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1. INTRODUCTION

Accurate measures of the size and direction of changes in monetary policy are very important. A number of variables/indicators have been used as a measure of the stance of monetary policy the world over. These include growth rates of monetary aggregates and credit aggregates, short-term interest rate as used by Sims (1992), index of minutes of Federal Open Market Committee (FOMC), as suggested by Friedman and Schwartz (1963) and reintroduced by Romer and Romer (1989), monetary policy index constructed by employing Vector Autoregression (VAR) estimation technique with prior information from Central Bank such as Bernanke and Blinder (1992) and Bernanke and Mihov (1998), and Monetary Conditions Index (MCI)—which is the focus of this paper—constructed by and used by Bank of Canada [Freedman (1995)], taking into consideration the interest rate and exchange rate channel of monetary policy transmission mechanism in a small open economy.

In case of open economy it is assumed that the monetary policy affects the economy and the prime objective of monetary policy, rate of inflation, through two important transmission mechanisms. These transmission channels are; interest rate channel and exchange rate channel. The working of the first channel is that the interest rate influences the level of expenditures, investment and subsequently domestic demand. The change in official interest rate effects the market rates of interest both short term as well as long term interest rates. This change in market rates of interest is transmitted to the bank lending rates and saving rates. The change in saving rate effects the spending behaviour of individuals (consumption) whereas the change in bank lending rate effects the investment behaviour of firms (investment). The change in aggregate consumption and investment has direct link to the gross domestic product (GDP).

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The second channel is exchange rate. The exchange rate is the relative price of domestic and foreign money. In principle the rate of exchange depends on both domestic and foreign monetary conditions. This channel works in this way. The change in exchange rate leads towards the relative prices of domestic and foreign produced goods and services. This movement in prices affect the pattern of spending of economic agents that is individuals and firms. The exchange rate changes can also effect directly to the rate of inflation. This effect is transmitted through the Rupees prices of imported goods. In a modern interlinked world the imported goods are important determinants of many of the firm's costs and consumptions expenditures of individuals. Appreciation of Rupee lowers Rupee price of imported good and depreciation of Rupee increases the price of imported goods. Hence in a small open economy the exchange rate is another important channel through which actions of monetary policy are transmitted to the ultimate objectives of policy that is rate of inflation and economic activity.

Considering the importance of interest rate and exchange rate channels of monetary transmission mechanism in an open economy it is required to have comprehensive measure of monetary policy stance. This requirement is fulfilled by the introduction of monetary conditions index by bank of Canada. Hataiseree (2000) argued that MCI is better in assessing the monetary conditions of the economy.

There are numbers of studies that have estimated Monetary Conditions Index for different countries. Kesriyeli and Kocaker (1999) estimated MCI of inflation for Turkey. Weights of MCI are estimated from inflation model by using real interest rate and real effective exchange rate as determinants. MCI of inflation for Thailand is constructed by Hataiseree (2000). To estimate the weights autoregressive distributed lagged model of inflation is used. This inflation equation include interest rate, nominal effective exchange rate. Import prices index, agricultural price index and government fiscal indicator. The estimate ratio of weights of exchange rate and interest rate for Thailand is 3.3:1. Real interest rate and real effective exchange rate variables are used in the construction of MCI of output for Hong Kong by Monetary Authority (2000). By estimating reduced form equation of aggregate demand relevant weights are obtained. The ratio of exchange rate and interest rate weights is 4.25:1. Further, the MCI estimated for different countries are as; Duguay (1994) for Canada, Hansson and Lindberg (1997) for Sweden, Hataiseree (2000) for Thailand, Kesriyeli and Kocaker (1999) for Turkey.

Pakistan is one of the emerging economies of the world which have no estimates of composite measure of monetary policy stance. This study intends to estimate the MCI for inflation for Pakistan that could be used by the monetary authorities and policy-makers to evaluate the stance of monetary policy. The distribution of the rest of the paper is given below. Section two deals with the monetary policy in Pakistan whereas Sections 3-4 discuss the concept of MCI, its uses and approaches to estimate MCI. Section five presents the methodology of estimation of MCI. Next two Sections (i.e., 6 and 7) contain unit root and cointegration analysis. Section 8 presents estimated MCI whereas Section 9 deals with decomposition analysis. The last section concludes the study.

2. MONETARY POLICY IN PAKISTAN

State Bank of Pakistan, the central bank, was established for two clearly broad objectives; to secure monetary stability and to find fuller utilisation of country's productive resources. These objectives are confined under the head of 'Functions and Responsibilities of the Central Board' by making it responsible to secure monetary stability and soundness of the financial system. Section 9A.1 of the Act 1956 of the State Bank of Pakistan (amended) elaborates the targets of monetary policy in Pakistan. It states that the target rates of growth and inflation set by the Federal Government are the targets of monetary policy. Therefore the objectives of monetary policy in Pakistan are to achieve the target rates of growth and inflation that are set by the Federal Government.

One of the important and crucial intermediate target variables of monetary policy in Pakistan is money supply. The SBP has been using M2 aggregate (i.e., currency + demand deposits + time deposits) for policy purposes on the assumption that the demand for M2 function is stable in Pakistan. Utilising the estimated money demand function the target rate of growth of M2 is set. Another variable that is used as intermediate target of monetary policy in Pakistan is credit. Target rate of growth of credit is set by the SBP while preparing the annual credit plan. This credit plan is made considering the sectoral requirements of credit in the country. It is implicitly assumed by the SBP that M2 and credit aggregates can be effectively controlled by the effective use of monetary policy instruments.

Last two decades witnessed a number of changes in the monetary sector of Pakistan. In the beginning of 1980s monetary authorities in Pakistan has decided to abandon the fixed exchange rate mechanism and to adopt for floating exchange rate system. This is to initiate another important channel of monetary transmission mechanism in Pakistan. Further in late 1980s the authorities has started working on comprehensive financial sector reforms with the help of international financial agencies such as International Monetary Fund and World Bank. During these reforms a number of steps have been taken to modernise monetary sector. On this road monetary authorities have taken steps to utilise the market based instruments of monetary policy in Pakistan.

After the start of financial sector reforms Open Market Operation (OMO) has become an important instrument of monetary policy in Pakistan. The SBP can influence/manage domestic liquidity through purchase or sale of government securities in the secondary market. The OMO can also be used to maintain the level of reserve money according to the operating target.

Further the SBP can impose cash reserve requirement on all deposits of scheduled banks as an instrument of monetary policy. Current weekly reserve requirement of every Bank is fixed as 5 percent of average weekly deposits. However, under another condition the amount of these reserves should not be less than 4 percent of daily deposits. Apart from the reserve requirement every Bank has to maintain 15 percent of total daily deposits as a liquidity requirement. For this purpose Bank can use cash, gold and government securities.

The SBP has been given responsibility to maintain the external value of currency by the government. For this purpose SBP has to maintain foreign currency reserve by intervening the foreign exchange market. This instrument has been used by the SBP during recent years to maintain and build foreign currency reserve. This intervention in the foreign exchange market helped to stabilise the external value of the Pak Rupee.

3. MONETARY CONDITIONS INDEX

In order to evaluate the monetary conditions in a country during different policy regimes there must be an indicator. The monetary conditions index is designed to serve as an indicator of monetary policy. It helps to evaluate the monetary policy stance. Weather monetary policy is tight or easy or just right. Theoretically MCI is considered as movement in the two important variables that is rate of interest and exchange rate from the base period. For example, the MCI for inflation variable can be expressed in equation as

$$MCI(\pi)_t = w_r\,(r_t - r_b) + w_e\,(e_t - e_b) \quad \ldots \quad \ldots \quad \ldots \quad \ldots \qquad (1)$$

Where r_t is interest rate at time t, r_b is base period interest rate, e_t is exchange rate at time t, e_b is base period exchange rate, w_r is weight of interest rate and w_e is weight of exchange rate. It is assumed that the sum of two weights that is w_r and w_e is unity.

In the process of construction of MCI the most important parameters are weights of interest rate and exchange rate. These estimated weights contain information about the relative importance of interest rate and exchange rate channels of monetary transmission mechanism in the determination of economic activity or rate of inflation. These weights can be derived from the existing econometric models or by estimating appropriate econometric model by a researcher.

One of the important goals of monetary policy in Pakistan, as discussed earlier, is to achieve Federal Government's targeted rate of inflation. Considering the targeted rate of inflation as objective variable the estimated weights refer to the relative importance of rate of interest and rate of exchange in the determination of rate of inflation in Pakistan. Therefore the model explaining the behaviour of rate of inflation, one of the possible choice variables, is specified as:

$$\pi_t = \beta_0 + \beta_1 r_t + \beta_2\, e_t + \varepsilon_t \quad \ldots \quad \ldots \quad \ldots \quad \ldots \quad \ldots \qquad (2)$$

The variable π_t is the rate of inflation. This is potential target for the monetary condition index. Whereas r_t is call money rate and e_t is monthly average nominal exchange rate and ε_t is well behaved error term.

4. USES OF MONETARY CONDITIONS INDEX

In the literature multiple possible uses of MCIs are discussed. One possible use of MCI is that it can be used as operational target of monetary policy. For this purpose desired MCIs are constructed by taking into consideration of long run monetary policy objectives. As a policy target monetary authority is required to bring actual level of MCI to the targeted level. The central banks of Canada and New Zealand, among others, are using MCI as an operational target of monetary policy. Another use of MCI is that it can be used an indicator of monetary policy conditions in a particular time. It can measure monetary policy stance that is whether monetary policy is tight or loose with reference to particular period. Furthermore, Monetary Condition Index can also be used as a monetary policy rule. For this purpose the objective function of monetary policy rule can be obtained by rearranging MCI equation. Then normalising it on interest rate or exchange rate, as the case may be. For detailed discussion MCI as a monetary policy rule see for example Ball (1998).

5. APPROACHES TO ESTIMATE WEIGHTS OF MONETARY CONDITIONS INDEX

In the calculation of Monetary Conditions Index the estimation of weights of interest rate and exchange rate for an objective function are very important. Broadly speaking there are two ways to get these weights. Either these are obtained from already estimated econometric models or get freshly estimate by specifying the model. New estimates are made by modeling the objectives of monetary policy, that is either rate of inflation or economic growth or both at a time.

In the literature there are number of approaches available to estimate these weights of two monetary instruments while calculating MCI. First approach contains single equation based MCIs. This method is used by the IMF (1996), among others, to estimate the weights of MCI. The second is called trade share based MCIs which is being employed by J. P. Morgan's while calculating MCI for UK, such as Suttle (1996). Third approach deals with the estimation of weights by using multiple equations model, for example MCIs constructed by Davies and Simpson (1996) for Gold Sachs in UK. Recently the concept of dynamic MCIs is introduced by Batini and Turnbull (2000). They calculated dynamic MCI for the monetary policy committee of Bank of England.

There are a number of econometric issues in the construction of MCI which are needed to be addressed. These include dynamics, non-stationarity of data, cointegration and parameter constancy among others. These issues are related with the empirical model on which the value of weights is based. In this study we estimate weights by estimating above equation.

6. METHODOLOGY FOR ESTIMATION OF THE MODEL

The important issue in the construction of MCI as compound measure of monetary policy stance in an open economy is the estimated value of weights of interest rate and exchange rate. These weights are important because they leads toward the construction of monetary condition ratio. This ratio indicates the relative importance of interest rate and exchange rate policy channels. The weights of MCI are not directly observable. They, however, could be obtained either from already estimated econometric models of the economy or by formulating empirical function by a researcher himself. It implies that MCIs are model dependent. In both cases, particularly new, estimates of the weights are subject to model building and estimation methodological criticism. This leads toward the econometric issues in estimating the weights. These issues include dynamics, time series properties of data, cointegration, exogeneity and parameters constancy [Eika, *et al.* (1996)].

Considering the importance of MCI in the analysis of monetary policy and criticism leveled against its measurement we start econometric methodology with the investigation of data generation process of individual time series. Specifically the testing of non-stationarity of time series data and order of integration. Since the seminal work of Nelson and Plosser (1985) on historical data of US economy, the time series data are assumed to be difference stationary. This finding of non-stationarity of time series data is confirmed by a number of researchers all over the world.

For the purpose of testing of order of integration of individual time series we used standard Augmented Dickey and Fuller (1979, 1981) method according to Hall's (1994) sequential rule. This ADF procedure for testing integration of series is still dominant method of testing the existence of unit roots in the time series data despite heavy criticism leveled against it, see for example Maddala and Kim (1998). This is to estimate the following type of equation;

$$\Delta y_t = \alpha + \beta T + \rho y_{t-1} + \sum_{i=1}^{n} \lambda_i \Delta y_{t-1} + \varepsilon_t \quad \ldots \quad \ldots \quad \cdots \quad \cdots \qquad (3)$$

for $i = 0, 1, 2, ..., n$

where y_t is any time series to be tested for unit roots, t is time trend and ε_t is white noise error term. We test the hypothesis that $\rho = 0$ in Equation 3 by τ-test by comparing the critical values of MacKinnon's (1991).

As a second and important step of analysis we estimate following model of inflation, one of the prime objectives of monetary policy in Pakistan. We include two policy variables as determinants of rate of inflation. Since we are considering an open economy, policy variable include the rate of interest and rate of exchange (Rupees in terms of Dollars). Each variable represents one monetary policy transmission mechanism explained earlier in the paper. The inflation model for Pakistan, a small open economy, is as;

$$\pi_t = \beta_0 + \beta_1 r_t + \beta_2 e_t + \varepsilon_t$$

where π_t is current rate of inflation measured by Log CPI_t–Log CPI_{t-1}, r_t is call money rate, e_t is average exchange rate, and ε_t is well behaved error term. Following the lead of Bank of Canada (1994) we used interest rate and exchange rate in nominal form [Freedman (1995)]. It is argued that in the short run the distinction between the nominal and real variables is of little importance [Reserve Bank of New Zealand (1996)]. In the short run MCIs constructed from both real and nominal rates moves in a similar way because in the short run relative prices and inflation rates assumed to be remain constant [Eika, *et al.* (1996)].

At this stage we test existence of cointegrating relationship between the variables by using Likelihood ratio test based on maximal eigenvalue and trace of stochastic matrix as proposed by Johanson (1988). Full Information Maximum Likelihood Method of Johansen (1988)[1] would be used to estimate long run parameters of the objective function. This method use vector autoregressive methodology to estimate the model having non-stationary time series data. Another importance of VAR technique is that it does not require variables to be distinguished into endogenous and exogenous variables. We can estimate system of equation simultaneously. Hence we do not face the problem of simultaneity biasedness. The estimated parameters of the model can be interpreted as weights of rate of interest and rate of exchange in the objective function. These weights are to be used in the construction of MCI.

One approach to formulate the dynamic error correction function is Vector Autoregressive (VAR) system adopted by Johansen (1988), Johansen and Juselius (1990). It can be represented by the following function.

$$X_t = \sum_{i=1}^{k} \Pi_i X_{t-1} + \mu_t + \Phi D_t + \varepsilon_t \qquad \ldots \qquad \ldots \qquad \ldots \qquad \ldots \qquad (4)$$

Where X_t is a vector of variables included in the model, μ_t is constant term, D_t is a vector of dummy variables and ε_t is iid(0, Λ) disturbance term. From this model, using Δ=1–L, where L is the lag operator, we can deduce the following dynamic error correction model

$$\Delta X_t = \Gamma_1 \Delta X_{t-1} + ... + \Gamma_{k-1} \Delta X_{t-k+1} + \Pi X_{t-k} + \mu_t + \Phi D_i + \varepsilon_t \qquad \ldots \qquad (5)$$

[1]This method would take care of the criticism levelled by Eika, *et al*. (1997) against the underlying estimated models of MCIs such as Duguay (1994), and Hansson and Lindberg (1997) among others.

where $\Gamma_i = -I + \Pi_1 + \ldots + \Pi_i$, $i = 1, 2, \ldots k$ … … … (6)

and $\Pi = -I + \Pi_1 + \ldots + \Pi_k$ … … … … … (7)

This error correction model captures the short-run dynamics as well as long run properties of the inflation model because it includes variables both in levels and in differences. Under the assumptions all the variables included in the model are stationary. Therefore, this model can be estimated with the ordinary least square method [Granger and Lee (1989)]. However, the term $\prod$ is a cointegrating matrix, which consists of the long-run stable relationship among the rate of inflation, interest rate and exchange rate and loading vector. It implies that this relationship between the variables is stable and can be used for forecasting purposes and policy analysis.

7. TESTING OF STATIONARITY OF THE DATA

The property of data, whether these are stationary or not, is investigated by using standard ADF method. This test helps to estimate the order of integration of series. The order of integratedness would lead towards the appropriate action, for example differencing of the series to convert it into stationary series before estimation of weights of the MCI. As can be seem from the Table 1, the data for the variables to be used in the analysis are not stationary. The data have unit roots at frequency one, therefore all the series are I(1).

Table 1

ADF Test of Unit Roots

Variables	Order of Lag	τ-Ratio	Variables	Order of lag	τ-Ratio
π	11	–2.42	Δ π	0	–16.96
Ex	12	–2.08	Δ Ex	11	–4.97
Cmr	10	–2.34	ΔCmr	0	–26.05

Note: Lag length is selected on the basis of the white noise property of error term along with AIC and SBC. The critical value at 5 percent level is 2.87.

8. COINTEGRATION ANALYSIS

In the previous section we have established that the time series data of the variable to be used in the modeling of inflation for the estimation of weights are not stationary at their level. However, these series can be made stationary after differencing. This univariate analysis leads towards the utilisation of econometrics techniques, such as cointegration analysis, tailored for the non-stationary time series data.

Johanson (1988) full information maximum likelihood method is used to test the presence of any long run relationship between the rate of inflation, rate of interest and exchange rate. For this analysis we used order of VAR as 24 months, which is chosen on the basis of the white noise property of error term and standard lag selection criteria such as Akiake Information Criteria (CIA) and Schwartz Baysian Criteria (SBC). As can be seen from the Table 2, both Maximal eigenvalue and Trace statistics lead to the conclusion that there are two cointegrating vectors between these variable at the 5 percent level of significance. This result is inline with the theoretical prediction. There is long run relationship between the rate of inflation and rate of interest as predicted by Fisher. And there is long run relationship between the rate of inflation and exchange rate as predicted by the theory of open economy. Further studies in Pakistan found that external factor are significantly contributing the rate of inflation, see for example, Khan and Qasim (1996); Hasan, *et al.* (1995); Naqvi, *et al.* (1994) and Bilquees (1988), among others.

Table 2

Cointegration; Likelihood Ratio Test Based on Maximal Eigenvalue/ Trace of the Stochastic Matrix

Null	Alternative	Maximal Eigenvalue	Trace
r = 0	r ≥ 1	119.56*	160.70*
r ≤ 1	r ≥ 2	35.98*	41.13*
r ≤ 2	r = 3	5.15	5.15

Following the tradition we used first cointegrating vector to estimate the coefficients of the inflation equation. The estimated equation is presented below (*t*–ratios are in the parentheses).

$$\pi_t = \underset{(773)}{0.116}\, LCMR_t + \underset{(836)}{0.041}\, LEXR_t$$

From this estimated model we obtained weights of rate of interest and exchange rate that are to be used in the construction of monetary conditions index of inflation in Pakistan. The estimated coefficients of rate of interest and exchange rate give the weights of 0.736 and 0.264, respectively. With the help of these estimated weights we calculated monetary condition ratio, which is 2.79:1. The monetary conditions ratio is an indicator of the relative importance of interest rate channel and exchange rate channel in the monetary policy transmission mechanism to affect the rate of inflation. The estimated monetary condition ratio of 2.79:1 implies that one percentage point movement in the rate of interest is equivalent to the 2.79 percentage points movement in the nominal exchange rate in term of effect on the rate of inflation. In other words, we can say that one percentage point increase in the rate of interest can be offset by the 2.79 percentage point fall in the exchange rate. This opposite directions movement in the interest rate and exchange rate would leave monetary condition in putting pressure on rate of inflation unchanged.

9. MONETARY CONDITIONS INDEX OF INFLATION

Finally monetary conditions index (MCI) is constructed by utilising the weights that are estimated in the previous section. For this purpose we used monthly data from July-1990 to June-2001. The June-1990 is used as base period. There is no theoretical reason to select the base period, it is rather an arbitrary decision. Since financial sector reforms initiated by the government of Pakistan during the financial year 1989-90, this choice seem to be reasonable to analyse monetary condition in Pakistan during the previous decade. The estimated weight of rate of interest is 0.736 and it is 0.264 for nominal exchange rate.

Table 3 presents the MCI of inflation variable for Pakistan whereas Table 4 contains movement in the MCI. Respective series are presented in the Figures 1 and 2. Linear trend line is fitted and it is also presented in the Figure 1. The visual inspection of the graph of MCI reveals the fluctuating behaviour of monetary conditions during 1990s. However, the linear trend line shows increasing pressure on inflation by the monetary authorities during the decade under discussion.

We have also estimated proper trend line. The estimated trend line is concave to the time period that is x-axis. This shape of trend line indicates changing stance of monetary policy by the monetary authorities during the decade under study. It seemed that in the earlier period of 1990s the monetary policy aimed to exert pressure on rate of inflation and authorities are trying to reduce the rate of inflation up to the target level. On the close inspection of the graph of MCI it is evident that spell of tight monetary policy remained operative till 1997. It seems that the monetary authorities are easing monetary policy since 1997-98. However, it is also clearly in evident that the monetary authorities are careful in the conduct of monetary policy. This implies that monetary authorities in Pakistan are determined to contain rate of inflation within given target level without damaging other macroeconomic objectives of the Government.

10. DECOMPOSITION OF MONETARY CONDITIONS INDEX

In the previous section we have constructed monetary conditions index for the period from 1999M6 to 2001M6. In this section our objective is to analyse the series of MCI by time series techniques. For this purpose we decompose the series into different components. It is assumed that a given series have four components such as seasonal, trend, cycle and irregular. We assume these components are of multiplicative nature, like

$$Y_t = S_t \times T_t \times C_t \times I_t$$

First we estimate seasonally adjusted series that is MCISA. For this purpose we used both twelve months moving average method and X-11 method. To get the seasonal components from the series we divided original series (MCI) by the seasonal adjusted

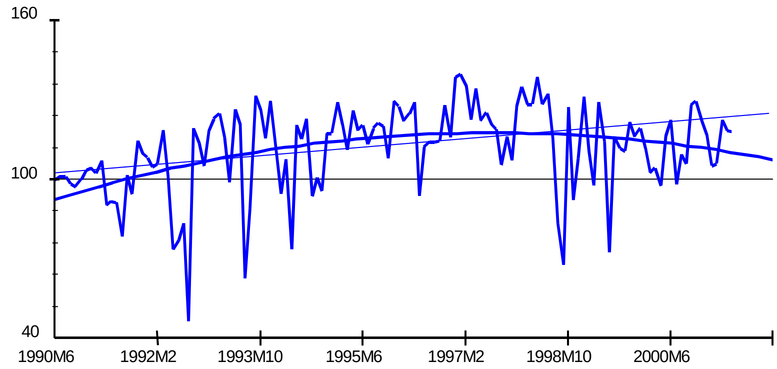

Fig. 1. Monetary Conditions Index and Fitted Trend Lines.

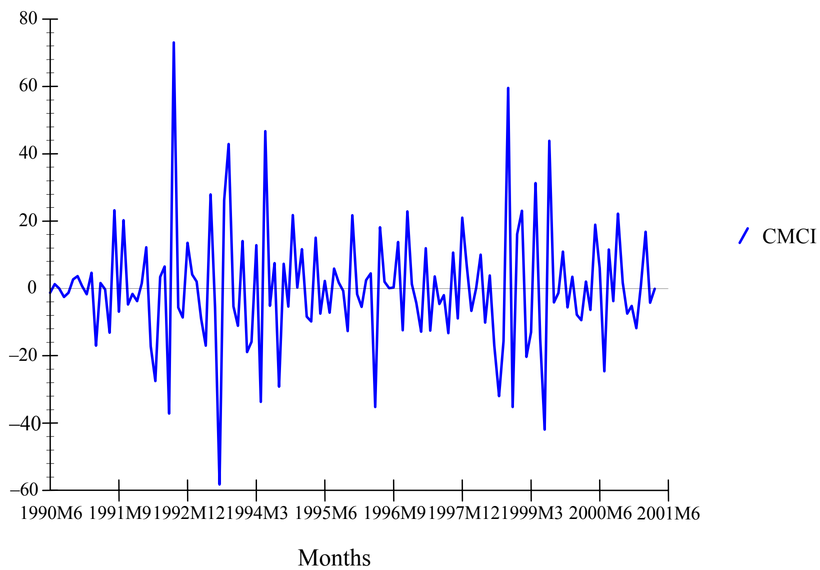

Fig. 2. Change in Monetary Conditions Index.

Table 3

Monetary Conditions Index of Pakistan (1999M6 – 2001M6)

OBS.	MCII	OBS.	MCII	OBS.	MCII
1990M6	99.9971	1994M7	122.8061	1998M8	83.3176
1990M7	101.2053	1994M8	93.6024	1998M9	67.6773
1990M8	101.2108	1994M9	100.9361	1998M10	127.2105
1990M9	98.6420	1994M10	95.5405	1998M11	92.0248
1990M10	97.3103	1994M11	117.3137	1998M12	108.1050
1990M11	99.9913	1994M12	117.5116	1999M1	131.1717
1990M12	103.6483	1995M1	129.1717	1999M2	110.8827
1991M1	104.3325	1995M2	120.8256	1999M3	97.8702
1991M2	102.5833	1995M3	111.0207	1999M4	129.1746
1991M3	107.2278	1995M4	126.0419	1999M5	114.3582
1991M4	90.2350	1995M5	118.5462	1999M6	72.3802
1991M5	91.8061	1995M6	120.7214	1999M7	116.2055
1991M6	91.4843	1995M7	113.5223	1999M8	112.0313
1991M7	78.3342	1995M8	119.3794	1999M9	110.662
1991M8	101.5816	1995M9	121.1339	1999M10	121.5921
1991M9	94.6043	1995M10	120.3660	1999M11	116.0295
1991M10	114.8401	1995M11	107.7205	1999M12	119.5114
1991M11	110.0901	1995M12	129.4301	2000M1	111.6898
1991M12	108.4142	1996M1	127.7208	2000M2	102.1873
1992M1	104.6455	1996M2	122.2359	2000M3	104.1921
1992M2	106.1363	1996M3	124.7475	2000M4	97.8178
1992M3	118.3299	1996M4	129.1601	2000M5	116.7180
1992M4	101.1485	1996M5	93.9643	2000M6	122.6732
1992M5	73.6892	1996M6	112.1252	2000M7	98.0675
1992M6	77.0846	1996M7	114.1062	2000M8	109.5979
1992M7	83.6303	1996M8	114.1770	2000M9	105.7583
1992M8	46.4118	1996M9	114.4224	2000M10	127.9761
1992M9	119.4532	1996M10	128.1883	2000M11	129.6603
1992M10	113.7991	1996M11	115.7311	2000M12	122.2142
1992M11	105.1336	1996M12	138.5339	2001M1	116.9945
1992M12	118.6222	1997M1	139.7258	2001M2	105.2279
1993M1	122.7103	1997M2	135.3751	2001M3	105.8019
1993M2	124.7216	1997M3	122.5178	2001M4	122.6207
1993M3	115.7573	1997M4	134.4620	2001M5	118.3507
1993M4	98.7652	1997M5	121.9490	2001M6	118.2465
1993M5	126.6061	1997M6	125.4804		
1993M6	120.9148	1997M7	120.8547		
1993M7	62.6480	1997M8	118.8520		
1993M8	88.8515	1997M9	105.5242		
1993M9	131.6691	1997M10	116.1496		
1993M10	126.3744	1997M11	107.2425		
1993M11	115.3238	1997M12	128.2175		
1993M12	129.4122	1998M1	135.0194		
1994M1	110.5034	1998M2	128.3300		
1994M2	94.6461	1998M3	128.5053		
1994M3	107.4143	1998M4	138.5559		
1994M4	73.7216	1998M5	128.3862		
1994M5	120.4602	1998M6	132.1760		
1994M6	115.3460	1998M7	115.2710		

Table 4

Change in Monetary Conditions Index of Pakistan (1999M6 – 2001M6)

OBS.	CMCI	OBS.	CMCI	OBS.	CMCI
1990M6	–1.2722	1994M7	7.4601	1998M8	–31.9535
1990M7	1.2082	1994M8	–29.2037	1998M9	–15.6403
1990M8	.0054508	1994M9	7.337	1998M10	59.5332
1990M9	–2.5687	1994M10	–5.3956	1998M11	–35.1857
1990M10	–1.3317	1994M11	21.7732	1998M12	16.0801
1990M11	2.6810	1994M12	.19794	1999M1	23.0668
1990M12	3.6570	1995M1	11.6601	1999M2	–20.2890
1991M1	.68418	1995M2	–8.3461	1999M3	–13.0125
1991M2	–1.7492	1995M3	–9.8049	1999M4	31.3044
1991M3	4.6445	1995M4	15.0211	1999M5	–14.8165
1991M4	–16.9928	1995M5	–7.4956	1999M6	–41.9779
1991M5	1.5712	1995M6	2.1752	1999M7	43.8252
1991M6	–.32186	1995M7	–7.1991	1999M8	–4.1742
1991M7	–13.1501	1995M8	5.8571	1999M9	–1.3651
1991M8	23.2474	1995M9	1.7545	1999M10	10.9259
1991M9	–6.9773	1995M10	–.76792	1999M11	–5.5626
1991M10	20.2359	1995M11	–12.6455	1999M12	3.4819
1991M11	–4.7500	1995M12	21.7096	2000M1	–7.8216
1991M12	–1.6759	1996M1	–1.7093	2000M2	–9.5025
1992M1	–3.7686	1996M2	–5.4849	2000M3	2.0048
1992M2	1.4907	1996M3	2.5116	2000M4	–6.3743
1992M3	12.1936	1996M4	4.4126	2000M5	18.9002
1992M4	–17.1814	1996M5	–35.1958	2000M6	5.9552
1992M5	–27.4593	1996M6	18.1609	2000M7	–24.6057
1992M6	3.3954	1996M7	1.9810	2000M8	11.53.5
1992M7	6.5456	1996M8	.070728	2000M9	–3.8396
1992M8	–37.2185	1996M9	.24543	2000M10	22.2178
1992M9	73.0413	1996M10	13.7659	2000M11	1.6842
1992M10	–5.6540	1996M11	–12.4572	2000M12	–7.4461
1992M11	–8.6656	1996M12	22.8027	2001M1	–5.2196
1992M12	13.4886	1997M1	1.1920	2001M2	–11.7666
1993M1	4.0881	1997M2	–4.3507	2001M3	.57398
1993M2	2.0113	1997M3	–12.8573	2001M4	16.8188
1993M3	–8.9643	1997M4	11.9442	2001M5	–4.2700
1993M4	–16.9921	1997M5	–12.5130	2001M6	–.10428
1993M5	27.8409	1997M6	3.5314		
1993M6	–5.6913	1997M7	–4.6257		
1993M7	–58.2667	1997M8	2.0027		
1993M8	26.2034	1997M9	–13.3278		
1993M9	42.8176	1997M10	10.6254		
1993M10	–52947	1997M11	–8.9071		
1993M11	–11.0505	1997M12	20.9749		
1993M12	14.0883	1998M1	6.8019		
1994M1	–18.9088	1998M2	–6.6894		
1994M2	–15.8573	1998M3	.17531		
1994M3	12.7682	1998M4	10.0506		
1994M4	–33.6927	1998M5	–10.1697		
1994M5	46.7385	1998M6	3.7898		
1994M6	–5.1141	1998M7	–16.9050		

series (MCISA) that is S_t = MCI / MCISA. As a second step we have estimated the long-term trend of the series. For this purpose we used Hodrick and Prescort (1997) method. Hodrick-Prescort method is two-sided linear filter that computes a smoothed series by minimising the variance of Y around S, that is

$$\Sigma\,(Y_t - S_t)^2 + \lambda\Sigma[(S_{t+1} - S_t) - (S_t - S_{t-1})]^2$$

where λ is penalty factor and it controls the smoothness of the series, larger the value of λ the smoother the series. The value of λ for the monthly series is proposed to be 14400. This Hodrick and Prescort trend line is plotted in Figure 3 along with the original seasonally adjusted MCI series. The figure gives interesting picture about the stance of monetary policy during the last decade. It indicates tightening of monetary policy for rate of inflation during early and mid nineties, that is from 1990 to March 1997. After that the stance of monetary policy seems to be easing. This trend of easing monetary policy continues till December 1999. However policy stance is still tight with respect to the base period. From January 2000 monetary policy seems to be putting pressure on the rate of inflation. This trend of increasing pressure on inflation goes on up to June 2001.

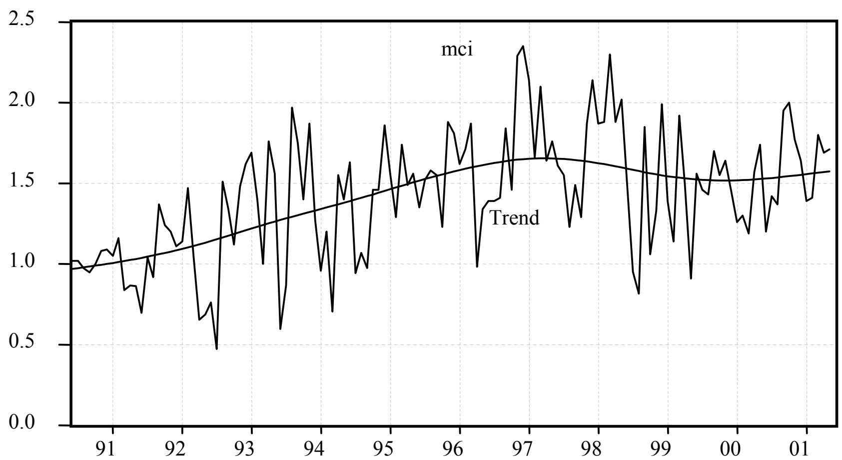

Fig. 3. Hodrick and Prescort Trend Line of MCI.

11. CONCLUSIONS AND POLICY RECOMMENDATIONS

This paper estimated Monetary Conditions Index (MCI) of inflation variable for Pakistan by using monthly data from June 1990 to June 2001. Before calculating MCI we have estimated weights of interest rate and exchange rate to be used in the construction of MCI. For this purpose we used unit root analysis and Johenson (1988) maximum likelihood method base on vector autoregressive technology. The estimated monetary conditions ratio for Pakistan is around 2.79:1. This is close to the estimated ratio of small developing countries as Turkey, Thailand etc. Finally we have constructed the MCI by utilising the estimated weights of rate of interest and exchange rate. For detailed analysis we decomposed the series into seasonal, trend, cycle and irregular factors. The trend factor is obtained by the application of Hodrick and Prescort (1997) filter. The analysis indicate overall tight monetary policy during the decade. However there is some easing spell during 1997 to 1999. This shows the determinedness of monetary authorities with objective of keeping inflation low. Low inflation at the end of the decade indicates the success of monetary authorities in the conduct of monetary policy in achieving the target of low inflation.

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