Cyclical Excess and Financial Instability in Thailand[*]

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1. Introduction

In a mild cycle, where output growth oscillates around its rising trend, there is no system-wide financial crisis. But in deep and severe cycles, the soundness of the whole financial system is threatened. Economic booms and busts can be attributed to excessive expansion and contraction of monetary aggregates. There exist long-term relationships between monetary and real output growths. Because the long-term output growth path is dictated by the productive capacity of the economy, monetary aggregates must increase at the rate corresponding to the trend growth path of real output. In the short run, lending booms and contractions lead to a deviation of output from its long-term path. In this paper it is shown that business cycles in Thailand can be explained by such excessive fluctuations in monetary aggregates. Massive and rapid capital inflows, enormous financial bailouts, and sharp monetary contraction are factors contributing to increase amplitudes of business cycles and lengths of cycle periods.

Undoubtedly, financial stability and macroeconomic stability are intricately related. A sense of prosperity during the expansion path gives rise to overoptimism, complacency, and overconfidence. Bold and risky projects, propelled by excessive credit expansion, are unnecessarily undertaken. As soon as overvaluation of asset prices has been realized, a loss of confidence, pessimism, and over-reaction set in. Rising bankruptcies, non-performing assets, and bank runs are the order of the day in a debt-deflation economy. The greater the amount of debt accumulated over the expansion phase of the cycle, the deeper the trough and the longer the duration of the recession. Financial instability leads to macroeconomic instability and vice versa.

The paper proceeds as follows. Section 2 discusses the characteristics of growth cycles between 1988 and 1998. Sources of booms and busts are identified. Section 3 examines the relationship between cyclical excess and monetary shocks. Section 4 contains empirical analysis using vector autoregressions (VARs). Section 5 provides concluding remarks.

2. Characteristics of Booms and Busts

The cyclical variations of the Thai economy during the last decade can be classified into three episodes: (1) the hyper growth period between 1988 and 1990, (2) the steady state growth path, from 1991 to 1995, and (3) the downturn and recession period between 1996 and 1998. Three years of the double-digit growth between 1998 and 1990 were the result of investment and consumption booms (Table 1). During this period, the rate of contribution to GDP growth from capital accumulation was higher than that of private consumption. The period of excessive growth rate was followed by a 5 year-span of stable growth path of 8 percent per annum from 1991 to 1995. Consumption booms became more preponderant in this period and in some years were stronger driving forces than investment expansion. Indeed, a stable and steady rise in income has raised the level of households' permanent income. When investment slowed down in 1996, consumption remained a positive contributor to output, dominating other components of aggregate demand.

Since investment collapsed in 1997 and 1998, the role of shock absorber played by consumption has been replaced by net exports. It is the consumption compression that led to a severe output contraction by almost 10 percent in 1998. Evidence in the US also points out to the same conclusion. Blanchard (1993) provides evidence showing that negative consumption shocks, originated from a drop in consumer confidence, led to the US recession of 1990-1991. In 1997, because of habit persistence, households tried to maintain their level of consumption, although their income growth rate declined. Consequently, the ratio of consumption to GDP rose from 54.4 percent in 1996 to 56 percent in 1997. Nevertheless, in 1998, households revised downward their permanent income in fear of continued recession, reducing consumer spending accordingly. Because consumption share in GDP was higher than the investment share, a same percentage reduction investment would lead to a lower percentage contraction in GDP. Investment fell by 22 percent in 1998, while private consumption declined by 8.9 percent. But both consumption and investment collapses contributed to the same magnitude of output contraction.

It should be noted that, both in 1997 and 1998 import compression and export surges in terms of baht also helped cushion the impact of reduction in private spending. Furthermore, there is a clear negative correlation between the growth contribution from consumption and net exports. A high growth rate achieved by consumption booms is unlikely to be sustainable, because a consumption-driven economy has to rely on foreign borrowing. In sum the longer the duration of the booms that were driven by foreign borrowing the higher the foreign debt burdens and wider current account deficit.

The role of government spending seems unimportant as a shock absorber, judging from Table 1, although the figures reported there may somewhat underestimate the fiscal impact. Multiplier effects of expansionary fiscal policy and impact of automatic stabilizers have been subsumed into changes in private spending. In addition, exante balanced budget indirectly reduced the crowding out effect and kept inflation at bay.

As observed in Table 1, real output growth declined from double digit rates, during the boom in the period 1987-1990, to 8 percent in the second phase during the period 1991-1996, and sharply contracted at the trough of the cycle in 1998. Likewise, the monetary base decelerated from 18.2 percent at the peak of the cycle to 16 percent in the normal expansion phase and markedly declined to 4.2 percent between 1997 and 1999 (Table 2). On the other hand, the standard error of the growth rate increased steadily, indicating greater fluctuations during the economic downturn. The coefficient of variation of growth rate of the monetary base rose from 0.2 at the peak of the cycle to 1.99 at the trough. While the growth rate of the monetary base reduced precipitously, it also fluctuated widely. However, the velocity of the narrow money (M1) remained surprisingly stable around the magnitude of 10, with a considerable degree of stability. In effect, the variation in output should not stem from changes in the velocity of money. The sources of fluctuations must come from monetary base and the money multiplier. Indeed, the money multiplier calculated from M1 exhibited a declining trend with increased variations, similar to the behavior of the monetary base.

There are various possible explanations for the declining money multiplier. Financial instability, fear of bank runs, and contagious bank runs led the public to prefer holding cash to bank deposits. In time of financial distress, banks would require holding a larger amount of excess reserves to protect against any unexpected withdrawals of deposits. Tightening rules of loan-loss provisions also imposed liquidity constraints on banks. As a result, it is not surprising that the money multiplier of narrow money declined during the period of financial turmoil.

Thus we can conclude that shrinkage in the monetary base and money multiplier led to a decline in nominal income, while increases in volatility of these monetary magnitudes led to fluctuations in the nominal income level. As evident in Table 2, both the private investment index and manufacturing production index show a dramatic decline with an increased degree of

fluctuations.

The broad money supply (M2) expanded throughout the three growth episodes, as a result of rising demand for wealth accumulation. However, while the money multiplier (M2) has an increasing trend, the velocity (V2) of the broad money declined from 1.5 in the boom years to 1.04 during the recession. The rising trend of the broad money multiplier is consistent with the increased value of the credit multiplier from 6.8 to 12.4. As a result, bank credit expanded rapidly around 22 percent during the first two growth episodes and slowed down to 13 percent on the average during the third episode. Consequently, the ratio of bank credit to GDP rose concomitantly from 59 percent to 125 percent of GDP during the same corresponding periods.

Table 2 also shows the value of semi-credit elasticity of investment. The declining value of the elasticity indicates that investment responded less vigorously to changes in credit. This can be interpreted that the efficiency of credit diminished as capital stock rose or credit was allocated to finance purchasing consumption goods instead of investment goods. Nevertheless, the quality of bank loan extension can be measured by the Incremental Capital Credit Ratio. An increase in the ICCR indicates an improvement in the efficiency of bank credit. From Table 2, there has been a drastic decline in the value of ICCR throughout the three growth episodes, suggesting diminishing quality of bank lending in terms of its contribution to capital stock accumulation.

Since we have already identified the sources of boom and bust, we can now turn to explore the relationship between financial excess and output variations that stemmed from consumption and investment.

3. Cyclical Variations and Financial Instability

From 1991 to 1995, both the monetary base and output exhibited a minimal

deviation from trend values. This was a period of stable growth, when the Thai economy grew at a steady rate of around 8 percent. It is clear from Figure 1 that the monetary base slightly dipped below its trend and so did the output growth, albeit at a larger drop. From 1995 to the beginning of 1997, monetary base grew faster than its trend, causing manufacturing output to grow rapidly above its trend. Nevertheless, a nosedive in manufacturing output began in 1997. This episode of production slowdown corresponds to the period of monetary contraction, which began earnestly after the currency crisis in mid 1997. This is reminiscent of the failure of the Federal Reserve during the banking crisis and stock market crash in 1929. The Fed could have prevented the Great the Depression in the 1930s, had it provided liquidity to offset the reduction in the money multiplier and the money stock (Friedman and Schwartz, 1963).

As international reserves had increased rapidly since 1987, the ability of the central bank to control the size of monetary base began to diminish. The ratio of net foreign assets to the monetary base increased significantly. But it fell sharply and fluctuated widely after 1997. As Kaminsky, et al (1998), point out, the ratio of broad money to international reserves is one of the best leading indicators of currency crisis. The sharp decline in the ratio of net foreign assets (NFA) to the monetary base (Figure 2), as well as the increased value of the broad money multiplier (Table 2), implies a rapid increase in the ratio of M2 to NFA. This signal had started warning for a year before the problem of capital outflows became a full-blown currency crisis in July 1997. Incidentally, during the same corresponding period, the Bank of Thailand's credit extended to financial institutions increased considerably as the financial crisis deepened.

Figure 3 illustrates the concentration of bank loans in both real estate and personal consumption. From 1981 to 1995, loans extended to consumption grew faster than total bank loans. It is not surprising that consumption booms were financed by bank credit. Similarly, a sharp decline in consumption corresponds to a cut back in consumer loans. It should be noted that from 1988

to 1992, bank loans allocated to construction and real estate increased at a tremendous speed. Its share in total loans rose from 8 percent to above 14 percent during the same period. Relaxation of liquidity constraint and a lower degree of credit rationing permitted consumers to enjoy an era of high-mass consumption. Likewise, investors were able to use speculative finance, in which refinancing is needed, to acquire illiquid assets.

Both investment and consumption are procyclical. The correlation coefficient between the rate of change in investment and consumption is 0.89 during the period 1987-1998. As such, an accommodating monetary policy may lead to bubbles in asset prices. Unproductive leading occurred in both investment and consumption sectors. Over capacity as a result of over-investment and over-borrowing lead to a nationwide property glut.

Minsky (1982) termed this type of speculative finance as Ponzi finance, as opposed to hedge finance, which does not require some rollover of debt for contracts to be fulfilled. Since a great number of investment projects in Thailand required short-term borrowing, they can be classified as speculative finance. As net increase in debt occurred, the over-indebtedness of the economy became so large that the margins of safety, i.e., the difference between cash receipts and payments commitments, the excess of value of assets over liabilities, and holding of cash and other liquid assets, had diminished.

When the bubble of asset prices bursts, investors who rely on speculative finance would find that their safety margins are negative. Rising interest rates and currency depreciation raise the cash payment commitments. A collapse in property and stock prices led to negative net worth. Holding large illiquid assets led to distress selling, further depressing the asset values. As a result, debt-deflation effects caused by a reduction in the price level would raise the real value of debt and depress consumption spending and reduce the velocity of money (Fisher, 1933). It should be noted that Fisher's debt deflation episode

starts with a state of over-indebtedness.

Crockett (1996) defines financial instability as a situation when economic performance is adversely affected by fluctuations in prices of financial assets and when financial intermediaries have difficulty in meeting their contractual obligations. Indeed, the currency crisis and financial crisis are related in the context of a debt deflation process. Banks are not willing to lend because of increased risk aversion, while borrowers are not willing to borrow because their ability is limited by their negative safety margins and their pessimistic view of the future.

When the bubble burst, banks faced difficulty as borrowers began to default. Non-Performing Loans (NPLs) rose rapidly as a result of economic slowdown, represented by a sharp percentage decline in manufacturing output (Figure 4). The NPL is a lagging indicator of economic activity. Shown in Figure 4 with nine-month lags, the rate of changes in manufacturing production is inversely related to the percentage of non-performing loans to total outstanding loans. Even the manufacturing sector has rebounded; it would take some time before we can see a significant fall in the level of NPL. Nevertheless, the level of NPLs also depends on the tightening of the accounting standard, which shortens the periods of loans that are classified as non-performing. The success of the debt restructuring process would also contribute to a fall in the level of NPLs. A decline in the level of the interest rate could have resulted in a lower level of NPLs. Nonetheless, moral hazard is apparent for some strategic borrowers who refuse to service their debts despite their sufficient capacity.

Households and firms had accumulated debt as a large proportion of income before the crisis broke out, amounting to 1.25 times GDP level. King (1994) finds the evidence that countries that accumulated a large amount of debts are likely to suffer a more prolonged recession than countries that were less burdened by debts. Economic recovery requires financing. It takes longer for banks to clean their mountains of non-performing assets and to recapitalize

their equity, in particular for banks in countries where bank credits are a major source of investment financing. To get out of recession as fast as possible, banks must start lending and injecting new funds to provide liquidity for consumption and investment. Viewed in this light, stringent capital adequacy ratio and strengthened accounting rules on loan-loss provisions and risk-based capital standards, though appropriate for the sound financial system in the long run, may hamper rather than help the economic recovery. Empirical evidence abounds. Peek and Rosengren (1995) find evidence of a capital crunch, which caused a dramatic reduction in the growth rate of bank credit associated with the 1990-91 recession in New England. Brinkmann and Horvitz (1995) show that the credit crunch was caused by the 1988 risk-based capital standards. It is important to note that implementation of measures to strengthen the regulatory framework must also consider its macroeconomic impacts.

4. Empirical Evidence: A VAR Model

The lack of accurate data on the unemployment rate in Thailand reflects the fact that unemployment had never been a problem for Thailand until the recent economic crisis. Unemployment is linked with output growth through Okun's law: The American economy loses 2.5 percent of output for each 1 percent that the unemployment rate exceeds the natural rate. In the Thai context, we can approximate the deviations from the natural rate of unemployment by utilizing the deviation of output from its trend or potential output.

where u is unemployment rate, u^* natural unemployment rate, Y output. Y^* is potential output, which is growing at a steady growth rate.

$$(1) \qquad (u/u^*)_t = f\,(\Delta \ln(Y/Y^*)_t \,; f < 0$$

It is hypothesized that a positive deviation from the potential output level causes a decline in the unemployment rate relative to the natural rate and vice versa.

$$(2) \qquad \Delta\ln(Y/Y^*)_t = \sum_{i=1}^{n} \alpha_i \, \Delta\ln(B/B^*)_{t-i} \; ; \; \sum \alpha_i > 0$$

If monetary shocks cause output fluctuations around the trend of output, then

where B = monetary base. The superscript (*) indicates the trend values.

The lag impact of the monetary policy is captured by the inclusion of past deviations from the trend growth rate of the monetary base. The employment of the monetary base as a measure of monetary aggregates in this model arises from the need to establish a link between output and the operating target of monetary policy. It should be noted, however, that the controllability of the monetary base is also an important issue. The conditions imposed by a fixed exchange rate regime imply that the control error can be a source of ineffectiveness of monetary policy. Inflation taxes through issuing seigniorage would interfere with the goal of price stability. More importantly, the injection of high-powered money to bail out individual financial institutions (with no penalty) would lead to excessive monetary expansion.

As argued by Solow (1997), an appropriate framework for analyzing short-run fluctuations must be aggregate demand components. In view of the hypothesis that the business cycle is caused by cyclical excess of aggregate demand components, such as investment (I/I^*) and consumption (C/C^*), we may rewrite (2) as

$$(3) \qquad \Delta\ln(Y/Y^*)_t = \sum_{i=1}^{n} \alpha_i \, \Delta\ln(B/B^*)_{t-1} + \sum_{i=1}^{n} \beta_i \, \Delta\ln(I/I^*)_{t-1} + \sum_{i=1}^{n} \gamma_i \, \Delta\ln(C/C^*)_{t-1} + \varepsilon_t$$

where ε_t is a random variable, representing a disturbance term capturing all non-systematic impacts of unimportant factors affecting output deviations. As shown in Table 1, both government spending and net exports are not important factors contributing to growth.

Causation runs both ways in equation (3). Exuberance and perception of buoyant economy must affect booms in consumption and investment expenditures. Consumption expenditures are determined by permanent income, while investment depends on expected output. Permanent income and expected sales can be formulated by past values of output growths. Booms and busts in consumption and investment spending must arise from past deviations of output growth and from conditions in money markets. Therefore, cyclical variations in private investment can be expressed by

$$(4) \qquad \Delta\ln(I/I^*)_t = \sum_{i=1}^{n} \delta_i \, \Delta\ln(B/B^*)_{t-1} + \sum_{i=1}^{n} \mu_i \, \Delta\ln(Y/Y^*)_{t-1} + \sum_{i=1}^{n} \upsilon_i \, \Delta\ln(C/C^*)_{t-1} + \omega_t$$

Similarly, consumption booms can be determined by similar distributed lag structures governing investment booms.

We can expect that cyclical excess variables, expressed by growth deviations from the trend of real variables such as output, consumption, and investment, would exhibit co-movements in the long run. Furthermore, if the monetary factor is responsible for such deviations, then deviations of the monetary base from its trend value must also have a long run relationship with these cyclical excess variables.

To test whether these four variables are cointegrated, monthly data are employed from 1992:2 to 1999:6. Availability of high frequency data forces us to consider only a certain set of variables to test the hypothesis of the existence of long-run relationships. Manufacturing Production Index (MPI) is used to replace output (Y). Sales of department stores (SALE) are used as a proxy for private consumption. Private Investment Index (PII) is utilized as private investment expenditures. The cyclical variables are generated by logarithms of the ratio between actual and trend values.

Augmented Dickey-Fuller (ADF) test statistics were employed to ensure the use of a stationary time series. As can be seen from Table 3, on the level form, they exhibit a nonstationary pattern. The null hypothesis that the series contain unit roots cannot be rejected. However, the first-differenced series rejects the null hypothesis of nonstationarity at one-percent significant level. It should be noted that the first difference form of the cyclical excess variable has a meaningful interpretation. It shows the rate of change of the deviation from its trend. For example, an overheated economy can be captured by a positive value of ln (MPI/MPI*). A severe monetary contraction is represented by a negative value of ln (Mbase/Mabase*), while a decline in consumption is indicated by a negative value of ln (C/C*).

We can test the presence of a long-term relationship among the four variables. Table 4 shows the result of Johansen tests for cointegration. Panel A reports that both cyclical variations in monetary base and output are conintegrated. Based on the likelihood ratio test, the hypothesis that there is no cointegration vector between the two variables can be rejected at one-percent significant level. When a four-dimension vector process is examined, the results reported in Panel B show that there are at least 3 cointegrating vectors at the 1 percent critical value.

Panel C reports cointegrating coefficients of the four-dimension vector process. After normalizing the coefficients, the resulting values of normalized coefficients yield an interpretation of the long-run elasticities. It shows that the rate of change in monetary base exhibits a strong influence on output variations. Since the long-run elasticity of output deviations with respect to changes in the monetary base relative to its trend value was around 4.6, the finding confirms the earlier conjecture that monetary shocks can magnify adverse consequences on the real economy. The ease or tightness of monetary conditions has a stronger impact on output.

Consumption expenditures, measured by sales of department stores, respond vigorously to changes in output. This evidence supports the hypothesis of excess sensitivity of consumption to changes in income. Flavin (1985) found evidence supporting the hypothesis of excessive sensitivity that consumption systematically responds too much to current income. Increased income level helps to reduce liquidity constraints, permitting consumption to respond to changes in income. It is not surprising that consumption spending output growth, capital accumulation, and monetary aggregates are interrelated. Interestingly enough, the evidence in panel C also shows that excessive investment the past was related to current economic recession. The model does capture adverse impact of over-investment.

In four-variable VARs, we can use the impulse response function to examine the effects of monetary shocks that might have occurred through a variety of reasons. Figure 5 illustrates the impacts of a one standard deviation shock in deviations of the monetary base from its trend. The impulse response functions indicate that a temporary shock in the monetary base has a positive impact on output, investment, and consumption. The impact dissipates within one year after the shocks have taken place. The policy implication of this finding is quite clear: monetary policy must avoid creating large swings in the monetary aggregate. Monetary policy can have a real impact on output in the short run.

5. Concluding Remarks

This paper finds evidence supporting the hypothesis that monetary shocks lead to fluctuations in output. Excessive acceleration and deceleration in monetary aggregates throw the economy out of the long-term growth path. Therefore, supply of monetary aggregates should grow at a steady rate, corresponding to the rate of growth of the quantity demanded from the long-run growth of the economy. In effect, monetary shocks such as a sudden loss

of international reserves, massive and sudden inflows of foreign capital, abrupt changes in capital requirement of the financial institutions, can create substantial changes in the monetary aggregates. A slight deviation from trend monetary base can magnify the impact of changes in the monetary base into virulent fluctuations in output and employment. Since real output fluctuates around a rising trend in a growing economy, stable and conservative monetary policy can keep the fluctuations around trend and should be employed to minimize its deviation.

The finding in this paper is in sharp contrast with the Real Business Cycle school, which monolithically argues that only real factors, not monetary factors, can cause business cycles. The empirical evidence in this paper illustrates that there exist long run relationships between aberrations in monetary aggregates and cyclical fluctuations in manufacturing output, consumption, and investment.

In asmuch as there was a sharp reduction in investment, consumption compression was an important factor causing a collapse of the Thai economy in 1998. Cyclical excess in consumption and investment led to economic booms and busts. The evidence of excess sensitivity in consumption is found. An increase in income level gives rise to a relaxation of liquidity constraint, allowing households to borrow excessively to finance current consumption. Interestingly enough, both investment and consumption expenditures exhibit high degree of excess sensitivity to cyclical movements in output.

In hindsight, it seems that reactions of monetary authorities in the past were too late and too little to cope with currency and financial crises. Nevertheless, overreactions can also cause damages, in particular, when the predictive capacity of the future event is limited. According to the Brainard conservatism principle, coined by Blinder (1997), under uncertainty of various multipliers, monetary policy should be more conservative. Policy instruments should be

moved in the same direction as optimal policy under certainty equivalence, but by smaller magnitudes under changing values of multipliers.

Monetary authorities must try to avoid large swings in the monetary base. Thanks to a flexible exchange rate system, monetary base is not subject to any attempt to peg the exchange rate. The ability to control money supply of the central bank will be enhanced. The intervention in the foreign exchange market should be kept at minimum or not at all. In addition, the absence of inflation tax and financial bailout would ensure that the central bank could manage the monetary base to pursue price stability without any constraints that used to hinder the effectiveness of monetary policy. Greater independence of the central bank, although does not guarantee price stability, would reduce the time inconsistency problem of monetary policy.

In deep recessions, financial instability becomes apparent and pervasive as output declines. Financial crisis prolongs economic recession and prevents sustainable recovery. In times of prosperity, cyclical excess leads to financial fragility, as speculative finance becomes the predominant means of debt accumulation. Macroeconomic stability and financial instability are therefore incompatible, whereas boom-bust cycles and financial crisis are intricately related. Implementation of measures to enhance stability of the financial system during the economic downturn must take in to account its macroeconomic impact that might further delay economic recovery.

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Growth Decomposition from Aggregate Demand

(Percentage point)

	GDP growth	Consumption	Investment	Government	Net Exports
1988	13.3	5.17	6.25	0.44	-3.06
1989	12.2	6.36	6.91	0.26	-0.31
1990	11.2	7.24	9.92	0.63	-4.05
1991	8.6	3.10	4.95	0.55	0.16
1992	8.1	4.82	2.69	0.55	1.47
1993	8.4	4.71	3.71	0.43	4.56
1994	8.9	4.46	4.68	0.68	-0.41
1995	8.8	4.09	4.61	0.44	-2.88
1996	5.5	3.46	2.52	0.78	-0.38
1997	-1.3	0.30	-8.61	1.59	6.56
1998	-9.9	-11.18	-11.71	1.10	11.01

Source: Calculated from data provided by the Bank of Thailand. Percentage contributions are ratios of changes in aggregate demand components to previous year GDP level.

Table 2

Period Average Growth Rate and Volatility in Monetary Aggregates

	1987-1990	1991-1996	1997-1999
Monetary Base (%change)	18.2 (0.196)	16.0 (0.298)	4.19 (1.995)
V1(GDP/M1) Velocity	10.53 (0.046)	10.91 (0.028)	10.79 (0.021)
m1(M1/Mbase) Money multiplier	1.15 (0.035)	1.03 (0.039)	0.92 (0.054)
V2(GDP/M2) Velocity	1.55 (0.052)	1.29 (0.039)	1.04 (0.048)
m2(M2/Mbase) Money multiplier	7.63 (0.071)	8.75 (0.043)	9.66 (0.094)
Credit Multiplier (Credit/Mbase)	6.87 (0.121)	10.13 (0.106)	12.42 (0.07)
Credit/GDP	0.59 (0.102)	0.92 (0.141)	1.25 (0.04)
Bank Credit (%change)	22.06 (0.254)	22.09 (0.197)	13.07 (0.838)
Semi -Credit Elasticity of Investment	1.15 (0.191)	0.61 (0.328)	0.44 (2.682)
ICCR Incremental Capital Credit Ratio	0.154	0.025	0.005
Private Investment Index (%change)		-3.36 (-5.26)	-38.1 (-1.24)
MPI: manufacture Production Index (%change)		9.46 (0.41)	-2.0 (-4.32)

Note: numbers in parentheses are coefficients of variation of corresponding variables.

Table 3: Unit Root Tests

VARIABLE	ADF Statistic	VARIABLE	ADF Statistic	Critical Value One percent
MBASE	0.125	ΔMBASE	-5.46	-3.49
MPI	-1.05	ΔMPI	-5.05	-3.49
SALE	-0.461	ΔSALE	-7.98	-3.51
PII	-0.83	ΔPII	-4.24	-3.49

Note: Variables are measured in the logarithmic form of the ratio of its actual value to trend. Mbase = Monetary base, MPI = Manufacturing Production Index, SALE = sales of department stores, PII= Private Investment Index

Table 4

Johansen Tests for cointegration

(VAR with four lags, constants and time trends)

A. Tests for ΔMPI and ΔMbase (1990:2-1999:6)

H_0	H_1	Eigenvalue	LR	Critical value (1%)
r = 0	r=1	2.331	69.2	30.45
r $\leq$1	r=2	0.237	30.5	16.26

B. Tests for ΔMPI, ΔPII, ΔSALE, and ΔMbase (1990:2-1999:6)

H_0	H_1	Eigenvalue	LR	Critical value (1%)
r = 0	r=1	0.447	138.3	70.1
r $\leq$1	r=2	0.389	83.6	48.4
r $\leq$2	r=3	0.271	42.3	30.4
r $\leq$3	r=4	0.170	15.7	16.2

Note: Cointegration likelihood ratio (LR) tests based on maximum eigenvalue of the stochastic matrix. H_0 and H_1 denote the null and the alternative hypothesis, respectively.
r denotes the number of cointegrating vectors.

C. Cointegrating vectors

ΔMPI	ΔPII	ΔMBASE	ΔSALE	
-27.018	-0.925	125.615	11.637	(unnormalized cointegrating coefficients)
(1.00)	(0.034)	(-4.649)	(-0.431)	(normalized)

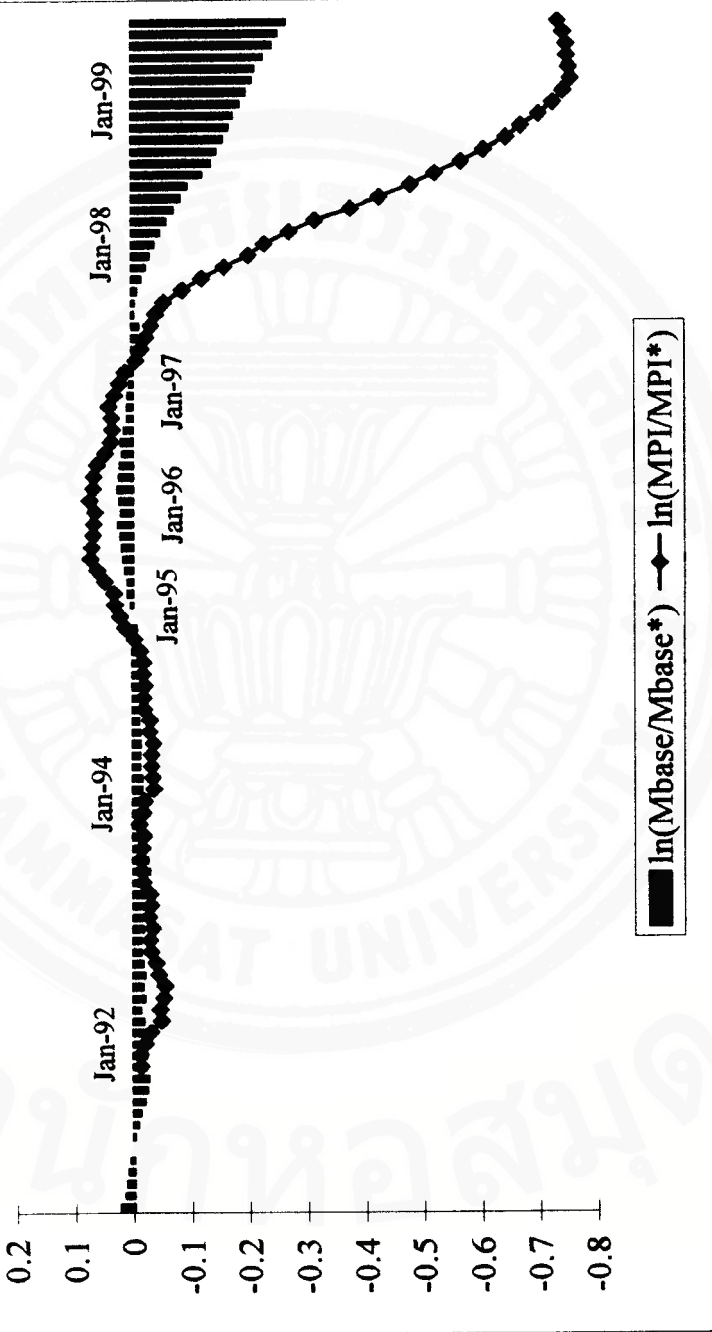Figure 1: Monetary shocks and deviation from potential output

■ ln(Mbase/Mbase*) ◆ ln(MPI/MPI*)

Figure 2: Capial Flows and Financial Bailout
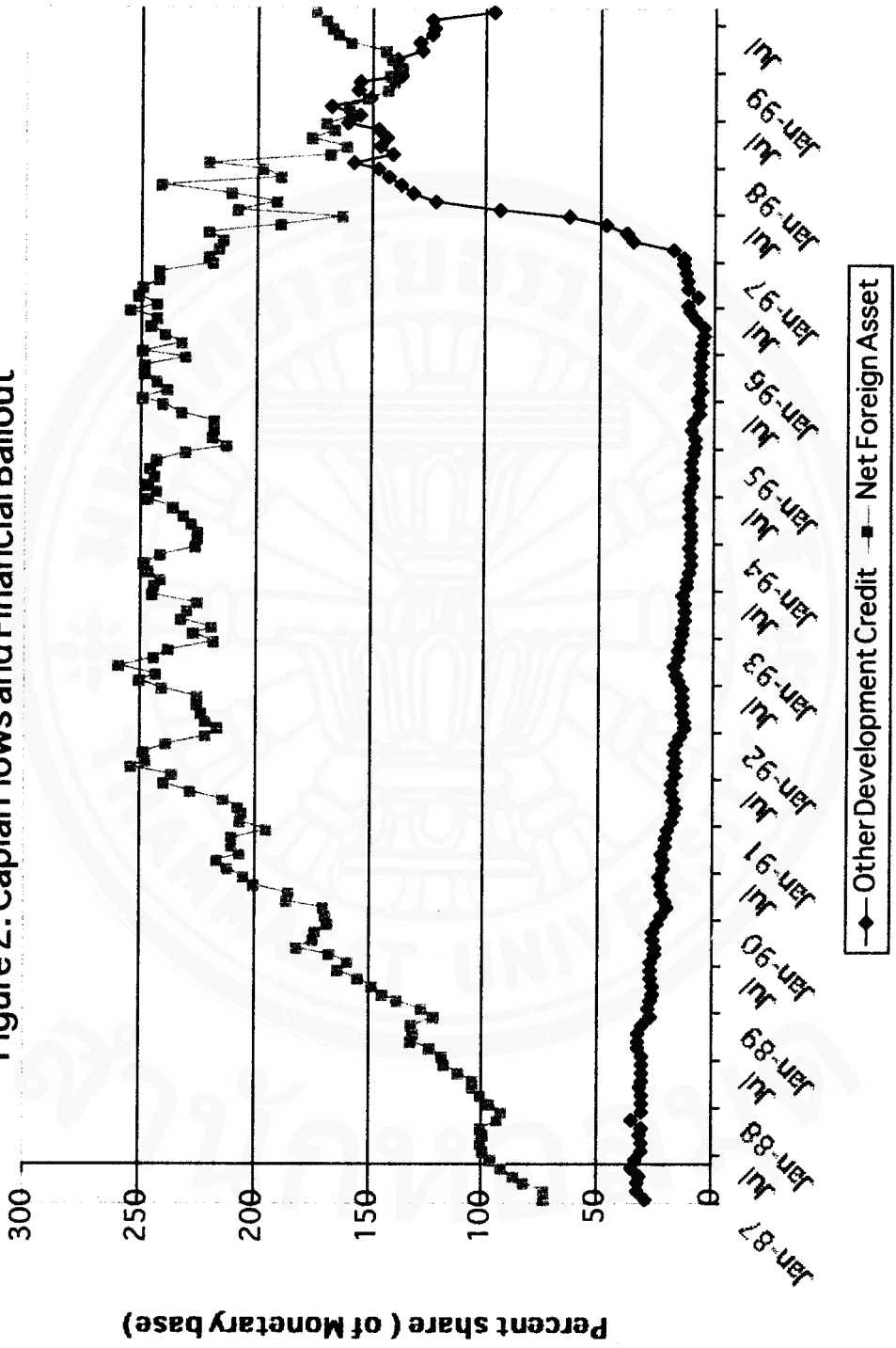
Figure 3: Property and Consumption Lending Booms
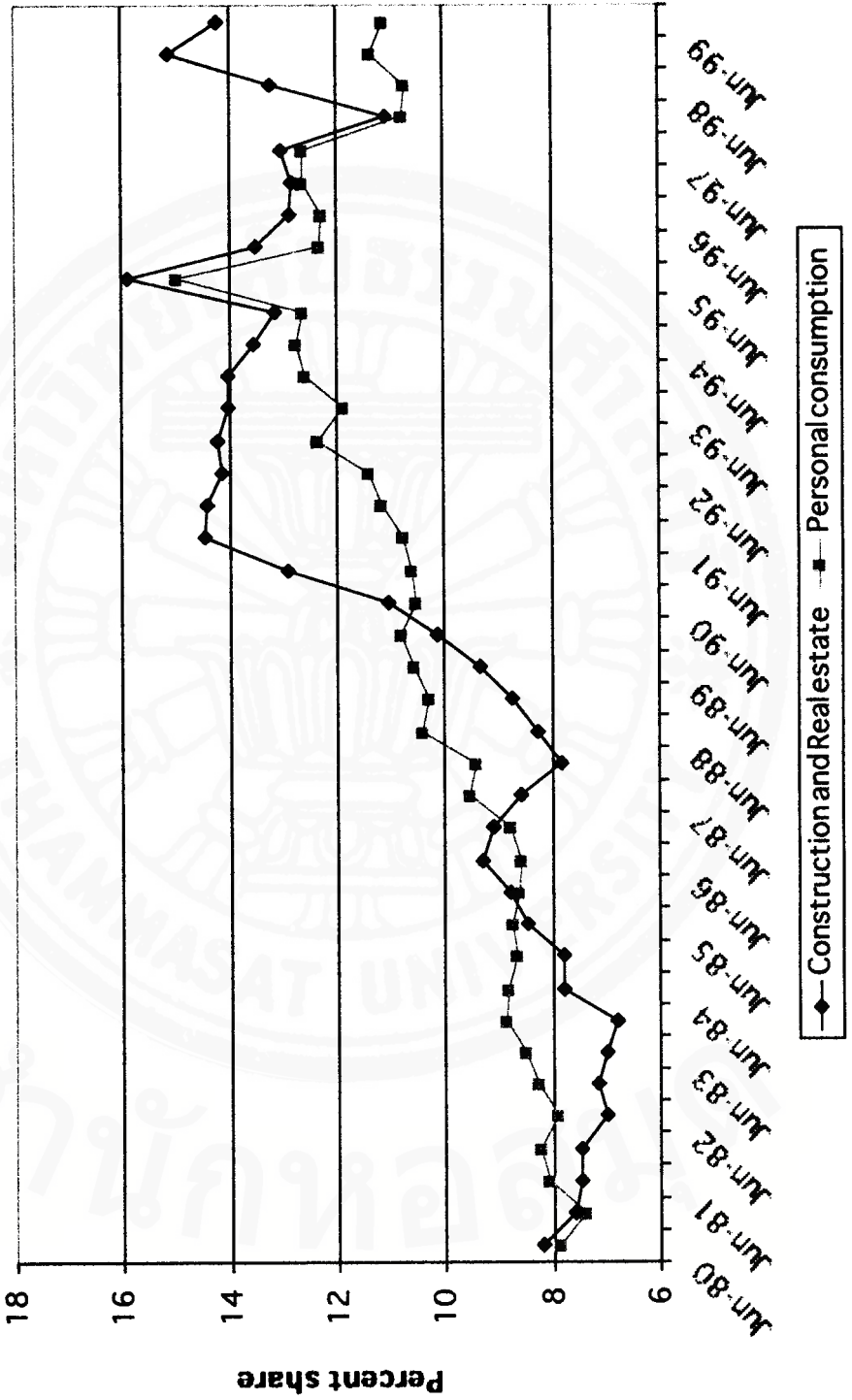
Construction and Real estate   Personal consumption
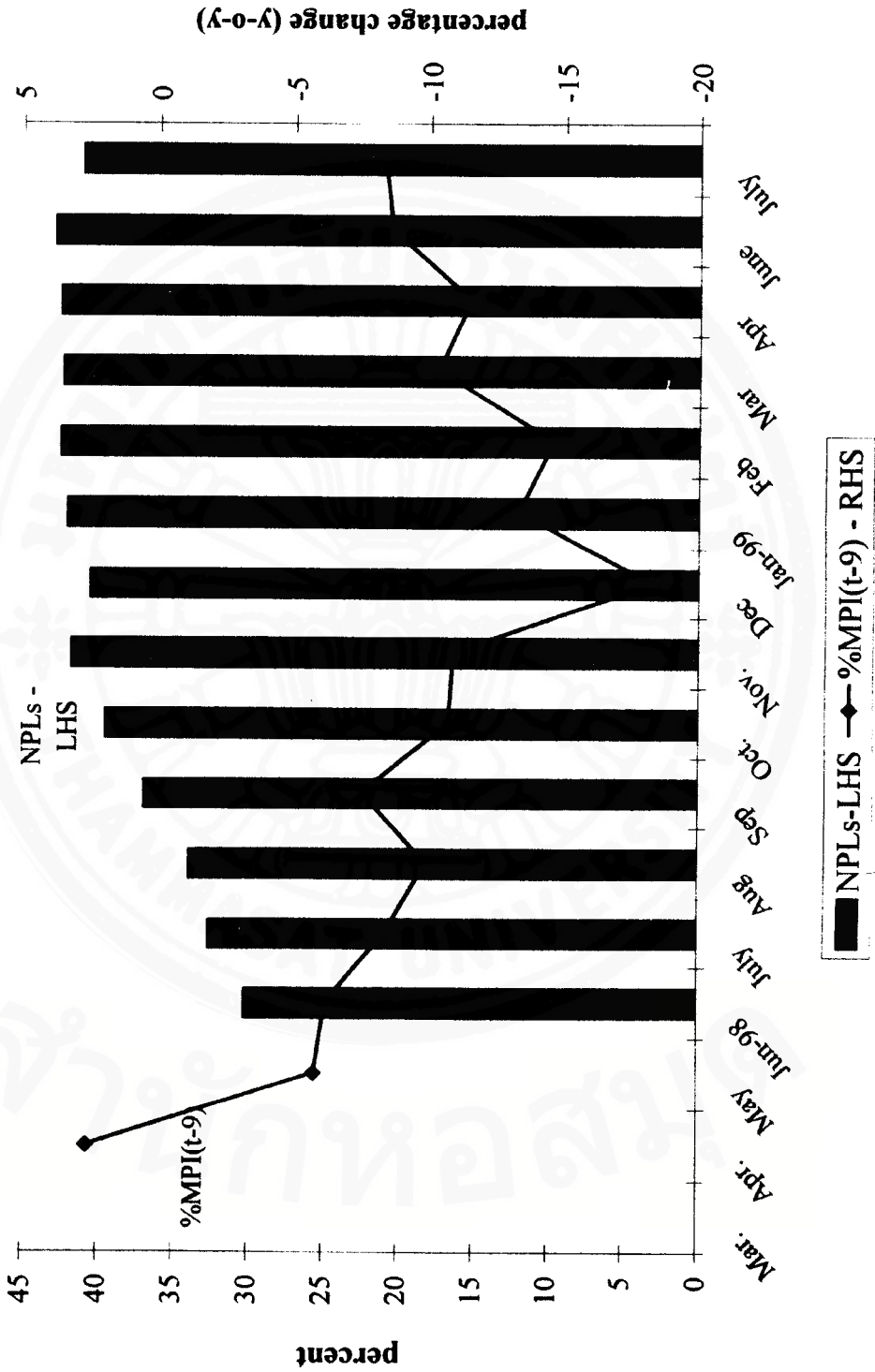
Figure 4: NPLs—a lagging indicator

Figure 5: Impulse response functions

Response to One S.D. Innovations ± 2 S.E.