may result in amplifying rather than moderating the inflation rate. Since the exchange rate is a noisy variable, an excessive reaction to the exchange rate is not a wise idea.

The rest of the paper is organized as follows. Section 2 describes the combination of the exchange rate regime and monetary policy framework, practiced by many countries. Section 3 examines the experiences of the four Asian central banks that had adopted inflation targeting. Section 4 examines the role of the exchange rate in inflation targeting. Section 5 concludes the paper.

2. Exchange Rate Regime and Monetary Policy Framework

Countries have adopted various combinations of an exchange rate regime and a monetary policy framework. The exchange rate regime varies from the hard peg to free float. The monetary policy framework ranges from no-independence to total independence. The possible combination is shown in Table 1. The two corners with shades are the so-called the two corner solutions, a hard-peg and free float.

Table 1 about here

2.1 The currency board

The currency board theoretically works like the gold standard, but replacing gold with foreign reserves (that are maintained, in most cases, US Treasury papers). The monetary authority holds foreign reserves as assets, and issue monetary base as liabilities. When capital inflows occur, the currency board monetary authority buys foreign currency at the fixed exchange rate, expanding monetary base. The interest rate will be lowered and capital inflows will be discouraged. Similarly, an increase in capital outflows automatically lowers foreign reserves and monetary base, raising the interest rate. Thus capital outflow will be discouraged. Therefore, the automatic adjustment mechanism is built in. The interest rate is maintained at the rate when capital inflows and outflows are balanced. If capital mobility is high, then the credible currency board will equate the domestic interest rate with the one in the foreign country to which the peg is maintained (in the case of Hong Kong, the US dollar).

Sterilization, or open market operations in general, is not possible because the monetary authority is not allowed to hold domestic assets. Under the currency board, there is no room for independent monetary policy, for better or worse.

The currency board has become popular when Argentina survived contagion from the Mexican crisis of 1994-95 and the Asian crisis of 1997 and Hong Kong survived contagion from the Asian crisis. However, as Argentina experienced the currency crisis and eventually de-peg from the US dollar in January 2002, the popularity was lost.

As the collapse of the currency board in Argentina shows, the currency board is not invincible.² There were several external and internal shocks to Argentina. Depreciation of the Brazilian real and of the Euro vis-à-vis the US dollar (and the Argentinean peso) from 1999 to 2001 had adverse impacts on the tradable sectors in Argentina. Domestic price and wage adjustment could not neutralize the changes in the price competitiveness quick enough. Downward adjustment of prices and wages proved to be difficult. Fiscal deficits also contributed to increasing volatility and fragility of the domestic economy, raising the interest rate, inviting short-term capital inflows. When the capital flows started to flow out as the economic conditions deteriorated, there was little choice that the government could do to prevent further outflows. The currency board collapsed in January 2002.

2.2 Free Float and Inflation Targeting

The other extreme of the two-corner solution is free float. The exchange rate is left to the market force, while monetary policy is concentrated on the domestic price stability. The central bank mandate is to keep the domestic price stability, and intervention into the foreign exchange market is kept minimal, if at all. In this category, New Zealand stands out. It was the first country to adopt inflation targeting in 1990, and its authorities have not intervened in the foreign exchange market since the late 1980s. Other countries that have adopted inflation targeting after New Zealand have intervened in the foreign exchange market time to time. However, the frequency of interventions tends to have decreased in many countries. Canada and Australia have adopted inflation targeting and the frequency of interventions has declined substantially.

Three major economies—the US, the Euro land, and Japan—have adopted free floating,

² See Mussa (2002) and Dominguez and Tesar (2005) for the crisis in Argentina.

but not inflation targeting. The Federal Reserve Board (FRB) has achieved price stability with discretionary monetary policy but with strong preference for price stability since the mid-1980s. Mr. Greenspan has achieved substantial credibility for price stability during his 18 year tenure at Chair of the FRB. Mr. Bernanke, who succeeded Mr. Greenspan in February 2006, was an academic who advocated inflation targeting so that a debate on adopting one in FRB may be stimulated. The US Treasury and FRB have not intervened in the yen/dollar market since 1998, and the euro/dollar market since 2000.

The European Central Bank since its establishment in 1999 has put emphasis on price stability. It has announced “0-2% but close to 2%” as a reference range of price stability. But it does not call the range as a target. It resisted a call for intervention during the sustained fall until the fall of 2000, although the Euro had depreciated from its introduction in January 1999 to September 2000 by more than 30%. The G7 intervened to support the Euro on September 22, 2000; and the ECB intervened on November 3, 2000. These are two occasions that the ECB and European national central banks intervened for the Euro.

The Japanese authorities have intervened in the foreign exchange market more often than the US and European counterparts. The intervention policy seemed to go through a few stages. (See Ito (2004b) for descriptions of the Japanese intervention policy.) After frequent interventions between 1991 and 1995, interventions had become very infrequent between June 1995 and December 2002. However, frequent and massive intervention occurred between January 2003 and March 2004. The Japanese authorities, namely the Ministry of Finance, purchased 35 trillion yen worth of US Treasury securities in the 15 months period. No intervention took place after March 16, 2004.

The Bank of Japan gained legal independence from the government in April 1998. The independent monetary policy board, with nine members, can decide on monetary policy without being pressured by the government. Since the exchange rate policy is decided by the Ministry of Finance and monetary policy by the Bank of Japan, a coordination problem may occur if the two institutions have different assessment on the economy. .

The Bank of Japan has not adopted inflation targeting. When the Japanese economy

went through a long stagnation, from 1992 to 2002, the monetary policy set the policy interest rate very low. In February 1999, the Bank of Japan introduced the zero interest rate policy. Although the zero interest rate policy was lifted in August 2000, the economy turned downward again in the fall of 2000. The zero interest rate was reinstated with additional feature of quantitative easing in March 2001. The unusual policy of quantitative easing was maintained for five years. The Japanese economy was in deflation, negative CPI inflation rate, from 1998 to 2005. Quantitative easing as well as massive intervention, was one of the means to fight deflation and economic stagnation. (See Ito (2004a) and Ito and Mishkin (2006) for assessment of monetary policy by the Bank of Japan.)

In March 2006, the Bank of Japan announced that 9 members of the Board had expressed their numerical “understanding” of price stability. They concluded that “It was agreed that, by making use of the rate of year-on-year change in the consumer price index to describe the understanding, an approximate range between zero and two percent was generally consistent with the distribution of each Board member's understanding of medium- to long-term price stability. Most Board members' median figures fell on both sides of one percent.” (The Bank of Japan, “The Introduction of a New Framework for the Conduct of Monetary Policy,” March 9, 2006.) However, this is not regarded as an inflation targeting.

2.3 Intermediate Regimes

Countries that have adopted neither hard peg nor free float are said to maintain intermediate regimes. This includes a fixed exchange rate regime without a currency board, a pre-set crawl arrangement with or without a band, and managed float. Managed float is also categorized into several variations. Some central banks operate without explicit target on the exchange rate, but conduct intervention to moderate the speed of changes. Other central banks implicitly target some range of the exchange rate, and attempt to keep the exchange rate within the range. For a central rate of the range, some countries have implicit or explicit reference to the basket value of major trading partners' currencies. Some countries allow drift, while others try to keep the central rate stable. Many countries do have some band of tolerance, and interventions are conducted to keep the exchange rate within the band. Most central banks under the managed float, however, do not announce the central rate or a band that they have in mind. Also, the central rate or a band would drift over time.

An intermediate regime seems to be compatible with various types of monetary policy frameworks. Some central banks adopt inflation targeting while others do not announce a numerical target for price stability.

Table 2 shows the variety of exchange rate regimes in Asia. Before the Asian crisis of 1997-98, most of the Asian currencies were de facto pegged to the US dollar. After the Asian currency crisis, the variety has increased, and now they distribute over a wide range of exchange rate regime.

Table 2 about here

2.4. Hungary

Hungary is unique in pursuing an announced fixed exchange rate with a band and inflation targeting. The objective of the central bank is to achieve and maintain price stability, and the inflation targeting has been adopted since the summer of 2001. It is said that the interest rate and exchange rate policies are subject to the inflation targeting policy. The central bank issues inflation reports and the fan chart is produced—both a hallmark of an inflation targeting central bank. The target rates have been set once a year with a reference period of two years ahead.³ In August 2005, the government and the central bank jointly adopted an explicit medium-term inflation target for the period starting in 2007, with a target range of inflation rate at 3%, measured in CPI.

What is unique to Hungary is that the Central Bank Act requires that the bank is to maintain the exchange rate within a certain band.⁴ The central parity, a peg to the euro, is 282.36 forint/euro. The market exchange rate may deviate from the parity within the

³ The target range has been revised as follows: 7% plus/minus 1% point for the period ending in December 2001 (set in June 2001); 4.5% plus/minus 1% point for December 2002 (set in June 2001); 3.5% plus/minus 1% point for December 2003 (set in December 2001); 3.5% plus/minus 1% point for December 2004 (set in October 2002); 4% plus/minus 1% point for December 2005 (set in October 2003); and 3.5% plus/minus 1% point for December 2006 (set November 2004).

⁴ The central bank act (Article 11 (2)) states: “The Government, in agreement with the MNB, shall determine the exchange rate regime, and all parameters thereof, in particular the width of the fluctuation band, the central parity and the composition of the currency basket. Changes in the exchange rate system shall be made without prejudice to the primary objective of the MNB to achieve and maintain price stability.” See Magyar Nemzeti Bank homepage: <http://english.mnb.hu/Engine.aspx>

+/-15 percent fluctuation band, namely between 324.71 forint/euro and 240.01 forint/euro. The central parity was 276.1 forint/euro between 4th May 2001, the widening of the band, and 4th June 2003. At the edges of the band, the central bank buys or sells foreign exchange to prevent the further appreciation or depreciation of the forint. The minimum amount of intervention is 4 millions euro.

The exchange rate stability is important for Hungary because it aims at joining the euro and the strategy requires the stability of the exchange rate. Spain also had inflation targeting before joining the euro. The stage of ERM-II, fixed exchange rate to the euro, is important, and any inflation target has to be consistent with this aim. Currently at the 15% band around the central parity is considered to be wide enough a margin to pursue both objectives.

For the purist of inflation targeting, the Hungarian arrangement is not a good form of inflation targeting. The double objective of inflation targeting and exchange rate peg (with a band) may result in incompatible situations. At the floor or ceiling of the exchange rate band, the central bank will put its power toward maintaining the exchange rate band. This may require compromising on the inflation front or resulting in the currency crisis.

However, from the Hungarian point of view, and any other EU-accessing countries that aspire to adopt the Euro, pursuing both price stability and exchange rate stability vis-à-vis the Euro is a necessary step. The narrow path of ERM-II has to be traveled for at least two years before the Euro is adopted.

2.5. Indonesia

The Bank Indonesia Act states that “the ultimate goal of Bank Indonesia is to achieve and maintain stability in the rupiah” (Article 7). The expression, “stability in the rupiah,” needs to be elaborated, since it could mean both stability in domestic prices and stability in the exchange rate. The Bank Indonesia explains it as follows: “Stability in the rupiah is reflected in the inflation rate and exchange rate. Inflation is reflected in the overall increase in prices for goods. ... Furthermore, the rupiah exchange rate is determined wholly by market supply and demand. However, BI is able to take some actions to keep the rupiah from undergoing excessive fluctuation.”⁵ This is quite an

⁵ The following sentences that are in the original are omitted from the quoted paragraph in text: “The factors influencing inflation can be grouped into two broad categories: pressure from

unclear statement as to the objective and ability of monetary policy with regard to the exchange rate movement. As the Indonesian Government mandates the inflation target to the Bank Indonesia, the stated objective in the Act is rather confusing.

3. Experiences of the Asian Inflation Targeting

In East Asia, four countries have adopted inflation targeting. Korea adopted inflation targeting in April 1998, followed by Indonesia in January 2000 and Thailand in April 2000. (See Ito and Hayashi (2004) for an early review of inflation targeting experiences in Asia.) The Philippines adopted inflation targeting in January 2002. Although all of them can be regarded as genuine inflation targeting, the details differ among the four countries. Table 3 shows the institutional and practical details of the inflation targeting in the four countries.

Table 3 about here

The target is set by joint efforts between the central bank and the government in Thailand, Korea, and the Philippines, while the Government of Indonesia sets the target for Bank Indonesia. The Thai target range between 0% and 3.5% is rather wide, but the range has been maintained without any modification since its inception in 2000. The central level of the target range in Korea started in 1998 at a very high rate, 9%, in the wake of the currency crisis—probably expecting pass-through from a large depreciation—but it was quickly lowered to 3% in 1999. The width of the range was also narrowed from 2% point to one percent point in 2004.

Bank of Thailand targets the inflation rate defined in terms of the core inflation rate. The target range is wide, 0-3.5%, compared to any other inflation targeting countries in the world. By taking the volatile items out and having the width of 3.5% points, Thailand has been able to keep the inflation rate in the target range. This is shown in Figure 1.

Figure 1: Thailand

demand-pull inflation and cost-push inflation. Concerning this, BI is only able to influence pressure from demand-pull inflation, while pressures from cost-push inflation (related to natural disasters, droughts, distribution bottlenecks, etc.) are entirely outside BI's control. Therefore, to achieve and maintain low, stable inflation, the cooperation and commitment of all economic players, including government and private sector, is essential. Without this support and commitment, it will be difficult to bring the current high rate of inflation under control.”

Target ranges of the Bank of Korea have been frequently adjusted since its introduction in 1998. The central target rate started at 9% in 1998, but lowered to 3% in 1999, to 2.5% in 2000. But the central target rate has been kept at 3% since 2001. The width of the range was narrowed from 2% point to 1% point in 2004. As shown in Figure 2, the inflation rate was more or less within the target. The convergence to a low, stable, and narrow range has been achieved in Korea.

Figure 2: Korea

Indonesia had a difficult time stabilizing the inflation rate, although it had adopted the inflation targeting in January 2000. As Figure 3 shows, the inflation rate was mostly outside the target range. However, sudden inflation rate increases from October 2005 can be explained and excused by the regulatory changes in energy prices (reducing subsidies). As the headline CPI has volatile components, the target range of 2% point may be not wide enough for Indonesia.

Figure 3: Indonesia

Thailand, Korea, and Indonesia experience currency crises in 1997-98 as shown in Figures 1-3 above. The exchange rate depreciated by 100% (the value was halved) in Thailand and Korea at the worst point of the crisis, while the value of rupiah became the one-sixth at the worst point. The rupiah also stabilized at the much lower rate after the crisis was over. The exchange rate depreciation had large impacts on the inflation rate in 1998 in all three countries. However, the inflation rate was brought down very quickly by end of 1999 in all three countries. During the more stable time between 2000 and 2006, there is a correlation between the exchange rate movement and the inflation rate. Depreciation is associated with a higher inflation, vice versa. This fact points to importance of the exchange rate in forecasting inflation rate.

The Philippines adopted inflation targeting in January 2002. The target range is narrow, 1 % point, compared to other countries. The central bank has been missing the target, most of the time. Due to the repeated fluctuations beyond the inflation target range, credibility of having an inflation targeting framework is questioned.

The correlation between the inflation rate and the exchange rate is no so obvious in the case of the Philippines. A large increase in inflation rate in 1997 and 1998 was in

tandem with the exchange rate depreciation, partly due to the currency crisis. The inflation rate came down very quickly in 1998-99, without any associated appreciation of the exchange rate. Although depreciation of 1999-2000 is associated with depreciation, the decrease in inflation rate in 2000-2001 is not accompanied by the exchange rate movement. The inflation rate experienced a large increase in 2003, but the exchange rate was rather stable.

Figure 4: the Philippines

4. The Exchange Rate in Inflation Targeting Theory

4.1. Compatibility of two goals in normal circumstances

Suppose that the central bank has both the inflation target, π^* , and the exchange rate target (equilibrium), e^* , and that they are compatible when the output gap is zero, and the expected inflation rate is also at the target, $\pi^e = \pi^*$. When the shock to the economy disturbs the inflation rate and the exchange rate, what would be an appropriate response of monetary policy?

Let us first consider a causal relationship from an exchange rate shock to inflation rate, and an appropriate response to this shock. Suppose that the exchange rate suddenly depreciates from the target (equilibrium) due to, for example, sudden withdrawal of portfolio capital inflows. Depreciation affects the inflation process directly through import price inflation. The depreciation also promotes exports, while less capital inflows dampens the capital markets. Higher output through competitive exports will put inflationary pressure on domestic prices. These considerations justify increasing the interest rate in response to the sudden exchange rate depreciation. Higher interest rate also stimulates capital inflows and restores the exchange rate equilibrium. The action of raising the interest rate is consistent with both the inflation and exchange rate target. The case of sudden exchange rate depreciation is just the opposite—raising the interest rate is an answer.

Let us consider the reverse causality, from inflation to the exchange rate, and an appropriate response to the inflation shock. Suppose that the inflation rate increased suddenly due to, for example, increased spending by households. Domestic inflation tends to depreciate the exchange rate by making domestic products less competitive. An appropriate response is to raise the interest rate that would dampen the aggregate

demand and raise capital inflows. Thus, the inflation rate will become lower and the exchange rate will appreciate, both offsetting the initial shock.

In general, various combinations of shocks to the inflation rate and the exchange rate are shown in Table 4. In the left-upper corner and right-lower corner, the monetary policy response will be consistent in both targets. Monetary policy reactions may be more complicated in the right-upper corner and left-lower corner.

Table 4 about here

In practice, as the inflation targeting has a range within which monetary policy has “constrained” discretion, and the managed exchange rate allows the exchange rate to deviate from a target level for short-term, then monetary policy may be able to keep both the inflation rate and the exchange rate within the respective range. Of course, some large shocks, such as a currency crisis, will make the management of inflation and exchange rate much more difficult, and achieving both targets may be impossible.

So far, lags in the cause and effects are ignored. Even in pure theory, things become much more difficult once lags and forecasts are introduced to derive an appropriate policy. However, again, if shocks were relatively small, and the target ranges are reasonably wide, achieving two range objectives with one instrument may not be impossible. In the next subsection, whether intervention was employed to keep the exchange rate relatively stable.

4.2. Demand Shock vs. Supply Shock

In the inflation targeting regime, the policy should forecast future inflation rate, and take actions now as it takes time that monetary policy actions make effects on the economy, and inflation. Inflation targeting does not necessarily mean that the central bank will target the inflation rate only. In the standard interpretation of inflation targeting, such as Svensson (1997, 1999, 2000), the inflation targeting central bank may minimize the loss function that has inflation gap and output gap as components.

When the economy is under demand shock, higher output (say, by an investment boom) will produce higher inflation. Raising the interest rate will be an appropriate policy response, to put brakes on the economy. With lags in the monetary policy transmission, one is not hitting the inflation rate always, as forecast errors cannot be avoided. With

inflation rate only targeter (narrow inflation targeting) may set the policy instrument so that the expected inflation rate always equals the inflation target, while more “flexible” inflation targeter will adjust the inflation rate toward the target gradually so that output variability does not become too large. See Svensson (1997: Section 6).

In case of an adverse supply shock, such as an oil price increases, rising price is accompanied by output decline. It is not so obvious how the monetary policy should respond when the loss function includes output gap as well as inflation gap. If the inflation is expected to persist, then the interest rate should be raised to prevent higher inflation rate to be engrained in the expectation. On the other hand, output decline should be moderated by the accommodation in the interest rate. In general, monetary policy response to a supply shock is more difficult than that to a demand shock. This difficulty is independent from a question whether the central bank should pay attention to the exchange rate in its policy making.

The exchange rate shocks act more like a demand shock in most of the times as described in the preceding subsection. A Sudden depreciation (exchange rate shock unaccompanied by other real shocks) will raise the output by promoting exports and raise the domestic prices via imported inflation. Thus, the interest rate response is unambiguously in the direction of tightening. This is how the inflation targeting framework works and it will bring back (partially) the exchange rate toward an equilibrium rate, so that it may look as if the central bank is chasing two goals with only one instrument. It is fortunate that in this case chasing two goals are not so difficult,

However, there are cases that exchange rate depreciation acts like a supply shock, so that depreciation should be tolerated. There are two typical cases. First, suppose that trading partners fall into a recession (foreign income shock) and reduce demand for exports from this country. Then reduction of exports (or expectation of such an event in the future) will be most likely accompanied by the exchange rate depreciation. If the imported inflation overwhelms the price decline pressure due to lower demand, then prices will be rising even during a recession. This was the case for Australia, New Zealand, and other commodity exporters to Asia in 1998. The demand from Asia collapsed and currencies of these countries depreciated.

Second, oil price increases for oil importing countries are another case of supply shocks. Imported price increases will be direct. Energy-related inflation will cause output to

decline. The combination of inflation and output declines will most likely induce depreciation.

Therefore, when the central bank experiences exchange rate depreciation, it is most important to examine what is causing the exchange rate depreciation in order to determine an appropriate response. Depreciation is a sign of demand shock, if it is accompanied by net export increases and domestic price increases. The appropriate response to the demand shock is unambiguously an interest rate hike in order to offset (most of) the shock.

Depreciation is a sign of supply shock (such as oil price increases for importing countries, and trading partners' recession), if it is accompanied by net export declines and domestic price increases. If it is a sign of supply shock, then the interest rate may not be raised as much in the case of demand shock even if the experienced price increase is in the same magnitude, and depreciation may be left as is to help promote exports.

Svensson (2000) is one of the few inflation targeting models that include explicitly the exchange rate. He built a model where the foreign shocks come through as exchange rate disturbances. Inflation forecast targeting can produce a reaction function that takes into account the exchange rate fluctuation. Our explanations above is consistent with what Svensson (2000) explains in a rigorous model.

4.3. Monetary Conditions Index

During the Asian crises, the exchange rates of commodity exporters depreciated substantially. New Zealand tightened more than Australia, taking the exchange rate depreciation as a sign of threatening inflation (demand shock), while it was actually a decline in trading partners' income decline (supply shock).

The weighted average of the exchange rate and the interest rate constitute Monetary Conditions Index (MCI), a concept developed by the Bank of Canada in the early 1990s, but later abandoned.⁶ This was used as a market signal that monetary stance is tight or loose. The popularity of MCI has declined after the Asian currency crisis. New

⁶ In Canada, the announcement of MCI has been discontinued at the end of 2006. The Bank of Canada had not used MCI as an input into its monetary policy decisions. <http://www.bankofcanada.ca/en/rates/mci2.html>.

Zealand did not loosen quickly enough and experience deeper recessions. It was said that Reserve Bank had taken MCI mechanically and depreciation was considered to be a potential threat to inflation. Australia was more flexible, probably knowing that the shock was of a supply shock.⁷

As explained in the previous subsection, depreciation can be either as a demand or supply shock above points to a danger of reacting to the exchange rate changes mechanically. One indicator that used the exchange rate was Monetary Conditions Index

4.4. Practice

All the four inflation-targeting East Asian countries have intervened in the foreign exchange market at least occasionally. As mentioned above, the mandate for Bank Indonesia contains reference to the exchange rate as well as the domestic inflation. Other central banks have inflation target as a single objective, they have tried to avoid wide fluctuations in the exchange rate. For example, the Bank of Thailand explains its exchange rate policy as follows.

Thailand ‘manages’ the exchange rate by intervening in the foreign exchange market from time to time in order to prevent excessive volatilities in the markets, while fundamental trends are accommodated. ... The managed-float exchange rate regime together with the Inflation Targeting framework, which was formally introduced in May 2000, with short-term interest rates as the operating target has worked well for Thailand. The inflation target performs the role of a new nominal anchor for monetary policy while flexibility in exchange rates helps absorb shocks to the economy. Since the adoption of the managed-float exchange rate regime, the Thai Baht has generally moved in line with the economic fundamental. However, extreme exchange rate movements have occasionally occurred due to various causes. As a result, different combinations of techniques and tactics were used depending on the market conditions. Broadly speaking, the Bank of Thailand focuses on containing excessive and persistent exchange rate volatility and intervenes when exchange rates movements appear to be inconsistent with fundamental changes. Short-term volatility is not a major concern unless it continues to persist and

⁷ See Brash (1998) and Stevens (1998) for comparison (and criticism) of how MCI was used and contributed to policy decisions in New Zealand at the time.

become a threat to stability.⁸

4.5. Foreign Exchange Interventions

This clearly states that the exchange rate fluctuations may be countered by foreign exchange interventions—an additional tool for exchange rate management. Thailand pursues both inflation targeting and smooth movement of the exchange rate and seems to be successful since 2000. It may be the key that interventions are limited to take out extreme volatility rather than targeting a particular exchange rate level. By lowering the medium-term volatility (amplitude) of the exchange rate, targeting a particular range of the inflation rate may become even easier than more difficult.

The exchange rate has an impact on the domestic inflation rate, the central bank should pay attention to the movement in the exchange rate predicting the inflation rate in the future. As explained above, a standard reaction of monetary policy instrument, the interest rate, to the exchange rate shock was discussed. However, there is a limit that one instrument can achieve in pursuit of two objectives, unless circumstances are favorable (a demand shock case) that the interest rate action can contribute to stabilization of two objectives simultaneously. If the exchange rate is to be influenced directly, foreign exchange market intervention (sales and purchases of foreign currencies with intent to influence the exchange rate movements). Including intervention in the menu of policy instruments, the policy question becomes richer. The question is whether the central bank should change the interest rate in reaction and/or intervene in the foreign exchange market in order to change the course of the exchange rate movement and whether the intent of influencing the exchange rate may be inconsistent with inflation targeting.

There is a considerable controversy on the effectiveness of non-sterilized interventions, and intent and practices of the monetary authorities. Ito (2007) summarizes the literature and concluded, based on the Japanese disclosed daily data, that the non-sterilized interventions can have impacts on the exchange rate movements if intervention amounts are large and infrequent.

⁸ “Foreign Exchange Policy and Intervention in Thailand” *Paper prepared for the BIS Deputy Governors’ meeting on “Forex Intervention: Motives, Techniques and Implications in Emerging Markets”, BIS, Switzerland, 2-3 December 2004.*
http://www.bot.or.th/bothomepage/BankatWork/FinMarketOpr/Download%20Articles/BIS%20FX%20paper_Nov2004.pdf.

In the case of emerging market economies, the daily data of interventions are not disclosed. Monthly movements of foreign reserves are used as proxies of intervention. Whether the central bank intervened in reaction to the exchange rate movements is examined for Thailand, Korea, Indonesia, and the Philippines, for the period of January 1999 to September 2006, in left panels of Figure 5. If the central banks tend to sell foreign reserves (to purchase the own currency) during the month when the exchange rate depreciates, then the negative correlation should be found. This tendency is confirmed in each country.

Whether the exchange rate changes (horizontal axis) resulted in CPI inflation (vertical axis) is also examined for those four countries in the right panels of Figure 5. Both variables measured as annual changes (year on year). Positive correlation would be evidence for pass-through of the exchange rate shocks to the domestic prices. Since there are overlapping observations (monthly year-on-year data), a casual observation is may be deceptive, but pass through were observed for Thailand, Korea, and the Philippines.⁹

5. Concluding Remarks

This paper considers the interaction between the exchange rate and inflation targeting. With a reasonable width of the inflation target range, and some fundamentally consistent exchange rate target with a range and a long-run drift for fundamental changes, pursuing two targets with a single instrument is, most of the time, consistent. The correlation between the inflation rate and the exchange rate movement is reviewed for Asian inflation targeting countries. It was argued that monetary policy actions in order to keep the inflation rate stable in response to an inflation shock will also offset the impact on the exchange rate from the inflation shock. Similarly, an exchange rate shock may be countered by monetary policy that will keep both the exchange rate and the inflation rate stable. Therefore, under usual circumstances, inflation targeting and the exchange rate management are not inconsistent, especially when both targets have reasonably wide ranges. The experiences of Thailand and Korea in particular seem to support this view.

⁹ For a rigorous study of the pass-through effects among the Asian countries, see Ito and Sato (2006).

References:

Brash, Donald (1998), "Reserve Bank Forecasting: Should We Feel Guilty?" Speech at the New Zealand Society of Actuaries, October 21.
<http://www.rbnz.govt.nz/speeches/0067862.html>

Brash, Donald T., (2002), "Inflation targeting 14 years on", Reserve Bank of New Zealand Bulletin, Vol. 65. No.1. March 2002, pp.58-70.

Dominguez, Kathryn M.E. and Linda L. Tesar, 2005. "International Borrowing and Macroeconomic Performance in Argentina," NBER working paper no. 11353, May.

Fischer, Stanley, (2001). "Exchange Rate Regimes: Is the Bipolar View Correct?" Journal of Economic Perspectives, vol. 15, no.2, Spring: 3-24.

Ito, Takatoshi (2004a). "Inflation Targeting and Japan: Why has the Bank of Japan not adopted Inflation Targeting?" in Christopher Kent and Simon Guttman (eds.) The Future of Inflation Targeting, August 2004: 220-267. Reserve Bank of Australia

Ito, Takatoshi (2004b). "The Yen and the Japanese Economy, 2004." C. F. Bergsten and J. Williamson, (eds.) *Dollar Adjustment: How Far? Against What?*, ch.8, Washington, D.C.: Institute for International Economics: 171-196.

Ito, Takatoshi, 2007. "Myths and reality of foreign exchange interventions: An application to Japan", *International Journal of Finance & Economics*, Volume 12, Issue 2, April: 133-154 .

Ito, Takatoshi and Tomoko Hayashi, 2004, *Inflation Targeting in Asia Hong Kong*: Hong Kong Institute for Monetary Research, Occasional Paper, No. 1, March.

Ito, Takatoshi and Frederic S. Mishkin. (2006) "Two Decades of Japanese Monetary Policy and the Deflation Problem," in T. Ito and A. Rose, (eds.) *Monetary Policy with Very Low Inflation in the Pacific Rim*, NBER-University of Chicago Press: 131-193

Ito, Takatoshi and Kiyotaka Sato (2006), "Exchange Rate Changes and Inflation in Post-Crisis Asian Economies: VAR Analysis of the Exchange Rate Pass-Through" RIETI discussion paper, April 2006 06-E-018
<http://www.rieti.go.jp/jp/publications/dp/06e018.pdf>

Mussa, Michael, 2002. *Argentina and the Fund: From Triumph to Tragedy*, Washington, DC: Institute for International Economics, July.

Stevens, Glenn, 1998, "Pitfalls in the Use of Monetary Conditions Indexes," *Reserve Bank of Australia Bulletin* (August): 34-43.

Svensson, Lars, E.O. 1997. "Inflation Forecast Targeting: Implementing and Monitoring Inflation Targets," *European Economic Review*, vol. 41, 1111-1146.

Svensson, Lars, E.O., 1999. "Inflation Targeting as a Monetary Policy Rule," *Journal of Monetary Economics*, vol. 43: 607-654.

Svensson, Lars, E.O., 2000. "Open-Economy Inflation Targeting", *Journal of International Economics*, Vol. 50 : 155-183.

Table 1: Exchange Rate Regime and Monetary Policy Framework

Exchange Rate Regime ↓	Monetary Policy Framework			
	Exchange Rate Anchor	Money Supply Targeting	Inflation Targeting	Others
No monetary Policy (Dollarized or other arrangements)	Ecuador, Panama, Marshall Islands, Western African countries in the CFA Franc zone			Euro Area countries (within the Area)
Currency Board	Hong Kong, Brunei, Estonia, Lithuania, Argentina(1994–2002)			
Fixed Exchange Rate (Announced and De facto)	Bangladesh, Nepal, Butan, Jordan, Macedonia, Maldive, China(1994– 2005), Thailand (–June 1997)			
Basket Peg	Botswana, Fiji, Kuwait, Morocco, Seychell, Indonesia (–1997)			
Peg with a band	Denmark, Cyprus, Egypt		Hungary	
Crawling Peg	Bolivia, Costa Rica, Nicaragua, Solomon Islands			
Band crawling	Belarus, Romania, Uruguay, Venezuela		Israel	
Managed Float (limited fluctuation)	China, Malaysia, Thailand (–1997)	Ghana, Guinea, Jamaica, Mongolia, Slovenia		Algeria, India, Slovak Rep.
Managed Float (Basket Band)		Thailand (July 1997–May 2000); Indonesia (1997–	Thailand (May 2000–)	Singapore
Free Float		Peru	Australia, Brazil, Canada, Chile, Columbia, Czech Rep., Iceland, Indonesia (Jan 2000–), Korea (April 1998–), Mexico, New Zealand, Norway, Poland, South Africa, Sweden, U.K., Philippines, Turkey	Japan, US, Euro Area (collectively), Papua New Genea, Haiti, etc.

(Source) IMF, International Financial Statistics April 2003, various central bank home pages and Author's judgment

(Notes) The classification is based on the de facto regimes.

Table 2

Exchange Rate Regimes in Asia

Managed Float	Inflation Targeting	Thailand, Korea, Indonesia, Philippines
	Not Inflation Targeting	Viet Nam, Taiwan, Singapore
	Narrow Band	China, Malaysia
Fixed Exchange Rate	Currency Board	Hong Kong, Brunei
	Multiple exchange rates	Myanmar (2)
De facto Dollarization		Cambodia, Lao Rep., Viet Nam

(1) China and Malaysia moved to the managed float system on July 21, 2005.

(2) Myanmar officially adopts a fixed exchange rate to SDR, but de facto multiple exchange rate system

File: InflTargetExRateRegime.xls (page 2)

Table 3: Inflation Targeting Framework in Asia

Inflation Targeting
Framework in Asia

	Bank of Thailand	Bank of Korea	Bank Indonesia	The Philippines central bank
Introduction	2000, April	1998, April	2000, January	2002, January
Index	Core CPI, quarterly ave.	Headline CPI in 1998–99; Core CPI, 2000–	CPI without regulated prices, 2000–01; Headline CPI 2002–	Headline CPI
Target Range	0–3.5%	9±1% in 1998, 3±1% in 1999	9–10% in 2002; 9±1% in 2003; 5.5±1% in 2004	5–6% in 2002; 4.5–5.5% in 2003; 4–5% in 2004–05
		2.5±1% in 2000, 3±1% in 2001–03; 2.5–3.5% in 2004–06	6±1% in 2005; 5.5%±1% in 2006; 5±1% in 2007	4–5% in 2006–07
Horizon	8 quarters ahead	One year	One to two years	2 years
Escape Clause	None	None except natural disaster & tax reform in 1999	None	changes in tax reform and subsidies; price changes in fresh food
Setting a goal	Gov't and BOT	BOK with consultation with	Gov't since 2005 –	Gov't and central bank
Monetary Policy instrument	Monetary Policy Comm. 7 members	Monetary Policy Comm. 7 members	Monetary Policy Comm.	Moneary Policy Comm. 7 members
Independence of central bank	No (Governor can be replaced at will)	Yes (no dismissal of Governor)	Yes (no dismissal of Governor)	Yes (no dismissal of Governor)
Accountability, if target is not achieved	Explanation to the public	Explanation to the public	NA	Governor sends letter to President
Transparency	Quarterly Inflation Report	Quarterly Bulletin	Monthly Review; Quarterly Reports	Quarterly Inflation Report

Source: Ito and Hayashi (2004)

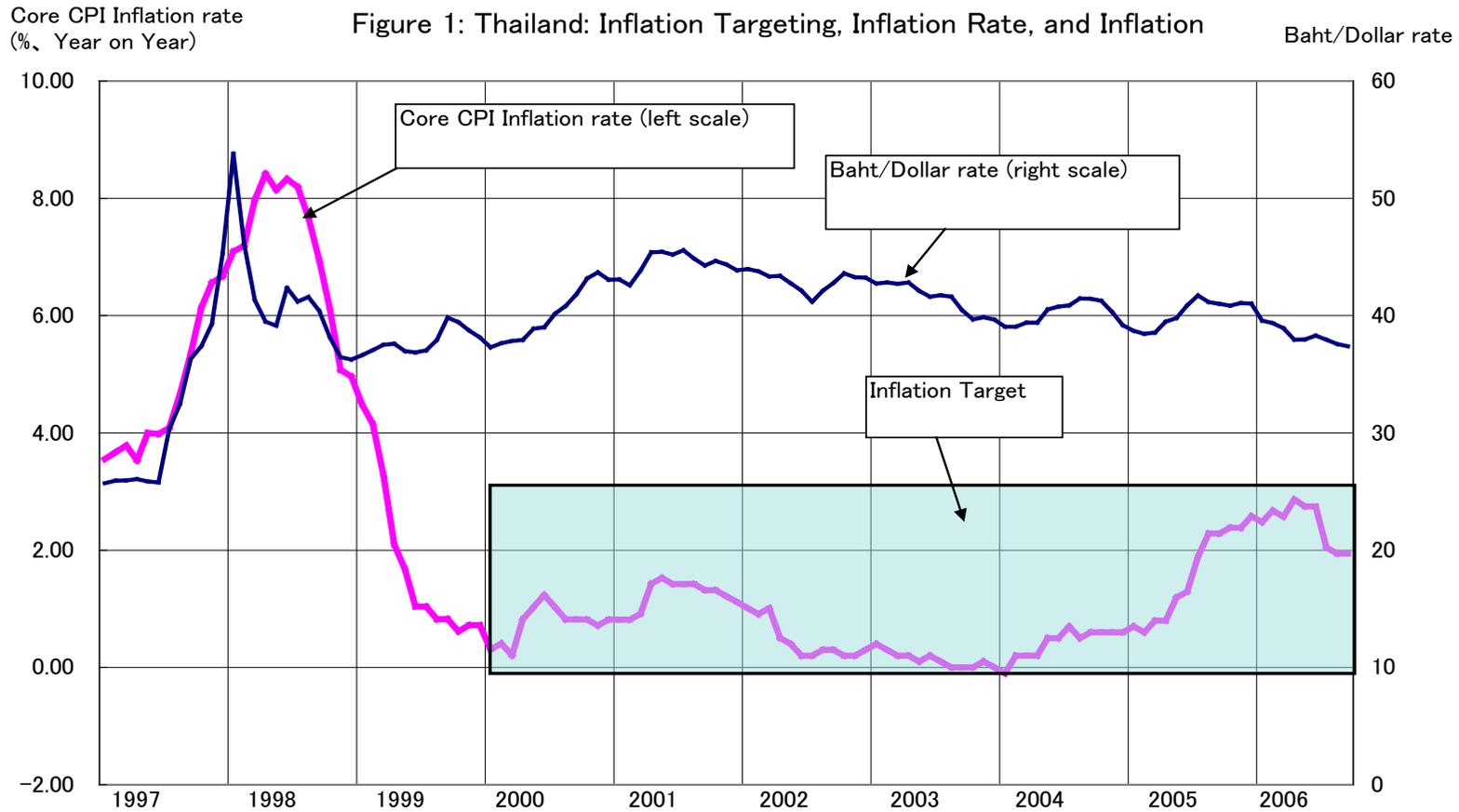
Table 4: Interest rate responses to shocks in inflation and exchange rate

	Inflation		
	high	just right	low
Exchange Rate	$\pi > \pi^*$	$\pi = \pi^*$	$\pi < \pi^*$
$e > e^*$ (depreciation)	high interest rate	slightly high interest rate	uncertain
$e = e^*$	slightly high interest rate	neutral	slightly low interest rate
$e < e^*$ (appreciation)	uncertain	slightly low interest rate	low interest rate

File: InflTargetExRateRegime.xls (page 2)

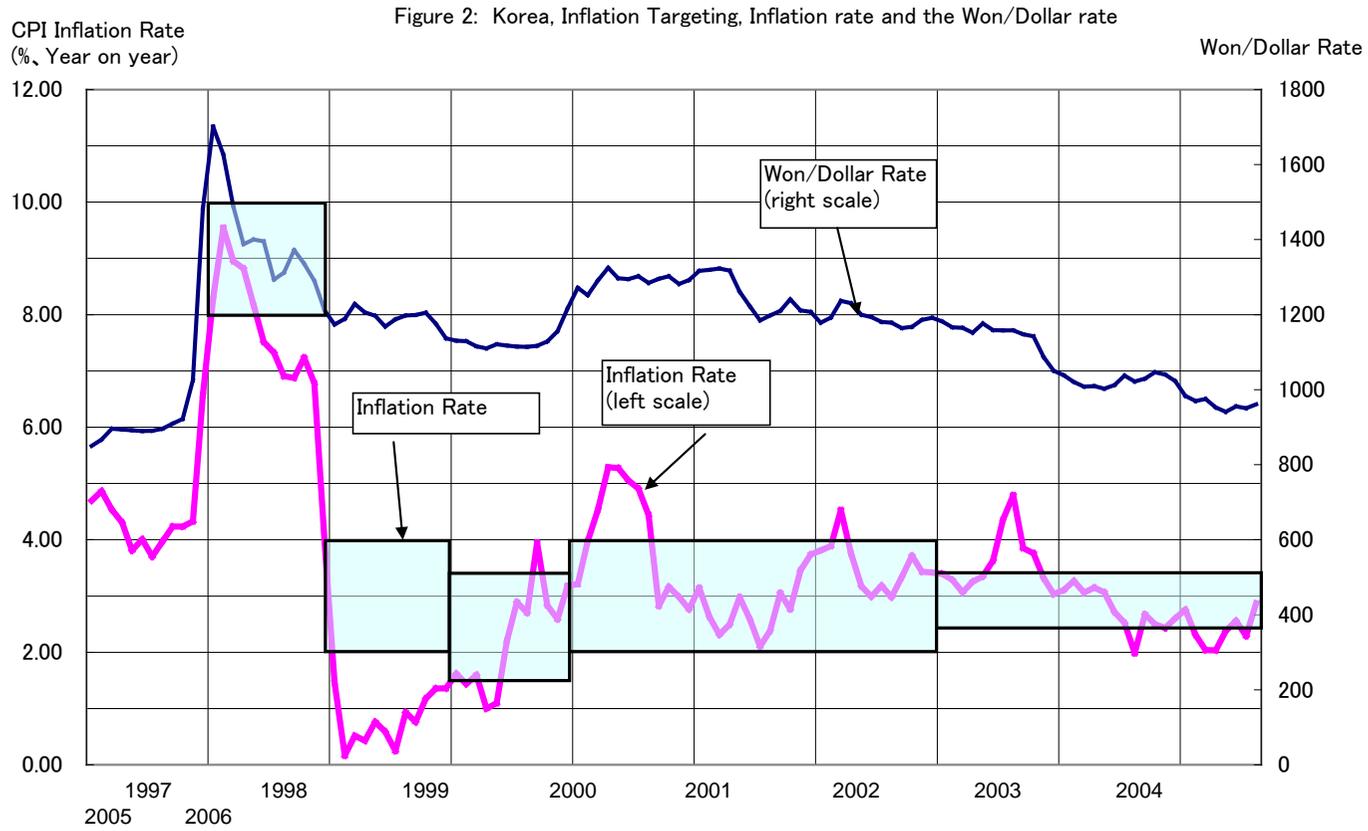
Figure 1

File: Thailand(InflTarget).xls



Source: IMF, *International Financial Statistics*; and Bank of Thailand for core inflation rate

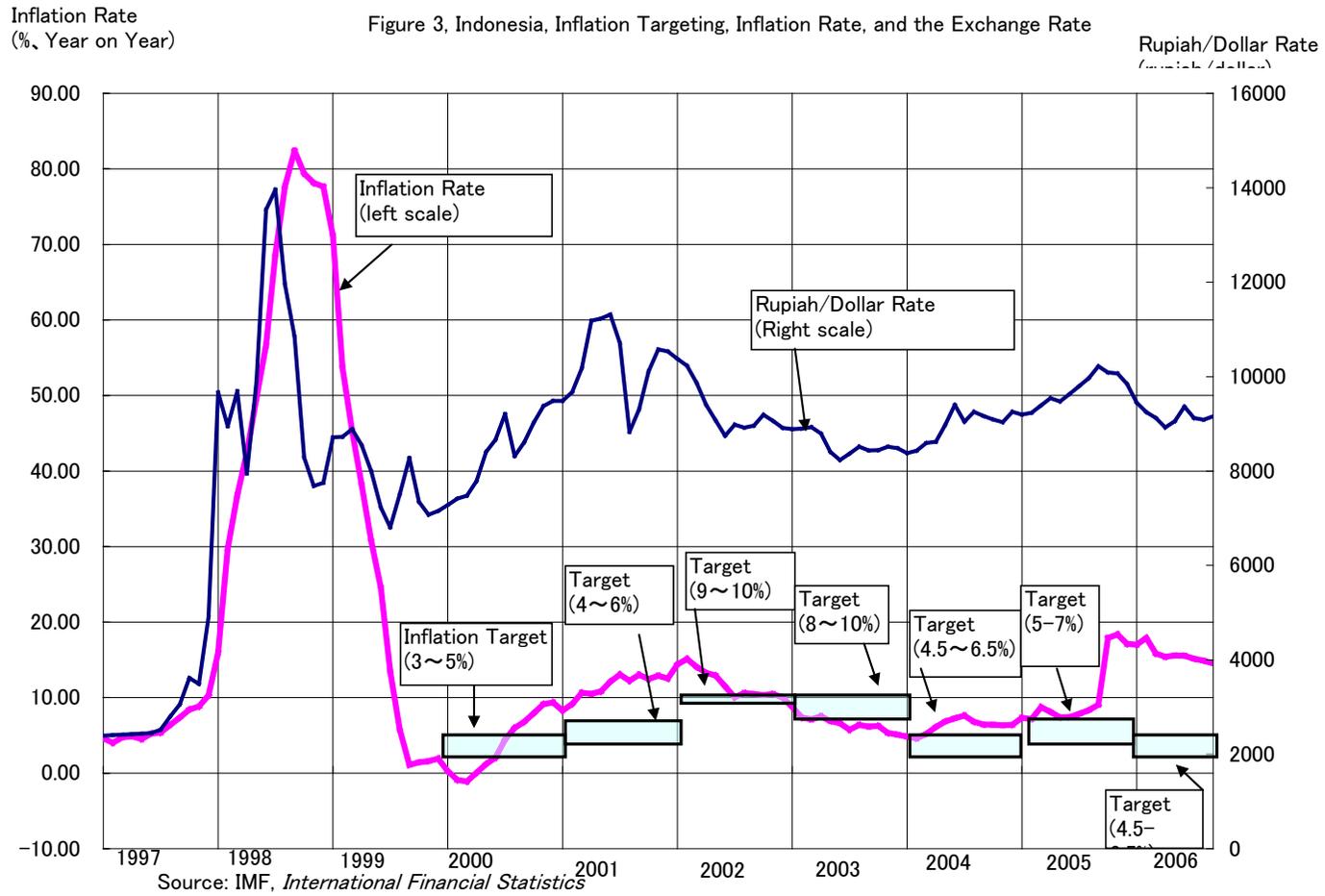
Figure 2



Source: IMF, *International Financial Statistics*

File: Korea(InfTarget).xls

Figure 3



File: Indonesia(InflTarget).xls

Figure4 File: Philippines(InflTarget)V2.xls

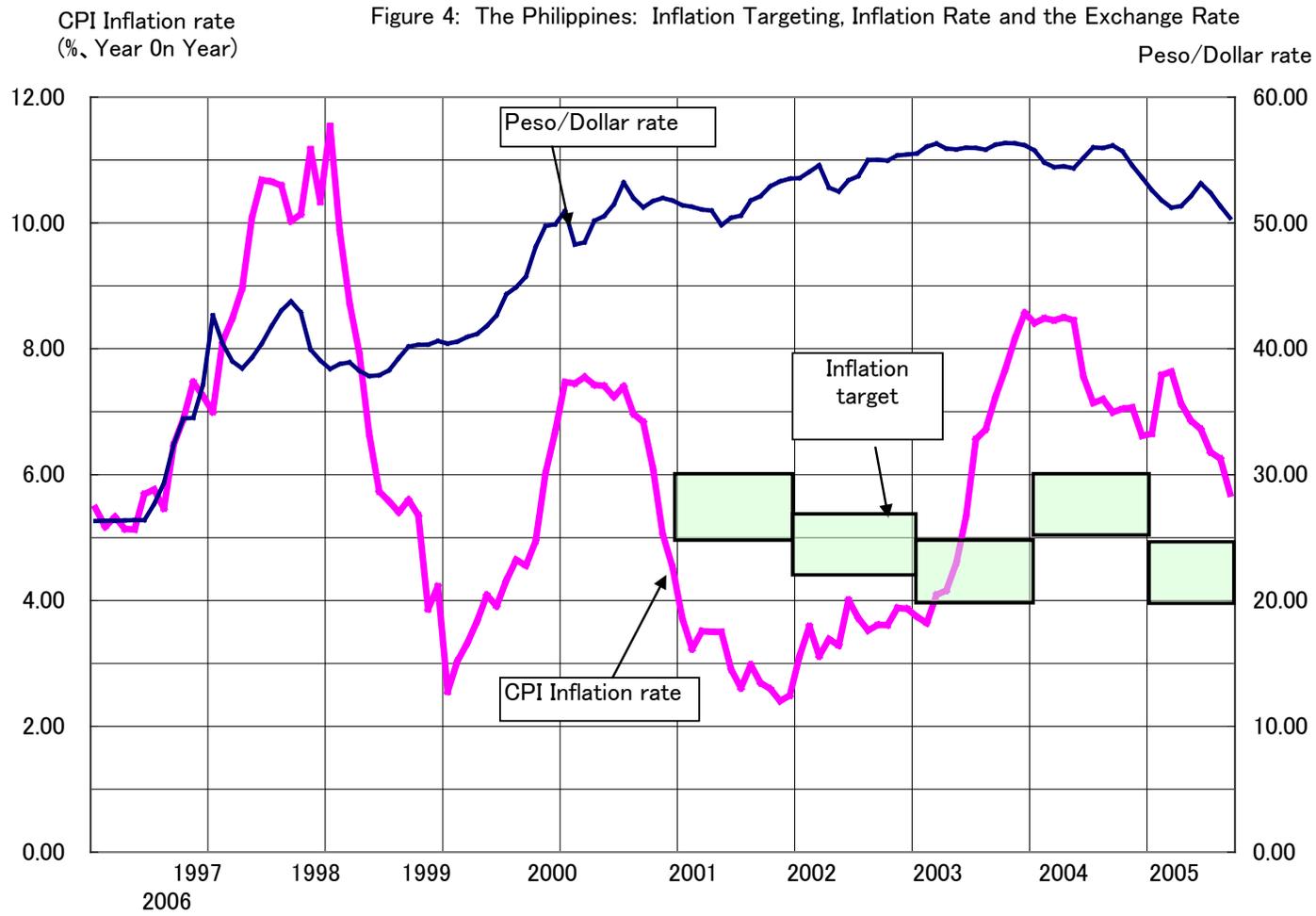


Figure 5::

(1) Thailand

Intervention when the exchange rate moves?

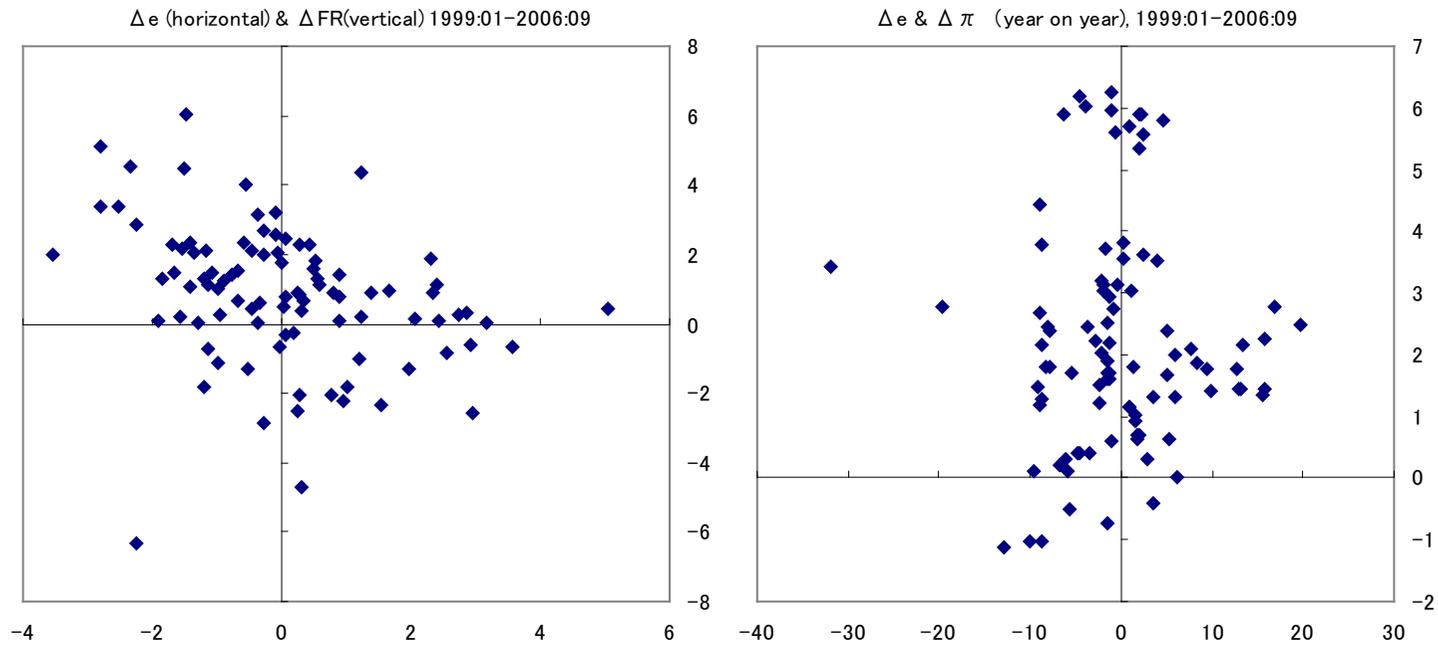
Negative correlation

if depreciation led to selling of the local currency

Did inflation rate tend to increase when the exchange rate depreciate?

Positive correlation

if depreciation led to inflation



(2) Korea

Intervention when the exchange rate moves?

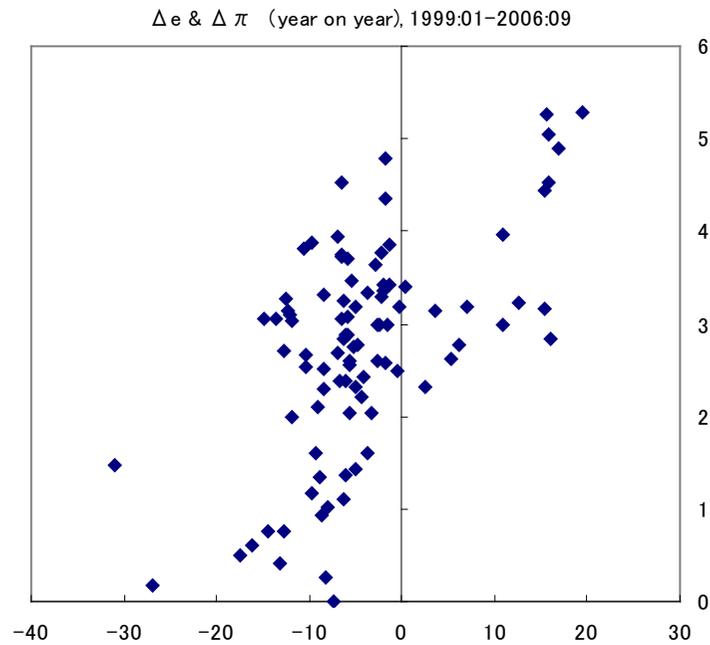
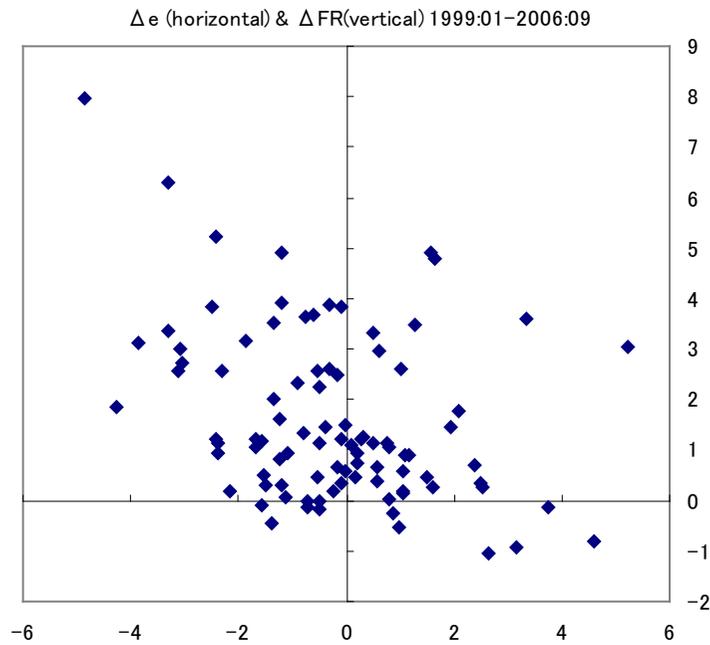
Negative correlation

if depreciation led to selling of the local currency

Did inflation rate tend to increase when the exchange rate depreciate?

Positive correlation

if depreciation led to inflation



(3) Indonesia

Intervention when the exchange rate moves?

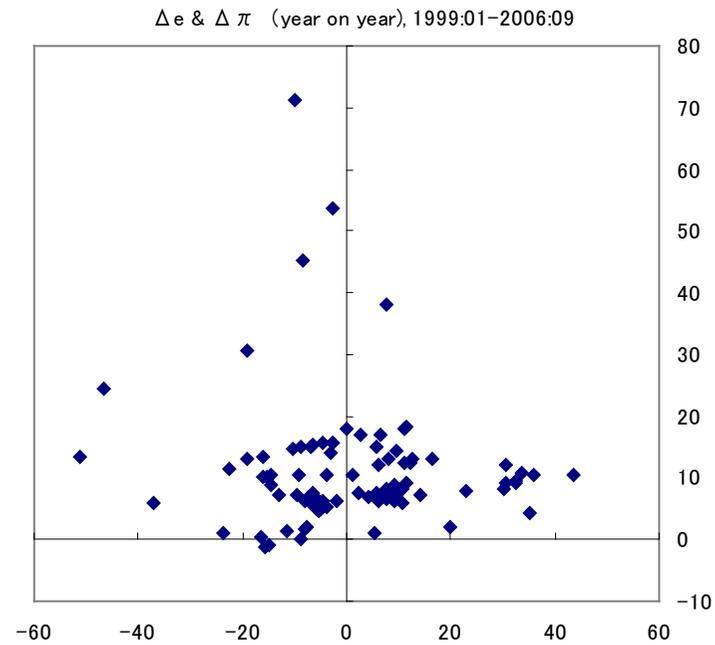
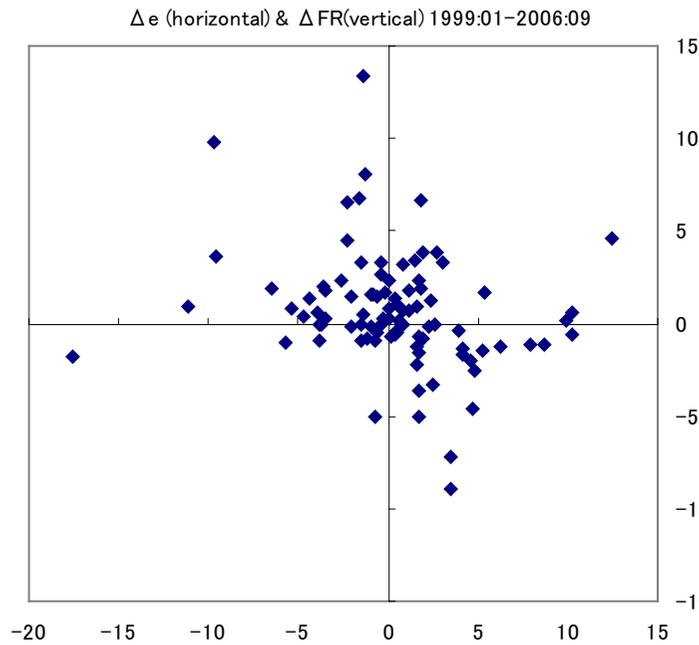
Negative correlation

if depreciation led to selling of the local currency

Did inflation rate tend to increase when the exchange rate depreciate?

Positive correlation

if depreciation led to inflation



(4) The Philippines

Intervention when the exchange rate moves?

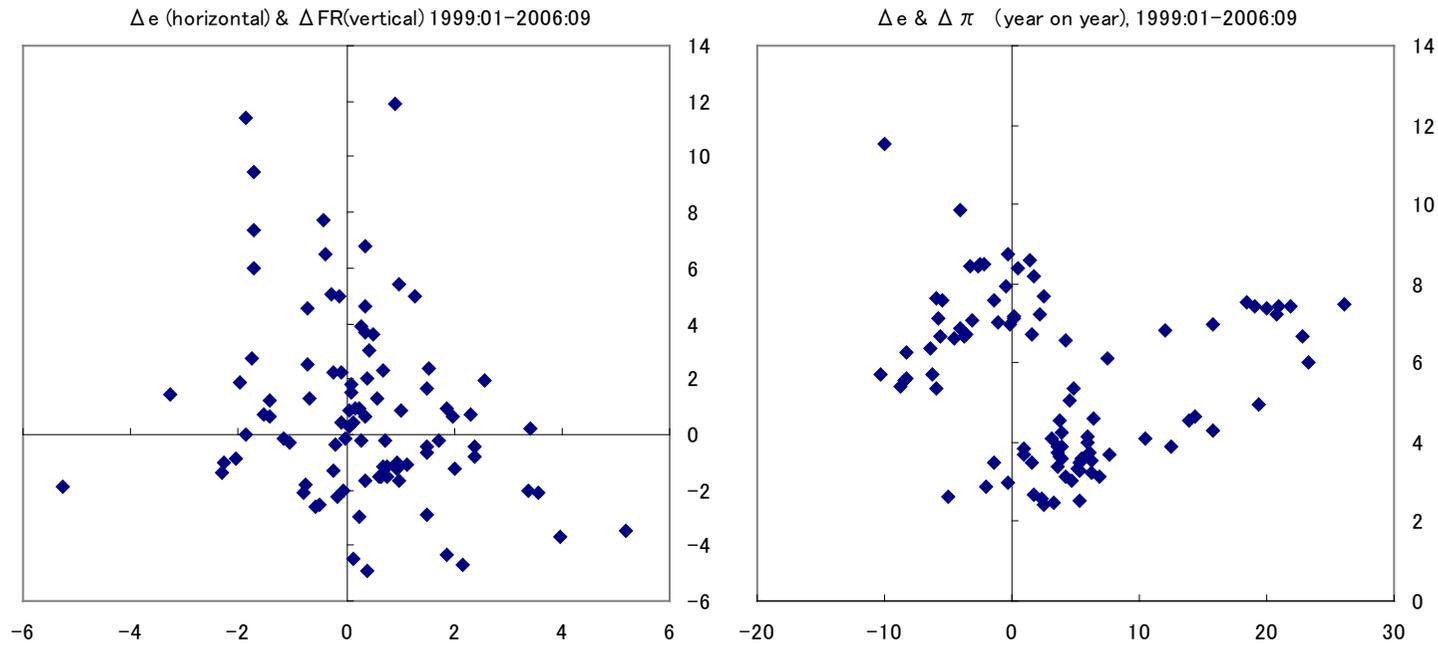
Negative correlation

if depreciation led to selling of the local currency

Did inflation rate tend to increase when the exchange rate depreciate?

Positive correlation

if depreciation led to inflation



Data: International Monetary Fund, International Financial Statistics, On-line December 2006.