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Muhammad Nadim Hanif
Sajawal Khan
Muhammad Rehman

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Muhammad Nadim Hanif, Sajawal Khan, Muhammad Rehman

Abstract

This paper estimates monetary policy stance measures like Monetary Conditions Index (MCI), Financial Conditions Index (FCI), and Bernanke and Mihov Index (BMI) for Pakistan. The estimated monetary policy stance guides whether the policy is tight, neutral or loose relative to its objectives. And thus, it may help policy maker adjusting policy instrument(s) to guide the economy in desired direction. It also helps in knowing which monetary policy transmission channel is more effective along with the impact of various monetary policy measures upon the desired goals. Despite the fact that supply shocks are found to be dominant in Pakistan which gives little room to monetary policy to play an effective role as stabilizing tool, movements in exchange rate and monetary aggregates turned out to be more important than the interest rate in policy transmission mechanism. Being a small open economy facing persistent current account deficits, exchange rate consideration thus played major role in monetary policy transmission in Pakistan. State Bank of Pakistan had been targeting monetary aggregate until recently and just recently started active use of interest rate as policy instrument. It may take some time for interest rate channel to take lead. The comparison of different estimated measures shows that MCI performs better as measure of monetary policy stance (compared to FCI and BMI) in the case of Pakistan.

JEL Classification: E440, E520

Keywords: Financial markets and macroeconomy, monetary policy

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Contact for correspondence:

Sajawal Khan,
Senior Joint Director, Research Department,
State Bank of Pakistan,
I.I. Chundrigar Road,
Karachi 74000, Pakistan.
Email: sajawal.khan@sbp.org.pk

Non-technical summary

The formulation of effective monetary policy requires better understanding of linkages among different economic and financial variables. Since policy induced changes propagate through complex transmission mechanism to the economy, different economic agents react in different ways and with different time lags. Furthermore, tradeoffs between different goals make the task of multiple goals targeting by monetary authority even more difficult. Keeping in mind such complexity, central bank designs its policies to achieve its goals in the best possible way. Central bank needs some quantitative measures of the policy stance to judge whether its policy is aligned with the objectives of the monetary policy. It helps monetary authority in adjusting policy, if required, by desired movements of relevant instruments. It also helps in identifying the relative importance of different channels through which the policy induced changes propagate to the policy goals.

The stance of monetary policy is defined as a quantitative measure of whether policy is tight, neutral or loose relative to objectives (stable prices and output growth) of monetary policy (Fung and Yuan (2001)). Despite its importance, the economists do not have consensus about what measures policy stance in a better and reliable way. Due to the lack of consensus, a variety of measures have been suggested ranging from single variable to composite index of several variables. This study attempts to construct and compare different composite measures including a) monetary condition index (MCI), b) financial condition index (FCI) and c) Bernanke and Mihov index (BMI) for monetary policy stance in Pakistan covering the 1993-2012 period.

Our results show that in the case of Pakistan, during the last two decades, movements in exchange rate and monetary aggregates were more important than the interest rate changes for transmission of monetary policy. The comparison of different measures shows that MCI performed relatively better as a measure of policy stance. Nonetheless, overall performance of these measures seems not up to the mark as indicators of demand pressures. The main problem is that supply shocks are dominant in case of Pakistan. This leaves smaller room for monetary policy to play an effective role as a shocks stabilizer. Despite some weaknesses, these measures provide useful insights for the formulation of monetary policy while assessing its impact on the final goals.

1. Introduction

The formulation of effective monetary policy requires better understanding of how monetary policy affects the economy under consideration; particularly the real economic growth and inflation. Different economic agents react differently to various policy decisions, including the monetary policy. It makes the time lag and the overall impact of monetary policy actions upon desired variables uncertain. Furthermore, central banks use more than one policy instruments, as per requirement and objective(s), with reference to prevailing (and expected) economic situation. Sometimes, they use different policy measures, simultaneously or over a (staggering) period of time. The use of multiple policy instruments (implicitly or explicitly) by a central bank and uncertainty in the resultant outcome necessitates to have a 'single measure of monetary policy' to gauge (monetary) authority's stance.

The stance of monetary policy is defined as "a quantitative measure of whether policy is tight, neutral or loose relative to objectives (stable prices and output growth) of monetary policy"[1]. Such a measure helps policy makers adjusting policy instrument to take economy to the desired direction/level. It is imperative not only for evaluation of alternative theories of monetary policy transmission but also for quantifying the impact of policy changes on the final goals [Bernanke and Mihov (1998)]. Despite its importance, economists could not reach a consensus about what measures policy stance in a better and more reliable way. Consequently, a variety of measures are used ranging from single variable to composite index of a set of variables. Though literature is rich on the subject, very few attempts have been made for the case of Pakistan (like Qayyum (2002), Hayder and Khan (2006), Khan and Qayyum (2007)). These studies focus only on monetary conditions index as 'weighted average of deviations of interest rate and exchange rate from their given (base period) levels.' These studies do not consider the other alternatives identified in the literature. These alternative approaches use a larger set of variables, especially the assets prices[2].

We attempt to estimate different composite measures both monetary conditions index (MCI) and financial conditions index (FCI) in addition to another such index developed by Bernanke and Mihov (1998) – BMI; for the case of Pakistan using monthly data from January 1993 to December 2012[3]. This study not only provides a comparison of different measures on the basis of certain criteria but also helps identifying the relative importance of different channels through which the (monetary) policy induced changes propagate to the goals. Before estimating the indices for monetary policy stance of Pakistan; first we give a brief overview of the development of conceptual literature on this, along with the methodological description on estimating such indices.

2. Development of Literature on Monetary Policy Stance

Traditionally a single variable (such as monetary aggregates or interest rate) was used to measure the monetary policy stance. For example, Friedman and Schwartz (1963) advocated that the innovations in the monetary aggregates are a good measure of monetary policy shocks; Sims (1992) and Bernanke and Blinder (1992) used innovation in interest rate as a measure of monetary policy change; Christiano and Eichanbaum (1992) suggested that the quantity of non-borrowed reserves can be a better indicator of

[1] See Fung and Yuan (2001) also Bernanke and Mihov (1998).

[2] Understanding the role of assets prices in monetary policy transmission gained much importance after the recent financial crises.

[3] This study is actually an extension of a working paper Khan and Qayyum (2007) by including MCI and enlarging the dataset to 2012.

monetary policy stance. But the problem with all these measures is the presumption of constant set of operating procedure by authorities. Fung and Kasumovich (1998) suggest that M1 innovations produce input responses that are consistent with what one would expect from a monetary policy shock. Several authors [e.g. Laurent (1988), Goodfriend (1991), and Oliner & Rudebusch (1996)] have suggested the term spread as an alternative measure of monetary policy stance. The idea behind this suggestion is that it incorporates agents' expectations about future (in response to policy changes) in addition to changes in short term interest rate itself. Though the use of single variable approach as policy stance is simple and easily understandable but has its own limitations like interest rate puzzle[4], price puzzle and exchange rate puzzle[5]. This creates ambiguity in using these variables as measure of monetary policy stance. Furthermore, there is a lack of agreement on "which single variable better captures the stance of policy" [Bernanke and Mihov (1998)].

Given the problems associated with, and disagreement over the use of single variable as an indicator of monetary policy stance, some composite measures have also been developed and used as a policy indicator. Freedman (1994) suggested the use of monetary conditions index (MCI), which is weighted sum of changes in interest rate and exchange rate, from a given (base period) level, as a measure of monetary policy stance. The proponents of the MCI assert that both the interest rate and the exchange rate are the key indicators of the overall economic conditions. An increase in interest rate or appreciation of exchange rate results into deceleration of the economy which in turn releases the pressure on price levels and vice versa. The continuous change in interest rate and exchange rate makes it hard to estimate whether the monetary conditions are relatively tight or loose. Such a situation arises, in particular, when interest rate and exchange rate move in opposite direction. Hence, an assessment of the monetary policy stance of the central bank requires a careful consideration of the behavior of these variables. The composite measure of MCI serves this purpose. Some countries (like Canada and New Zealand) have used MCI as an operational target[6]. However, this approach is also not free of criticism. For example, interest rate and exchange rate are not necessarily directly related to central bank's policy[7]; and that MCI does not consider other financial variables that may also be important in impacting the final outcome of the policy decisions.

Bernanke and Mihov (1998) suggests a VAR methodology that includes all the policy variables previously proposed for the United States as particular specifications of general model. Fung and Yuan (2001) applied Bernanke and Mihov methodology to Canada. They assumed that policy stance, though unobserved, is reflected in the behavior of financial variables. They included four financial variables, M1, the term spread, the overnight rate, and exchange rate in a VAR framework and estimated Bernanke and Mihov Index (BMI) of monetary policy stance for Canada. But this measure can also be criticized on the ground that it includes both the price and the quantity of monetary aggregates while modeling to extract shocks.

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[4] An increase in monetary aggregates followed by increase in interest rate [Leeper and Gordon (1992)].

[5] A positive innovation in interest rate increases prices [Sims (1990)] and depreciates local currency [Sims (1992) and Grilli and Roubini, (1998)].

[6] See Lack (2003) for details

[7] As in case when exchange rate is market driven. Furthermore, it is possible that market interest rates are more reflective of prevalent liquidity conditions than the ongoing interest rate for reverse repo rate announced by the central bank in its last policy decision.

Recent development, in literature [Goodhart and Hofmann (2001), Mayes and Viren (2001), and Gauthier et al. (2004)], is the use of financial conditions index (FCI); which is basically an extension of monetary conditions index (MCI). FCI includes, besides the interest rate and exchange rate, other financial variables[8] as well; which are important in transmission mechanism of monetary policy. It is the most comprehensive measure of monetary policy stance despite the fact that it also shares some of the weaknesses[9] of MCI.

3. Measuring Monetary Policy Stance

3.1 Monetary Conditions Index (MCI)

Monetary Conditions Index is usually defined as weighted sum of changes in short term real interest rate and real exchange rate relative to their values in the base period. Mathematically it can be expressed as follow:

$$MCI = \omega_e(e_t - e_0) + \omega_i(i_t - i_0) \tag{1}$$

Where ω_e and ω_i are (respective) weights assigned to exchange rate and interest rate, t = 0 is base period. The change in MCI is interpreted as "the degree of tightening or easing the monetary conditions". MCI captures, in a single composite number, the degree of pressure that monetary policy places on economic growth and therefore upon inflation. Monetary conditions index has several attractive features; it is easy to work out and captures both domestic and foreign influences on the general monetary conditions of a country. Interestingly, MCI itself can be an appealing operational target (instead of short term interest rate alone) for monetary policy (Ericsson et al. 1998).

Following model is used to estimate weights on exchange rate and interest rate[10]:

$$y_t = \alpha_1 + \sum_i \sum_j \lambda_{i,j} x_{i,t-j} + \sum_k \gamma_k y_{t-k} + \varepsilon_{yt} \tag{2}$$

$$\pi_t = \alpha_2 + \sum_m \beta_{1m} \pi_{t-m} + \sum_l \beta_{2l} y_{t-l} + \varepsilon_{\pi t} \tag{3}$$

Where y_t is output, π_t is inflation rate, and x = {real interest rate, real exchange rate}.

Equations (2) represents a backward-looking IS curve while equation (3) is backward-looking Phillips curve. The weights for MCI can be obtained as:

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[8] For example term spread, long term interest rate, etc.

[9] Like model dependency, possible parameter inconsistency, ignored dynamics and/or non-exogeneity of regressors etc as pointed out by Ericsson et al.(1998) and Batini and Nelson (2002). However, while implementing these methods on Pakistan economy, we have taken care of some of these shortcomings of MCI as well as FCI. With reference to parameter stability we would like to state that, particularly in case of Pakistan, change remained a permanent feature of the economy as country was subjected to different reforms including financial sector reforms, trade liberalization and adoption of flexible exchange rate system. Those regimes are staggered as well. Most recent change is the switch from explicit monetary aggregate targeting to use of interest rate as major instrument of monetary policy. Hence it would be near impossible to distribute data sample into different regimes for doing some meaningful time series analysis (on short sample).

[10] See Goodhart and Hofmann (2001), Lack (2003) for details.

$$\omega_t = \frac{\sum_j \lambda_{i,j}}{\sum_{i=1}^{n}\sum_{j=1}^{i}\left|\lambda_{i,j}\right|} \quad (3a)$$

3.2. Financial Conditions Index (FCI)

As discussed above, MCI is criticized for ignoring other important variables despite being an improvement over the single variable monetary policy stance measures. Financial conditions index (FCI) is an extension of monetary conditions index which includes other financial variables[11] besides the interest rate and exchange rate while measuring the monetary policy stance. The other financial variables may include some or all of following variables depending upon the level of financial development of the country under study: long-term interest rate, corporate bond risk premium, term spread, stock prices, market capitalization-to-GDP ratio, dividend price ratio, property prices etc. We, in this study, include stock prices[12] besides real interest rate and real exchange rate[13]. Model is similar to that described in equations (2) and (3) with one additional variable in equation (2).

3.3 The Bernanke and Mihov Measure

Bernanke and Mihov (1998) used a semi[14] structural VAR-based methodology to construct a composite measure of monetary policy stance. This measure is a linear combination of different candidates of policy indicators. This method has several advantages over other approaches as described in Bernanke and Mihov (1998). First, it nests other quantitative indicators of monetary policy. Second, it is applicable to other countries and periods and to alternative institutional setups as well. Following Fung and Yuan (2001), we now discuss how to estimate BMI.

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

$$Y_t = \sum_{i=0}^{k} B_i Y_{t-i} + \sum_{i=0}^{k} C_i P_{t-i} + A^y V_t^y \quad (4)$$

$$P_t = \sum_{i=0}^{k} D_i Y_{t-i} + \sum_{i=0}^{k} G_i P_{t-i} + A^p V_t^p \quad (5)$$

Where B_i, C_i, A^y, D_i G_i and A^p are square matrices of coefficients. Y is non-policy block of variables containing real GDP growth and inflation. P is block of policy variables that includes real interest rate, real exchange rate, term-spread (defined as short term minus long term interest rate), and broad money supply. Here assumption is that variables in non policy block are not affected by contemporaneous innovations to variables in policy block (i.e. C_0 =0). If one element, say V_t^s of the set of shocks V_t^p in Equation (5) denotes the shock to monetary policy, equations (4) and (5) can be re-written as:

$$Y_t = \sum_{i=0}^{k} H_i Y_{t-i} + \sum_{i=0}^{k} H_i^p P_{t-i} + U_t^y \quad (6)$$

[11] Which are also important in transmission of changes in monetary policy to the output and inflation.
[12] This accounts for wealth effect. Changes in consumer wealth following changes in equity prices shape the way consumers consume/save.
[13] See Montagnoli and Napolitano (2005) for detail.
[14] Since restrictions are imposed upon policy block only.

$$P_t = \sum_{i=0}^{k} J_i^y Y_{t-i} + \sum_{i=0}^{k} J_i^p P_{t-i} + \left((I-G)^{-1} D_0 U_t^y + U_t^p\right) \tag{7}$$

Comparing equations (6) and (7) with equation (4) and (5), we get

$U_t^y = (I-B)^{-1} A^y V_t^y$ and

$$U_t^p = (I-G_0)^{-1} A^p V_t^p$$

or

$$U_t^p = G_0 U_t^p + A^p V_t^p \tag{8}$$

Equation (8), a standard structural VAR system, relates observable VAR-based residuals U_t^p to unobservable structural shocks V_t^p. The inversion of the Equation (8) gives us structural shocks V_t^p including the exogenous monetary shock V_t^s. Therefore we can write Equation (8) as:

$$V_t^p = \left(A^p\right)^{-1} (I-G_0) U_t^p \tag{9}$$

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

$$\left(A^p\right)^{-1} (I-G_0) U_t^p \tag{10}$$

Estimated linear combination of policy variables included in P block can be used to measure policy stance, including both endogenous and exogenous component of policy. The shock to this measure can be considered as exogenous component of policy. We can write relationship between U and V in matrix form as

$$\begin{bmatrix} 1 & \beta & 0 & 0 \\ 0 & 1 & 0 & 0 \\ 0 & 0 & 1 & 0 \\ \gamma_1 & \gamma_2 & \gamma_3 & 1 \end{bmatrix} \begin{bmatrix} U_m \\ U_{ts} \\ Ui \\ Uer \end{bmatrix} = \begin{bmatrix} 1 & 0 & 0 & 0 \\ \alpha^d & 1 & \alpha^s & \alpha^x \\ \phi^d & \phi^b & 1 & \phi^x \\ 0 & 0 & 0 & 1 \end{bmatrix} \begin{bmatrix} V^d \\ V^b \\ V^s \\ V^x \end{bmatrix} \tag{11}$$

Equation (11) can be inverted to determine how the monetary policy shock depends on the VAR residuals. Therefore we can write policy shock as,

$$V^s = \omega_m U_m + \omega_{ts} U_{ts} + \omega_i U_i + \omega_{er} U_{er} \tag{12}$$

In similar way other structural shocks can be obtained. Equation (12) shows that monetary policy shock is a linear combination of all VAR residuals in policy block, with weight on each variable as given below. A measure of policy stance can be constructed using the same weights on (corresponding) variables. To avoid the over identification problem we impose following restrictions [as suggested in Bernanke and Mihov (1998)].

$$\gamma_1 = 0, \quad \gamma_2 = 0, \quad \gamma_3 = 0 \quad \text{and} \quad \phi^d = 0 \tag{13}$$

First three restrictions imply that the innovation in exchange rate is purely stochastic, while the last restriction implies that the central bank fully offsets the shocks to money demand to keep the interest rate from changing. The weights on different policy variables are obtained as:

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

$$\omega_i = \frac{1}{\left[1-\phi^b \alpha^s\right]}, and \qquad \omega_{er} = \frac{\left[\phi^b \alpha^x - \phi^x\right]}{\left[1-\phi^b \alpha^s\right]} \qquad (14)$$

4. Empirical Application to the case of Pakistan

Monthly data for Pakistan from January 1993 to December 2012 is used in this study. The variables used in this study are: industrial production index (as proxy of real GDP), year on year inflation rate, broad money supply, T- bill rate, interest rate term spread, and KSE 100 price index. Industrial production index and broad money supply are in growth form, while KSE 100 price index is HP filtered. All the series used in this study are stationary. Data are taken from international financial statistics (of IMF) and various publications of State Bank of Pakistan.

In this section we present the empirical results for the three measures discussed in previous section. The coefficient estimates from Equation 2 (for MCI and FCI) and Equation 11 (for BMI) are given in tables 1 and 2.

Table 1: Estimated Coefficients for Equation (2)

Variables	**Different Measures of Monetary Policy Stance**	
	MCI	**FCI**
Interest rate	-0.02	-0.01
Exchange rate	-0.98	-2.80
KSE price index	-----	0.06

Regarding the first criteria by which we judge the performance of our different estimated policy measures is consistency of estimated coefficients with economic theory. All the parameters estimated are statistically significant. Interest rate and exchange rate have negative (as expected) signs in equation (2) [15]. We can see that the signs of the estimated coefficients for MCI in our study are conceptually the same as found by Hyder and Khan (2006)[16]. Negative estimated coefficients of interest rate and exchange rate in our study show that increase in any of these variables has negative impact on output. The sign of coefficient for KSE index is positive which means an increase in KSE (price index) will impact output positively, which is in accordance with theory. Booming stock market brings new investors to the stock market; and encourages new firms to get registered and perform economic activity to contribute to economic growth of the country.

[15] It is important to mention here that we have used IS equation for the estimation of desired parameters. Conceptually, we can estimate any one of the two equations - IS curve or Phillips curve. Practically, one should use the equation which is more relevant with respect to the objectives of monetary policy. In Pakistan, the monetary authority (SBP) attempts to control inflation without being prejudice to real economic growth in the country.

[16] Hyder and Khan (2006) constructed MCI (only) for the case of Pakistan. They estimated both the IS and Phillips curves (but used only one in the construction of MCI). We can compare our estimated coefficients of equation (2) with those from their estimated IS equation.

Table 2: Estimated Coefficients for Equation (11)

Coefficients	Estimated values
β	0.270
α^d	2.660
α^s	-0.021
α^x	-0.002
ϕ^b	-2.070
ϕ^x	2.120

Similarly in equation 11, the interest rate elasticity of money demand, β, is positive. The coefficient α^d has a positive sign and is numerically significant which implies that when a positive demand shock occurs, interest rate rises to clear the market. The parameter estimate α^s is also negative which shows that term spread declines when short-term interest rate rises. 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 parameter ϕ^b, that captures the reaction of the central bank to innovations in the term spread, is negative which implies that when there is a positive innovation in the term spread, the Bank would lower the short-term interest rate to extract the excess liquidity from the market. Unexpected currency depreciation would lead to an increase in interest rate; hence term spread declines as a result. Therefore the estimated parameter α^x is negative. The Bank would raise the interest rate in response to unexpected currency depreciation, resulting in a positive sign of ϕ^x. This suggests that the Bank in general responds vigorously to liquidity and exchange rate shocks.

Now we have to obtain weights for these variables to construct different measures of monetary policy stance. The weights are calculated as given in equations (3a) and (14) and are presented in table 3.

Table 3: Estimated weights assigned to different variables in various measures

Variables	**Different Measures of Monetary Policy Stance Used in this Study**		
	MCI	**FCI**	**BMI**
Interest rate	0.02	0.002	0.11
Exchange rate	0.98	0.97	0.23
KSE price index	-----	-0.02	-----
Term spread	-----	-----	0.07
M2	-----	-----	-0.60

A look at table (3) reveals that our MCI has estimated weights for interest rate and exchange rate[17] as 0.02 and 0.98 respectively. That is, increase in interest rate and/or exchange rate appreciation means tighter monetary policy. The weight for interest rate is very small as compared to exchange rate. In case of FCI, the weight for KSE is negative and thus higher KSE price index means loose monetary policy. The weight for interest rate is positive for BMI, which suggest higher interest rate means tight monetary policy and vice versa. The sign of weight for exchange rate is also positive which suggests that depreciation of domestic currency means loose monetary policy. The weight for monetary aggregate M2 is negative which show higher growth of M2 is defined as loose monetary policy. The weight for interest rate spread is positive which means that if short term rate is higher relative to long-term rate, this mean tight monetary policy is prevalent. The signs of the estimated weights in this study are in accordance with

[17] Exchange rate in this study is defined as US Dollar per Pak Rupees

the mainstream macroeconomic theories and empirical literature (like Fung & Yuan (2001) and Hyder and Khan (2006)).

The higher weight of exchange rate, particularly in cases of MCI and FCI, deserves some explanation. What we can say is that during the period under study we observed external sector gaining importance, particularly after the (foreign) payments reforms of 1992 according to which residents and non-resident Pakistanis and foreign nationals were allowed to bring-in and take-out foreign exchange to/from Pakistan. Furthermore, trade liberalization measures taken during the 1990s and then adoption of flexible exchange rate regime helped Pakistan open its economy during the last two decades (1993 to 2012 - estimation period of this study). During this period we have also seen persistent current account deficit in the country. It made exchange rate consideration more important notwithstanding the fact that foreign exchange reserves of Pakistan also increased from around 1 percent of GDP in early 1990s to around 5 percent of GDP in 2012[18].

After estimating weights, we constructed the different measures as given by equations (1) and (13). The second criterion is to see the dynamic correlations between output-gap/change in inflation and different measures. We can see in Table 4 that MCI has relatively stronger (and negative) correlations, in comparison with FCI, with both output-gap and (change in) inflation at all lags. However, in the case of BMI, there are some positive correlations at some lags, with change in inflation which is against the conventional wisdom.

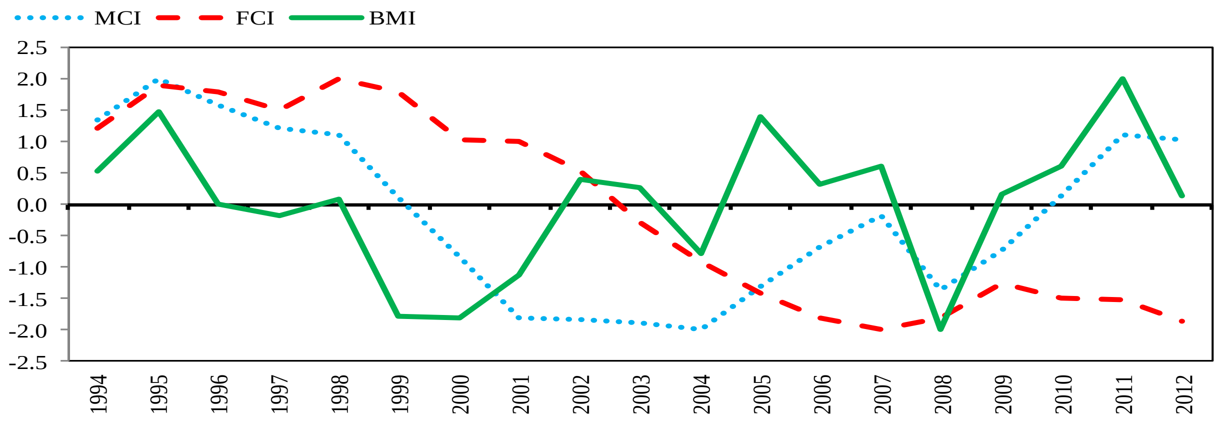
Table 4: Dynamic Correlations between Output-Gap/ Change in Inflation & Different Measures

Leads	Different Measures					
	MCI		FCI		BMI	
	Output-Gap	ΔInflation	Output-Gap	ΔInflation	Output-Gap	ΔInflation
1	-0.29	-0.31	-0.02	-0.26	-0.15	-0.07
2	-0.27	-0.32	-0.04	-0.26	-0.14	-0.03
3	-0.27	-0.33	-0.06	-0.26	-0.14	0.02
4	-0.27	-0.34	-0.09	-0.26	-0.13	0.05
5	-0.27	-0.34	-0.12	-0.26	-0.14	0.07
6	-0.27	-0.34	-0.13	-0.25	-0.16	0.08
7	-0.29	-0.34	-0.14	-0.25	-0.17	0.07
8	-0.30	-0.34	-0.15	-0.25	0.17	0.05
9	-0.31	-0.33	-0.16	-0.25	-0.16	0.03
10	-0.32	-0.31	-0.17	-0.25	-0.15	-0.01
11	-0.33	-0.27	-0.17	-0.24	-0.15	-0.04
12	-0.34	-0.27	-0.18	-0.24	-0.15	-0.08

Different measures are plotted in figure 1. MCI indicates a tight monetary policy till 1999, while loose policy from 2000 to 2010 and then again tight policy afterwards. FCI indicates tight policy between 1994 and 2003 but loose policy for the reaming period. BMI displays tight policy during 1994-1996, 2005-2007 and 2009-2011 while it indicates loose or mildly loose for 1997 -2004 and 2008. For the case of MCI, our results are in line with those of Qayyum (2002) for the overlapping period. Qayyum (2002) estimated MCI (only) for 1990s.

[18] Significant improvement in country's trade openness and foreign exchange reserves came in 2000s and early 2010s compared to the level of 1990s. This could be one of the reasons of why the weight for exchange rate is higher in our study compared to that obtained by Hyder and Khan (2006).

Figure 1: Different Measures of Monetary Policy Stance (Annual)



The stance indices from 1994 to 2011 and output-gap and change in inflation for each year are presented in table 5 below. The stances are normalized to a scale of –2 to 2: –2 to –1 denotes" very loose (L)" to "mildly loose (ML)", 0 denotes "neutral (N)", 1 to 2 denotes "mildly tight (MT)" to "very tight (T)". In last column, each year is labeled as demand shock (D) or supply shock (S) - dominated according to movements of output-gap and change in inflation: in any given year, co movements of output-gap and change in inflation are considered as demand-shock. An increase shows positive demand shock while decrease indicates negative demand shock. If movements of the two variables are in opposite directions, it is considered as a supply shock. In this case increase in output gap will be positive supply shock - and vice versa. From 1995 to 2011, half of the period can be termed as a period with demand shock (9 out of total 17 years - 1995, 1999, 2001, 2006, 2007, 2009, 2010, and 2011).

Table 5: Numerical Presentation of Policy Stance, 1995 to 2012

Years	Output-Gap(%)	Change in Inflation	MCI	FCI	BMI	D or S
1995	+	+	T	T	MT	D+
1996	+	-	T	T	N	S+
1997	+	-	MT	MT	N	S+
1998	-	+	MT	T	N	S-
1999	-	-	N	T	MT	D-
2000	-	+	ML	MT	N	S-
2001	-	-	L	MT	MT	D-
2002	-	+	L	MT	ML	S-
2003	+	+	L	N	N	D+
2004	+	-	L	ML	N	S+
2005	+	-	ML	ML	N	S+
2006	+	+	ML	L	MT	D+
2007	+	+	N	L	MT	D+
2008	-	+	ML	L	L	S-
2009	-	-	ML	ML	T	D-
2010	-	-	N	L	ML	D-
2011	-	-	MT	L	MT	D-
2012	-	-	MT	L	N	D-

MCI captures only 5 shocks correctly i.e.1999, 2003, 2006, 2007, and 2012, while it fails to provide right signal during 2001, 2009, 2010, and 2011. Similarly FCI gives 4 correct signals out of 9 demand shocks i.e.1999, 2001, 2006, and 2007. The BMI measure displays relatively poor performance in this regard. It indicates only 3 correct signals prior to demand shock in 2003, 2009, and 2012. One may think that the poor performance (as an indicator of demand pressure) of measures as policy stance, on the basis of last criterion, could be due to use of annual data set which aggregates over time. And in a time span of a year some adjustments may take place and variables may normalize to pre shock level. To check this, or one can say to check the robustness of our annual data results, we also performed the whole exercise upon quarterly dataset. These results are given in table A and B in the appendix. Graphical representation of different measures of monetary policy stance is also shown in figure (A) in appendix. Again, in quaterized case, MCI performs relatively better. It gives 19 correct signals for demand shocks out of total 45 demand shocks; FCI captures 16, while BMI only 10 demand shocks one quarter in advance. We can say that the results from annual and quarterly data set are not very different.

5. Concluding Remarks

In this paper we have provided a brief of different measures of policy stance defined as quantitative measures to judge aggressiveness (or otherwise) of monetary policy relative to its objectives. A measure of policy stance is a useful indicator of future changes in output and subsequently in inflation. It is also important to estimate and have a look at such measure because it combines the central bank's response(s) to internal and external sectors' current situation and expected outlook (in the form of an index comprising indicators of these sectors). At the same time it also helps the monetary authority determine the 'should be' course of monetary policy action(s) needed to keep the objective (goals) within the target range. It also covers different channels of monetary policy 'in work' in the country.

An attempt is made to construct different measures of monetary policy stance in the case of Pakistan. These are: Monetary Conditions Index (MCI), Financial Conditions Index (FCI), and a measure developed by Bernanke and Mihov - BMI. We also compared these estimated measures on the basis of certain performance criteria. Our results show that, in the case of Pakistan, during the period of study, movements in exchange rate and monetary aggregates were more important than the interest rate changes for transmission of monetary policy. (Foreign) payments reforms of 1992, international trade liberalization of 1990s and then adoption of flexible exchange rate regime might have helped us to inch up towards (trade and financial) openness as is evident from some crude indicators (like improvement in international trade to income ratio during 1992 to 2012). As the domestic goods and financial markets get linked closer and closer to rest of the word; the exchange rate gains increasing importance being a monetary policy transmission channel that can have desired impacts upon the real side of the economy. Other reason could be that State Bank of Pakistan has (just) recently started active use of interest rate as policy instrument by abandoning the monetary aggregate targeting as its monetary policy regime[19]. Earlier SBP had been targeting monetary aggregates to achieve noninflationary stable growth.

The comparison of different measures shows that MCI performs better, in relative term, as measure of policy stance. Overall performance of these measures seems not up to the mark as indicators of demand pressures. The main problem is that supply shocks are significant in case of Pakistan. This leaves relatively smaller room for monetary policy to act as an effective demand stabilizer. Despite the

[19] Since FY10 SBP has stopped giving any target for M2 growth.

weaknesses, however, these measures provide some useful insights for formulation of monetary policy and analysis of its impact on final goals. Furthermore, the use of more sophisticated techniques to construct these measures and availability of more information on relevant variables may improve the quality and performance of these measures.

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Appendix

Table A: Numerical Presentation of Policy Stance: 1994 to 2012 (Quarterly)

Quarter	y-gap	∆inf	MCI	FCI	BMI	Quarter	y-gap	∆inf	MCI	FCI	BMI
1994-Q2	-2.7	-0.66	0.9	0.94	0.79	2003-Q4	-5	1.02	-1.63	-0.48	0.95
1994-Q3	-7.6	-0.32	1.22	1.08	0.6	2004-Q1	5.5	0.29	-1.7	-0.77	-0.39
1994-Q4	1	1.34	1.41	1.24	0.22	2004-Q2	-1.8	-0.41	-1.87	-0.9	-0.42
1995-Q1	7.9	-0.21	1.53	1.54	0.68	2004-Q3	-0.4	0.18	-1.94	-0.85	-0.04
1995-Q2	1.8	0.29	1.83	1.72	0.98	2004-Q4	-0.3	0.86	-1.72	-0.95	0.72
1995-Q3	-4.7	-0.9	2	1.64	1.09	2005-Q1	4.3	0.03	-1.56	-1.33	0.07
1995-Q4	8.2	1.44	1.44	1.66	-0.29	2005-Q2	3.4	0.04	-1.23	-1.22	0.72
1996-Q1	11.5	0.08	1.59	1.55	0.51	2005-Q3	-1.2	-0.2	-1.04	-1.33	0.09
1996-Q2	3.4	-0.67	1.5	1.5	0.27	2005-Q4	-0.5	0.48	-0.88	-1.52	1.1
1996-Q3	-3	-0.68	1.51	1.71	-0.16	2006-Q1	6.9	0.36	-0.76	-1.82	0.16
1996-Q4	2.8	1	0.82	1.48	-0.19	2006-Q2	9.2	0.26	-0.69	-1.72	-0.43
1997-Q1	3.5	-0.08	1.06	1.41	0.7	2006-Q3	1.3	-0.65	-0.6	-1.67	1.03
1997-Q2	-7.8	-0.61	1.18	1.49	0.15	2006-Q4	-0.9	0.2	-0.39	-1.66	0.23
1997-Q3	-6.8	-0.02	1.27	1.23	0.29	2007-Q1	9.4	0.96	-0.32	-1.75	0.17
1997-Q4	1.3	1.2	0.6	1.08	-0.83	2007-Q2	11.5	-0.98	-0.31	-1.97	-0.05
1998-Q1	9	0.18	1.05	1.28	0.86	2007-Q3	4	0.5	0.01	-1.9	0.89
1998-Q2	-4.2	-0.82	1.15	1.77	-0.32	2007-Q4	-2.5	-0.45	0.02	-1.97	-0.03
1998-Q3	-6.4	-0.15	0.84	1.9	-0.04	2008-Q1	11.5	1.67	-0.14	-2	-0.66
1998-Q4	0.1	1	0.74	2	0.05	2008-Q2	8.7	-1.04	-1.01	-1.91	-1.29
1999-Q1	5.8	-0.28	0.8	1.97	0.69	2008-Q3	-5.1	-0.82	-2	-1.62	-1.69
1999-Q2	-3.8	-0.38	-0.03	1.55	-2	2008-Q4	-8.6	0.11	-1.8	-1.32	0.74
1999-Q3	-7.1	-0.32	-0.33	1.36	0.89	2009-Q1	-3.3	0.24	-1.36	-0.86	-0.45
1999-Q4	2.4	1.26	-0.16	1.3	0.26	2009-Q2	-2.6	0.16	-0.77	-1.12	0.15
2000-Q1	2	-0.62	-0.47	0.73	-0.48	2009-Q3	-6.5	-0.73	-0.37	-1.36	1.24
2000-Q2	-2.8	0.23	-0.59	0.94	-0.07	2009-Q4	-4.7	0.79	-0.12	-1.43	-0.08
2000-Q3	-3.9	0.2	-0.9	0.95	-1.41	2010-Q1	5.2	0.33	-0.28	-1.48	0.08
2000-Q4	-1.3	0.18	-1.08	0.95	1.74	2010-Q2	2.4	-0.69	-0.02	-1.42	0.35
2001-Q1	8	0.61	-1.48	0.86	-0.91	2010-Q3	-6.3	-0.59	0.21	-1.38	1.41
2001-Q2	-2	-0.27	-1.66	0.81	-0.72	2010-Q4	-5	1.42	0.47	-1.44	0.37
2001-Q3	-4.1	0.1	-1.85	0.95	0	2011-Q1	7.6	0.68	0.72	-1.49	0.82
2001-Q4	-6.2	0.01	-1.53	0.91	2	2011-Q2	0.7	-1.25	0.84	-1.52	0.74
2002-Q1	1.5	0.62	-1.67	0.57	0.3	2011-Q3	-5.3	0.99	1.04	-1.41	1
2002-Q2	-3.1	-0.05	-1.74	0.55	-0.2	2011-Q4	-3.4	-0.31	1.13	-1.36	0.32
2002-Q3	-11.8	-0.45	-1.61	0.48	1.28	2012-Q1	8.6	0.52	0.93	-1.58	0.35
2002-Q4	-11.2	0.62	-1.59	0.19	0.28	2012-Q2	1.8	-1.16	0.85	-1.69	-0.05
2003-Q1	2	1.16	-1.74	0.12	-0.09	2012-Q3	-5.1	-0.36	0.89	-1.84	0.48
2003-Q2	-6.4	-0.59	-1.77	-0.17	0.22	2012-Q4	-3.1	1.1	0.83	-1.99	-0.23
2003-Q3	-9.7	0.22	-1.72	-0.57	0.05						

Table B: Comparison of different measures: 1994 to 2012 (Quarterly)

Quarter	shock	y-gap	∆inf	MCI	FCI	BMI	Quarter	shock	y-gap	∆inf	MCI	FCI	BMI
994-Q2	D-	(-)	(-)	MT	MT	MT	2003-Q4	S-	(-)	(+)	T	N	MT
1994-Q3	D-	(-)	(-)	MT	MT	MT	2004-Q1	D+	(+)	(+)	T	ML	N
1994-Q4	D+	(-)	(+)	MT	MT	N	2004-Q2	D-	(-)	(-)	T	ML	N
1995-Q1	S+	(+)	(-)	T	T	MT	2004-Q3	S-	(+)	(+)	T	ML	N
1995-Q2	D+	(+)	(+)	T	T	MT	2004-Q4	S-	(-)	(+)	T	ML	MT
1995-Q3	D-	(-)	(-)	T	T	MT	2005-Q1	D+	(+)	(+)	T	ML	N
1995-Q4	D+	(+)	(+)	MT	T	N	2005-Q2	D+	(+)	(+)	ML	ML	MT
1996-Q1	D+	(+)	(+)	T	T	MT	2005-Q3	D-	(-)	(-)	ML	ML	N
1996-Q2	S+	(+)	(-)	MT	MT	N	2005-Q4	S-	(-)	(+)	ML	T	MT
1996-Q3	D-	(-)	(-)	T	T	N	2006-Q1	D+	(+)	(+)	ML	T	N
1996-Q4	D+	(-)	(+)	MT	MT	N	2006-Q2	D+	(+)	(+)	ML	T	N
1997-Q1	S+	(+)	(-)	MT	MT	MT	2006-Q3	S+	(-)	(-)	ML	T	MT
1997-Q2	D-	(-)	(-)	MT	MT	N	2006-Q4	S-	(-)	(+)	N	T	N
1997-Q3	D-	(-)	(-)	MT	MT	N	2007-Q1	D+	(+)	(+)	N	T	N
1997-Q4	D+	(+)	(+)	MT	MT	ML	2007-Q2	S+	(-)	(-)	N	T	N
1998-Q1	D+	(+)	(+)	MT	MT	MT	2007-Q3	D+	(+)	(+)	N	T	MT
1998-Q2	D-	(-)	(-)	MT	T	N	2007-Q4	D-	(-)	(-)	N	T	N
1998-Q3	D-	(-)	(-)	MT	T	N	2008-Q1	D+	(+)	(+)	N	T	ML
1998-Q4	D+	(+)	(+)	MT	T	N	2008-Q2	S+	(+)	(-)	ML	T	ML
1999-Q1	S+	(+)	(-)	MT	T	MT	2008-Q3	D-	(-)	(-)	T	T	T
1999-Q2	D-	(-)	(-)	N	T	T	2008-Q4	S-	(-)	(+)	T	ML	MT
1999-Q3	D-	(-)	(-)	N	MT	MT	2009-Q1	S-	(-)	(+)	ML	ML	N
1999-Q4	D+	(-)	(+)	N	MT	N	2009-Q2	S-	(-)	(+)	ML	ML	N
2000-Q1	S+	(-)	(-)	N	MT	N	2009-Q3	D-	(-)	(-)	N	ML	MT
2000-Q2	S-	(-)	(+)	ML	MT	N	2009-Q4	S-	(-)	(+)	N	ML	N
2000-Q3	S-	(+)	(+)	ML	MT	ML	2010-Q1	D+	(+)	(+)	N	ML	N
2000-Q4	S-	(+)	(+)	ML	MT	T	2010-Q2	S+	(-)	(-)	N	ML	N
2001-Q1	D+	(+)	(+)	ML	MT	ML	2010-Q3	D-	(-)	(-)	N	ML	MT
2001-Q2	D-	(+)	(-)	T	MT	ML	2010-Q4	S-	(-)	(+)	N	ML	N
2001-Q3	S-	(+)	(+)	T	MT	N	2011-Q1	D+	(+)	(+)	MT	ML	MT
2001-Q4	S-	(-)	(+)	T	MT	T	2011-Q2	S+	(-)	(-)	MT	T	MT
2002-Q1	D+	(+)	(+)	T	MT	N	2011-Q3	S-	(+)	(+)	MT	ML	MT
2002-Q2	D-	(+)	(-)	T	MT	N	2011-Q4	D-	(+)	(-)	MT	ML	N
2002-Q3	D-	(-)	(-)	T	N	MT	2012-Q1	D+	(+)	(+)	MT	T	N
2002-Q4	S-	(-)	(+)	T	N	N	2012-Q2	S+	(-)	(-)	MT	T	N
2003-Q1	D+	(+)	(+)	T	N	N	2012-Q3	D-	(-)	(-)	MT	T	N
2003-Q2	D-	(+)	(-)	T	N	N	2012-Q4	S-	(-)	(+)	MT	T	N
2003-Q3	S-	(-)	(+)	T	ML	N							

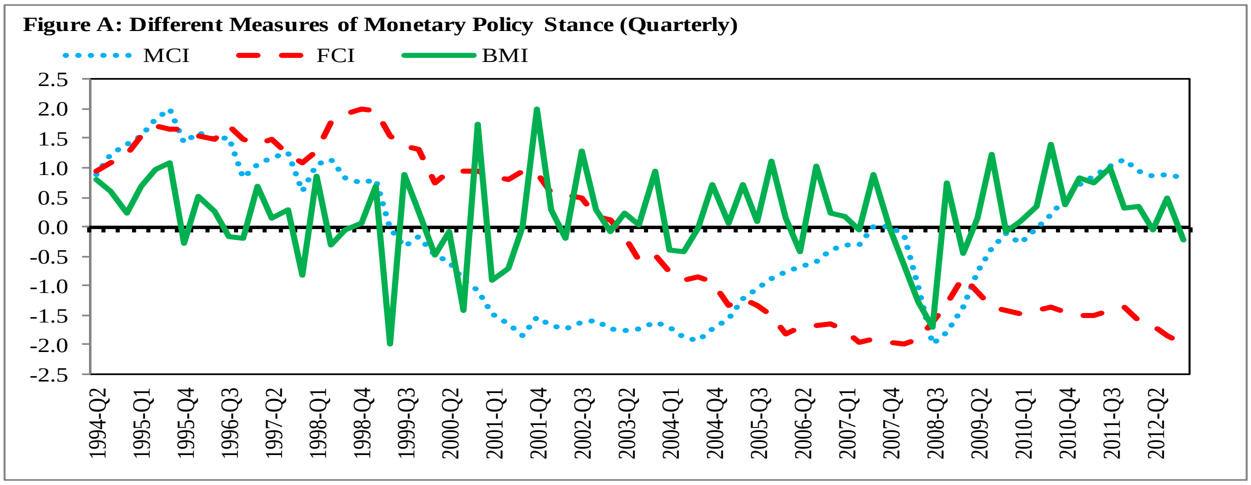
Figure A: Different Measures of Monetary Policy Stance (Quarterly)
MCI
FCI
BMI
2.5
2.0
1.5
1.0
0.5
0.0
-0.5
-1.0
-1.5
-2.0
-2.5
1994-Q2
1995-Q1
1995-Q4
1996-Q3
1997-Q2
1998-Q1
1998-Q4
1999-Q3
2000-Q2
2001-Q1
2001-Q4
2002-Q3
2003-Q2
2004-Q1
2004-Q4
2005-Q3
2006-Q2
2007-Q1
2007-Q4
2008-Q3
2009-Q2
2010-Q1
2010-Q4
2011-Q3
2012-Q2