

THE XXXI ANNUAL MONETARY STUDIES CONFERENCE

Estimating a Monetary Conditions Index for Jamaica

*Claney Lattie **
Monetary Analysis & Programming Department
Bank of Jamaica

Prepared for:
Centre for Monetary Studies Conference
October 18-22, 1999
Paramaribo, Suriname

* *The author wishes to express sincere thanks to members of the Research and Economic Programming Division of the Bank of Jamaica for their comments on previous drafts of the paper.*

ABSTRACT

Estimating a Monetary Conditions Index for Jamaica

Increased interest in alternative intermediate or operating targets has encouraged the development and estimation of the monetary conditions index (MCI). The development of MCI's has been propelled by two issues faced by policy makers. First, financial market liberalization and deregulation has weakened the relationship between monetary aggregates as intermediate targets and inflation, and second, there is frequently a need to explicitly measure the influence of exchange rate developments on the final target – inflation.

The paper explores the development and estimation of an MCI for Jamaica to augment the existing monetary policy framework. The arguments that rationalize the use of MCI's are applicable to the Jamaican economy, which has experienced deregulation and liberalization of the financial sector since 1991. Various works, including the current work validate the appropriateness of a monetary conditions index within the existing monetary policy process.

To estimate the weights of the index for Jamaica, the analysis is couched in a paradigm consistent with that of a small open economy. The standard MCI reflects the weighted average of changes in an interest rate and an exchange rate, relative to their values in a base period, with the considered variables being the 180-day treasury bill rate and the average selling rate per US dollar.

The conclusions herein suggest that the index is most useful when the exchange market exhibits stable conditions, and would be a constructive thrust towards the simultaneous management of the foreign currency and domestic money markets. A secondary conclusion emerging from the analysis is that extending the current framework to include the MCI as an auxiliary operating target would be useful since it retains its simple property of ease of calculation and displays a close association with domestic inflation.

However, the use of the index is limited to the extent that there needs to be further foundations laid for forecasting inflation six to eight quarters ahead. Despite this the index still represents a short-term indicator of the stance of monetary policy and its usefulness is not necessarily diminished, since the index broadens interest-rate targeting to include the effects of the exchange rate on an open economy. This is critical to the policy framework in the Jamaican macroeconomy, since preliminary findings indicate a persistent influence of adjustments in the exchange rate on inflation for at least four months, and relatively short-lived effects attributed to interest rate adjustments.

TABLE OF CONTENTS

	Pages
INTRODUCTION	1
SECTION I: Jamaica's Monetary Policy Framework	2
SECTION II: Frameworks for the Conduct of Monetary Policy	5
- The Monetary Conditions Index or Indicator	9
SECTION III: Econometric Examination and Estimation	11
- The Model	11
- Data	13
- Estimation and calculation of the MCI ratio	15
- Construction of the Index for Jamaica	17
SECTION IV: Using the index in the current monetary policy framework	19
SECTION V: Concluding Comments	22
APPENDICES	25

Introduction

Central banks of developed countries have included and in some instances fully adopted the use of a monetary conditions index in their monetary policy framework. Increased interest in alternative variables to function as intermediate or operating targets and information variables has encouraged the development of MCI's. That interest has been motivated by the weakened relationship between monetary aggregates and inflation and desirability of explicitly measuring the influence of exchange rate developments on output and inflation.

The current exposition focuses on the development and estimation of an MCI for Jamaica to augment the existing monetary policy framework. While the theoretical arguments that justify the examination of alternative information variables are applicable to Jamaica, they are validated empirically by various works (including the current one) that describe Jamaica's inflationary process. The conclusions of the paper lend support to the long-standing view of the existence of close contemporaneous relationships between exchange rate changes and domestic inflation, and therefore warrant the current focus of estimating the relative impact of interest rate and exchange rate changes on inflation.

An MCI has several attractive features. Its motivation simply recognizes the impact of exchange rates in small open economies, thus focusing on the combination of interest rates and exchange rates may be important in understanding the economy's behaviour. Also, an MCI is easily calculable and is intuitively appealing to central banks as an operational target for monetary policy. Finally, it generalizes interest-rate targeting to include the effects of exchange rates on an open economy.

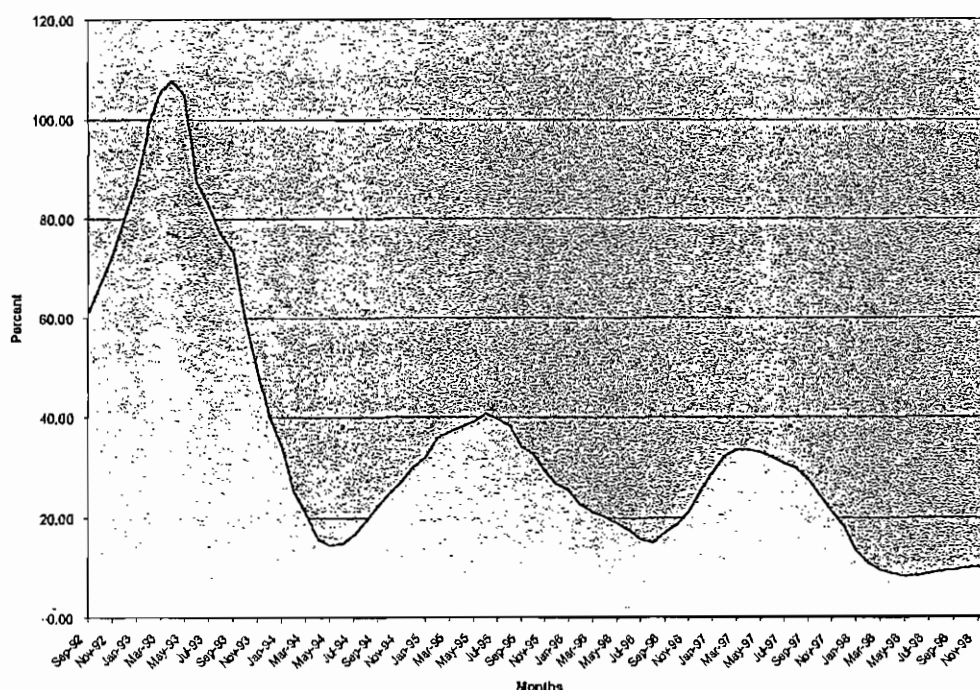
The analysis is developed in three subsections, with the final sections providing summarizing views and comments on the index as calculated. Section I provides an assessment of Jamaica's monetary framework and outlines the thrust to broaden the framework to include a monetary conditions index for Jamaica. Section II synoptically outlines some frameworks for the conduct of monetary policy, and provides the foundation arguments for the continued progress towards developing MCI's. Section III gives the empirical estimation and results of deriving the relative weights of the index, and subsequently uses this information to calculate an MCI for Jamaica. In section IV, the computed index is examined in a more intuitive fashion with concluding comments presented in section V. Supplementary notes, tables and charts complete the work.

Section I: Jamaica's Monetary Policy Framework

The evolution of domestic prices and the monetary policy process 1991-1998

Jamaica's experience of inflation has been very high annual growth rates in domestic prices, which peaked at a high of over 100 percent in February 1992. Following on the heels of liberalization of the foreign exchange and financial markets in 1991 and within a context where domestic money supply was not under strict control, domestic prices rose sharply to coincide with the sharp depreciation in the exchange rate. The country's inflation problem persisted as the depreciation and inflation spiral permeated the economic landscape, and encouraged the demands for compensating wage claims by the labour force. Of course, with monetary policy during the period being largely accommodative, the consequence was a continuation of exchange rate depreciation that influenced further inflation, at least up until mid-1996 (see chart 1).

Chart 1: 12-Month Inflation for Jamaica – September 1991-December 1998



The persistent depreciation and high inflation environment created an uncertainty within the country's macroeconomic environment. The instability in the foreign exchange market and its associated inflation, created incentives for hedging and speculative activity rather than investing in productive real sector activity. This resulted in the blossoming of a 'new' era of financial

management, as the opportunities for making capital gains from foreign exchange trading and the domestic money market became evident. With productive activity severely stifled by various competing uses of resources, the central bank embarked on stabilization policies to limit unwieldy exchange rate fluctuations, to reduce the level of liquidity within the system aimed at achieving low inflation and preserving the value of the domestic currency.

Within the country's experience for conducting monetary policy, stabilization marked the beginning of new challenges for monetary policy management. Monetary policy management adopted indirect policy instruments that required the use of intermediate and operating targets to assess the effects of monetary policy changes on the ultimate inflation objective. This mechanism replaced the monetary targeting framework that was abandoned with liberalization. The money market represented the channel for transmitting monetary policy decisions, although interest rates in the domestic money market mirrored the past experiences of chronic inflation that influenced inflationary expectations that maintained interest rates exorbitantly high. Empirical evidence that describes Jamaica's inflationary process suggests that disorderly fluctuations in the exchange exert a significant influence over domestic prices. Within this context, the central bank envisioned that the control of inflation could only be attained by effecting monetary restraint to reduce the growth in monetary aggregates that has fueled excessive exchange rate volatility. In April 1996, the central bank adopted an alternative monetary policy framework that was based on base money management and money supply targeting.

The monetary policy framework relies on the links between monetary aggregates (as intermediate and operating targets) and inflation. The reliance on the measures of base money and the broader aggregate M3¹ assume that the relationship to inflation is stable and predictable. However, like in other economies that have liberalized and have experienced the transformation of the financial sector, the stability of the relationship remains questionable. It has been observed that having successfully completed the transition from high inflation to lower inflation rates, monetary aggregates continue to expand faster than the inflation counterpart.²

While the foregoing may be a true monetary phenomenon emerging within the Jamaican economy, the monetary authorities have maintained its vigilance in keeping low and steady

¹ M3 is defined as the sum of currency in circulation, demand, time, savings and other deposit liabilities of the banking system.

inflation. For the first eight (8) months of 1999, monthly inflation has averaged 0.51 percent, with the 12 month annual inflation of 5.09 percent. This represents further declines in inflation relative to corresponding periods of previous years where the 12-month annual inflation was 8.2 percent and 8.6 percent in 1997 and 1998 respectively.

To underwrite monetary stability in the Jamaican economy, the Central Bank has in practice adopted a combination of approaches. Two important aspects that have contributed to securing this continued low inflation environment are:

- a) tight base money management, which reflects the continuous reliance on liquidity management to restrict monetary expansion, and
- b) maintaining relative stability in the value of the domestic currency, which in practice has provided a strong nominal anchor for the system.

Further analysis of the effects of changes in base money and M3 on inflation reveals the non-existence of weak causal relationships. The results of the F-tests of exclusion restrictions of the effects of lagged values of the monetary aggregates, and exchange rates on inflation, are presented in Table 1, Appendix A. It is observed that based on the results of the Granger-causality test, the evolution of base money and money supply (M3) aggregates do not Granger-Cause the observed changes in CPI inflation or headline inflation, but that the exchange rate exhibits some causal relationship.

Outside of the inability to precisely detect an economic relationship that supports contemporaneous movements between the operating and intermediate targets and inflation, empirical justifications for broadening Jamaica's monetary policy framework has been purported.³ Robinson and Robinson (1997) validate the argument for incorporating a monetary conditions index within the Central Bank's policy framework, since there is evidence which suggests persistent influence of deposit rates and exchange rate on CPI inflation. In examining the transmission process of monetary policy impulses, it is suggested that the reverse repurchase rate may be an effective tool in the process, since it directly influences deposit rates offered by financial intermediaries. However, the effectiveness of changes in the reverse repurchase rate could be diminished, since it functions through base money that is characterized by exogeneity

² See Appendix A, which details the evolution of monetary aggregates and inflation since September 1992.

³ From Robinson and Robinson (1996) block exogeneity tests indicate that the reverse repurchase rate and the exchange rate were the only two variables that exerted some causal relationship on the evolution of CPI inflation.
Estimating a Monetary Conditions Index for Jamaica

properties, which make it inefficient to function as a ‘true’ policy lever. Changes in the base predominantly reflect expenditure decisions and therefore mirrors the actual transaction decisions with respect to the central bank’s domestic and foreign assets and liabilities. In this regard, it is concluded that the linkage between base money and inflation is potentially thwarted and would distort the clear transmission of interest rate changes to the inflation target.

Robinson (1997) empirically illustrates that the trace of monetary policy impulses in Jamaica suggests that one main direction of causation is identifiable in the changes in the reserve repurchase rate and the influence exerted on domestic deposit rates. The effect eventually feeds through to the exchange rate to impact the CPI. An alternative transmission is isolated directly through monetary aggregates – base money and money supply- then to deposit rates and finally through the exchange rate to influence domestic prices. More predominantly however, the trace delineates direct causal influences of exchange rate changes on CPI inflation and real output, and places the exchange rate at the core of the transmission process. Emerging from the forgoing discussion it is evident that some combination of interest rates and exchange rate would be beneficial to the policy decision process, and elucidates the need to develop a MCI for Jamaica.

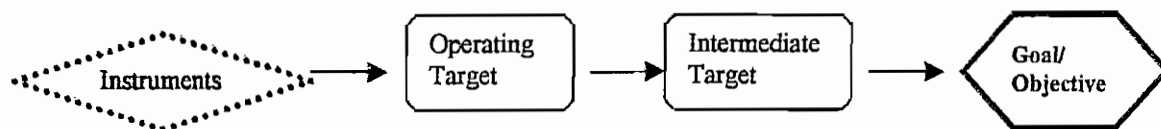
Section II: Frameworks for the Conduct of Monetary Policy

The conduct of monetary policy relies on the process of transmission from the policy variable to the final objective. Central banks have assumed the mandate of controlling the rate of growth in prices or some measure of nominal output, which in liberalized economies cannot be directly set. Therefore, the central bank has used a general conceptual framework that relies on economic variables including operating targets, intermediate targets, and information variables to link its policy actions to the ultimate goal.⁴ A schematic representation of monetary transmission is presented in figure 1, in which it is observed that the set comprises some combination of variables functioning as operating or intermediate targets, through which policy signals are transmitted to the final target. Variables that function as operating targets most often include short-term interest rates and the monetary base, and are variables that the monetary authority can directly influence. The set of intermediate targets predominantly comprise money or credit

⁴ A clear distinction is made in defining the components of a monetary policy framework. ‘Goal’ refers to the ultimate but typically non-operational objective of the Central Bank, while ‘target’ refers to an operational variable that takes precedence in the actual conduct of monetary policy. See the “Introduction to Monetary Policy” for further reference.

aggregates, the exchange rate, and the rate of growth of nominal gross domestic product (GDP), variables that can serve as a nominal anchor for the system.

Figure 1: Schematic representation of the monetary transmission process



As illustrated in figure 1, at the beginning of the transmission process, are instrument(s) conceptually defined as the variables that the central bank actually manipulate on a daily or weekly basis to achieve its monetary policy target. These instruments may comprise various direct and indirect means of control – namely reserve ratios and, open market-type operations that primarily influence the availability of domestic liquidity in the money market. Other indirect non-market methods of control that rely on imposing quantity and/or price restrictions are not applicable in liberalized economies.

Within a liberalized economic framework, since there is no unilateral link between monetary policy instruments and the final objective, the process assumes a closely linked relationship between the intermediate targets, operating targets, information variables and the final target. In this regard, the key perceived advantage of using intermediate targets is that it enables the authorities to adjust instrument settings faster and more accurately in response to a shock to the system than it could if it focused solely on the final goal. Further, it is believed that the intermediate target variable leads the ultimate target and provides the monetary authorities with some measure for monitoring and evaluating the impact of its actions during the period between policy change and the impact on the final target. A critical assumption in the transmission process therefore, is that the changes in the policy instrument influence these intermediate variables.

Though contentions have been raised concerning the selection of the final target, it is concluded that the difference between the use of an inflation target or some nominal spending growth is unlikely to be large (McCallum, 1997). An appropriate selection criterion between these two contenders is to choose the variable that corresponds most closely to the central bank's views about social objectives that are influenced by monetary policy. This gives inflation the natural edge, as it is perceived among many central bankers that the best contribution to make to long-term economic growth is maintaining orderly price movements.

Other justifications for inflation as the final target assert empirical and theoretical deficiencies in using the nominal income measure. First, it is believed by a large number of policy makers that in the long run, monetary policy has no substantial effect of adjusting actual output to its desired or full employment level. It is further asserted that even if monetary policy affected output to its optimal level, the effects would be temporary since one-off policy changes will influence liquidity conditions only once and the effects will exhibit diminishing returns to policy. Second, measurement of full employment output creates difficulty and controversy as it relates to defining the adjustment that would be required to bring actual output in line with potential output. It is also conjectured that the magnitude of measurement errors of output far exceeds the potential measurement errors of changes in relative prices. The third reason stems from the ease with which information on inflation measures may be conveyed to the public, relative to output data.

Having outlined the general framework for the conduct of monetary policy in open economies, it becomes relevant to discern the advantages and disadvantages of variable selection that will function as the intermediate or operating target. This distinction becomes necessary since the range of options – monetary base, interest rates, exchange rates, and money or credit aggregates are numerous. The selection of intermediate or operating targets is more complicated, as the existence or non-existence of a stable and predictable relationship between the choice variable and the ultimate target becomes very crucial. The choice of variables that will represent the intermediate link between policy instrument/(s) and the final objective is primarily dependent on the stability and consistency of the empirical relationship between the variable and the final target. In the case of inflation, the intermediate target should serve as a reliable guidepost to the evolution of prices. In addition, the links between policy instruments and ultimate targets through intermediate channels relies on the assumption that the central bank is able to exert predictable control over the variable. In this regard, appropriateness of the variable rests on the ability of the monetary authorities to guide the intermediate variable towards its target.

Over the years, several choice variables have been identified as appropriate intermediate and operating targets, depending of course, on how the transmission process is conceptualized. On the one hand, if the monetary policy process is characterized by stating the final objectives in general terms, such as low inflation, then the central bank could see the growth in a particular

monetary aggregate or the exchange rate as an adequate guidepost for achieving the low inflation objective. In this regard, the broader monetary aggregates, credit growth, or the exchange rate would be intermediate targets that would require changes in the policy instrument to steer the variable to its target. This framework is broadened to include operating targets, since the central bank identifies the need to monitor a variable that it can observe with a greater frequency and exert control. In this case, a narrow definition of money such as the monetary base, or interest rates would suffice as an operating target. There are several identified caveats regarding the use a nominal exchange rate anchor for the system, hence the gravitation towards the use of monetary aggregates⁵, whether as operating or intermediate targets for the monetary policy framework.

The use of monetary aggregates as intermediate targets for monetary policy stemmed from the theoretical foundations of the 1970's and 80's. Here, scholars and policy makers advocated the importance of 'rules', and the advantages, in particular, of using a money rule instead of an interest rate rule due to the perceived difficulties with precisely identifying which of the credit or money channel of the transmission process exerted the more dominant effect. While this has led most central banks to adopt monetary aggregates as policy targets, another difficulty emerges, as the selection of the aggregate to target becomes the issue. Hoggarth (1996) suggests a solution that requires countries to target more than one aggregate. In this regard, the intention is to monitor aggregates satisfying a range of criteria – easily measurable, controllable, and comprehensive enough to capture the effect of movements in bank liabilities on inflation.

The continuum of economic thought into the 1990's suggest that the perceived advantage of using monetary aggregates as reliable intermediate targets has eroded. The general consensual agreement, at least among developed nations, is that the conditions that existed during the 1980's that warranted adoption of monetary aggregates has long disappeared. This is in light of numerous transformations in financial sectors, and economies as a whole since the beginning of the century, which have undoubtedly brought into question the empirical relationship between monetary aggregates and the ultimate target – inflation. For example, where the use of monetary aggregates rely on a quantity theory framework, with increased sophistication and innovations in financial markets globally, resulting from financial liberation and macroeconomic stabilization, the velocity of circulation could be rendered unstable and unpredictable, hence violating the

⁵ Further reference on the selection of the exchange rate as a nominal anchor is cited in Hoggarth (1996).
Estimating a Monetary Conditions Index for Jamaica

requirement of a stable velocity of circulation for policy decisions structured within the quantity theory framework.ⁱ Pursuing money growth targets within an environment plagued with uncertainty of money velocity could have the disadvantage of causing frequent short-run swings in interest rates and real output.

The Monetary Conditions Index or Indicator

The framework previously outlined comprises intermediate and operating targets that have been dominated by a select group of money and exchange rate variables. Recent experiences have demonstrated that the set of intermediate parameters are not limited to this defined group as some countries have successfully conducted policy by relying on a single indicator variable or set of information parameters that provide leading or contemporaneous information about the potential movements in the final target. The success of this approach is directly attributed to the weakening relationship between monetary variables and inflation and output, and has led many central banks to calculate a monetary conditions index for use in assessing monetary policy decisions.

The MCI is a simplified numerical indicator of the relative ‘tightness’ or ‘looseness’ of monetary policy. It captures the degree of pressure that monetary policy exerts through interest rate and exchange rate changes on the economy, and hence inflation. When the index increases, it is interpreted as a loosening of monetary conditions with respect to the defined base period. A MCI is specified as a weighted average of the measured effects of interest rate and exchange rate changes on the final target.

As alluded to in earlier discussions, the MCI has emerged as an alternative to monetary targeting. While it is observed that there remains some uncertainty about the relative strengths of the money and credit channels, the monetary conditions index conceptually captures both channels into a single specified relationship. Having made an attempt at combining both sides of the transmission process through the incorporation of an exchange rate and interest rate variable, MCI’s have been largely accepted as intermediate and indicator variables that have shown significant correlation with final targets. Consequently, MCI’s have gained widespread use among developed economies such as Canada (1995), New Zealand (1996), Norway, and Sweden, which publish an index, and to varying degrees use their respective indexes to inform policy decisions.

The Bank of Canada (BOC) utilizes the index most extensively in its policy framework as changes in the monetary policy stance are, to a large extent, determined by observed shifts in the index. In adopting the MCI as its operating target, the BOC has replaced the short-term interest rate as an operating target. To operationalize the index, an inflation target is announced, and the evolution of the path for the interest rate and the exchange rate is examined to derive the monetary conditions that would be consistent with achieving this inflation target. Economists from the Bank of Canada note that while monetary policy is adjusted to bring the actual index in line with its desired level, the process is not mechanical, since initiating the adjustments require tactical timing of policy changes.⁶

Several monetary authorities have concluded that both interest rates and exchange rates are relevant where policy changes are transmitted through these variables rather than money and credit aggregates. Freedman (1994) argues for the thrust to broaden the concept of monetary conditions to include the exchange rate. His justifications are embedded in two main spheres of reasoning. First, operating in a flexible exchange rate regime, monetary policy impulses are transmitted directly through two channels – interest rates and exchange rates. Secondly, the need for policy makers to offset the effects of exogenous exchange rate shocks on aggregate demand and domestic price changes.

The arguments for adopting MCI's are premised on the need to fully encapsulate within an assessment of the transmission process, the nexus between interest rate and exchange rate changes. Freedman justifies his arguments by suggesting that where policy changes are effected in interest rates, the contemporaneous movement in the exchange rate that results may vary wildly. In this regard, misinterpretation of shifts in economic parameters may result in excessive adjustment in policy levers, exerting adverse influences on other economic sectors. The focus on the combination of interest rate and exchange rate changes enables the central bank to avoid the potential error of implementing inappropriate interest rate policy to influence the economy. His other contention is for a more practical use of the index aimed at facilitating the immediate reaction to changes in monetary conditions due to exogenous shifts in economic variables. The MCI construct allows the central bank to quickly identify changes in monetary conditions, resulting from internal shifts in the domestic economy, or exogenous shocks, and

⁶ More detailed exposition of the MCI used by the BOC is presented in Freedman (1994).
Estimating a Monetary Conditions Index for Jamaica

provides a direct mechanism signaling the need to take action to offset the monetary conditions that emerge. The implications of adopting a monetary conditions index, in this regard, helps to ensure that appropriate attention is paid to exchange rate and interest rate changes in the transmission process. It is noted that the index measures the degree of ease or tightening in monetary conditions from an arbitrary date, and no meaning is attached to the *level* of the MCI.

Section III: Econometric Examination and Estimation

The paper adopts the model framework that is consistent with describing a small open economy. The model is used to estimate the effects of both domestic and international variables on the final target-inflation.

The Model

A small open economy paradigm is adopted with all the variables, except interest rates in logs. Since the economy is described as 'open', it produces and consumes goods from domestic and foreign markets, (with '*' indicating corresponding foreign parameters). The model equations are outlined as follows:

$$y_t^d = a_0 - a_1 r_t + a_2 q_t + a_3 y_t^* + v_t \quad [3.1]$$

$$r_t = r_t^* + E_{t-1}(q_{t+1} - q_t) \quad [3.2]$$

$$q_t = e_t + p_t^* - p_t \quad [3.3]$$

$$y_t^s = \bar{y}_t + d(p_t - E_{t-1} p_t) + u_t \quad [3.4]$$

$$P_t = p_t + (1 - \alpha)(e_t + p_t^*) \quad [3.5]$$

$$e_t - e_{t-1} = \{c - E_{t-1}(p_{t+1}^* - p_t^*)\} - \lambda \{E_{t-1}(P_{t+1} - P_t) - c\} \quad [3.6]$$

For completeness the LM equation is added:

$$m_t - P_t = b_0 + b_1 y_t - b_2 i_t + \chi_t \quad [3.7]$$

where: y_t^d = demand for domestic output

r_t = real interest rate

q_t = real exchange rate

y_t^s = supply of domestic output

\bar{y}_t = potential output

e_t = nominal exchange rate

P_t = general price level

y_t^* = foreign output

r_t^* = foreign real interest rate

p_t^* = price of foreign output

p_t = price of domestic goods

m_t = measure of liquidity

i_t = nominal interest rate

u_t and χ_t = disturbance terms for supply and money demand respectively

c = the one-month proportional rate of inflation that gives the centre of the inflation target per annum.

Equation 3.1 represents the equilibrium of the goods market that is supported by the corresponding money market equilibrium defined in equation 3.7. Equation 3.2 posits the condition for uncovered interest rate parity (UIP) and recognises that the foreign interest rate and the exchange rate expectations should play an important part in a small open economy. In this regard as specified, the domestic interest rate is not characterized as an active monetary management tool. The role for interest rates is defined to the extent that free capital movements occur within a context where the interest rate differential across economies and the expected change in the spot rate are equated. Equation 3.5 defines the general price level within the domestic economy as a weighted average of domestic prices and foreign prices. In this regard, it takes into account the pricing of tradeables as well as non-tradeables within the economy. The final equation represents a reaction function for the monetary authority and relies on the monetary model of exchange rate determination. Within this context, having evoked the UIP condition, the transmission process for interest rate changes holds when capital mobility and minimal transaction costs are assumed. In this regard, it is assumed that there is full adjustment in the actual price level to the price expectations within a context of perfect capital mobility.

The structural specification allows for a solvable reduced form equation for the general price level P_t . The nominal version of the model estimates the following price level equation:

$$\begin{aligned}
P_t = & \left[\frac{\alpha a_0}{a_1 + a_2} + c(1 + \lambda) \right] \frac{1}{1 - \lambda} - \frac{\alpha}{a_1 + a_2} \left(\frac{1}{1 - \lambda} \right) \bar{y}_t - \frac{\alpha a_1}{a_1 + a_2} \left(\frac{1}{1 - \lambda} \right) r_t^* + \frac{1}{1 - \lambda} e_{t-1} + \frac{\alpha a_3}{a_1 + a_2} \left(\frac{1}{1 - \lambda} \right) y_t^* \\
& + \frac{2(a_1 + a_2) - \alpha a_1}{a_1 + a_2} \left(\frac{1}{1 - \lambda} \right) p_t^* - \frac{\alpha}{a_1 + a_2} \left(\frac{1}{1 - \lambda} \right) E_{t-1} e_{t+1} + \left(\frac{\alpha}{a_1 + a_2} - \lambda \right) \left(\frac{1}{1 - \lambda} \right) E_{t-1} P_{t+1} \\
& - \frac{2a_1 + a_2 - \alpha a_1}{a_1 + a_2} \left(\frac{1}{1 - \lambda} \right) E_{t-1} p_{t+1}^* + \frac{\alpha}{a_1 + a_2} \left(\frac{1}{1 - \lambda} \right) v_t
\end{aligned}
\tag{3.8}$$

Based on the theoretical construct, the evolution of the domestic price level is reflective of domestic and foreign variables. The reduced form equation offers some intuitive relevance to small open economies since the effects of external shocks will most likely affect these economies. Conceptually, the equation defines the effects of foreign output, prices and interest rates on the domestic price level. Given the underlying economic structure of small open economies, this derivation is consistent with their vulnerability to various external shocks. Interestingly, the inclusion of the effect of the foreign interest rate on the domestic price level would imply that the capacity of the domestic monetary authority to alter domestic monetary conditions is limited, in so far as the foreign interest rate and exchange rate movements are its determinants.

As suggested by the theories on transmission of monetary policy impulses, where interest rate changes occur, the transmission is initially through relative changes in the availability of domestic resources available to acquire goods and services. As interest rates rise and domestic liquidity declines, the impact is a lowering in the rate of increase in domestic prices, as the market reallocates the scarce liquidity resources among its competing end-uses.

The dynamics of domestic prices also incorporate exchange rates effects. Developing economies that have flexible exchange rate regimes inevitably face this type of economic relationship as the patterns of production and consumption frequently reflect the demand for imported goods. It is therefore expected that as the exchange rate depreciates, or there are expectations for depreciation in the domestic currency, domestic prices will move in tandem with the adjustments in exchange rates.

Data

The reduced form equation establishes the basis for including both domestic and foreign parameters in estimation. Monthly data from September 1991 to December 1998 is used in conducting the estimation, calculatedly aimed at circumventing issues relating to financial

liberalisation that may create difficulties of parameter stability and constancy in the estimated weights. Expanding the data set to periods prior to economic liberalization would require alternative specification and estimation of systems of equations that would adequately incorporate the effects of changing MCI ratios in the presence of dynamic multipliers (Beaumont and Eckhold, 1994).

The variables include some measure of the long-run trend for domestic output $y(\bar{y})$. Potential output is derived by applying to the domestic GDP series the Hodrick Prescott filtering technique with $\lambda=14400$ as the smoothing parameter to transform current output to its long-run path. Additional domestic variables include the end of period exchange rate (e , defined as \$J per \$US), and the consumer price index. Foreign variables used were the Federal Reserve discount rate (r^*), monthly data for GDP of the United States (y^*) and the consumer price index (p^*).

Empirical work in developing economies has been largely constrained by the deficiency in data collection and availability. The current work is limited to the extent that the monthly output performance for Jamaica is unavailable, and even where it is available at a higher than annual frequency has been subject to various discrepancies. While the alternative of interpolating monthly data points for output performance is used in the current analysis, there are inevitably limitations on the full interpretation afforded by estimated parameters. These issues cannot be resolved within the current exposition; hence caution needs to be exercised in interpreting regression results and their ultimate use for policy analysis. While the foregoing is true, the importance of analysing existing and alternative mechanisms for assessing monetary policy in developing countries is not diminished. What it clearly identifies is a need to continuously improve data collection and dissemination in our economies.

It is assumed that an adaptive approach is adopted in forming expectations for a month ahead, based on information during the previous month. Expectations for exchange rates and foreign prices are defined as a three-period moving average and are represented as $E_{t-1}e_{t+1}$ and $E_{t-1}p_{t+1}^*$ respectively. The other expectation variable $E_{t-1}P_{t+1}$ is defined as the arithmetic mean of the consumer price index for the past three months. Other methods of expectation formation may be useful in capturing the realism of a simulated correction of how economic agents perceive the evolution of the variables. In this regard, the paper recognises the limitations of adopting an

adaptive expectation hypothesis, as the alternative of rational expectations would allow further examination of the relative weights in a more dynamic monetary framework.

Results of tests examining stationarity in the selected series indicate that all variables except the domestic and foreign interest rates, and foreign output are I(1) (see table 2, Appendix B). Trend GDP is considered stationary having applied the HP filter that renders stationary any variable that is integrated of order four or less (King and Rebelo, 1993).

Estimation and Calculation of the MCI ratio

As previously outlined the paper focuses on estimating the MCI ratio that measures the relative impact of exchange rate movements and interest rate changes on domestic monetary conditions. Eika et al (1995) constructed a partial equilibrium analysis, which they found adequate in providing estimates for output MCI ratio for New Zealand. By extension, to produce estimates of the ratio of exchange rates to interest rates for Jamaica’s MCI, the following 2SLS regression equation that defines the impact of the various domestic and foreign parameters on the ultimate objective of inflation is estimated.

$$\begin{aligned}
 P_t = & 9.598 + 0.373e_{t-1} + 0.007E_{t-1}e_{t+1} - 0.082p_t^* + 0.001E_{t-1}p_{t+1}^* + 0.429\bar{y}_t \\
 & (0.69) \quad (3.84) \quad (-2.02) \quad (0.03) \quad (-0.30) \quad (7.85) \\
 & -1.08y_t^* - 0.007r_t^* + 0.001E_{t-1}P_{t+1} \\
 & (-2.69) \quad (2.14) \quad (14.45) \qquad \qquad \qquad \qquad \qquad \qquad \qquad \qquad \qquad [3.8p]
 \end{aligned}$$

T=84{1991(12)-1998(12)}
 R²=0.99
 Q(14)=21.56*

The parameters are specified in logs, and estimated results represent the specification in levels, since the estimates from running the regression in first differences suffered from serial correlation and insignificant variables. The numbers in parentheses represent the respective t-statistics of the estimated coefficients. The diagnostic tests on the residuals are summarised in the subsequent lines. The estimated price equation produced an R² of 0.99, with statistically significant coefficients on most of the foreign parameters included in the regression equation.

In the nominal equation estimated in 3.8’, the one-month lagged exchange rate variable has a positive coefficient that is consistent with the expected economic intuition. This estimated parameter displays an intuitively consistent result with the understanding of the dynamics of the

Estimating a Monetary Conditions Index for Jamaica Page 15 of 28

evolution of Jamaica's domestic prices. It is observed that any depreciation in the exchange rate is likely to translate into increases in domestic prices; as long as monetary policy does not act through interest rate adjustments to reduce money supply growth. One plausible explanation of this observation relates to the underlying economic structure and the market imperfections that engenders this relationship. It is clear that in an economy that is structured on domestic production that largely requires imported raw material and intermediate inputs, adjustments in the exchange rate will have an immediate influence of the cost of production, hence ratifying adjustments in the price of final goods. Also, the proportion of tradeables to non-tradeables included in the consumer basket and with the imperfectly competitive pricing strategies of firms, the impact of exchange rate adjustments are transmitted directly to the ultimate user.

Alternatively, theory suggests that exchange rate movements should act as a switching mechanism between aggregate demand for locally produced goods relative to foreign goods. If for instance there is a real depreciation in the exchange rate, this should influence lower demand for foreign produced goods by domestic agents, while potentially inducing greater supply, at least in the context where supply is elastic. In Jamaica's case, the indirect effect, is often swamped by its direct counterpart and the episodes of depreciation are typically accompanied by increasing inflation, in so far as money supply expansion is not prudently managed.

Current inflation is fuelled by its expected value. The expectation defined in terms of past inflation values exhibits an overwhelming influence which points to the experiences of inflationary/devaluation spirals throughout most of the sample period. This phenomenon is associated with movements in the exchange rate, since depreciation is immediately incorporated in domestic prices. Consequently, episodes of exchange rate depreciation coincide with the expectations for higher inflation.

Further, entrenched inflation that is associated with devaluation spiral is not an uncommon feature within economies that have experienced economic liberalisation within a context where there is insufficient macro-economic policy support and legislation to strengthen the financial system. As in the case of Jamaica, the deficiency in ensuring the existence of supporting macro-economic policy and legislative framework (at the initial stages of liberalisation, including the foreign exchange market) has exacerbated the inflationary process.

It is noteworthy that the foreign interest rate reflects statistical significance on domestic prices, albeit the effect is very minimal. The statistical significance of the foreign interest rate variable bears relevance to domestic monetary conditions in so far as it is an exogenous determinant of domestic interest rates. The UIP condition that defines the dynamics of domestic interest rates in terms of foreign interest rates and exchange rate depreciation, suggests that domestic interest rates adjust through a reactive mechanism to expected changes in exchange rates since it is observed that foreign interest rates exhibit relative stability over time. Within this context, while interest rates are not explicitly reflective of an active monetary policy stance, its role in domestic monetary decisions remains important.

The measures of output of both the domestic and the US economy display statistically significant effects on domestic inflation, albeit domestic output carrying the incorrect sign on its coefficient. The unavailability of monthly data on domestic output, and having to use interpolated GDP data, may *ex ante*, include statistical biases that are reflected in its coefficient. The other variables, foreign prices are statistically insignificant at the 95% level and exert minimal explanatory content of the influence on domestic prices. Therefore a detailed exposition of their intuitive relationships is not required within the current work.

Construction of the MCI for Jamaica

a. Defining the index:

The monetary conditions index is the weighted sum of changes in the 180-day nominal treasury bill rate(r) and the nominal exchange rate (e), where both variables are relative to values in a base period. It is noted that while the central bank typically defines an interest rate signal through the reverse repurchases rate, the treasury bill rate represents the most widely or frequently used market determined rate. Algebraically, it is convenient to write the MCI as:

$$MCI(v)_t = \varphi_{v,r}*(R_t - R_0) + \varphi_{v,e}*(e_t - e_0), \quad [3.9]$$

where t is a time index, $t=0$ is the base period, φ_r and φ_e are the respective weights on the interest rate and the exchange rate, and variables in lower case denote logarithms. Thus, the calculated MCI depends upon the weights $\varphi_{v,r}$ and $\varphi_{v,e}$, the measures of the exchange rate and the interest rate, and the base period. Usually, the exchange rate in [3.9] is in logarithms or in percent deviations from the base period, whereas the interest rate is in levels.

b. Measuring the relative weights:

The weights are the parameters of interest in constructing the MCI and they are chosen to reflect the effects that changes in the monetary policy instruments have on the final target (v). In this instance, the weight in the index represents the relative impact of interest rate and exchange rate changes on inflation. Where the MCI is used as an operational target, the weights are intended to reflect the linkages between the operating target and the final objective, with changes in the index indicating the likely changes in v .

To derive the relative weights of the index, the coefficient of the one-month lag exchange rate and the coefficient on the interest rate variable are adopted from the estimated equation in 3.8'. The relative impact of changes in the variables indicates a ratio of 0.007 and 0.37 for the interest rates and exchange rate respectively. This is interpreted that a 1- percent change in the exchange rate exerts a greater influence on domestic prices over time, than a 1-percentage point change in the interest rates.

c. Assessing the estimated MCI for Jamaica:

The tightening or loosening of monetary conditions within the Jamaican economy is measured relative to January 1994, when conditions in the foreign exchange market settled at new equilibrium. Invoking the *ceteris paribus* assumption, a decline in the interest rate potentially increases liquidity, and hence exerts upward pressure on domestic prices. Alternatively, for a depreciation in the exchange rate, the impact of increased costs of production is immediate and will create increasing pressure on inflation. So, a rise in the index is interpreted as a loosening of monetary conditions.

Another useful perspective on the movements in the index is that it signifies a change in the relative attractiveness of Jamaican dollars versus foreign currency assets. Thus an increase in the index would be consistent with a weakening in the demand for Jamaica dollars which can be corrected by a combination of exchange rate stabilisation and interest rate increases.

As a policy indicator, the MCI aims at tracking the relative effects of interest rate and exchange rate changes on inflation. In Jamaica's case, movements in the index are symmetrical to the fluctuations in the exchange rate (*Chart 3, Appendix C*). Periods of sharp depreciation exchange rate coincide with the precipitous loosening of monetary conditions, while periods of relative stability produce a stable index.

Section IV: Using the index in the current monetary policy framework

The existing monetary policy framework relies on the changes in the monetary base and monetary aggregates as precursors for inflationary effects of the domestic economy. The index, at least in a theory, serves to complement this analysis by: - a) allowing timely calculation and examination of its components to examine imminent effect on domestic inflation, b) providing information on indicative policy adjustments that would be required to maintain conditions and limit the potential for higher inflation in future periods, and c) incorporating both channels of the transmission process – interest rate effects of the domestic economy and exchange rate effects influenced by domestic and foreign conditions.

Since the estimated index mirrors the movements in the exchange rate, the pertinent question at this juncture is whether or not the computed index broadens the information base required for monetary policy formulation, or do exchange rate movements function sufficiently as an intermediate anchor for the system.

One simple response to this issue is examining two calculated MCI's: one defining the effect of interest and exchange rate changes relative to the identified base period (*denoted index #1*), and the other, the pure impact of the changes in the exchange rate from the same base (*denoted index # 2*). *Chart 3* presented in *Appendix C* depicts this comparison.

In the first instance, sharp depreciation is observed in the exchange rate from June 1993 to November 1996, with the attendant rise in interest rates not being sufficient and effective in offsetting the impact of an exchange rate rise on the domestic monetary conditions (*see Chart 3 & 4, Appendix C*). As a result, the index increases sharply, creating conditions conducive to maintaining high monthly and annualised inflation rates. Further, it is noted that during this period, there is the marginal difference between the calculated indexes, which suggests that monetary conditions are most likely unaffected by interest rate changes when there exists unstable conditions in the foreign exchange market.

On the other hand, during periods of moderate exchange rate movements (June 92-June 93, and January 1994-January 1995) and with interest rates remaining relatively high; there is some distinction in the calculated indexes. The effect of interest rates becomes clear, as the degree of loosening in monetary conditions (measured by index #1) is not as sharp as that indicated by

index # 2. The interest rate effects continue through to the subsequent period, where interest rates remained fairly high during periods of relative stability in the value of the currency, resulting in conditions that reflect some tightening to remain consistent with the creation of the low inflation and interest rate economic environment.

The conclusions herein suggest that there are distinct circumstances where monetary policy directed through interest rate changes were effective or ineffective in controlling inflation, and depended largely on the nature of the adjustments in the exchange rate. During periods with moderate exchange rate changes, monetary policy gains momentum in guiding inflation to the target, while during disorderly exchange market conditions, the role of interest rate adjustments are diminished.

As specified, whether from the structural or reduced form relationships, or empirically illustrated, domestic interest rates do not exert an overwhelming influence in monetary transmission process. Arguably, the literature on the transmission process indicate that an increase in interest rates is likely to prove more effective in reducing inflation where the financial system is open and competitive, and with more contracts set on a floating basis. A critical underlying assumption within this context is that the financial system is sound, so that monetary policy signals are appropriately transmitted through the representative money or credit channels, and finally to economic parameters. Typically, a sound banking system (defined in terms of concepts of solvency and liquidity) enhances the monetary policy process, as banks not only interpret, but also act appropriately to alter balance sheets to adequately mirror the prevailing stance of monetary authority.

It is noted that with vulnerable banks, the central bank's expectations of linkages between policy instruments and performance in the economy will become uncertain, rendering it increasingly difficult to set and adjust policy parameters appropriately. Further, the effectiveness of policy instruments will diminish as banks become unable to respond to monetary policy signals through appropriate and timely balance sheet adjustments. The most obvious result is inefficient credit allocation, which feeds through to have negative impacts on the real domestic economy.

The transmission of monetary policy signals require the underlying support of appropriate micro-economic conditions of the banking system as the effectiveness of policy instruments will

be determined by the extent to which banks can effect timely adjustments in their balance sheets (Guitian, 1997). He concludes that appropriate macro-economic policies are necessary to achieve price stability, but are not sufficient to maintain it unless supported by appropriate micro-economic conditions.

While theoretical grounds partially support to this broad empirical result of the ineffectiveness of monetary policy in engendering any long-term fine-tuning the macro-economy, the structure of the financial system has diluted monetary policy actions. The developments within the Jamaican economy, specifically relating to the instability of the financial sector, have to a large extent compounded the effectiveness and transmission of monetary policy changes to the final target. The instability experienced in the financial sector since 1996 has thwarted the extent to which further monetary adjustments could be made, or even transmitted through banks with very weak balance sheets. Panton (1998), in commenting on the performance of commercial banks up to 1996, noted that with the efforts of macroeconomic stability, there was wide-scale exposure of fragility of the banking sector, a situation that became increasingly visible since 1995. This fragility was evidenced by the growth in non-performing loans and the declines in capital adequacy requirements, which has imminently affected the viability and soundness of the sector. *It is evident that the apparent ineffectiveness of monetary policy or its largely reactive role is disguised by the persistent fragility of the banking system.*

The MCI is by no means a precise measure of the effects that changes in exchange rates and interest rates exert in the domestic economy, but represents a reasonable indicator of future inflation movements. A pure examination of the contemporaneous linkage between the MCI and inflation shows positive correlation in which the MCI acts as a satisfactory information variable in defining future movements of inflation. The test for the association between these variables⁷ indicates that there is strong correlation between inflation and the monetary conditions index, and hence satisfactorily establishes some dependence between both variables.

It is clear that identifying the source of exchange rate shocks is critical to the functioning of Jamaica's monetary policy framework. However, a case is made for using the combined index. Exogenous shocks to the exchange rate, for example, if there are disorderly market conditions that would fuel a sharp depreciation and loosen monetary conditions, would require tactful and

timely policy adjustment to maintain a relatively stable monetary index. Focusing on the monetary conditions index, the need for tightening action would show up directly since the index would show the easing resulting from currency depreciation, and immediate action taken to return monetary conditions to their previous level. Note however, that the index cannot define the magnitude of change required, but practically serves as an economic barometer continuously measuring the degree of inflationary pressures within the economy.

The case is therefore made for adopting the combined index rather than the sole movements in the exchange rate. The focus of monetary policy within the current environment is to achieve simultaneous stability in the foreign exchange and money markets that will maintain the current low inflation environment. To this end, changes in the exchange rate would not be sufficient intermediate target since it only includes one side of the economy, and the central bank would be limited in effecting timely changes in interest rates to temper the effects of exchange rate changes. Index #1, as defined broadens the span of monetary policy assessment to include interest rate and exchange rate targeting to maintain a stable index, and by extension low inflation.

Section V: Concluding Comments

The main conclusion emerging from the foregoing discussions point to the relevance of incorporating both the interest rate and exchange rate in examining the changes in policy and the imminent impact on the final target. Further, estimating the MCI ratio, and by extension deriving an index, supports the long-standing view that stability of the exchange rate will create and facilitate better macro-economic fine-tuning. In the case of Jamaica, like most developing countries the underlying market structures dictate that the effect of exchange rate changes have an immediate impact and direct impact on domestic prices. In this regard, it is imperative that as soon as exchange rate shifts occur (from whatever source), the attendant adjustments be made in the domestic policy to offset the fluctuations. The index facilitates this timely assessment and adjustment since it may be continuously calculated and examined on a more frequent basis than other intermediate variables such as M3.

⁷ For full discussion on this topic see M.G. Kendall and A. Stuart, *The Advanced Theory of Statistics, Vol.2, 2nd edition, Griffin & Co. Ltd.(London), 1967, p296.*
Estimating a Monetary Conditions Index for Jamaica

A limitation in using the nominal index as an intermediate target is the relatively short horizon that it defines, and the inability to direct policy actions over longer periods. To extend the period of focus, an index defined in real terms, measuring the changes in real variables from their base periods is more useful, albeit in the short-term the nominal should serve as well as real MCI. While this is noted, the usefulness of the nominal index is not diminished since broadening the analysis to estimate a real MCI is hampered by the deficiency in economic data capture for the country.

As a secondary conclusion, the work highlights the need to adopt an additional operating target to augment the current use of base money. It is observed that information on the variables contained in the index is available on a relatively frequent basis, and with close contemporaneous movements with inflation established, it would facilitate more timely monetary policy adjustments. While not establishing its superiority to the exchange rate as an intermediate target, as an operating target it is clear that the index provides a basis for the monetary authorities in changing market expectations with a time-consistent, transparent operation of monetary policy linked to a single objective. The index, in estimating a comprehensive measure to assess the impact of shifts in the economy, affords the timeliness for adjustments that are required to impact inflation.

A pertinent issue that emerges from the foregoing discussion is determining the level of monetary conditions that would be consistent with achieving low and steady inflation. The typical response is for a stable MCI. However, given the endogeneity of our domestic interest rates, and the pervasive effect of exchange rates on domestic prices, the effectiveness of using monetary policy under these circumstances is doubtful. It is observed that stability in the exchange rate augurs well for interest rate effects, however, under the alternative scenario, instability in the exchange rate would require sharp interest rate movements to maintain a stable index. This is only in a conceptual sense, since significant interest rate movements would mean reverting to an economic landscape that would offer substantial capital gains at the expense of a stifled real sector.

Lastly, the adoption of the MCI as an operating target would need to be combined with more sophisticated inflation targeting than currently practised. The ability to forecast inflation six to eight quarters ahead and to associate these targets with movements in the MCI would set the

stage for elevating the MCI to a more permanent place. Both these developments will become more valuable as inflation expectations continue to fall.

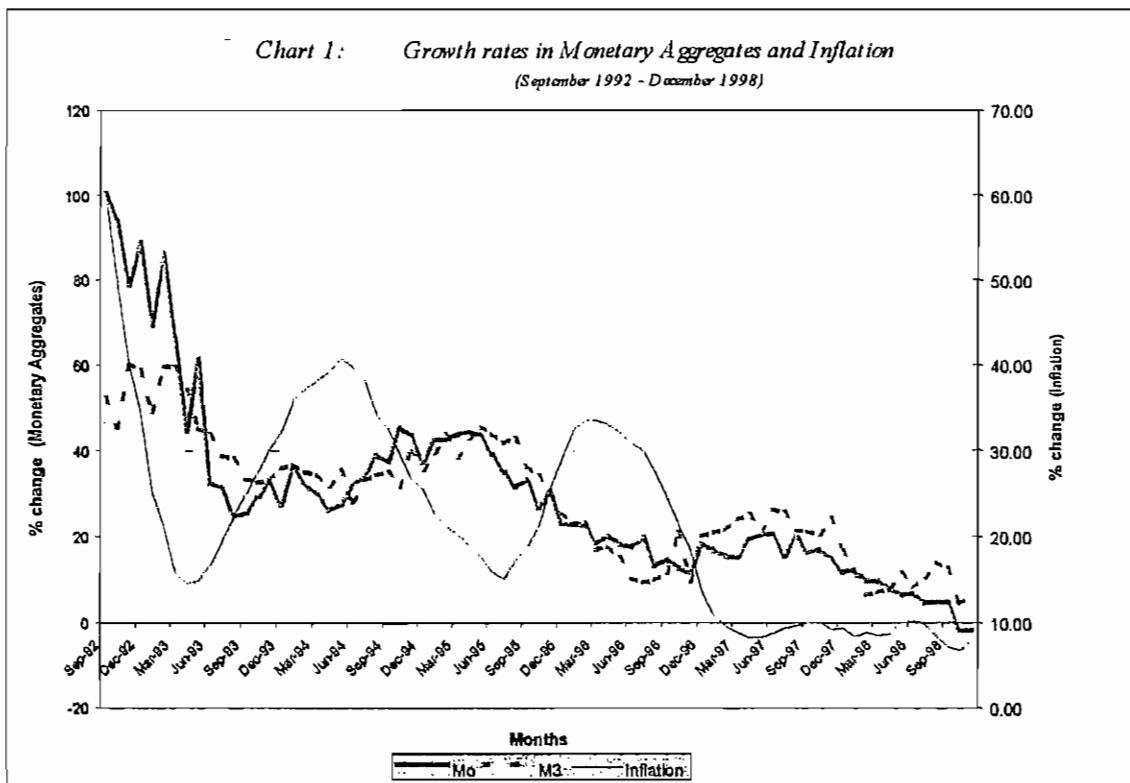
APPENDIX A

Table 1: Summary results of F-tests of exclusion restrictions on lagged base money, M2 exchange rates on inflation.

	Test Statistics
Base Money	0.87
Exchange Rate	5.30*
Money Supply (M3)	0.87

* denotes significance at the 5% level.

Sample: 84: 1991(09) to 1998(12)



Note: variables are measured in percentage changes, with monetary aggregates on the LH axis and inflation on RH axis.

Table 2: Augmented Dickey-Fuller tests for Unit Roots

Variable	Trend/ No trend	Test Statistic
e_t	T	-1.764
p_t^*	T	-0.116
y_t^*	T	6.832*
π_t^*	-	-1.116
P_t	T	2.977

* indicates the rejection of the null hypothesis at the 5% significance level

Test: _

$$y_t = \alpha + (1-\Delta)y_{t-1} + \epsilon_t$$

$$H_0: \Delta=1$$

Chart 3: Monetary Conditions Index
(January 1994=0)

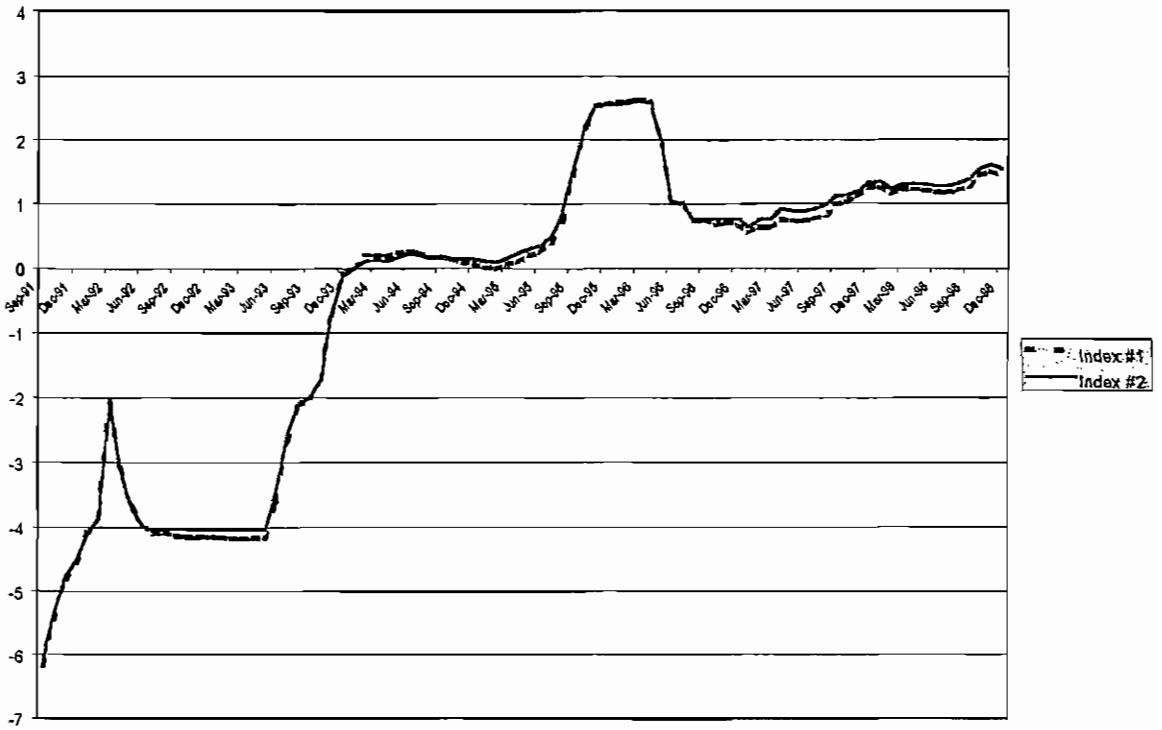
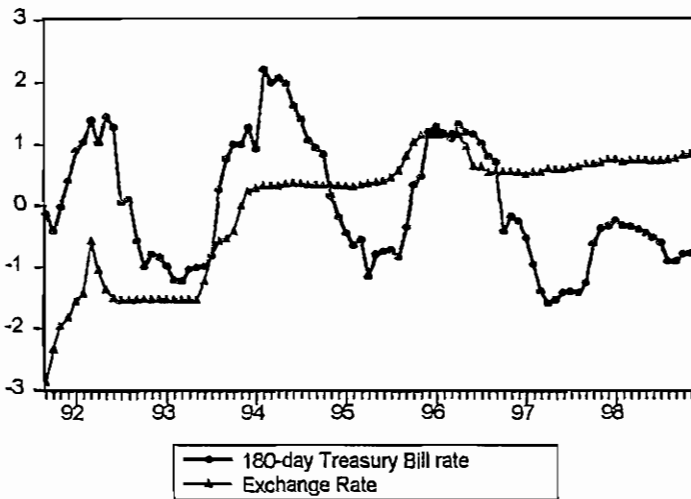


Chart 4: Components of the Monetary Conditions Index for Jamaica: September 1991-December 1998



NB. The scales have been normalised to reflect the relative movement over time.

References

Bank of Jamaica, *Statistical Digest*, (various issues).

Ericsson, Neil et al, (1997), "Understanding a Monetary Conditions Index", Forthcoming.

Freedman, Charles, (1994), "The Use of Indicators and the Monetary Conditions Index in Canada", in *Frameworks of Monetary Stability, Policy Issues and Country Experiences*, edited by J.T. BaliSo and Carlo Cottarelli. (Washington: International Monetary Fund).

Dennis, Richard, (1997), "A measure of Monetary Conditions", *Reserve Bank of New Zealand Discussion Paper*, G97/1.

Gonzalez-Hermosillo and Takatoshi Ito, (1997), "The Bank of Canada's Monetary Policy Framework: Have Recent Changes Enhanced Central Bank Credibility?", *IMF Working Paper*, WP/97/171.

GuPtan, Manuel, (1997), "The Other Dimension of Monetary Policy" in *Banking Soundness and Monetary Policy, Issues and Experiences in the Global Economy*, edited by Charles Enoch and John Green. (Washington: International Monetary Fund).

Hoggarth, Glen.,(1996), "Introduction to Monetary Policy" *Handbooks in Central Banking No. 1*, Bank of England.

International Monetary Fund, *International Financial Statistics*, (various issues).

Nadal-De-Simone, Francisco, (1996), "A monetary conditions index for New Zealand", *Reserve Bank New Zealand Discussion Paper*, G96/2.

Nadal-De-Simone, Francisco and Richard Dennis, (1996), "Where has our MCI research has led us and where do we go from here? An evaluation of past methodology", *Research Memo*, M96/39.

Panton, Novelette, (1998), "The commercial banking industry in Jamaica: Some issues of efficiency, 1990-1995" *Money Affairs*, vol., No.1, Jan-June.pp107-136

Robinson and Robinson, (1997), "The Transmission of Monetary Policy in the Jamaican Economy", Bank of Jamaica.

ⁱ Economies in transition from a high inflation environment to a low inflation environment may experience a shift in the velocity. This may not be a precursor to higher future inflation, which if not recognized may lead policy makers to react unnecessarily.