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Measuring Monetary Conditions in A Small Open Economy: The Case of Malaysia

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ABSTRACT

The paper explores the measurement of monetary condition in Malaysia to augment the existing monetary policy framework. As an open economy, Monetary Condition Index (MCI) and Financial Condition Index (FCI) are applicable to understand the monetary condition especially in the era of financial deregulation and liberalisation. The results obtained suggest that the index is most useful when the exchange market exhibits stable conditions, and would be a constructive tool in the simultaneous management of the foreign currency and domestic money markets. However, the frequent experience of instability caused by supply and demand shocks with persistent and large inertia in the economy complicates the practical use of MCI and FCI in Malaysia. While this approach obviously does not provide answers to every question and as a leading indicator for inflation, it nonetheless makes it possible to measure the monetary condition in the Malaysian economy.

JEL classification: E43, G21

Key words: Monetary condition index, Monetary Policy, Malaysia

1. INTRODUCTION

“Implicit in any monetary policy action or inaction, is an expectation of how the future will unfold, that is, a forecast The belief that some formal set of rules for policy implementation can effectively eliminate that problem is, in my judgment an illusion. There is no way to avoid making a forecast, explicitly or implicitly”, Alan Greenspan (1994).

Assessment of the monetary policy stance serves to determine in which direction the central bank attempts to steer the economy. There are two main channels through which monetary policy influences aggregate demand: interest rates and exchange rates. Changes in the stance of monetary policy affect short-term money market interest rates, which in turn influence the investment and saving decisions of households and firms and thus domestic demand conditions. In addition, the change in interest rates affects the exchange rates via interest rate differential which in turn affects the competitiveness of domestic firm vis-a-vis foreign firm and thus external demand conditions. Alternatively, monetary authorities should also consider changes in financial sector behaviour and institutional structure can affect monetary condition. This view has recently been strengthened by developments in capital markets and the new environment hypothesis, as suggested by Borio and Lowe (2002). They argue that a credible monetary policy could create a favourable ground for financial stability in addition to having an improved supply side and a credible stabilisation program.

One way of measuring changes in monetary conditions is by estimating a Monetary Conditions Index (MCI). An MCI, a weighted average of the short-term interest rate and the exchange rate, has commonly been used, at least in open economies, as a composite measure of the stance of monetary policy (Goodhart and Hoffman, 2001)¹. MCI has several attractive features due to its simple motivation: exchange rates influence aggregate demand, especially in small open economies. Thus, focusing on exchange rates as well as interest rates may be important in understanding an economy’s behavior, and so in policymaking. An MCI is also easy to calculate. For central banks, an MCI is an intuitively appealing operational target for monetary policy. It generalizes interest-rate targeting to include effects of exchange rates on an open economy, and it serves as a model-based policy guide between formal model forecasts. For institutions other than central banks, an MCI as an index may capture both domestic and foreign influences on the general monetary conditions of a country.

¹ Four central banks, those for Canada, New Zealand, Norway and Sweden publish an MCI and to varying degree, use their respective MCIs in the conduct of monetary policy. Additionally, the International Monetary Fund (IMF) and the Organisation for Economic Cooperation and Development (OECD) calculate MCIs for evaluating the monetary policies of many countries.

Central banks use it as a predictor for future inflation in order to take policy decisions. This index was first implemented in March 1990 by the New Zealand Central Bank and the Canadian Central Bank, which is known as the biggest contributor to the methodology to calculate this index. They were followed by Bank of England (October 1992), Sweden (January 1993), Finland (February 1993), Australia (April 1993) and Spain (summer 1994). In developing countries, countries like Colombia, Thailand, Chile and Turkey also calculate their own MCIs and Mexico is discussing its implementation. Institutions like the IMF and others use this index to compare monetary policy across countries.

The purpose of this paper is twofold. First, this paper attempts to provide empirical estimate of the MCI in Malaysia along with the evolution of financial deregulation and interest rate liberalisation. Owing to the liberalisation of financial markets in Malaysia, the role of interest rates and the exchange rate in the economy has risen over time which also makes it necessary to find out the combined effect of policy variables on monetary condition. When there are multiple channels of monetary transmission, it may be desirable to consider as many of the channels as possible to evaluate the general stance of monetary policy in particular exchange rate and interest rate. Malaysia as an open economy, the extent of monetary tightening or ease relative to previous periods may best be gauged by looking at both principal channels of transmission. This is particularly true when movements in relative interest rates cannot fully explain movements in the exchange rate. Second, we suggest a methodology in order to account for the impact of asset prices on real output. The concept of Financial Condition Index (FCI) and the way it is constructed are fundamental in the evaluation of the resulting policy rules that will emerge under different behavioural assumptions. Furthermore, there are variations regarding the sensitivity of the monetary authorities to respond to a misalignment in the asset markets.

This paper is set out as follows: Section 2 gives an overview of the monetary policy framework in Malaysia. Section 3 and 4 briefly review related literature on MCI and FCI respectively. Section 5 provides some criticisms on the use of MCI and FCI in practice and the construction of MCI and FCI. Section 6 outlines the approaches to the methodology and estimation of MCI and FCI. Finally, Section 7 provides concluding remarks.

2. MONETARY POLICY FRAMEWORK IN MALAYSIA

Malaysia's monetary policy framework is officially set out in the Central Bank of Malaysia Act 1958 (Revised 1994, CBA). The legislation enumerates the principal objectives of the

central bank, Bank Negara Malaysia (BNM), which are to issue currency, to keep reserves for safeguarding the value of the currency, to act as a banker and financial adviser to the government, to promote monetary stability and a sound financial structure, and to influence the credit situation to Malaysia's advantage. The CBA however was amended in 2003 to include additional objectives: to promote the reliable, efficient and smooth operation of national payment and settlement systems, and to ensure that the national payment and settlement systems policy is directed to the advantage of Malaysia. The CBA does not identify any priority between its objectives and provides little guidance on how to reconcile conflicting objectives. Nevertheless, its ultimate policy goal for BNM is economic growth and price stability (BNM, 2004). The BNM also highlights its plays a significant role in the Malaysia's national development goals.

The BNM's Annual Report provides a general description of monetary policy, and the CBA outlines monetary policy objectives from which targets can be derived. In the past, it has been argued that the lack of clear and published annual targets substantially diminished monetary policy transparency. In order to allay this concern, the BNM has stepped up its efforts, although with the initial minimum disclosure, to enhance transparency by improving its communication strategy and enhancing the dissemination of information to stakeholders.

The main operating target for the BNM is the interest rate. In April 2004, the BNM replaced the three-month Intervention Rate with the Overnight Policy Rate (OPR) as the main indicator of its monetary policy stance. The OPR has a dual role: as a signalling device to indicate the monetary policy stance and as a target rate for the day-to-day liquidity operations of the central bank. Liquidity management is aimed at ensuring the appropriate level of liquidity that would influence the overnight inter-bank rate to move closer to the OPR. Liquidity operations are also conducted at other maturities without targeting a specific interest rate level, such that inter-bank interest rates at other maturities would be determined by the market - reflecting overall demand and supply conditions in the money market as well as interest rate expectations. Any change in the OPR is announced in the Monetary Policy Statement (MPS), which is issued on the same day as the corresponding Monetary Policy Committee (MPC) meeting. Should the monetary policy stance change in the period between two scheduled MPC meetings, an additional MPS would be issued.

In term of the the exchange rate regime, from September 1998 to July 2005, the ringgit was pegged to the US dollar and a policy of non-internationalisation of the ringgit, enforced by limiting access to ringgit offshore operations, allowed Malaysia to set domestic interest rates while keeping the exchange rate stable. In July 2005, Malaysia replaced the peg

with a managed float against a trade-weighted basket of currencies. BNM does not use the exchange rate as an instrument of policy; the BNM does not have a target for the exchange rate and does not declare details of the reference trade-weighted basket of currencies. The overriding objective of the exchange rate policy is the “promotion of exchange rate stability against the currencies of Malaysia’s major trading partners” (BNM Report, 2005). BNM also states that the exchange rate is determined by market forces and that there is no target within a band, so that the BNM would only intervene to minimise volatility although frequent intervention has been carried out to achieve undisclosed objectives. Nevertheless, historical events in the foreign exchange market revealed that in the early 1990s, BNM has acted as “a dominant force on the foreign exchange scene for some years” and it was accused by some forex operators as “a market bully” (Milman, 1995).

3. WHAT DOES THE ANALYTICAL LITERATURE ON MCI TELL US?

MCI has become popular in several countries over the past few years as a way of interpreting the stance of monetary policy and its effect on the economy. There exist excellent sources which explain the specification and construction of an MCI (Ericsson et al., 1998; Freedman, 1995; Thiessen, 1995; Reserve Bank of New Zealand, 1996; and Bank of Canada, 1998). However, much attention used to be paid to the role of MCI in monetary policy conduct rather than the construction and usefulness of FCI.

The Bank of Canada pioneered the use of this concept in the early 1990s and used the MCI as an operational target, setting a short-term target path that is compatible with the ultimate inflation target. As Freedman (1994) explains, it is obviously not an intermediate target that the central bank would commit itself to. It is simply a provisional reference path that shows the direction to take in the short run. The central banks of Finland, Sweden and Norway have constructed monetary conditions indices on the Bank of Canada model, but these are merely synthetic indicators and they have no operational role. On the other hand, the MCI indices of the Sveriges Riksbank and the Suomen Pankki, unlike the Bank of Canada MCI, are used as leading indicators of inflation for monitoring the inflation targets that define the monetary policies of Sweden and Finland.

The construction of MCI has been operationalised around the world in several ways. Freedman (1994, 1995) understood it as an indicator, assisting the central bank in tracing the transmission process from policy instruments, over operating targets and intermediate targets to ultimate target. Bofinger (2001) builds a model where MCI helps to minimize the loss

function of the central bank subject to internal and external equilibrium conditions, which yields a unique solution for real interest and exchange rate. Stevens (1998) considers MCI as a hybrid of instrument and target of a central bank, as in a free floating regime no direct control exists over the exchange rate. Mayes and Viren (2000) stress in this context the importance of profound knowledge of empirical interactions between the interest and exchange rate. According to Frochen (1996), MCI cannot be treated as a synthetic indicator of monetary policy actions because it takes market-based variables into account; market is also pricing in its own expectations and perception. This point of view seems to have been widely accepted in subsequent literature. Siklos (2000) emphasizes in this context the role of MCI in communication, as a feedback from the financial markets towards the central bank. Blot and Leveuge (2008) examine the usefulness of MCI in G-7 countries to explaining future economic activity. The findings suggest that informational content of MCI is very sporadic. The past evolution of exchange rate, interest rate and asset prices affect the economic activity with different impact and timing.

While there has been extensive literature examining the role of MCI in developed countries, the evidence from developing countries are scarce. Hyder and Khan (2007) for Pakistan discusses how changes in interest rate and exchange rate, through Monetary Conditions Index (MCI), are used for assessing the overall monetary policy stance in Pakistan. The constructed MCI indicates that Pakistan has eight tight and six soft periods of monetary stance during March 1991 to April. The results also suggests that MCI moved largely with the changes in interest rate after the September 2001 events, as rupee appreciated due to surge in remittances and incomplete sterilization of forex flows led to unprecedented reduction in interest rates. From 2004 onward, MCI reflects tightening of monetary stance after the bottoming out of interest rates due to inflationary concerns 2006. In a similar line of research, Esteves (2003) calculates a MCI for the Portuguese economy. The results suggest that despite all the simplifying assumptions underlying its construction, the dynamic versions of the Monetary Conditions Index may be helpful in explaining the contribution of monetary conditions to the evolution of the Portuguese economy especially in the more recent past.

4. THE EXPANDED MCI: A FINANCIAL CONDITION INDEX (FCI)

Taking into account the increasing debate over the role played by asset prices in the monetary transmission mechanism, through wealth effects and balance sheet effects, many central banks and institutions have developed FCI in recent years. Policy-makers and international organisations often use the FCI in their assessment of the monetary policy stance with different definition of FCIs across methodologies. While some researchers compute FCIs that

measure the tightness/accommodativeness of financial factors relative to their historical average in terms of an effective policy rate (Guichard and Turner, 2008), others measure the estimated contribution to growth from financial shocks in a given quarter (Swiston, 2008). However, in general to some extent, the FCI provides useful information about inflation and monetary conditions.

Financial conditions can be defined as the current state of financial variables that influence economic behavior and (thereby) the future state of the economy. In theory, such financial variables may include anything that characterises the supply or demand of financial instruments relevant for economic activity. This list might comprise a wide array of asset prices and quantities (both stocks and flows), as well as indicators of potential asset supply and demand. The latter may range from surveys of credit availability to the capital adequacy of financial intermediaries.

Ideally, an FCI should measure financial shocks – exogenous shifts in financial conditions that influence or otherwise predict future economic activity. True financial shocks should be distinguished from the endogenous reflection or embodiment in financial variables of past economic activity that itself predicts future activity. If the only information contained in financial variables about future economic activity were of this endogenous variety, there would be no reason to construct an FCI. Hence, past economic activity itself would contain all the relevant predictive information.

The construction of FCIs relies on few different approaches. Goodhart and Hofmann (2001) propose three different methodologies. First they simulate a large scale macro-econometric model; then they implement a system with reduced-form aggregate demand equations; and finally they analyse VAR impulse responses. They found that, except for Germany and the UK, both approaches are very similar. The other broad approach is a principal components methodology, which extracts a common factor from a group of several financial variables. This common factor captures the greatest common variation in the variables and is either used as the FCI or is added to the central bank policy rate to make up the FCI (this latter method is a combination of the weighted-sum approach and the principal-components approach). In most cases, financial condition indexes are based on the current value of financial variables, but some take into account lagged financial variables as well. Some FCIs can be interpreted as the summarising the impact of financial conditions on growth, others can be interpreted as measuring whether financial conditions have tightened or loosened.

Gauthier, Graham and Liu (2003), construct several FCIs for Canada based on three approaches: an IS-Curve-based model, generalised impulse response functions and factor analysis to address one or more criticisms applied to MCIs and existing FCIs. Based on the IS-Curve method with monthly data, the results suggest that housing prices, equity prices and bond yield risk premia, in addition to short- and long-term interest rates and the exchange rate, are significant in explaining output from 1981 to 2000. However, housing prices have a higher or comparable absolute-value coefficient than that of the exchange rate in both the HP-filter and first difference specifications. Lack (2002) also undertake a similar line of research, expanding the MCI into an FCI by adding housing prices for Switzerland and examines the role of housing and stock prices in the monetary transmission mechanism in Switzerland. The weights of the FCI components are estimated with the medium-sized macro-model used by the Swiss National Bank (SNB). The results suggest that housing prices increase the predictive power for inflation of the new FCI compared to traditional MCIs.

Montagnoli and Napolito (2005) investigate the role of asset prices in the conduct of monetary policy in United States, Canada, the euro area and United Kingdom and construct FCI for the four countries using the Kalman Filter algorithm. The results using the Taylor rules equation suggest that the FCI enter positively and statistically significant into the Federal Reserve Bank, Bank of England and Bank of Canada interest rate setting. This gives a positive view for the use of the FCI as an important short-term indicator to guide the conduct of monetary policy in three out of four countries analyzed.

In practice, central banks, international organisations (IMF, OECD) and financial institutions (Deutsche Bank, Goldman Sachs, JP Morgan) resort to MCI and FCI as a single simple indicator for measuring monetary conditions. In addition, there are several well-established FCIs for the U.S (Bloomberg FCI, the Citi FCI, Kansas City Federal Reserve Financial Stress Index). On the other hand, there are limited numbers of FCIs constructed for other developing countries. These indices also based on a wide range of construction methodologies and financial variables.

5. MCI AND FCI: SOME CRITICISMS

Notwithstanding the intuitive attraction of a MCI and FCI, substantive limitations in the use of the index arise from tactical difficulties, the choice of weights and variables, the underlying model's assumptions, and the associated uncertainty of the estimated relative weight (Batini and Turnbull, 2000). The index has also been criticized both on their conceptual and empirical

foundations². While the criticism is valid, there is no reason why MCI and FCI should be taken literally as any other indicators of monetary condition (Siklos, 2000). First, the relationships between the policy instruments, the exchange rate, the short-term interest rate, output, and inflation generally are dynamic, implying different short-run, medium-run, and long-run multipliers. Thus, the policy horizon may affect the relative weight. If policy is concerned with several horizons, the weight for a single horizon may not be adequate.

Second, the temporal properties of the data themselves bear on the construction of an MCI and FCI. In particular, nonstationarity of the data (as in a series with drift) may affect the distribution of the error-terms in the associated model and thereby affect statistical inference. Non-stationary data also may be cointegrated. If so, the relevant equations should include levels of the series, and calculations of multipliers should account for those levels. A central bank which displays insufficient concern about the MCI would be tempted to let it drift over time, thereby possibly impeding its inflation objective. Furthermore, the MCI and FCI itself is calculated on the levels of the data. Adjustment of the MCI and FCI relative to a base period simply subtracts a constant from an unbased MCI and FCI and does not constitute working with differenced data. The mixed use of differences and levels affects the interpretation of the weights: short-run for differences, contrasting with long-run for levels.

Third, the postulated exogeneity of the policy instruments and other variables is potentially misleading. In the MCI and FCI itself, the weights are interpreted as elasticities of aggregate demand with respect to the interest rate and the exchange rate. This interpretation assumes no feedback from aggregate demand or inflation onto exchange rates and interest rates over the relevant policy horizon. With feedback, the potential impact of aggregating interest and exchange rate changes do not reflect the total effects these movements on aggregate demand. For example, a currency depreciation accompanied by an interest rate rise will leave monetary conditions unchanged.

Fourth, parameter constancy is critical to the interpretation of an MCI and FCI, and it turns on all three of the aforementioned issues. Statistically nonconstant weights may arise empirically from misspecified dynamics, improper treatment of nonstationarity, or incorrect exogeneity assumptions. Because the MCI and FCI is designed for policy, it is important to establish the invariance of the weights to changes in policy, yet this conjectured invariance generally has not been investigated empirically. With nonconstant parameters, estimation over

² See among others, Eika, Ericsson and Nymoén (1996); King (1997); Ericsson et al (1998)

different sample periods would result in different estimates of the weights, and so different choices of weights (Eika, et al., 1996).

Fifth, as argued by Ericsson et al. (1998), the choice of model variables determines the variables omitted from the model. Significant omitted variables in the model's relationships may affect dynamics, cointegration, exogeneity, and parameter constancy in the model. More generally, the use and interpretation of an MCI and FCI in policy assumes the existence of direct and unequivocal relationships between the variables involved. Possible additional influences in those relationships can confound the strict interpretation of an MCI and FCI as an index of monetary conditions. One such relationship is that between the actual policy instrument (such as the central bank's overnight interest rate) and the exchange rate and short-term interest rate. If variables other than the policy instrument play an important role in determining the exchange rate and interest rate, neglect of those other variables has substantive implications for policy with an MCI and FCI.

The variables from which the MCI and FCI is constructed may reflect phenomena other than just direct monetary policy, so movements in the MCI and FCI are not tied unequivocally to changes in monetary stance. Conversely, by following or targeting an MCI and FCI, a central bank could be misled into adopting an overly tight or loose monetary policy, simply because some external shock affected the exchange rate or the domestic short-term interest rate. Finally, the relative weight in an MCI and FCI is based on an estimated empirical model, and so is subject to coefficient uncertainty from that estimation. Thus, the estimated weight may be numerically nonconstant, even if it is statistically constant. Numerically nonconstant weights may arise from the lack of information content in the data, leading to large standard errors.

A further technical issue is whether MCI and FCI should be calculated in terms of real or nominal variables. Theoretically, it would seem preferable to express the MCI and FCI on the basis of real variables as the real MCI and FCI take account of inflation movements. It is also generally believed that rational agents consider the real rather than nominal rates in their consumption and investment decisions. However, there is evidence that individuals can suffer from money illusion whereby they consider the nominal rather than the real variables in their decision making (Akerloff and Shiller, 2009; Fehr and Tyran, 2001; Peeters 1999). Gerlach and Smets (2000) also put forward the argument that economic behaviour often reacts on the basis of nominal interest rates in the short run. Furthermore, the nominal MCI and FCI seem to be a reasonable approximation for the real MCI and FCI in the short run, in the context of a low inflation environment.

Empirical research in the literature, however, shows that there are certain advantages and disadvantages between nominal and real calculation of an MCI and FCI. The advantages of nominal calculation is that it can be calculated without delay, even on a daily basis, so it provides the most timely indication of changes in monetary policy stance whereas the limitations is that it looks at nominal values which may be misleading, especially in periods of high inflation. On the other hand, the real values use real variables so that it provides the most accurate picture of the current monetary policy stance. The disadvantage is that it calculated with a lag needed to obtain real values of interest rates and real effective values of the exchange rate.

6. ESTIMATES OF MCI AND FCI IN MALAYSIA

A starting point for constructing the MCI begins with the selection of a single interest rate and exchange rate. If we are deriving the weight from aggregate demand equation, then trade-weighted effective exchange rate is more relevant in trade equation and hence in aggregate demand equation. The weightings of the two variables in MCI can be determined by employing various econometric techniques such as: (i) single equation of either price or output; (ii) trade elasticities approach; and (iii) Vector Autoregressive (VAR) and Johansen's cointegrating models. The MCI is defined as the weighted sum of changes in the exchange rate (ER in logs) and in the interest rate ($INTR$ in levels) from their levels in a chosen base year. The concept of MCI has been developed in seminal papers by Freedman (1994, 1995). The formula for MCI is as follows:

$$MCI_t = \omega_{INT}[INT_t - INT_b] + \omega_{ER}[\log(ER_t) - \log(ER_b)] \quad (1)$$

where INT_t and ER_t are interest rate (overnight rate) and exchange rate at time t , respectively. INT_b and ER_b are interest rate and exchange rate at a given base year. The most important factor is weights, ω , as the value of these weights provides useful information regarding the relative importance of interest rates and exchange rates. In this instance, the weight in the index represents the relative impact of interest rate and exchange rate changes on inflation. If the MCI increases by one unit, this corresponds to a tightening of monetary conditions equivalent to a one percentage point increase of the interest rate. In this context it needs to be emphasised that the level of the MCI depends on the base value, the chosen weights and the measures of the interest rate and the exchange rate.

In light of criticism on MCI, Gauthier, et al. (2004) suggested some methods that could improve the construction of MCI. In the first method weights are derived from reduced form IS-PC Framework. The weights are obtained by summing up the coefficients on the lags variables as well as by including individual lags in MCI to take into account the dynamics of those variables over time. The weights used for the calculation of the MCI reflect the estimated relative effects of an interest rate and an exchange rate impulse on aggregate demand. They can be derived from econometric evidence regarding the determinants of aggregate demand. In doing this, we present a simple model which is the equivalent of a conventional backward looking aggregate demand:

$$\pi_t = \sum_{i=1}^n \beta_i \pi_{t-i} + \sum \beta_i y_{t-j} + \varepsilon_t \quad (2)$$

$$y_t = \sum_{i=1}^n \gamma_i y_{t-i} + \sum_{j=1}^n \lambda_j rir_{t-j} + \sum_{k=1}^n \eta_k rer_t + \mu_t \quad (3)$$

where π_t is equal to $100 * [\ln(CPI_t / CPI_{t-12})]$, where CPI is the consumer price index, and the output gap, y_t is the difference between actual and potential output, is calculated as the percentage deviation of the natural logarithm of the monthly industrial production from a Hodrick-Prescott trend with a smoothing parameter of 1600; The ex-post real short-term interest rate, rir_t is measured as the short-term money market rate less monthly inflation. The financial markets are proxied by rsp_t , stock price index of Bursa Malaysia (Malaysia stock market). We calculate the long-term of the assets prices using the above Hodrick-Prescott filter methodology. The sample covers the period from 1980 to 2004 that is the period before the introduction of the new monetary policy framework in Malaysia to ensure consistency of the results. Figure 1 plots the component of MCI, the interest rate and exchange rate, against the inflation rate.

[Insert Figure 1]

The parameter λ gives the effect on aggregate demand of a one percentage point increases of the interest rate, controlling for the effects of the interest rate impulse on the exchange rate. The parameter η represents the corresponding effect of a one percent appreciation of the domestic currency. The relative MCI weight ω is $\hat{\lambda} / \hat{\eta}$, where $\hat{\lambda}$ and $\hat{\eta}$ are the estimated coefficients from Eq. 3.

In attempt to incorporate some additional factors such as stock market in the subsequent analysis, we focus on the construction of the FCI. Goodhart (2001) has long argued that central banks should lead to a broader price index which includes the prices of assets, such as houses and equities. If the prices of goods and services and those of assets move in step, then excluding the latter does not matter. But if the two types of inflation diverge, a narrow price index could send central bankers astray. Following the pioneering contribution of Alchian and Klein (1973) and more recently Eika et al. (1997), Mayes and Viren (1998), Goodhart (2000), Mayes and Viren (2001) and Goodhart and Hofmann (2001), we formulate a formal model of the economy in order to show the importance of financial variables in the conduct of monetary policy. The simple model in Eq.2 and Eq. 3 which is the equivalent of a conventional backward looking aggregate demand – aggregate supply augmented with the asset markets (an extended version of Rudebusch and Svensson, 1998; as suggested by Goodhart and Hofmann, 2001):

$$y_t = \sum_{i=1}^n \gamma_i y_{t-i} + \sum_{j=1}^n \lambda_j rir_{t-j} + \sum_{k=1}^n \eta_k rer_t + \sum_{k=1}^n \phi_k rsp + \mu_t \quad (4)$$

In order to test the MCI and FCI indices constructed above are a good predictor for inflation behaviour, we used Granger causality test to determine if inflation is predicted by each of these indices. The null hypothesis of the Granger test is that the variable Y is not explained by the variable X. This means that if we have the following equation:

$$Y_t = C + \alpha_1 Y_{t-1} + \alpha_2 Y_{t-2} + \dots + \alpha_p Y_{t-p} + \beta_1 X_{t-1} + \beta_2 X_{t-2} + \dots + \beta_p X_{t-p} + \mu_t \quad (5)$$

then the parameters satisfy the following restriction:

$$\beta_1 = \beta_2 = \dots = \beta_p = 0 \quad (6)$$

If the MCI and FCI is a good predictor of the consumer price index, then the null hypothesis will be rejected.

Table 1 presents the estimation results of the aggregate demand for deriving the weights of the MCIs and FCIs. The equations were estimated separately by OLS. In order to obtain well behaved residuals a number of impulse dummies, which are mainly related to the oil price shocks and financial crisis, have also been included. The lag orders were chosen by a general-to-specific modelling strategy, eliminating all variables which were not significant at

least at the 10% level. Underneath the coefficient estimates we report t-statistics in parentheses. For each equation we also report the adjusted R , White's (1982) test for heteroskedasticity (H) and a Lagrange-Multiplier test for serial correlation up to order five (LM). The diagnostics suggest that there is no evidence of misspecification in the estimated equations.

[Insert Table 1]

The estimation for the Phillips Curve shows that the output gap is significant at least at the 5% level. The coefficient estimates suggest that an increase in the output gap by one percentage point leads to an increase of the inflation rate of between 0.37 to 0.41 percentage points. The results for the IS Curve in Eq.4 suggest that the real interest rate, the real exchange rate, and real equity prices all have a significant effect on the output gap, although the timing of the impact sometimes differs considerably. The real interest rate coefficient estimate of 0.29 in the FCI equation is significantly smaller than the coefficient estimates of 0.46 for MCI. However, the real share price has a relatively weak effect on output gaps with the coefficient of 0.06.

Using the estimated coefficients of interest rate and the exchange rate variables in, the ratios or weights of the MCI indices turn out to be 3.8:1. The ratios of the estimated coefficients suggest that a one-percentage-point rise in the real interest rate is roughly equivalent to four-percentage-point increase in REER appreciation in terms of the effect on real GDP growth. The result also indicates that the interest rate channel into inflation is found to be more powerful than the exchange rate channel. This is consistent with the empirical findings of relatively high pass-through of interest rate in Malaysia (Zulkhibri, 2010) and a low exchange rate pass-through to domestic prices in Malaysia (Zulkhibri, 2010) similar to other open economies such as New Zealand, Sweden and Canada. In the case of FCI, using the estimated coefficients of interest rate and stock prices generated the ratios or weights of the FCI to be 3.4:1 for exchange rate and 16.6:1 for share prices respectively. Although the impact of interest rate alone has slightly deteriorated with respect to the changes in the exchange rate, the impact of stock price seems to be very small with one-percentage point rise in the real interest rate equivalent 16.6 percentage point increase in real stock price in term of the effect on real GDP. It is interesting to note that the importance of the REER relative to the real interest rate is relatively similar in magnitude for both the MCIs and FCIs estimations.

Figure 2 plots an MCI index for Malaysia. The MCI has been computed using a 3-month interbank interest rate and the U.S dollar/Malaysian ringgit exchange rate. The first month of 1990, which is the period at which the level of economy operate at the long-run equilibrium, has been chosen as the base period and the weights are taken from Eq. 2. The MCI suggests a distinct easing of monetary conditions in 1985-1988, reflecting a weaker ringgit, a relaxed lending policy by banks, and an easing of deflation, which reduced the real interest rate. This contributed to faster economic growth thereafter. However, macroeconomic measures to curb credit supply and interest rate hikes in 1991 resulted in tighter monetary conditions. This was marked by a considerable rise in the MCI, which indicated a reversal of about a quarter of the earlier easing.

[Insert Figure 2]

Looking at the path of the FCI over time in Figure 3, financial conditions tightened sharply in 1984 and 1985, contributing to a slowdown in growth. Economic activity picked up again in 1986 and 1987 as the FCI improved, and growth was robust from 1988 through 1989 as financial conditions remained accommodative. The FCI indicates a slightly expansionary or neutral stance in the late 1990s and a strong expansion starting in 1990, thereby better explaining the increase in inflation rates from 1990 to 1992 than the MCIs. The recession of 1997-98 coincided with another plunge in the FCI and output in the subsequent recovery also closely tracked financial conditions. The fall in equity prices from the peak of the bubble in 1997 until the trough in 1998 implies a stronger tightening of financial conditions and a more restrictive monetary policy stance than indicated by the MCIs, which could explain the persistently low inflation rates experienced since 1999. Even the brief rebound in growth in mid-1999, a period for which many forecasters had predicted recession, was not entirely unanticipated by the FCI, as its contribution to growth reversed from a low point at the end of 2000. As evidenced in Figure 1, the looseness of the monetary policy in Malaysia has hardly changed over the few years. All in all, the nominal MCI and FCI, taking into account the very recent changes in domestic monetary conditions, suggests, similar to the real MCI and FCI, that monetary easing in Malaysia has to end in the near future and one should expect a rate hikes, given emerging risk factors to inflation in the economy.]

[Insert Figure 3]

To answer the predictive content of MCIs and FCIs, Table 2 reports the Granger-causality test between the movement in inflation and the movement in MCIs and FCIs. The Granger-causality test rejects the null hypothesis that the MCIs and FCIs explain the inflation

behaviour whereas the null hypothesis that the inflation movement explains movement in MCIs and FCIs cannot be rejected in both cases. The results may suggest that immediate sign of inflationary pressure in the economy will be followed by adjustments in either interest rate or exchange rate depending on policy preferences. The result is also consistent with the role of monetary policy in maintaining price stability.

[Insert Table 2]

8. CONCLUSION

In this paper we provide a more uniform analysis of measuring the monetary and financial condition in Malaysia. It is a well-known feature of monetary policy operation that authorities aim to exercise control over short-term interest rates by adjusting the official rate and that it is commonly assumed that there is complete transmission to the short-term rate within short period of time. With complete pass-through, monetary policy can be more efficient in its ability to control inflation although incomplete pass-through can still be effective if it is predictable. It is generally considered that a tightening in monetary policy will slow demand in the economy as credit becomes more expensive. Hence, the aim of such monetary policy tightening will be to reduce inflation, but an unintended consequence of this could also be a slowdown in the rate of economic growth.

This paper provides the estimations of the MCIs and FCIs to measure monetary conditions for the Malaysian economy. The approach is based on the conventional backward-looking aggregate demand and is intended to address one or more criticisms in the literature applied to the construction of the index. As an indicator, the MCI and FCI can be calculated in both real and nominal terms and used to assess how 'tight' or 'loose' are the monetary conditions. Despite of the MCI and FCI ability to explain the monetary conditions in Malaysia, the results show that the method in determining the weights for each policy component of the index indicates some degree of instability. As such, MCI and FCI do not offer a precise signal on the state of monetary condition in Malaysia. It is also failed to capture the dynamic of the policy components of the index due to different lags and different shocks that drive the estimated equations.

On the surface, an MCI or FCI seems to be straightforward and easy to understand and timely to construct. The results also show that the movement inflation induces the movement in either interest rate or exchange rate. However, the wide uncertainty surrounding its estimation and interpretation makes it an unreliable stand-alone element to assess the

monetary condition and further investigation is necessary to identify the actual role of stock prices in the transmission mechanism of monetary policy in Malaysia. The recent evidence of high volatility in stock and property prices in the U.S, European countries and other emerging markets economy has renewed the interest in the role of asset prices for monetary policy. The diverging movements in equity and housing prices have also raised concerns about the appropriate stance of monetary policy when markets are moving in different directions (Goodhart and Hofmann, 2001; Mayes and Viren, 2001). The extension of this research to identify and incorporate additional financial variable in the construction of the index will be a very useful finding for policy with respect to the between interest rate and exchange rate interaction.

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Table 1: Regression Results – Backward Looking Aggregate Demand

For deriving MCI weight:					
$\pi_t = 0.453\pi_{t-1} + 0.201\pi_{t-3} - 0.124\pi_{t-4} + 0.412y_{t-2} + 0.455DCRISIS$					
(2.20)	(2.30)	(3.45)	(4.34)	(2.56)	
$\bar{R}^2 = 0.73$	$H= 21.26$	(0.34)	$LM= 7.73$	(0.12)	
For deriving FCI weight:					
$y_t = 0.863y_{t-2} + 0.113y_{t-8} - 0.462rir_{t-1} + 0.164rer_{t-4} + 0.987DCRISIS$					
(2.20)	(3.30)	(2.25)	(2.04)	(3.56)	
$\bar{R}^2 = 0.73$	$H= 23.36$	(0.34)	$LM= 7.24$	(0.12)	
$\pi_t = 0.371\pi_{t-1} + 0.265\pi_{t-3} - 0.212\pi_{t-3} + 0.371y_{t-1} + 0.055DCRISIS$					
(4.20)	(3.30)	(3.45)	(3.34)	(2.56)	
$\bar{R}^2 = 0.78$	$H= 24.66$	(0.34)	$LM= 8.76$	(0.12)	
$y_t = 0.563y_{t-1} + 0.131y_{t-5} - 0.291rir_{t-1} + 0.161rer_{t-4} + 0.063rsp_{t-1} + 0.987DCRISIS$					
(8.20)	(3.30)	(4.45)	(2.34)	(4.56)	(3.43)
$\bar{R}^2 = 0.86$	$H= 16.66$	(0.34)	$LM= 10.76$	(0.12)	

Note: The table reports the results of estimating equations (1) and (2). Coefficients estimates are reported with t-statistic in parentheses. \bar{R}^2 is the adjusted coefficient of determination. H is White's (1982) test for heteroskedasticity and LM is a Lagrange Multiplier test for serial correlation up to order of six. In parentheses, we report probability values for diagnostic test.

Table 2: Granger-causality Test

$H_0:$	Lag(s)	F-statistic	P-value
<i>Inflation</i> $-/\rightarrow$ <i>MCIs</i>	12	1.931*	0.031
<i>MCIs</i> $-/\rightarrow$ <i>Inflation</i>	12	1.388	0.171
<i>Inflation</i> $-/\rightarrow$ <i>FCIs</i>	12	2.034*	0.022
<i>FCIs</i> $-/\rightarrow$ <i>Inflation</i>	12	1.109	0.353

Note: * indicates significant at 5% level, $-/\rightarrow$ denotes that X does not Granger cause Y . Sample period from 1982-2004.

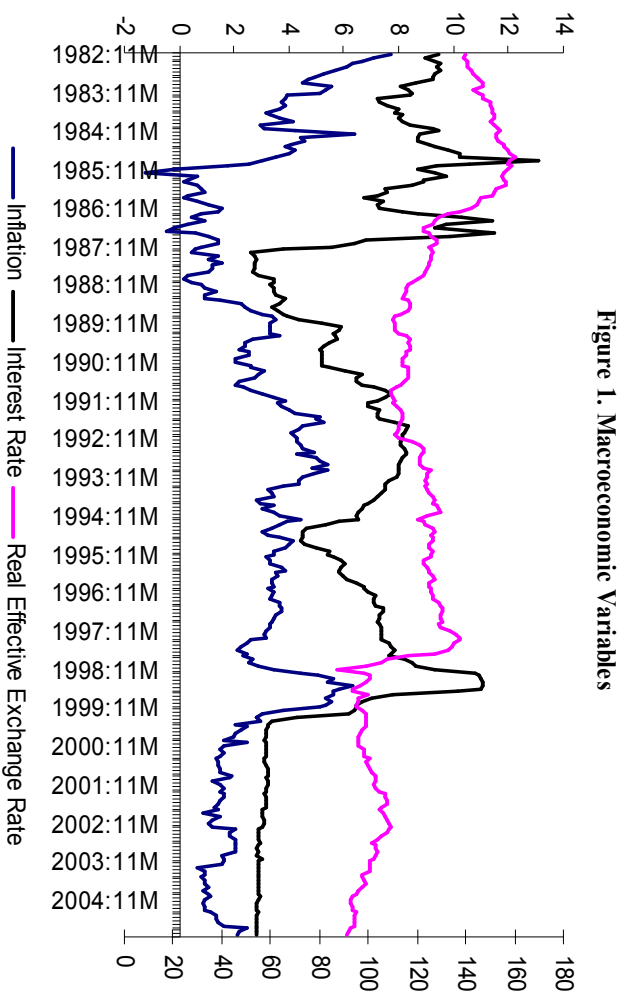


Figure 2. Monetary Condition Index in Malaysia: 1982-2004

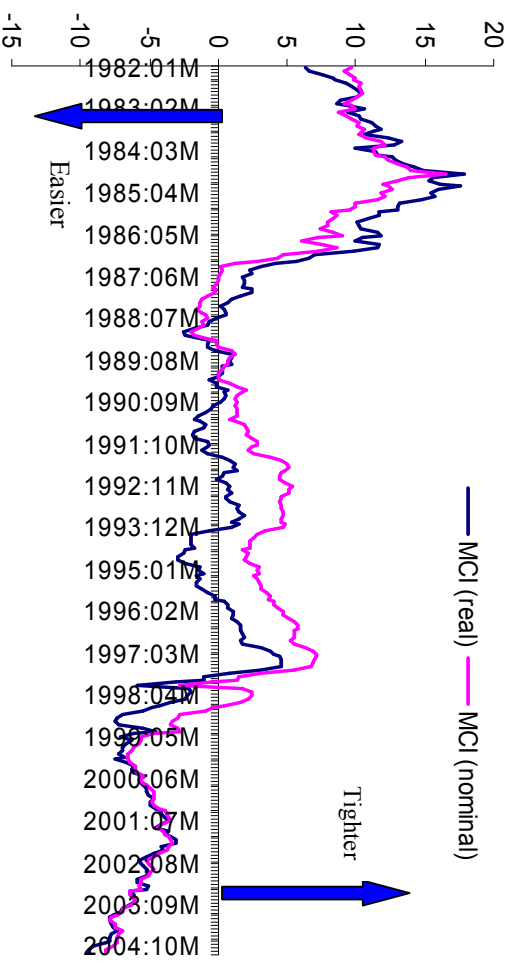


Figure 3. Financial Condition Index in Malaysia: 1980-2004

