A monetary conditions index for Mainland China

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This article presents a monetary conditions index (MCI) for assessing Mainland China's monetary and financial conditions, which have significant implications for maintaining monetary and financial stability in Hong Kong and Asia as a whole. Because bank credit is an important channel through which the Mainland's monetary policy is implemented, the study extends the conventional MCI – a weighted sum of real interest rates and the real effective exchange rate – to capture the credit availability effect.

The MCI suggests a distinct easing of monetary conditions in 2002-2003, reflecting a weaker US dollar, a relaxed lending policy by banks, and an easing of deflation, which reduced the real interest rate. This contributed to faster economic growth. However, macroeconomic measures to curb credit supply and raise interest rates in 2004 resulted in tighter monetary conditions. This was marked by a considerable rise in the MCI, which indicated a reversal of about half of the earlier easing.

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 its monetary policy transmission mechanism 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 due to the depreciation of the US dollar for rising prices and demand pressures.

This article introduces a monetary conditions index (MCI) for assessing monetary conditions on the Mainland. An MCI is usually defined as a weighted sum of measures of real interest rates 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 rates and exchange rates according to macroeconomic conditions. The optimal weight on the exchange rate depends on the elasticities of aggregate demand on the real interest rate and real exchange rate.

The literature also shows that because of imperfect information and other frictions in the credit market, the credit stance of banks has important supplementary effects on monetary policy transmission {Bernanke and Gertler (1995)}. This is important for Mainland China for two reasons. First, bank finance plays a dominant role in financial

intermediation and, therefore, credit supply remains an important channel of the monetary policy transmission mechanism. Secondly, administrative measures to control bank credit expansion remain an important tool for monetary policy implementation, as shown by the experience of macroeconomic control in the first half of 2004. This study 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. 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. Hence emphasis is now placed on using an MCI as an indicator of monetary and financial conditions, rather than a policy target, particularly for economies that have a fixed (pegged) exchange rate regime. In 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, 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. This study differs in three aspects. First, it uses bank credit to capture credit availability effect, while Bu and Zhou use a broad money aggregate. The use of bank credit 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, in this study the effective exchange rate of the renminbi is calculated based on trade weights that are adjusted for indirect trade via Hong Kong. Trade weights based on gross trade volumes overstate Hong Kong's role as a trade competitor with the Mainland. Finally, the weights of component variables in the MCI are calibrated by estimating an aggregate demand equation using output growth instead of output gap as the dependent variable, because of difficulties in estimating potential output for the Mainland.

The rest of the article is organised as follows. The next section considers the components of the MCI and their relationship with the aggregate demand on the Mainland. Section III presents the computed MCI and discusses the implications of its recent movements. The final section concludes.

II.   Components of the MCI

Real interest rates, real effective exchange rates and credit supply are selected as possible components of the MCI. The technical annex explains how 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. Owing to reforms and structural changes in Mainland China 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-

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[1]   These included central banks of Canada, New Zealand, Australia, and Thailand {Stevens (1998) and Hataiseree (1998)}.

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. Nevertheless, the development of the housing market and rapid growth in mortgage loans on the Mainland suggests that households are likely to have become more responsive to interest rate changes in more recent years.

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 in 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, the 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. An appreciation in the domestic currency may have a positive (negative) balance sheet effect depending on whether the economy has a net foreign currency liability (asset) position vis-a-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 Mainland's largest trading partners, a major part of this trade is associated with re-exports. 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 accounts for about 1% of Mainland China's total trade (Table 1).

CHART 1
Lending and deposit rates
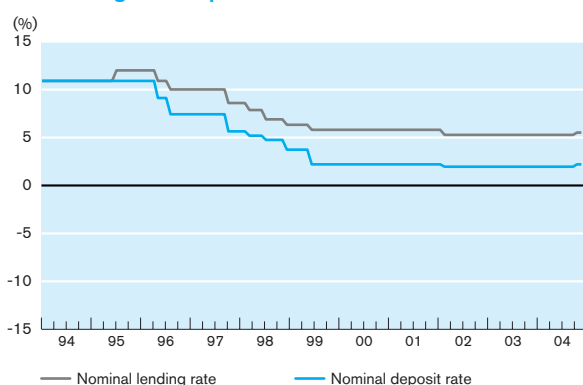
Source: CEIC.
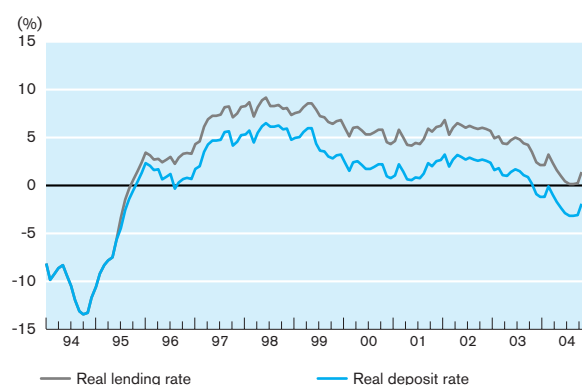Note: Real rates are defined as one-year interest rates minus annual CPI inflation.

Share in total trade of the first nine trading partners of Mainland China (Average of 1999-2003)

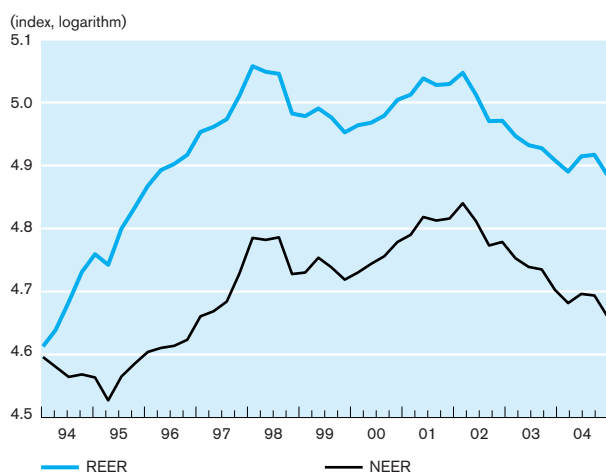| Trading partners	Share in total trade (%)	Share adjusted for Hong Kong's re-export trade (%)
US	16	19
Europe *excluding* UK	17	19
Japan	17	18
Hong Kong	11	1
South Korea	7	7
Taiwan	7	7
Singapore	2	3
UK	2	3
Malaysia	2	2
Total of the above	81	79

Source: Staff estimates.

Chart 2 shows the movements in the nominal effective exchange rate (NEER) and the 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, due 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 notably since then as the US dollar weakened against other major currencies.

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.
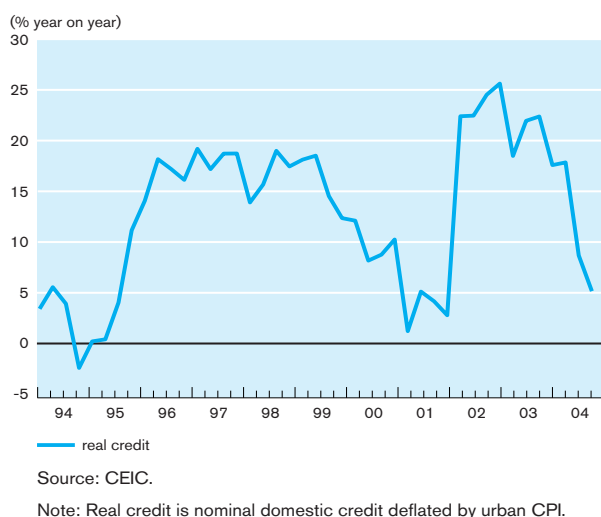
Credit growth

Important progress has been made in liberalising interest rate controls. However, credit availability remains an important channel for the Mainland's monetary policy transmission mechanism {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

Effective exchange rates of the renminbi

(index, logarithm)

Source: Staff estimates.

5% in 2001, as banks tightened their lending in an effort to strengthen risk controls. The banks subsequently increased lending, and real credit growth accelerated to high levels of over 20% in 2002-03. However, as the expansion in bank credit was seen to be excessive and a main contributing factor to overheating pressures, the authorities took drastic steps to control 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

(% year on year)

— real credit

Source: CEIC.

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

III. Estimated MCIs

Two measures of the MCI are considered. A narrowly-defined MCI (narrow MCI) is constructed as a weighted sum of real interest rates 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.

In determining the weights of the narrow and broad MCIs, two aggregate demand functions are estimated with real GDP growth as the dependent variable. The empirical results are explained in detail in the technical annex. The formulae for computing

the two MCIs derived from the estimated aggregate demand functions are

$$Narrow\ MCI = r + 0.275\ \Delta reer \qquad (1)$$

$$Broad\ MCI = r + 0.249\ \Delta reer - 0.400\ \Delta credit \qquad (2)$$

where r denotes real interest rates, $\Delta reer$ denotes changes in REER, and $\Delta\ credit$ denotes real credit growth. The results suggest that a one-percentage-point rise in the real interest rate is roughly equivalent to a four-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 plots the narrow and broad MCIs constructed from monthly data.[2] The indices exhibit 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 five percentage points in the real interest rate, reflecting a tightened lending stance by banks. Although both indices 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 in lending by banks during the period. The broad MCI shows a larger rise than the narrow MCI in 2004, attributable to the

CHART 4

Broad and narrow MCIs

(index)

— Broad MCI   — Narrow MCI

Source: Staff estimates.

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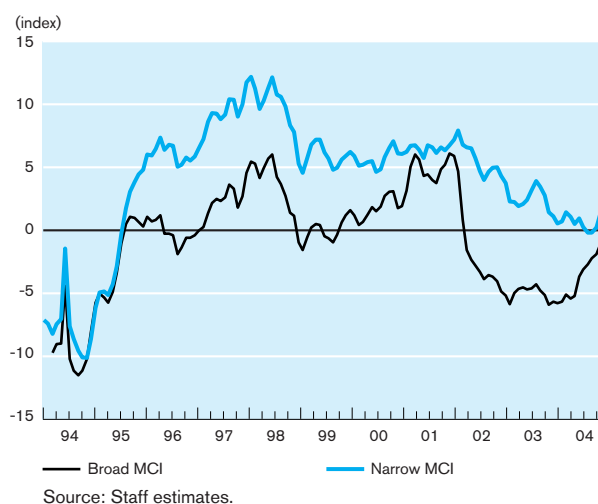
[2] While the aggregate demand equations are estimated using quarterly data, higher frequency data are used to construct the MCIs to provide more timely information.

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 contributions by components, and Table 2 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.

CHART 5
Broad MCI and contribution of its components

(index)

MCI   Real exchange rate
Real interest rate   Real credit

Source: Staff estimates.
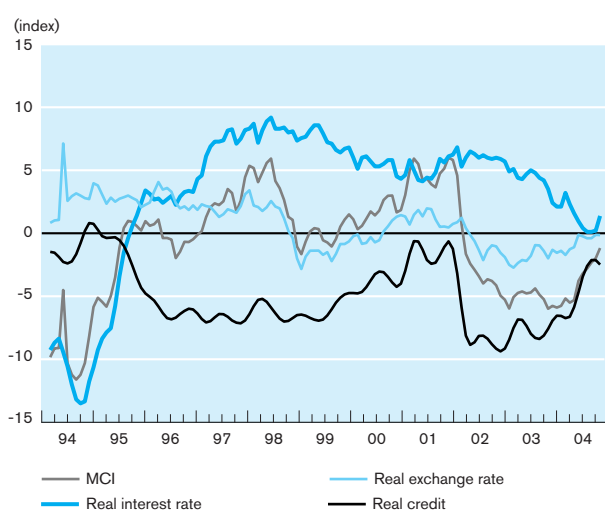
- Monetary conditions tightened from 1994 to the first half of 1998, due mainly to sharp disinflation, which raised the real interest rate. This followed a sizeable easing of monetary conditions in the early 1990s as a result of the depreciation of the renminbi exchange rate and double-digit inflation.

- 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 in 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 a more conservative lending stance by banks.

- Monetary conditions eased considerably in 2002-03, as deflation abated, the US dollar weakened and banks relaxed their credit stance. The fall in the MCI was equivalent to a drop of over 10 percentage points in the real interest rate.[3] All three components of the MCI contributed to the monetary easing in 2002-2003.

TABLE 2
Cycles of monetary conditions

Period	Change in MCI	Contribution of Components			Major influences
		Interest rate	REER	Credit	
1994-1998 H1	15.8 (tightening)	18.5	1.7	-4.4	Sharp disinflation Asian currency devaluation
1998 H2	-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 US dollar
2002-2003	-10.5 (easing)	-4.7	-2.4	-3.4	Easy lending stance of banks Easing of deflation Weak US dollar
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.

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

- Economic growth has accelerated since 2002 assisted by the easy monetary conditions. However, 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 People's Bank of China raised interest rates for the first time in nine years in late October 2004. While the real interest rate dropped in 2004 as a result of higher inflation, the fall in credit growth led to a tightening of overall monetary conditions. The broad MCI shows that the measures introduced, so far, are equivalent to a rise of about 4.6 percentage points in the real interest rate.

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, but discrepancies are notable in two episodes. 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 Mainland provinces in that year. The spikes in real GDP growth in the first two quarters of 2003 were associated with the outbreak of Severe Acute Respiratory Syndrome. Considering that real interest rates, credit growth and real effective exchange rates 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. 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.

Finally, caution is required in interpreting the tightening of monetary conditions in 2004 due to slower credit growth. The sharp slowdown in credit growth has probably overstated the reduction in

CHART 6

MCI and GDP

MCI (LHS)
Real GDP (RHS, inverted scale)
Sources: CEIC, and staff estimates.
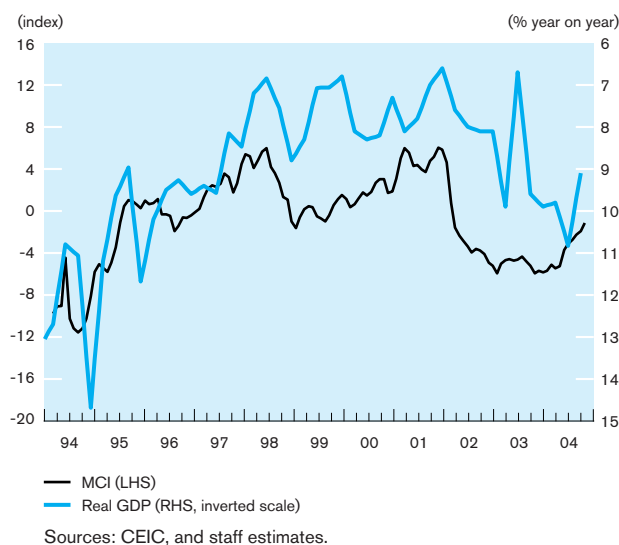
credit availability. Credit rationing in the banking sector has driven enterprises to look for other sources of funding. Activities in the informal credit market reportedly increased in 2004, as indicated possibly by an increase in the proportion of self-funded investment projects by enterprises (Chart 7). Therefore, the recent increase in the MCI could overstate the extent of tightening in financial conditions, although the degree of distortion is uncertain.

CHART 7

Sources of investment funds

Bank loans (LHS)
Self-raised fund (RHS)
Source: CEIC.
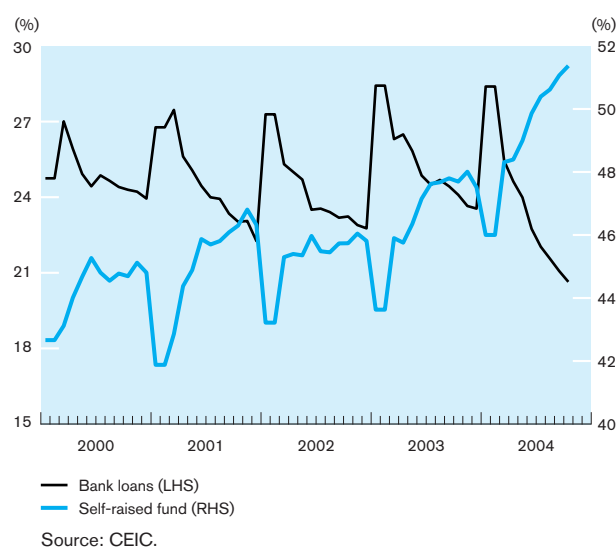
IV. Conclusions and caveats

Monetary conditions on the Mainland could be measured by an MCI, which is a weighted sum of real interest rates, real exchange rates 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. Because of 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 an 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 the 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, especially as the recent sharp slowdown in credit growth may overstate the decline in credit availability considering the increased activity in the informal credit market.

ANNEX

Estimation of weights of the MCIs

This annex explains in detail how the weights of the components in the MCI are determined. For this purpose, two measures of the MCI are considered. A narrowly-defined MCI (narrow MCI) is constructed as a weighted sum of the 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.[4]

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. There is also considerable uncertainty in estimating the output gap for Mainland China 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)}.

In addition, if the output gap is used as the dependent variable, deviations from the equilibrium value should be estimated for the REER and real interest rates for the sake of consistency. However, it is difficult to estimate the neutral or equilibrium level of the REER and real interest rates. Therefore, the concept of equilibrium levels is not employed in this study. Instead, movements in the estimated MCI are interpreted with reference to a base period.

Using the broad MCI as an example, the following equation is estimated:

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

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

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.

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[4] 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 markets on the Mainland are still being developed and the wealth effect associated with changes in stock prices is likely to be limited.

The sample consists of quarterly data on four-quarter change in the logarithm of real GDP (y), real interest rate (r), and four-quarter changes in the logarithms of REER ($\Delta reer$) and real credit ($\Delta credit$) for the period of 1994 Q1-2004 Q3.[5] Following the general-to-specific approach, the aggregate demand functions are estimated.[6] The results are presented in Table A1. 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.

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

$$Narrow\ MCI = r + 0.275\ \Delta reer \qquad (3)$$

$$Broad\ MCI = r + 0.249\ \Delta reer - 0.400\ \Delta credit \qquad (4)$$

The ratios of the estimated coefficients suggest that a one-percentage-point rise in the real interest rate is roughly equivalent to a four-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.

Table A1. Estimated aggregate demand equations

Narrow MCI

$$y_t = 0.092 - 0.197\ r_{t-3} - 0.054\ \Delta reer_{t-4}$$
$$\quad (42.98) \quad (-6.16) \qquad (-2.65)$$

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.

Broad MCI

$$y_t = 0.081 - 0.274\ r_{t-3} - 0.068\ \Delta reer_{t-4} + 0.110\ \Delta credit_{t-1}$$
$$\quad (41.69) \quad (-8.93) \qquad (-3.85) \qquad (6.80)$$

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.

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[5] 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.

[6] 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 problems, 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.

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