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Measures of Monetary Policy Stance: The Case of Pakistan

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ABSTRACT

In this paper we construct two measures of the monetary policy stance. The stance of monetary policy, regarded as a quantitative measure of whether the policy is too tight, neutral, or too loose relative to objectives of stable prices and output growth, is useful and important for at least two reasons. First, it helps the authority (central bank) to determine the course of monetary policy needed to keep the objective (goals) within the target range. Secondly, a quantitative measure of the stance is important for an empirical study of the transmission of monetary policy actions through the economy. Measuring the stance of the monetary policy free from any criticism, however, is not an easy task. As pointed out by Gecchetti (1994), "there seems to be no way to measure monetary actions that does not raise serious objections".

Our results show that an individual coefficient Monetary Condition Index (MCI) performs better than both the summarised MCI coefficient and the Overall measure proposed by Bernanke and Mihov (1998). The results show that in the 21-year period from 1984 to 2004, the demand shocks have dominated for about eight years. The MCI (IS-Individual coefficient) can explain six of them. However, it indicates the negative demand shock in two years as neutral. The other two measures, however, fail to capture demand shocks most of the time. This analysis suggests that the MCI (IS-Individual coefficient) plays an important role in determining output and inflation when the economy is not dominated by supply shocks. The results also show that supply shocks are dominant in the case of Pakistan. Furthermore, the exchange rate channel is more important than the interest rate channel.

JEL classification: E42, E52, E58

Keywords: Monetary Policy Measures, Monetary Condition Index, Composite Measures

1. INTRODUCTION

Monetary authority, with the responsibility of keeping the economy in the line with policy objectives, needs policy stance to full fill this responsibility. The stance of monetary policy is defined as quantitative measure of whether policy is too tight, Neutral or too loose relative to objectives (stable prices and output growth) of monetary policy.[1] Accurate measurement of policy stance is important for the evaluation of alternative theories of transmission, or to obtain quantitative estimates of monetary policy changes on output and inflation [Bernanke and Mihov (1998)]. Measuring the stance of monetary policy is, however, not an easy task. If the monetary policy is reaching to state of economy, then it is unlikely to influence the economic performance in the current period, however the exogenous part of monetary policy is likely to influence the economic performance.

A variety of empirical approaches have been used to measure the policy stance, by different researchers. The traditional approach is to use a single variable (such as monetary aggregate or discount rate) as policy measure. Friedman and Schwartz (1963) advocate the innovations in the monetary aggregates as a good approximate measure of monetary policy shocks. But some puzzling characteristics in subsequent economic development following money stock innovations have been identified for example 'liquidity puzzle"[2]. An increase in interest rate following the innovations in monetary aggregates is evident from empirical analysis [Leeper and Gordon (1992)]. Furthermore, money growth rate may not distinguish between changes in money demand and changes in supply. Besides financial innovations, deregulations rendered the use of money growth rates as measure of direction of policy. The recognition that traditional approach of identify monetary policy shocks with changes in monetary aggregate is misleading encouraged the Bernanke (1992) and Sims (1992) to use innovation in interest rate as a measure of monetary policy change. However, this created addition challenges known as "*price puzzle*"[3]. Another common puzzle is that positive innovation in interest rates is followed by depreciation of local currency rather than appreciation, *exchange rate puzzle* [Sim (1992) and Grilli and Roubini (1998)]. Therefore the use of the changes in

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[1]See Bernanke and Mihov (1998).

[2]With monetary contraction, the interest rate decreases rather than increases. See Sim and Zha (1998).

[3]With positive innovations in interest rate, the prices increase rather than decrease. See Sim (1990).

these variables as policy measure becomes ambiguous. To solve these problems some strategies have been pursued in the literature.

Some studied [Bernanke and Blinder (1992) and Sims (1992)] consider that the federal funds rate could be a better indicator of policy stance. However other [Christiano and Eichenbaum (1992)], suggest quantity of non-borrowed reserves as an indicator of monetary policy. But the problem with these measures of policy is that they presume a constant set of operating procedure by authorities (Fund-rate or non-borrowed reserves based procedure).

Strongin (1992) argued that authority is constrained to meet total resources demand in the short run, but can effectively tighten policy by reducing non-borrowed reserves and forcing banks to borrow more from the discount window. Econometrically, this approach has an edge over the earlier two approaches i.e. it is able to test alternative operating procedures (Bernanke-Blinder and Christiano-Eichenbaum). Though the main focus of all the three studies are on the measurement of monetary policy innovation, these also suggest some potentially interesting indicators of overall policy's stances. Armour, *et al*. (1996) is of the view that innovation in overnight rate could be a good measure of policy innovations in case of Canada's monetary policy. Fung and Kasumovich (1998) suggest that M_1 innovations produces inputs responses that are consistent with what one would expect from a monetary policy shock. Several authors [e.g. Laurent (1988); Goodfriend (1991) and Oliner and Rudebusch (1996)] have suggest the term spread as an alternative measure of policy. They based their argument on Central bank actions to change shot-term interest rate and market participant's expectations about this change. For example if they expect the short-term rate to return gradually back to the starting value in future, then long rate will change less than short rate, on the other hand if market participants expect that this change is just the first stage of longer sequence of change, then long rate will move by more than short rate. Therefore, term spread i.e. difference between short-term rate and long-term rate is important to include in monetary policy analysis.

All these studies assumed *a priori* that a single financial variable is the best policy indicators. However, there exists little agreement on which single variable must accurately captures the stance of policy [Bernanke and Mihov (1998)].

Due to the disagreement about the use of single variable as a policy indicator, the composite measures have been developed and used as a policy indicator. The Bank of Canada uses monetary condition index (MCI), which is weighted sum of changes in interest rate and exchange rate from given base period, as measure of policy stance. MCI, however, is criticised due to many reasons. First, is that it reflects changes in interest rate and exchange rate that are not related to central bank policy. Second, MCI does not consider other financial variables that may be important in transmission mechanism.

Bernanke and Mihov (1998) suggested a VAR methodology that can include all the policy variables previously proposed for the United States as particular specifications of general model. This approach need not assume that a single variable is the best indicator of monetary policy. Fung and Yuan (2001) apply Bernanke and Mihov methodology to Canada. They assumed policy stance, though unobserved, is reflected in the behaviour of financial variables. They consider four financial variables, M_1, the term spread, the overnight rate, and exchange rate.

Romer and Romer (1989) adopted a “narrative approach” to address the identification problems highlighted by the time series models. Based on their reading of Federal Reserve documents, the Romers’ created a dummy variable for periods when the Fed contracted to offset inflationary pressures. They argued that responses of out-put and unemployment to such identified monetary policy contractions demonstrates that monetary policy has strong and persistent real effects on the economy.

This measure of monetary policy shocks got acceptance as a standard indicator of monetary policy [Norrbin (2000)]. The appealing aspects of this approach are that it uses additional information and is nonparametric[4]. But this approach suffers from the problems of subjectivity and endogeniety [Leeper (1993, 1997) and Sims and Zha (1993)].[5] Furthermore it considers movements in only contractionary direction, besides makes no distinctions between mildly and severely contractionary episodes [Bernanke and Mihov (1998)].

Boschen and Mills (1991) developed a monthly index that not only considers the expansionary episodes but also makes distinctions between “strongly”, “neutral”, and “mildly contractionary/expansionary” episodes. Though more information are used in this measure and it also provides a more continuous measure than Romer’s does but other two problems i.e. subjectivity and endogeniety becomes more severe.

Bagliano, *et al.* (1999) further extended this narrative approach to an open economy. But identification of interest rate movements as monetary policy changes becomes more difficult due to simultaneity problem of exchange rate and interest rate [Norbin (2000)]. Other also attempt to extend the Romer’s approach [for example Skimmer and Zettelmeyer (1996) and Rudebusch (1996)]. Skimmer and Zettelmeyer use a change in three months interest rate instead of dummy. However, this approach also suffers from endogeneity problem [Norrbin (2000)]. Rudebusch (1996) creates an unexpected change in interest rate from 30-day Fed fund contracts. The problem with this estimate is that it measures all unexpected movements in

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[4]See Bernanke and Mihov (1998).

[5]The problem of subjectivity arises as this approach depends on the interpretation of economists as some one has to interpret the central bank action to determine whether shock has occurred.

interest rate not only such that associated with Federal Reserve announcements [Norrbin (2000)].

There is only study for Pakistan by Qayyum (2002) that measures Monetary Condition Index. Our study is different in that we construct two composite measures i.e. Monetary Condition Index (MCI) and measure developed by Bernanke and Mihov (1998). We then compare both measures on the basis of performance criteria i.e. the consistency of estimated weights with economic theory, visual inspection *vis-à-vis* output growth as well as changes in inflation (Graphical inspection of turning points), its dynamic correlation with output and growth and inflation. We use monthly data from 1982 to 2005 for Pakistan.

The plan of the study is as: in Section 2 methodologies are discussed, the empirical results are given in Section 3, in Section 4 a comparison of the two measures is made, while Section 5 summarises.

2. METHODOLOGY

In this section, we present the methodologies to construct two composite measures i.e. MCI and overall measure [developed by Bernanke and Mihov (1998)].

2.1. Monetary Condition Index (MCI)

The bank of Canada was first to develop and use MCI as policy indicator. The MCI is a weighted sum of changes in short term interest rate and exchange rate relative to the values in a base period. Algebraically

$$MCI_t = \omega_{er}\,(er_t - er_0) + \omega_i\,(i_t - i_0)$$

Where ω_e and ω_i are weights assigned to exchange rate and interest rate, $t = 0$ is base period, and $\omega_{er} + \omega_i = 1$.

MCI is, however, subject to many criticisms [Ericsson, *et al.* (1998); Batini and Nilson (2002)]. These include: Model dependency, ignored dynamics, parameter inconsistency, and non-exogeneity of regressors.

In light of criticism on MCI, Gauthier, *et al.* (2004) suggested some methods that could improve the construction of MCI. In the first method weights are derived from reduced form IS-PC Framework. The weights are obtained by summing up the coefficients on the lags variables as well as by including individual lags in MCI to take into account the dynamics of those variables over time. The second method derives weights based on generalised impulse-response function from a VAR, and the 3rd method derives weights based on factor analysis. The last two methods avoid the non-exogeneity and model dependency problem. We use 1st method to derive weights. This method was first adopted in the construction of MCI at Banks of Canada. [i.e. Duguay (1994)] and is a popular methodology. Model used for this purpose usually consist of an IS-Philips curve. For example, in Duguay (1994), the IS curve relates the components of the MCI (the interest rate and exchange rate) to output growth controlling for external output, commodity prices, and fiscal policy. The Phillips curve provides the relationship between the output gap and inflation, controlling for expectation.

We adopt a framework similar to this approach. Our model consist of a backward-looking IS curve and a backward-looking Phillips curve.

$$Y_t = \alpha 1 + \sum_{t=1}^{n} \sum_{j=1}^{ni} \lambda_{i,j} x_{t-j} + \sum_{k=1}^{p} \gamma_k y_{t-k} + \varepsilon_{yt} \qquad \ldots \qquad \ldots \qquad (1)$$

$$\pi_t = \alpha_2 + \sum_{i=1}^{m1} \beta_{1i} \pi_{t-i} + \sum_{j=1}^{m2} \beta_{2j} y_{t-j} + \varepsilon_{\pi t} \qquad \ldots \qquad \ldots \qquad \ldots \qquad (2)$$

Where Y_t is output (manufacturing production index MPI as proxy in case of monthly data), π_t is inflation rate, x_i is component i of MCI, here x = {interest rate, exchange rate}.

2.2. The Bernanke and Mihov Overall Measure[6]

Bernanke and Mihov (1998) use a semi structural VAR-based methodology to construct a composite measure of policy stance. This measure is a linear combination of all the potential candidates of policy indicators. The advantage of this approach over MCI is that it considers financial variables which may be important in monetary transmission mechanism. This method has several advantages over other approaches as suggested by Bernanke and Mihov (1998). First, it nests the quantitative indicators of monetary policy. Second, it is applicable to other countries and periods, and to alternative institutional setups. There methodology is discussed below.

Suppose that the “true” economic structure is the following unrestricted linear dynamic model:

$$Y_t = \sum_{i=0}^{K} B_i Y_{t-i} + \sum_{i=0}^{K} C_i P_{t-i} + A^y V_t^y \qquad \ldots \qquad \ldots \qquad \ldots \qquad \ldots \qquad (3)$$

$$P_t = \sum_{i=0}^{K} D_i Y_{t-i} + \sum_{i=0}^{K} G_i P_{t-i} + A^p V_t^p \qquad \ldots \qquad \ldots \qquad \ldots \qquad \ldots \qquad (4)$$

Where B_i, C_i, A^y, G_i and A^p are square matrix of coefficients. Y is non-policy block of variables and P is block of policy variables. Variables included in non-policy block are real GDP(y), CPI (p), and world commodity price (wcp). World commodity price are used to avoid price puzzle. Variables included in policy

[6]This section heavily depends on Bernanke and Mihov (1998).

block are call money rate (i), exchange rate(er), term-spread (ts), and monetary aggregate (m_2).

One element, say V^s of the set of shocks V_t^p in Equation (4) can denotes the shock to monetary policy. For the identification of V^s and dynamic responses to shock, we assume that innovations to variables in policy block do not affect variables in non policy block within that period i.e., C_0=0. So Equations (3) and (4) can be written as:

$$Y_t = \sum_{i=0}^{K} H^y Y_{t-i} + \sum_{i=0}^{K} H^p P_{t-i} + U_t^y \quad \ldots \quad \ldots \quad \ldots \quad \ldots \quad (5)$$

$$P_t = \sum_{i=0}^{K} J^y Y_{t-i} + \sum_{i=0}^{K} J^p P_{t-i} + \left[(I - G_0)^{-1} D_0 U_t^y + U_t^p \right] \quad \ldots \quad \ldots \quad (6)$$

Comparison of Equations (5) and (6) with Equations (3) and (4) implies that

$$U_t^y = (I - B_0)^{-1} A^y V_t^y \, and \; U_t^p = (I - G_0)^{-1} A^p V_t^p$$

$$or$$

$$U_t^p = G_0 U_t^p + A^p V_t^p \quad \ldots \quad \ldots \quad \ldots \quad \ldots \quad \ldots \quad (7)$$

Equation (7), a standard structural VAR system, relates observable VAR-based residuals U_t^p to unobservable structural shocks V. The inversion of the Equation (7) gives us structural shocks U_t^p including the exogenous monetary shock V^s.

Therefore we can write Equation (8) as

$$V_t^p = (A^p)^{-1} (I - G_0) U_t^p \quad \ldots \quad \ldots \quad \ldots \quad \ldots \quad \ldots \quad (8)$$

Given the estimates of the VAR we can obtain the following vector of variables.

$$(A^p)^{-1} (1 - G_0) p \quad \ldots \quad \ldots \quad \ldots \quad \ldots \quad \ldots \quad \ldots \quad (9)$$

Estimated linear combination of policy variables included in P can be used to measure policy stance, including both endogenous and endogenous portions of policy, shock to this measure represents the exogenous monetary policy shock.

We can write relationship between U and V in matrix form as

$$\begin{bmatrix} 1 & \beta & 0 & 0 \\ 0 & 0 & 0 & 0 \\ 0 & 0 & 1 & 0 \\ \gamma_1 & \gamma_2 & \gamma_3 & 1 \end{bmatrix} \begin{bmatrix} U_m \\ U_{ts} \\ U_i \\ U_{er} \end{bmatrix} = \begin{bmatrix} 1 & 0 & 0 & 0 \\ \alpha^d & 1 & \alpha^s & \alpha^x \\ \phi^d & \phi^d & 1 & \phi^x \\ 0 & 0 & 0 & 1 \end{bmatrix} \begin{bmatrix} V^d \\ V^b \\ V^s \\ V^x \end{bmatrix} \quad \ldots \quad \ldots \quad (10)$$

Equation (10) can be inverted to determine how the monetary policy shock, V^s, depends on the VAR residuals.

Therefore we can write policy shock as,

$$V^s = \omega_m U_m + \omega_{ts} U_{ts} + \omega_i U_i + \omega_{er} U_{er} \qquad \dots \qquad \dots \qquad \dots \quad (11)$$

In similar way other structural shocks can be obtained.

Equation (11) shows that monetary policy shock is a linear combination of all VAR residuals in policy block, with weight on each variable as given above. A measure of policy can be constructed using same corresponding weight on variables.

Model is under identified as 14 unknowns are to be estimated from 10 residual variances and covariance. We need four more restrictions for identification of model. Bernanke and Mihov (1998) impose enough restrictions to just identify the model, which allows the derivation of a measure of policy stance as a linear combination of all the policy variables. We adopt the same strategy by choosing restrictions in such a way that weight on each variable remain non-zero and avoiding the imposition of too many restrictions.

For identification purpose we impose restrictions as follow,

$$\gamma_1 = 0, \gamma_2 = , \gamma_3 = 0 \ \ and \ \ \varphi^d = 0 \qquad \dots \qquad \dots \qquad \dots \qquad \dots \quad (12)$$

First three restrictions imply that the innovations in exchange rate do not respond to any other variable contemporaneously and this is purely stochastic. The last restriction implies that the bank fully offsets the shock to money demand to keep the overnight rate from changing. Therefore we can write weights as:

$$\omega_m = \frac{\left[\left(\phi^b \alpha^d\right)\right]}{\left(1 - \phi^b \alpha^s\right)}, \quad \omega_{ts} = \frac{\left[\left(\phi^b \alpha^d\right) B - \phi^b\right]}{\left(1 - \phi^b \alpha^s\right)},$$

$$\omega_i = \frac{1}{\left(1 - \phi^b \alpha^s\right)}, \text{ and } \ \omega_{er} = \frac{\left(\phi^b \alpha^x - \phi^x\right)}{\left(1 - \phi^b \alpha^s\right)}$$

We can obtain policy shock using Equation (11)

3. EMPIRICAL RESULTS

In this section we present the empirical results for the two measures discussed in previous section. Since some of the data series are not stationary, we take appropriate difference on the basis of seasonal unit root test, to make the series stationary.[7] We take first difference of m_2, wcp, and s as we find the unit roots at zero frequency in case of all these series. However, we the take 12th difference of y as we find the seasonal unit roots at π/6 frequency. We use these differences in further analysis.

(i) Monetary Condition Index

We estimate the Equations (1) and (2) and obtained following results for the two equations.

$$\begin{aligned} y_t = & -0.48\,y_{t-1} - 0.46\,y_{t-2} - 0.45\,y_{t-3} - 0.58\,y_{t-4} - 0.55\,y_{t-5} - 0.58\,y_{t-6} \\ & - 0.56\,y_{t-7} - 0.59\,y_{t-8} - 0.55\,y_{t-9} - 0.43\,y_{t-10} - 0.30\,y_{t-11} - 7.7\,er_t \\ & - 10.2\,er_{t-2} - 11.3\,er_{t-5} + 10.8\,er_{t-14} - 0.002\,i_{t-1} - 0.002\,i_{t-10} - 0.002\,i_{t-12} \end{aligned}$$

and

$$\begin{aligned} \pi_t = & -0.8\,\pi_{t-1} - 0.8\,\pi_{t-2} - 0.6\,\pi_{t-3} - 0.6\,\pi_{t-4} - 0.5\,\pi_{t-5} - 0.4\,\pi_{t-6} - 0.5\,\pi_{t-7} \\ & - 0.5\,\pi_{t-8} - 0.3\,\pi_{t-9} - 0.4\,\pi_{t-10} - 0.2\,\pi_{t-11} - 3.5\,y_{t-12} \end{aligned}$$

weights for summarised coefficients MCI are obtained as:

$$\omega_1 = 7.7 + 10.2 + 11.3 + 10.8 = 40.07$$

$$\omega_2 = 0.002 + 0.002 + 0.002 = 0.006$$

$$\omega_e = \frac{\omega_1}{\omega_1 + \omega_2} = \frac{40.07}{40.08} = 0.999$$

$$\omega_i = \frac{\omega_2}{\omega_1 + \omega_2} = \frac{0.006}{40.08} = 0.001$$

We take only those coefficients which are statistically significant[8]. Weights for individual coefficients MCI are obtained by dividing individual coefficients on sum= $\omega_1 + \omega_2$. i.e. $\omega_{i,t-j} = \dfrac{jth \quad lag \quad coefficient}{\omega_1 + \omega_2}$, where i=1, 2, 1 stands for exchange rate and 2 for interest rate and j for lag corresponding to the coefficient. These weights are given in the Table 1 below.

[7]Seasonal unit root test is employed following Beaulieu and Miron (1993), who extended the HEGY (1990) procedure to monthly context. Result are not reported here to save the time and space.

[8]Our Philips curve does not play any role in analysis, beyond ensuring theoretical desirable properties of our observed data.

Table 1

Weights for Individual Coefficients

$\omega_{1,t}$	$\omega_{1,t-2}$	$\omega_{1,t-5}$	$\omega_{1,t-14}$	$\omega_{2,t-1}$	$\omega_{2,t-10}$	$\omega_{2,t-12}$
0.19	0.26	0.28	0.27	0.00004	0.00004	0.00005

We then constructed monetary condition index (summarised coefficient) as:

$MCI_t = \omega_e\,(er_t - er_0) + \omega_i\,(i_t - i_0)$, we chose 1992:02 as base period.

Then monetary condition index (individual coefficient) is constructed as:

$MCI_t = \sum\omega_{i,t\text{-}j}\,(x_{i,t-j} - x_{i0})$, where x_{i0} is value of variable in the base period.

(ii) Bernanke and Mihov Measure

We estimate the seven variables model given by (5) and (6) using vector autoregressive methodology. The variables included in non-policy block are; industrial production index, inflation rate, and world commodity prices. While in policy block we include; monetary aggregate M_2, interest rate spread, exchange rate, and market interest rate. We store the reduced form residuals so obtained and then use these residuals to obtain the values of β, α^d, α^s, α^x, ϕ^b, and ϕ^x by putting restrictions given by (12). These values are given in Table 2 below.

Table 2

Estimates of Parameters

β	0.01(3.4)
α^d	10.8(4.1)
α^s	–0.9(2.97)
α^x	27.9(5.2)
ϕ^b	–0.9(2.5)
ϕ^x	10.1(1.98)

All the parameters estimated are statistically significant. The market interest rate elasticity of money demand, β, is estimated to be 0.01. α^d has a positive sign and significant which implies that when a positive demand shock occurs, market rate rises to clear the market. The parameter estimate $\alpha^s = -0.9$ shows that term spread declines 90 basis points when market rate rises by 100 points. The sign could be positive or negative depending upon which of the two offsetting effects of monetary policy shock i.e. liquidity effect and expected-inflation effect is dominant. The estimated value of the parameter ϕ^b is –0.9 implies that when appositive innovation occurs in term spread. The market rate is raised in response to unexpected currency depreciation, resulting in positive sign of ϕ^x. An unexpected currency depreciation would lead to an increase in market rate, hence $\alpha^x>0$.

We obtained weights ω_m, ω_{ts}, ω_i, and ω_{er} using Equation (13). These weights are normalised i.e. $\sum\omega_j = 1$ and given below.

Table 3

Weights for the Overall Measure

ω_m	ω_{ts}	ω_i	ω_{er}
–0.20	0.02	0.02	–0.75

Then we obtained over all measure as:

$V^s = \omega_m m_t + \omega_{ts} ts_t + \omega_i i_t + \omega_{er}\, er_t$

4. MONETARY CONDITION INDEX VERSUS THE BERNANKE-MIHOV MEASURE

Regarding the first criteria by which we judge the performance of our different policy measures is consistency of estimated weights with economic theory, the inspection of tables above reveals that our summarised coefficient MCI has estimated weights for market interest rate(*i*) and real exchange rate(*er*), –0.0001 and –0.999 respectively. The weights for interest rate(*i*) has negative sign, as higher interest rate mean lower investment and hence lower output growth. The weight of real exchange rate is also negative, however it could be positive or negative as it effect economic activities in different ways and sign depends upon which of effects is dominant. The weight for interest rate is much smaller as compared to exchange rate, which shows that exchange rate has dominant role in the economy.

The weights obtained for individual coefficients MCI are all negative (as coefficients of both exchange rate and interest rate are negative for all lags).

The weights obtained for Bernanke-Mihov Measure are also consistent with theory. The weight for market interest rate is positive which mean higher interest implies strong monetary policy and vice versa. The sign of weight for exchange rate is negative which means that appreciation of domestic currency implies lose monetary policy which could be possible because of multidimensional effects of exchange rate on output growth. The weight for monetary aggregate M_2 is negative which implies higher growth of M_2 will result into higher output growth i.e. lose monetary policy. The weight for interest rate spread is also positive which means that if short run rate is higher relative to long-run rate, this implies expansionary monetary policy. We want to make here clear that the weights for two measures are obtained using different techniques; therefore these are interpreted in different ways. The weights for MCI are obtained by OLS regression of *y* on *i* and *er* while weights for Bernanke-Mihov Measure are obtained by using VAR approach. second criterion is to see the Dynamic Correlations between Output-Growth/change in Inflation and different measures. We can see in Table 4 below that MCI (IS-individual coefficients) has stronger and negative correlations with output-growth at different lags. Although MCI (IS-summarised coefficients) has higher

Table 4

Dynamic Correlations between Output-Growth/ Inflation and Different Measures

	Different Measures					
	MCI (IS-individual Coefficients)		MCI (IS-summarised Coefficients)		Bernanke-Mihov Measure	
Leads Months	Output Growth	Changes in Inflation	Output Growth	Changes in Inflation	Output Growth	Changes in Inflation
0	–0.08	0.03	–0.13	–0.02	0.02	0.01
1	–0.14	0.05	–0.01	0.04	–0.06	0.03
2	–0.07	0.02	–0.08	–0.02	0.03	–0.01
3	–0.07	–0.05	–0.07	–0.01	0.04	–0.10
4	–0.10	0.08	–0.04	–0.05	–0.02	0.09
5	–0.10	–0.01	–0.03	–0.05	–0.03	–0.03
6	–0.13	0.04	–0.002	0.03	–0.04	0.03
7	–0.06	0.08	–0.07	–0.04	0.04	0.08
8	–0.11	–0.01	–0.001	–0.10	–0.01	–0.02
9	–0.07	–0.01	0.04	0.03	0.02	–0.06
10	–0.11	0.09	–0.08	–0.01	–0.003	0.08
11	–0.07	0.04	–0.12	–0.07	0.03	0.02
12	–0.13	–0.02	0.07	–0.07	–0.05	–0.05

correlation with output-growth at zero and 11th lags but MCI (IS-individual coefficients) has stronger correlations at other lags. The correlations of Bernanke-Mihov Measure are low with both output-growth and change in inflation almost at all lags.

The third criterion by which we compare the performance of our measures is visual inspection *vis-à-vis* output growth as well as changes in inflation (Graphical inspection of turning points). Figure 1 compares different measures with output-growth while Figure 2 compares different measures with change in inflation. Figure 1(a) and Figure 1(b) show that both MCIs perform well as upturns of output-growth match with downturns of MCIs and vice versa, which implies that higher output-growth is associated with expansionary policy while lower output-growth is associated with tighter monetary policy. Figure 1(c) shows that Bernanke-Mihov Measure catches the turning points of output-growth in advance only after 2000. Similar conclusions can be drawn from the inspection of Figure 2. In this case upturns and downturns of MCIs catch respectively the downturns and upturns of change in inflation in advance. This confirms the idea that inflation responds slowly, as compared to output-growth, to policy induced change and policy has real effects in short run. On the basis of performance criteria the summarised coefficient MCI works well.

Fig. 1(a). Output and MCI (Individual Coefficient)

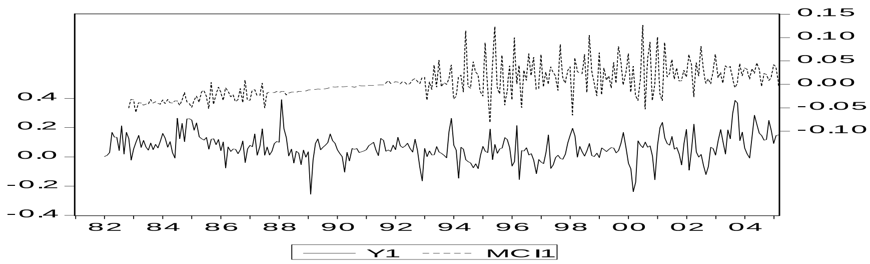


Fig. 1(b). Output and MCI (Summarised Coefficient)

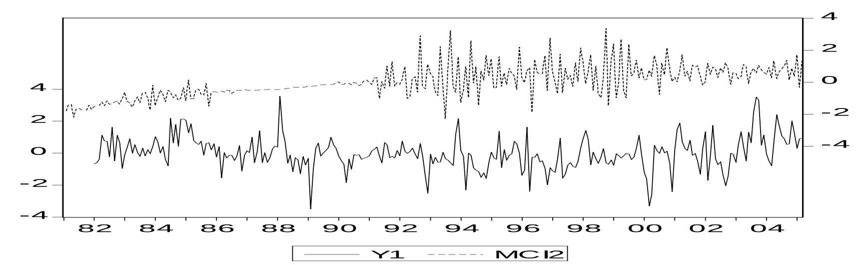


Fig. 1(c). Output and Overall Measure

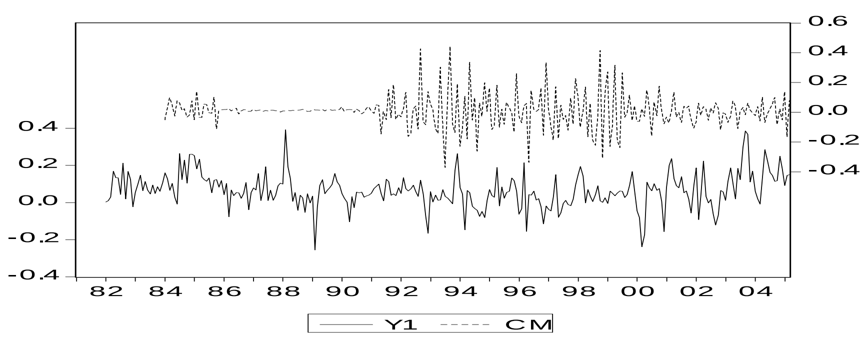


Fig. 2(a). Inflation and MCI (Individual Coefficient)

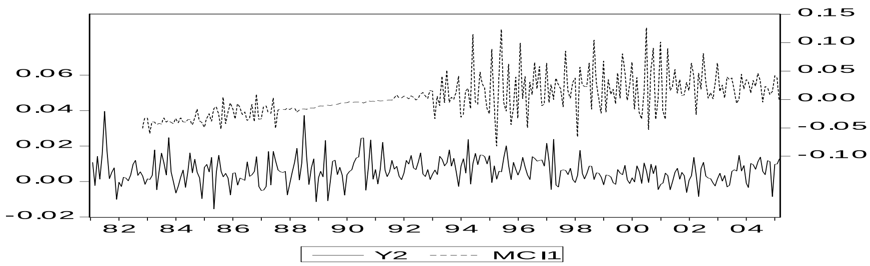


Fig. 2(b). Inflation and MCI (Summarised Coefficient)

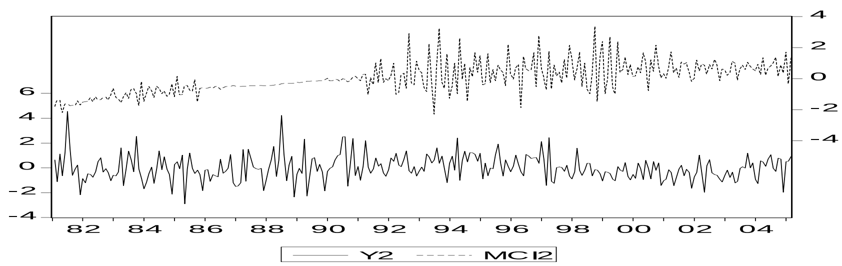
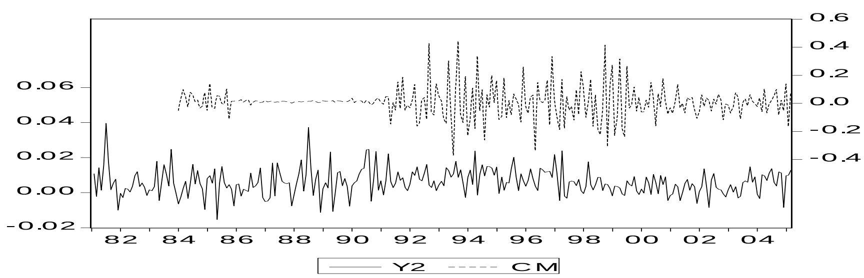


Fig. 2(c). Inflation and Overall Measure



The stance indices from 1984 to 2004 and 1-year output growth and changes in inflation for each year are presented in table 5 below.[9] The stances are normalised to a scale of –2 to 2: –2 to –1 denotes" very loose" to "mildly loose", 0 denotes "neutral", 1 to 2 denotes "mildly tight" to "very tight". In last column, each year is labeled as demand shock (D)- or supply shock (S)-dominated according to co-movements of output growth and inflation. In any given year, if output and inflation move in same direction, the year is considered to be demand-shock-dominated; otherwise it is considered as supply-shock-dominated. If output and inflation both increase together then it is positive demand shock and if both decrease together then it is negative demand shock. Similarly if output increases but inflation decreases then

[9]The indices for each year are the average of the months of that year. Same is for output growth and changes in inflation.

it is positive supply shock and if the case is opposite then it is negative supply shock. In 21-year period from 1984 to 2004, we see that demand shocks have dominated for about 8 years. MCI (IS-Individual coefficient) can explain 6 of them (assuming that policy affects the economy with a lag of 1-year): 1985; 1990; 1994-95; and 1999-2000. Policy indicates the negative demand shock in 1988 and 1992 as neutral. The other two measures, however fail to capture demand shocks most of the times. This analysis suggests that MCI (IS-Summarised coefficient) plays an important role in determining output and inflation when the economy is not dominated by supply shocks.

Table 5

Numerical Presentation of Policy Stance, 1984 to 2004

Year	$Y_t – Y_{t–12}$	$\pi_t\ \pi_{t–12}$	MS(MCI1)	MS (CM)	MS(MCI2)	D or S
1984	0.100396	–0.00316	2	–2	–1	+s
1985	–0.13393	–0.01552	0	–2	–1	–d
1986	0.011812	–0.00746	1	–1	0	+s
1987	0.026458	–0.00243	0	–1	0	+s
1988	–0.10167	–0.01009	0	–1	0	–d
1989	0.057374	–0.00985	1	–1	0	+s
1990	–0.0072	–0.00251	1	0	0	–d
1991	0.03038	–0.00575	0	0	0	+s
1992	–0.21404	–0.00367	0	0	0	–d
1993	0.203708	–0.00691	1	0	0	+s
1994	–0.0683	0.001217	1	0	0	–s
1995	–0.00823	–0.00794	–1	0	0	–d
1996	0.043372	0.005055	1	1	0	+d
1997	0.130508	–0.02054	–2	1	0	+s
1998	–0.12201	0.003003	–2	1	1	–s
1999	0.064699	0.000671	1	1	1	+d
2000	–0.11179	–0.00653	0	1	1	–d
2001	0.010272	–0.00445	–1	1	1	+s
2002	–0.17505	0.000907	–1	1	1	–s
2003	0.00848	–0.00493	–1	1	1	+s
2004	0.120503	–0.00758	0	1	1	+s

5. SUMMERY AND CONCLUSIONS

In this paper we provide a brief detail of different measures of policy stance discussed in the literature. The stance of monetary policy, regarded as a quantitative measure of whether policy is too tight, Neutral or too loose relative to objectives of stable prices and output growth, is useful and important for at least two reasons. Firstly it helps the authority (central Bank) determine the course of monetary policy needed to keep the objective (goals) with in the target range. Secondly, a quantitative measure of stance is important for empirical study of the transmission of monetary policy actions through the economy. Measuring the stance of monetary policy free from criticism is, however, not an easy task. As rightly pointed out by Gecchetti (1994) that" there seems to be no way to measure monetary actions that does not raise serious objections.

A variety of empirical approaches have been used to measure the policy stance, by different researchers. Traditionally changes in interest rate or some monetary aggregates were considered as monetary policy stance. But some puzzling characteristics were associated with these changes. To solve this problem two basic strategies have been pursued in the literature. The first in "the narrative approach" and second approach is in the tradition of "vector auto regression (VAR) literature". Earlier VAR approaches consider shocks to a single variable an exogenous policy indicator. But there is disagreement on which single variable must accurately captures the stance of policy. This disagreement encourages the researchers to use composite measures that includes monetary condition index and an overall measure developed by Bernanke and Mihov. Though MCI is considered an improvement over other policy indicators it is subject to many criticisms. The Bernanke and Mihov approach is assumed to be advantageous over MCI as it considers financial variables which may be important in monetary transmission mechanism. It nests the quantitative indicators of monetary policy. It is applicable to other countries and periods, and to alternative institutional setups. In this paper, an attempt is made to avoid some of the drawbacks of MCI. We also construct measure developed by Bernanke and Mihov. We compare these measures on the basis of certain performance criteria i.e. the consistency of estimated weights with economic theory, visual inspection vis-à-vis output growth as well as changes in inflation (Graphical inspection of turning points), its dynamic correlation with output and growth and inflation. The individual coefficients MCI perform better than both summarised coefficient MCI and Bernanke-Mihov Measure. The results show that in 21-year period from 1984 to 2004, the demand shocks have dominated for about 8 years. MCI (IS-Individual coefficient) can explain 6 of them. However, it indicates the negative demand shock in two years as neutral. The other two measures, however fail to capture demand shocks most of the times. This analysis suggests that MCI (IS-Summarised coefficient) plays an important role in determining output and inflation when the economy is not dominated by supply shocks. The results also show that supply shocks are dominant in case of Pakistan. In such a situation, monetary policy is less likely to be effective. For example, the contractionary policy in response of negative supply shock will further accelerate the inflation rather than reducing it. Furthermore, empirical findings suggest that exchange rate channel has dominating role over the interest rate channel in Pakistan. So exchange rate could be a better policy instrument to control the economy. However, this could be dangerous as volatility in exchange rate may result into inflation as well as output growth's uncertainty and makes monetary policy more complicated.

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