



A MONETARY CONDITIONS INDEX FOR MAINLAND CHINA

Summary:

- *Economic and financial developments on the Mainland have important implications for Hong Kong. This paper presents an empirical framework for assessing monetary and financial conditions on the Mainland by estimating a monetary conditions index (MCI).*
- *An MCI is usually defined as a weighted sum of some measures of real interest rate and the real effective exchange rate (REER). Because bank credit is an important channel of monetary policy transmission mechanism in Mainland China, this study extends the conventional MCI by including a quantity variable to capture the credit availability effect.*
- *Estimates suggest that, in terms of the effect on real GDP growth, a rise in real interest rates by 1 percentage point is equivalent to an increase in REER appreciation by about 4 percentage points or a fall in real credit growth by 2.5 percentage points.*
- *The estimated MCI suggests a sharp easing in monetary conditions in 2002-2003, reflecting a weaker US dollar, relaxed credit stance of banks, and easing of deflation which reduced real interest rates. The fall in the MCI is equivalent to a decline of about 10 percentage points in real interest rates during the period. Easy monetary conditions have contributed to an acceleration in economic growth since 2002.*
- *Fears of overheating pressures prompted the authorities to implement administrative measures in early 2004 to curb credit supply to selected sectors and raise interest rates in late October 2004. The estimated MCI suggests that the tightening of monetary conditions is equivalent to a rise in real interest rates by about 4.6 percentage points.*

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I. INTRODUCTION

Developments in Mainland China have important implications for the rest of Asia including Hong Kong, given the increasing economic and financial integration in the region. Balanced and sustainable growth on the Mainland is conducive to the maintenance of monetary and financial stability in Hong Kong. In monitoring macroeconomic developments on the Mainland, it is important to assess monetary and financial conditions. However, this is not an easy task, as the monetary policy transmission mechanism on the Mainland is not well understood. This is evidenced by the debate in 2004 on overheating pressures and the appropriate policy responses. Views differ on the effectiveness of adjusting interest rates and bank credit supply for macroeconomic control. Some also blame a weak renminbi as a result of the depreciation of the US dollar for rising prices and demand pressures.

This paper provides an empirical framework for assessing monetary conditions on the Mainland by estimating a monetary conditions index (MCI). An MCI is usually defined as a weighted sum of some measures of real interest rate and the real effective exchange rate (REER), with the weights reflecting their relative effects on aggregate demand or inflation. It is typically motivated from standard open-economy macro models in which both interest rates and exchange rates are important monetary policy transmission channels (Hataiseree 1998). Gerlach and Smets (2000) derive a theoretical model to show that the optimal feedback rule of a central bank can be written in terms of an MCI, that is, the central bank can optimise its objective function by setting a weighted average of interest rate and exchange rate according to macroeconomic conditions. Furthermore, the optimal weight on the exchange rate depends on the elasticities of aggregate demand with respect to the real interest rate and real exchange rate.

The literature also shows that, owing to imperfect information and other frictions in the credit market, the credit stance of banks have important supplementary effects on monetary policy transmission (Bernanke and Gertler 1995). This is particularly important for Mainland China for two reasons. First, bank finance plays a dominant role in the Mainland's financial intermediation, and therefore credit supply remains an important channel of the monetary policy transmission mechanism. Secondly, administrative measures to control bank credit expansion remains an important tool for monetary policy implementation,

as evidenced by the experience of macroeconomic control in the first half of 2004. This study therefore extends the conventional MCI by including a quantity variable to capture the credit availability effect.

Since the early 1990s, several central banks have estimated MCIs as an indicator of policy stance, or even as an operational target for monetary policy.¹ However, problems associated with the use of an MCI for these purposes have been increasingly recognised (Stevens 1998). Gerlach and Smets (2000) show that the theoretical assumptions required for an MCI to be an optimal policy target are rather restrictive. In particular, exchange rates can be influenced by factors other than monetary policy actions, and it is difficult for central banks to assess the source and nature of shocks to the exchange rate and appropriate policy responses. Consequently, emphasis is now placed on using an MCI as an indicator of monetary and financial conditions, rather than a policy target. This is particularly so for economies that have a fixed (pegged) exchange rate regime. In the case of Hong Kong, for example, both exchange rate and interest rate movements are beyond the control of the monetary authority, because the Hong Kong dollar is linked to the US dollar under the currency board arrangement. Nevertheless, the MCI is still a useful tool for measuring monetary conditions in Hong Kong, as the effective exchange rate of the Hong Kong dollar moves along with the US dollar exchange rate against other currencies (Peng 2000).

Bu and Zhou (2004) provide a recent study estimating an MCI for the Mainland. Our analysis is different from theirs in three aspects. First, we use bank credit to capture credit availability effect, while Bu and Zhou use a broad money aggregate. Our approach is based on the consideration that credit growth reflects more directly changes in the lending stance of banks and administrative measures imposed by the authorities to control credit expansion. Secondly, the effective exchange rates of the renminbi is calculated based on trade weights that are adjusted for indirect trade via Hong Kong in this study. Trade weights based on gross trade volumes overstate Hong Kong's role as a trade competitor to the Mainland. Finally, this study calibrates the weights of component variables in the MCI by estimating an aggregate demand equation using output growth instead of output gap as the dependent variable. This is owing to the difficulties in estimating potential output for the Mainland (see Section III).

¹ These included, in particular, central banks of Canada, New Zealand, Australia, and Thailand (Stevens 1998 and Hataiseree 1998).

The rest of the paper is organised as follows. Section II considers the components of the MCI and their relationships with the aggregate demand on the Mainland. Section III estimates the weights of the components in the MCI, and section IV presents the computed MCI and discusses implications of its recent movements. Section V concludes.

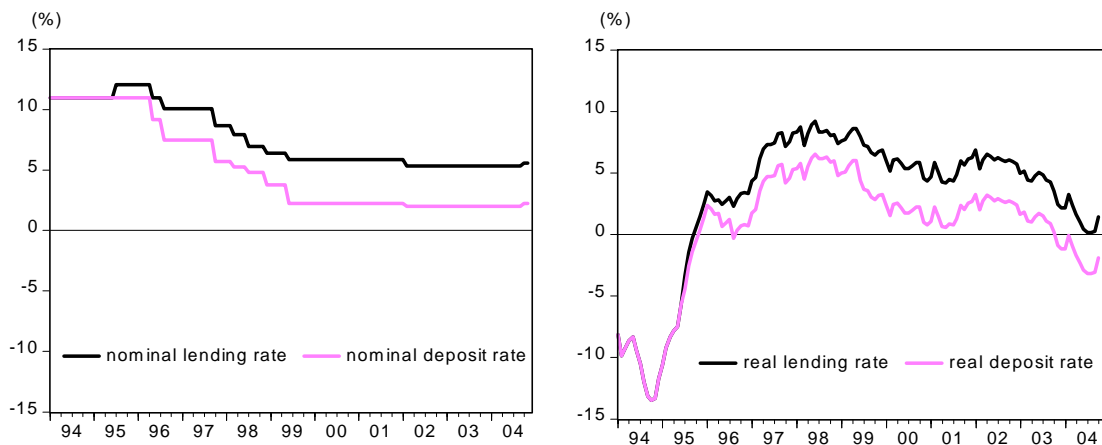
II. COMPONENTS OF THE MCI

Real interest rate, real effective exchange rate and credit supply are selected to be possible components of the MCI. In the next section, an empirical model will be employed to determine whether all three variables should be included in the MCI and, if so, how much weight each should have. This section describes the definition and measurement of these three financial variables and their recent developments.

Real interest rates

In a market-based economy, changes in interest rates affect economic activity by altering the cost of capital. The interest rate effect is the primary channel of monetary policy transmission in advanced economies. In Mainland China, owing to reforms and structural changes in the past two and a half decades, the role of interest rates in the economy has risen over time. According to Ha and Fan (2003), fixed capital investment has begun to respond to changes in interest rates since the mid-1990s. However, retail sales, a proxy for private consumption, appear not to be responsive to interest rates, as the substitution effect of changes in interest rates is offset by the income effect. That said, the development of the housing market and rapid growth of mortgage loans on the Mainland suggests that households are likely to have become more responsive to changes in interest rates in more recent years.

Chart 1. Lending and deposit rates



Source: CEIC.

Note: Real rates are defined as one-year interest rates minus annual CPI inflation.

For the purpose of this study, the real interest rate is measured by the one-year lending rate subtracted by the CPI inflation rate. Chart 1 shows the movements of the one-year lending and deposit rates in both nominal and real terms. Movements of the real interest rates reflected mainly changes in inflation during the 1990s. In particular, while nominal interest rates were reduced from 1996 to 1998, real interest rates rose because of sharp disinflation. Despite relatively stable nominal interest rates since 2002, real lending and deposit rates have decreased, reflecting a pick-up in inflation. The decline in real interest rates has likely contributed to demand growth in the past couple of years.

Real effective exchange rate

As the Mainland economy is increasingly integrated with the rest of the world, real exchange rate has become an important variable affecting economic growth. Real exchange rate changes affect spending by changing the relative price of domestic and foreign goods. Movements in exchange rates may alter the terms of trade, leading to an income effect on domestic demand. Furthermore, an appreciation of the domestic currency may have a positive (negative) balance sheet effect depending upon whether the economy has a net liability (asset) position vis-à-vis the rest of the world.

The effective exchange rate used in this study is computed by excluding the bilateral exchange rate of the renminbi against the Hong Kong dollar. Although Hong Kong is one of the largest trading partners of Mainland China, a large part of the Mainland's trade with Hong Kong is associated with re-exports,

and direct trade accounts for only 10% of the total bilateral trade. After adjusting for the Mainland's trade via Hong Kong with the rest of the world, Hong Kong would account for only about 1% of Mainland China's total trade (Table 1).

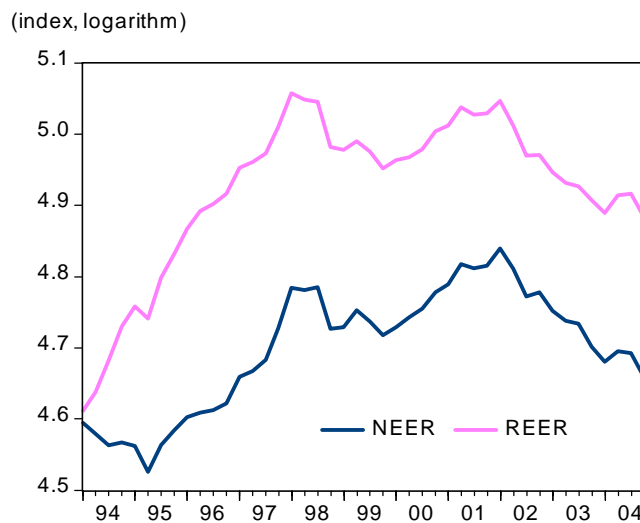
Table 1. Share in Total Trade of the First Nine Trading Partners of Mainland China (Average of 1999-2003)

Trading partners	Share in total trade (%)	Share adjusted for Hong Kong's re-export trade (%)
US	16	19
Europe <i>excluding</i> UK	17	19
Japan	17	18
Hong Kong	11	1
South Korea	7	7
Taiwan	7	7
Singapore	2	3
UK	2	3
Malaysia	2	2
Total of the above	81	79

Source: Staff estimates.

Chart 2 shows the movements of the nominal effective exchange rate (NEER) and real effective exchange rate (REER) of the renminbi since 1994. The NEER depreciated sharply in 1994 in connection with the unification of the exchange rate regime. It subsequently followed an upward trend until early 1998, owing to a strong US dollar (particularly against other Asian currencies in the wake of the Asian financial crisis). The NEER declined in 1998-99, but recorded a marked rise in 2000-01, again reflecting the strength of the US dollar. The index has depreciated sharply since then as the US dollar weakened against other major currencies.

Chart 2. Effective exchange rates of the Renminbi



Source: Staff estimates.

The REER appreciated sharply in 1994-1998, in part reflecting relatively high domestic inflation. It has subsequently followed the movements of the NEER as domestic inflation declined to a low level. The drop in the REER by over 10% since late 2001 implies a significant improvement in the competitiveness of the Mainland economy.

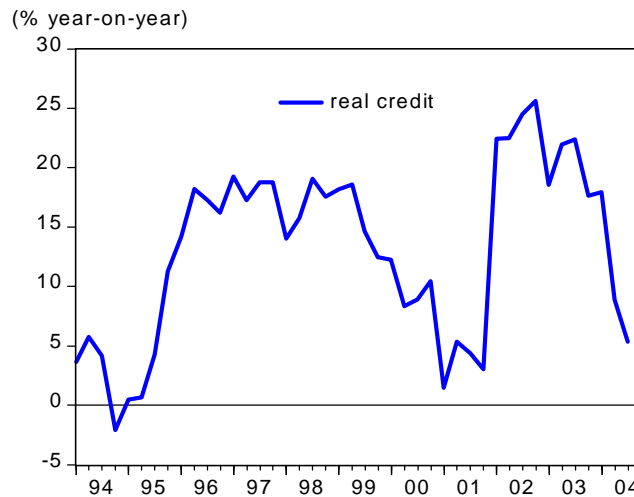
Credit growth

Important progress has been made in liberalising interest rate controls. However, credit availability remains an important channel of the monetary policy transmission mechanism on the Mainland (Ha and Fan 2003). Tightening banks' lending stance through administrative means continues to be an important tool for monetary policy. Interest rate regulations also distort proper pricing of credit risk, forcing banks to use credit rationing to control the risk of their loan portfolios. Consequently, the quantity of credit supply and real interest rates can be two independent forces that affect aggregate demand growth.

Chart 3 shows growth of real credit in 1994-2004. Real credit is measured by the banking system's total loans (in both renminbi and foreign currencies) deflated by the consumer price index. Credit growth in real terms rose sharply in 1995-96, reflecting mainly disinflation in consumer prices. The growth rate dropped from over 15% in 1998-99 to below 5% in 2001, as banks tightened their lending stance in an effort to strengthen risk controls. Banks increased

lending subsequently, and real credit growth accelerated to high levels of over 20% in 2002-03. As the expansion in bank credit was seen to be excessive and a main contributing factor for overheating pressures, the authorities took drastic measures to control bank lending in the early part of 2004. As a result, credit growth decelerated sharply to just above 5% in the third quarter of 2004.

Chart 3. Growth of real credit



Source: CEIC.

Note: Real credit is nominal domestic credit deflated by urban CPI.

III. DETERMINATION OF WEIGHTS

This section estimates the weights of the components in the MCI. For this purpose, two measures of the MCI are considered. A narrowly-defined MCI (narrow MCI) is constructed as a weighted sum of real interest rate and REER, with the weights reflecting their relative influence on real GDP growth. A more broadly defined MCI (broad MCI) extends the narrow MCI by including real credit growth to capture the effect of credit availability.²

² A broader measure of financial conditions, termed the financial conditions index (FCI), incorporates equity prices as well. FCI is more relevant for developed economies, where equity prices are shown to have an important impact on economic growth through the wealth effect. However, equity market on the Mainland is still being developed and the wealth effect associated with changes in stock prices is likely to be limited.

Two aggregate demand functions with real GDP growth as the dependent variable are estimated to determine the weights of the narrow and broad MCIs. In calibrating the relative importance of components of an MCI, inflation rate or output gap is commonly used in the literature as the dependent variable in the equation. In this study, output growth rather than inflation rate is used in part because the presence of price controls on the Mainland distorts the relationship between inflation and monetary conditions. Furthermore, there is considerable uncertainty in estimating the output gap for Mainland China. This is because structural changes and liberalisation in the Chinese economy make it difficult to estimate potential output. The empirical evidence on the validity of conventional Phillips curves that relate inflation to a measure of output gap is also weak for the Mainland (Gerlach and Peng 2004).

Take the case of the broad MCI as an example, the following equation is estimated:

$$y = -\alpha r - \beta reer + \theta credit \quad (1)$$

$$MCI = r + \frac{\beta}{\alpha} reer - \frac{\theta}{\alpha} credit \quad (2)$$

where y is real GDP growth, r is the real interest rate, $credit$ is real credit and $reer$ is the real effective exchange rate. Thus, a rise in the MCI indicates a tightening of monetary conditions. Specifically, one point change in the MCI is equivalent in its effect on output growth to one percentage point change in the real interest rate. The aggregate demand function for the narrow MCI is similar to that for the broad MCI, with the real credit growth variable excluded.

The sample consists of quarterly data on 4-quarter change in the logarithm of real GDP (y), real interest rate (r), and 4-quarter changes in the logarithms of REER ($\Delta reer$) and real credit ($\Delta credit$) for the period of 1994/Q1-2004/Q3.³ Following the general-to-specific approach, the aggregate demand functions are estimated.⁴ The results are presented in Table 2. Coefficients of the estimated equations are statistically significant and of the expected signs. Specifically, real GDP growth is negatively associated with real interest rate and exchange rate appreciation, and is positively related to credit expansion.

Table 2. Estimated aggregate demand equations

<u>Narrow MCI</u>	
$y_t = 0.092 - 0.197 r_{t-3} - 0.054 \Delta reer_{t-4}$	
(42.98) (-6.16) (-2.65)	
Sample period: 1994/Q1-2004/Q3	
Adjusted R ²	0.632
Durbin-Watson	1.190
Note: Numbers in parentheses are t-statistics. The Newey-West estimators are used.	
<u>Broad MCI</u>	
$y_t = 0.081 - 0.274 r_{t-3} - 0.068 \Delta reer_{t-4} + 0.110 \Delta credit_{t-1}$	
(41.69) (-8.93) (-3.85) (6.80)	
Sample period: 1994/Q1-2004/Q3	
Adjusted R ²	0.728
Durbin-Watson	1.460
Note: Numbers in parentheses are t-statistics. The Newey-West estimators are used.	

Source: Staff estimates.

³ Real interest rate is measured as the difference between one-year lending rate and annual CPI inflation. Real credit growth is calculated as four-quarter changes in the logarithm of real credit, which is obtained by deflating nominal domestic credit by the CPI.

⁴ The variables are tested for stationarity before the aggregate demand functions are estimated. Augmented Dickey-Fuller (ADF) tests reject the null-hypothesis of nonstationarity for all variables, except for real GDP growth. The failure to reject nonstationarity for real GDP growth is attributable to sampling problem, as real GDP growth decelerated steadily during the sampling period. The ADF test rejects the null hypothesis of nonstationarity for real GDP growth if the sample is extended to 1985-2004. Thus, this is unlikely to be a major concern for our estimates.

IV. ESTIMATED MCIs

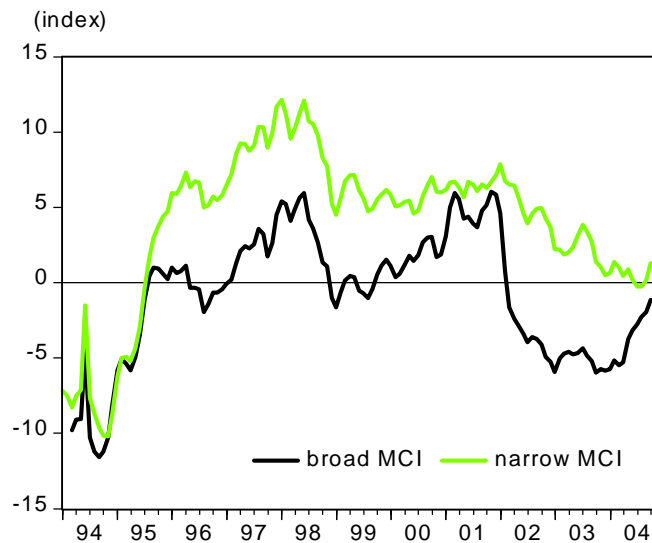
The formulas for computing the two MCIs derived from the aggregate demand functions are as follows.

$$\text{Narrow MCI} = r + 0.275 \Delta \text{reer} \quad (3)$$

$$\text{Broad MCI} = r + 0.249 \Delta \text{reer} - 0.400 \Delta \text{credit} \quad (4)$$

The ratios of the estimated coefficients suggest that a 1 percentage point rise in the real interest rate is equivalent to about 4 percentage point increase in REER appreciation or a 2.5 percentage point decline in real credit growth in terms of the effect on real GDP growth. It is interesting to note that the importance of the REER relative to the real interest rate is almost the same in the two MCIs.

Chart 4. Broad and narrow MCIs



Source: Staff estimates.

Chart 4 plots the narrow and broad MCIs constructed from monthly data.⁵ The indices exhibited notable differences in some periods. While the narrow MCI was generally stable in 1999-2001, the broad MCI rose by an amount equivalent to an increase of over 5 percentage points in the real interest rate, reflecting a tightened lending stance by banks. Subsequently, although both indices

⁵ While the aggregate demand equations are estimated using quarterly data, higher frequency data are used to construct the MCIs to provide more timely information.

suggest an easing of monetary conditions in 2002-03, the broad MCI indicates a much sharper decline. The difference is due to a significant relaxation of lending stance by banks during the period. The broad MCI shows a larger rise than the narrow MCI in 2004, owing to the imposition of administrative measures by the authorities to curb credit growth.

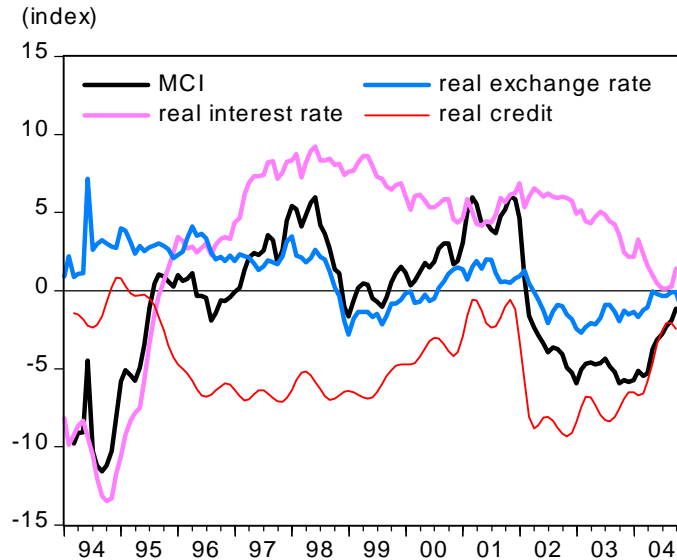
Chart 5 presents a time-series plot of the broad MCI, along with a breakdown of contribution by components, and Table 3 shows the major cycles of monetary conditions in the past decade. Some observations on the movements of the MCI in relation to its components are as follows.

- Monetary conditions tightened sharply from 1994 to the first half of 1998, brought about mainly by sharp disinflation, which raised the real interest rate. The tightening followed a sizeable easing in the early 1990s as a result of the depreciation of the renminbi exchange rate and double-digit inflation.
- The broad MCI dropped markedly in the second half of 1998, largely due to real exchange rate depreciation. The latter was associated with a rebound of most other Asian currencies against the US dollar as the Asian financial crisis eased. This was followed by a rise of the MCI in 1999-2001, reflecting a strong US dollar and more conservative lending stance of banks.
- Monetary conditions eased markedly in 2002-03, due to easing of deflation, a weakening of the US dollar and relaxation of credit stance by banks. Specifically, the fall in the MCI is equivalent to a drop of over 10 percentage points in the real interest rate.⁶ All three components of the MCI contributed to the monetary easing in 2002-2003.
- Easy monetary conditions have contributed to an acceleration in economic growth since 2002. Fears of overheating emerged in late 2003, and the authorities responded in the early part of 2004 by implementing administrative measures to tighten credit supply to selected sectors. The PBoC also raised interest rate for the first time in nine years in late October 2004. While the real interest rate dropped in 2004 owing to higher inflation, the fall in credit growth led to a tightening of overall monetary conditions. The broad MCI

⁶ Although a 10 percentage points decline in real interest rate seems large, it should be noted that the sensitivity of the Chinese economy to real interest rate is smaller than that of more market-based economies. The estimated aggregate demand equation suggests that a 10 percentage points decrease in real interest rate would lift real GDP growth by only 2.74 percentage points.

shows that the measures introduced so far are equivalent to a rise of about 4.6 percentage points in the real interest rate.

Chart 5. Broad MCI and contribution of its components



Source: Staff estimates.

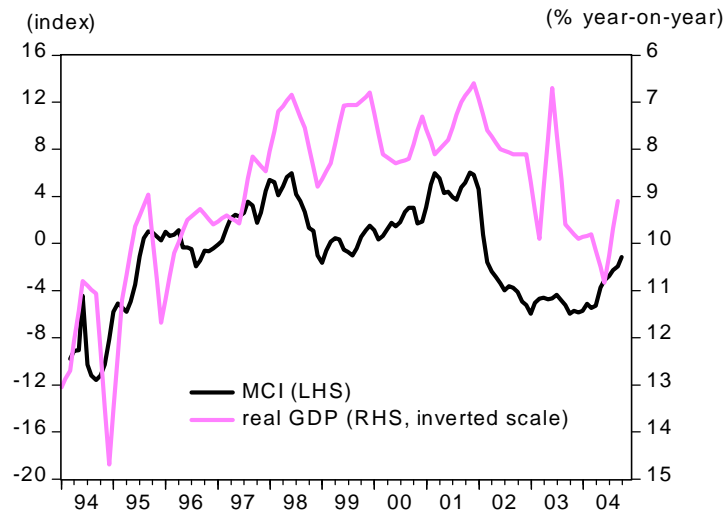
Table 3. Cycles of monetary conditions

Period	Change in MCI	Contribution of Components			Major influences
		Interest rate	REER	Credit	
1994-1H/1998	15.8 (tightening)	18.5	1.7	-4.4	Sharp disinflation Asian currency devaluation
2H/1998	-5.2 (easing)	-0.9	-4.1	-0.1	Rebound of Asian currencies
1999-2001	7.5 (tightening)	-1.3	3.6	5.2	Interest rate cuts Tight lending stance of banks Strong USD
2002-2003	-10.5 (easing)	-4.7	-2.4	-3.4	Easy lending stance of banks Easing of deflation Weak USD
2004 (up to Oct.)	4.6 (tightening)	-0.7	1.3	4.1	Interest rate hike Tight lending stance of banks Return of inflation

Source: Staff estimates.

Chart 6 compares real GDP growth and the broad MCI. Changes in the MCI seem to track the inverse movements of real GDP growth reasonably well. Two episodes of discrepancy are notable. In 1999, while monetary conditions seemed to be stable, real GDP growth slowed significantly. This possibly reflected the impact of severe floods in a number of provinces in that year. The spikes in real GDP growth in the first two quarters of 2003 were associated with the impact of the SARs outbreak. Considering that real interest rates, credit growth and the REER affect the aggregate demand through different channels, the source of changes in the MCI should have implications for the composition of GDP growth. Real interest rates decreased markedly in 1992-1994 and 2001-2003 in the face of rising inflation, while the REER declined in 1998 and 2002 on a rebound of Asian currencies and depreciation of the US dollar against other major currencies respectively. Consistent with the composition of changes in the MCI, fixed asset investment was the driving force behind accelerated growth in 1992-94 and 2002-03, while exports rose strongly in 1998-2000 and 2002-03.

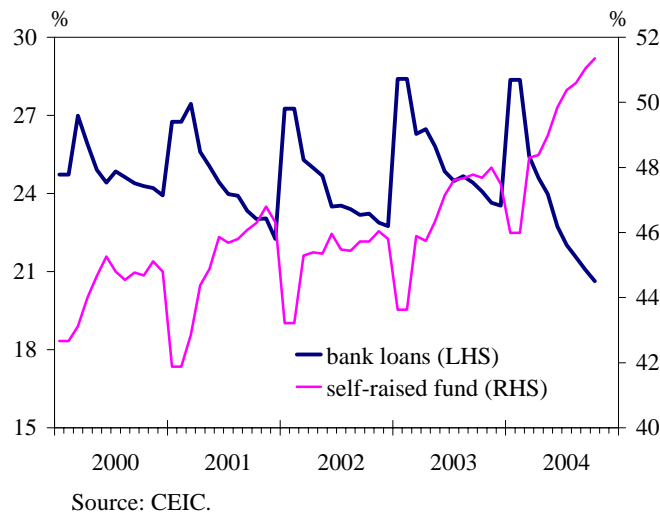
Chart 6. MCI and GDP



Source: CEIC and staff estimates.

Finally, caution is required in interpreting the tightening of monetary conditions in 2004 due to slower credit growth. The sharp slowdown in credit growth this year probably overstates the reduction in credit availability. Credit rationing in the banking sector has driven enterprises to look for other sources of funding. Activities in the informal credit market reportedly increased in 2004, as indicated possibly by an increase in the proportion of self-funded investment projects by enterprises (Chart 7). The increase in the MCI this year could therefore overstate the extent of tightening in financial conditions, although the extent of the distortion is uncertain.

Chart 7. Sources of investment funds



V. CONCLUSIONS AND CAVEATS

Monetary conditions on the Mainland could be measured by an MCI, which is a weighted sum of real interest rate, real exchange rate and real credit growth. The estimated MCI suggests a sharp easing of monetary conditions in 2002-2003, reflecting a weaker US dollar, relaxed credit stance by banks, and easing of deflation which reduced the real interest rate. This has contributed to the acceleration in economic growth. Owing to tightening measures introduced by the authorities in 2004, monetary conditions have tightened, as shown by a considerable rise in the MCI in recent quarters. The rise in the MCI primarily reflects a sharp slowdown in credit growth.

Although the concept of MCI is theoretically appealing, there are caveats in the empirical implementation. There are considerable uncertainties stemming from measurements of the real interest rate, the REER and credit stance, as well as estimation of the relative weights of the component variables. An MCI is only as good as the underlying model from which the weights are derived. Thus, caution is required in interpreting the estimates. In particular, the recent sharp slowdown in credit growth may overstate the decline in credit availability, considering the increased activity in the informal credit market.

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