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Effectiveness of SBP's Monetary Policy Communication

Sajjad Zaheer, Fatima Khaliq and Waqas Ahmed [1]

Abstract: *This study investigates the impact of monetary policy communication of the State Bank of Pakistan (SBP) on two different aspects. First, whether the information in Monetary Policy Statement (MPS) alters the way market analyzes the economy, using a text-mining approach. Second, whether the voting pattern disclosed in the Monetary Policy Committee (MPC) minutes provide market with some direction about the future path of the policy rate. The results show that the communication of monetary policy decisions changes the market sentiments in accordance with the information provided in the MPS. Moreover, we find that the voting record provided in the minutes of the MPC meetings guides the market about future path of interest rates. These findings support the effectiveness of SBP's monetary policy communication, which is one of the requisites in implementation of the inflation targeting framework.*

JEL Classification: E52, E59

Key Words: Monetary Policy, Effectiveness of Monetary Policy Communication, Textual Analysis, Voting

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1. Introduction

Effective communication by central banks have gained much importance in recent times. As described in Filardo and Guinigundo (2008), central bank's communication approach has changed significantly due to three main reasons. First, the recognition that monetary policy action would be more effective if understood better by the markets. Second, an emerging consensus that a clear communication of targets and policies is a form of accountability process for an unelected central bank in an era of increased central bank independence. Third, rising popularity of the conduct of forward looking inflation targeting monetary policy strategy across the world that puts a lot of emphasis on a well-defined communication strategy.

Apart from the stated reasons, communication becomes altogether important in presence of large informal sector in the economy as it can have an anchoring role in managing inflation expectations of agents outside the ambit of formal financial channels.

Literature on central bank's communication has continuously been evolving and communication by central banks across the world has taken various forms. Mostly, the central banks use press conferences as a mean of communication to provide details of their monetary policy stance and outlook. Publication of meeting minutes also plays an important role in communicating various views of the decision-making committee. Forward looking inflation reports and monetary policy reviews are also playing important role in anchoring inflation expectations. Advance announcement of monetary policy meeting schedules is adding on to the certainty and confidence in the market.

For Pakistan, State Bank of Pakistan (SBP) operates under a dual mandate to stimulate economic growth given the optimal utilization of available resources along with maintaining monetary (price and financial) stability. The need to have stability in these macroeconomic objectives safeguards against short-term economic shocks and has broad based positive dividends for the economy. In this regard, policy communication by SBP has to be simple, clear and credible.

In moving towards transparency and openness regarding monetary policy formulation, SBP has achieved several milestones and gradually improved its communication in line with best international practices, particularly in the last decade. Increased focus on economic outlook, regular and frequent assessment of economic conditions, press conferences and speeches are some of the important features of SBP's enhanced communication practices. Both the monetary policy framework and its communication have also experienced important improvements over time. To further strengthen SBP's independence and bring transparency in policy making process, the SBP Act (1956) was amended in 2015 to constitute the statutory Monetary Policy Committee (MPC). MPC was established with six internal and three external members (economists of good reputation) with a mandate to formulate, support and

recommend the monetary policy (SBP Act 1956: Section 9E). Globally, it has been recognized that the creation of the MPC is a major achievement towards the establishment of an independent and autonomous central bank (Blinder 2004, Vandenbussche 2006). However, in the context of international best practices, some tasks are yet to be undertaken by the SBP. For instance, these include the need to provide a schedule of monetary policy meetings to be held in, at least, next one year. Moreover, the central bank can think of providing the names of MPC members along with their choice of vote towards decision making.

At present, the ***monetary policy statement (MPS)*** and ***minutes of the MPC*** are the most important documents pertaining to information on monetary policy decisions for the stakeholders. In order to communicate the MPC decision, MPS is published on alternative months carrying policy rate decision along with brief discussion on trends and developments of the economy. After publication of MPS, minutes are published after a gap of one-month. It includes detailed information on MPC discussion as well as voting pattern of its members. Disclosing voting records with attributes i.e. names of the MPC members, has not been adopted yet.

Given the two sources of monetary policy information, this study aims to analyze the impact of both MPS and MPC minutes on market sentiments and future path of interest rates respectively. Accordingly, we divide our analysis in two parts.

First part attempts to see whether the information contained in MPS affects market perception by analyzing the contents of the statements and compare it with market perception and market reaction before and after its release, respectively. As the market looks forward to the announcement of policy rate, it comments on the expected policy change. Important sources of this discussion include brokerage house reports and newspaper articles. The purpose is to find out that how effective is the communication of the SBP in shaping up the views of the market regarding important economic variables. Methodology of textual analysis/text mining technique has been used to gauge the impact. Similarly, tone of the documents and market commentary is also analyzed using Loughran/McDonald dictionary. The results disclose that market sentiments do adjust after release of the MPS. Market participants not only align their focus in line with the extent of attention to issues discussed in the MPS but also the tone of their sentiments is affected.

Second part investigates if the voting records published in MPC minutes provide market with additional information regarding future path of the policy rate. Specifically, it tests the hypothesis whether voting details explain changes in future policy rate in Pakistan. The econometric evidence reveals that the voting details comprehend significant evidence about changes in future policy rate both with and without incorporating the element of market expectations. The findings support the effectiveness of SBP's monetary policy communication, one of the desirable conditions in implementation of inflation targeting framework.

In terms of the contribution of this study, we have not found any comparable study for Pakistan focusing on change in both sentiments and tone after policy level decision making. Also, use of MPC voting pattern to infer direction of the future policy rate is a new area of policy research in the context of Pakistan as no earlier evidence exists regarding public decision making on basis of voting. Both these aspects highlight the emerging importance of effective communication regarding monetary policy. The need to understand its impacts is going to be extremely useful to design the appropriate flexible inflation targeting framework that the SBP plans to implement going forward[2].

Paper is organized as follows. Section 2 describes procedure and results of the textual/content analysis of MPS and market reports. Section 3 presents econometric evidence on importance of voting details, published in minutes of MPC, for future policy rate. Last section concludes the discussion.

2. Monetary Policy Statements and Market Reaction- Textual Analysis

Content analysis, also termed as textual analysis, is a well-known methodology in the social sciences to quantify various patterns in communication. Many words of similar meaning or of similar class are classified into fewer classes (Weber 1990). The core assumption of content analysis is that the words and phrases cited and stated most often in a text or series of texts are those that reveal the most important apprehension of that particular discussion (Muema & Mutisya, 2012). Textual analysis is an exploration process that necessitates the examiner to meticulously study the content of communication rather than the structure of the content. Historical documents and narratives have been widely analyzed using this technique.

Initially, the research involving textual analysis was performed in different fields. For instance, areas of psychology (Sexton and Helmreich 1999) and communications (Stephen 1999) were analyzed using text mining techniques. The research scope was also extended to multiple fields like political science (Gentzkow and Shapiro 2010), religious studies (Dershowitz et al. 2011), finance (Tetlock 2007) and literature (Koppel et al. 2002). However, in economics, it's still in its developing phase since there has been very few studies on the subject. Konsik (2014) seems to be the first mainstream study in economics employing textual analysis. He conducted frequency analysis of word choice in the "Hydroelectric Dam Contract License" of U.S covering 30 years period along with traditional regression techniques to find out "completeness" of the contracts. His results show that contracts are becoming flexible over time instead of rigid as environment concerns increases. Similarly, another attempt was made by the same author in 2015 investigating research focuses of economists over last 50 years in top seven journals. He found that microeconomics dominates the research attention.

[2] http://www.sbp.org.pk/spd/StrategicPlan-2020-Eng.pdf

For central banks, the use of this methodology is also new. However, in presence of its growing popularity, recently, an attempt was made to comprehend central bank communication; The Bank of England (2015) noted in their publication named "*One Bank Research Agenda",* the potential use of textual information and text sources that could help improve the understanding of economic and financial systems. In the same context, for Pakistan, Mahmood and Munawar (2016) performed textual analysis on monetary policy statements issued by the SBP from January 2006 to September 2015 to investigate the structure of MPS. They concluded that trends in inflation and external sector developments play key role in forming decision and the document lacks forward looking content.

Methodology

Over the usage of textual analysis, present literature has identified three broad areas: 1) measurement of information in the documents related to particular theme i.e. theme mining; 2) analyzing market reaction to statements/news/documents i.e. opinion mining; 3) tone of discussion gauging presence of negative, positive or uncertain pattern in the discussion i.e. sentiment mining. These aspects now make the approach more intuitive and powerful to address relevant questions as compared to using the traditional word-counter based textual analysis.

There exists a range of methodologies while performing textual analysis. For instance, *Boolean Technique* treat variables as binary entity. It tests a document for presence of any key term. *Dictionary Technique*, somewhat similar to Boolean Technique, scans the document given a dictionary (list of key words) to capture the defined theme. *Weighting Words technique*, on the other hand, assigns weights to word list according to their importance whereas *Vector Space Models* are used where we are comparing similarity of topics between the two documents, instead analyzing a standalone document. *Latent Symantec Analysis* assumes that words in the text are not independent rather are associated together. This technique permits algorithms to arrest the close link between words and latent variables without using pre provided list of words the way Boolean and Dictionary based techniques do (Bholat et.al. (2015)). The simplest form of content analysis is word frequency count (Stelmer, Steve (2001)), however, it can be extended beyond this.

Among various text-mining approaches, our study employs Dictionary Text Mining approach to analyze market's discussion focus before and after the release of monetary policy statement. For this purpose, the MPS itself, reports of major brokerage houses and articles along with news coverage appearing in newspapers before and after the decision are used for this analysis. Being deductive in nature[3], it starts with a predefined list of words, motivated by a general theory as to why these

[3] Boolean and dictionary techniques are considered deductive approaches as a certain pre-defined list of words are provided at the start according to some theory and then a particular document is tested for validity of that theory.

words matter. Simplicity and scalability is considered the merit and strength of this particular methodology. Dictionary technique is typically performed in two steps, a) a list of key words are formulized initially to apprehend the information of interest; b) then each document/article analyzed is denoted in terms of the (normalized) frequency of words in the dictionary. However, this approach only focuses the predefined words and ignores the context as well as any other phrase having same meaning, which may undermine the strength of this method.

From the existing literature, some examples can be quoted where dictionary techniques have been utilized to analyze financial and economic texts. For instance, Tetlock (2007) is a well-known and highly recognized research in this particular case. The author used dictionary (aka lexicons) to scale the tone of the column "Abreast of the Market" from 1984 to 1999 published in Wall Street Journal. His research employed the Harvard IV- 4 dictionaries, comprising word lists of positive and negative sentiments. His findings suggests that greater variation in word counts across columns reflects swings from optimism to pessimism and that the next day's returns are much responsive to negative news and discussion in the market. Aase (2011) also employed Dictionary Technique in his paper and investigated the impact on asset prices from the context of finance.

Over the implementation front, there are various software packages available to perform content analysis. However, in our study, instead of employing text analysis software, an algorithm is constructed to extract the word count of required category. For instance, if dictionary pertaining to any economic field, $D_{E,}$ having $(x_1, x_2, \ldots x_n)$ words, then we can present each separate document/article d_i as the share $s_i d_i$ of words in the dictionary, i.e.,

$$S_{i\ d_i} = {}^{D_{i\,E}} \Big/ _{\sum_{i=1}^{n} D_{iE}} \tag{1}$$

In our study, each document was loaded into the Excel (in text file format) and given algorithm was executed over each and every report/ newspaper item along with the MPS.

Over the selection of target documents, with an objective to analyze the effect of monetary policy communication, MPS along with market discussion in form of brokerage houses reports and newspapers have been selected[4]. Rationale for using brokerage house reports is the importance of their views over change in policy rate, as Bloomberg incorporates their opinion/vote while devising "Economist estimates of the SBP Target Rate" before the announcement of monetary policy decision of SBP. Internally, SBP also prepares a market expectation report before the announcement of

[4] Market reports include reports by JS Research, Elixir Securities, Topline Research, BMA Research, AKD Research, Next Capital Research, Optimus, InvestCapital and Shajar Capital whereas news items include Business Recorder, Financial Daily, The News, The Express Tribune, The Nation, Daily Times and Dawn.

policy rate where it gathers view/opinion from a sample of senior executives at banks, brokerage houses, asset management companies and some corporate bodies.

In terms of sample reports included in the study, the research departments of brokerage houses publish multiple reports on the state of economy, financial stability (banking sector), external sector and real sector. However, some brokerage houses also publish pre monetary policy analysis discussing policy rate expectations. Similarly, some research houses also publish post monetary policy discussion on the MPS. In our study latter version of the reports have been included. In addition to brokerage houses, newspapers also publish news and opinion pieces/articles about the upcoming meeting of MPC. Similarly, post MPS analyses/opinions are also published in these newspapers.

In terms of sample frequency, on average 5 discussions (reports, news, and opinions) are included while forming aggregate view. In total, we have reviewed 8 monetary policy statements and around 90 news items, articles and brokerage house reports have been analyzed. Generally, pre-MPS opinions/discussions start getting published 4 to 5 days before the meeting of MPC. However, most of such discussion is published a day before the MPC meeting takes place. Similarly, post MPS analysis generally gets published a day after MPC meeting takes place. In newspapers, such analysis mostly gets published by maximum of one week. All such opinions/discussions are then included in forming pre and post monetary policy discussion.

Over the discussion content in the MPS as well as market reports, we identified five main macroeconomic themes for textual analysis which are generally emphasized in reports discussing monetary policy. These themes include trends in inflation, real sector, external sector, monetary sector and fiscal variables. While analyzing five sectors, each sector is further decomposed to various words pertaining to particular sector. For instance, real sector is a broader term, the words such as LSM, GDP growth, and services have been clubbed together for detailed text analysis to refine the search pattern. Similarly, to analyze the external sector discussion, export, import, balance of payments, reserves, remittances and financial inflows are included in external sector dictionary. Likewise, same procedure is executed for other two macroeconomic themes (for details see Appendix A: Table A).

Further, to add meaningful value to our work, i.e. to know the tone of the discussion, dictionary text mining approach is employed. The dictionary categorizes words into positive, negative and uncertain categories. In our tone analysis exercise, which has been conducted for the same sample period mentioned earlier, we have used the Loughran and McDonald (2011) word list[5].

[5] A dictionary published in Journal of Finance containing a list of positive, negative and uncertainty words according to the Loughran and McDonald finance specific dictionary. It is relatively better at apprehending tone in business text compared to Diction, a commonly used mean to determine the tone of business document.

To compile this classification, we computed the frequencies of all words appearing in MPS and analysts' reports after and before the announcement of monetary policy statement. Then, from among the most frequent words we choose the words belonging to these three groups: (1) positive words, (2) negative words, (3) words indicating uncertainty. For instance, symbolically, tone dictionary can be represented by

$$P= \{x_1, x_2, x_3 \ldots x_n\} \quad (2)$$

$$N= \{x_1, x_2, x_3 \ldots x_n\} \quad (3)$$

$$U= \{x_1, x_2, x_3 \ldots x_n\} \quad (4)$$

Where P, N and U are sets of positive, negative and uncertain words respectively as per defined by Loughran and McDonald dictionary where each document is represented by

$$Sa = \sum_{i=1}^{n} Pi \,/ \sum_{i=1}^{n} Pi + Ni + Ui \quad (5)$$

$$Sb = \sum_{i=1}^{n} Ni \sum_{i=1}^{n} Pi + Ni + Ui \quad (6)$$

$$Sc = \sum_{i=1}^{n} Ui \sum_{i=1}^{n} Pi + Ni + Ui \quad (7)$$

Where Sa is share of positive words in total words attributing sentiments, Sb is share of negative words and Sc is share of uncertain words.

Results

While performing the exercise of dictionary based textual analysis, the behavior of the market for eight monetary policy statements, i.e. September 2017-November 2018, and brokerage houses reports before and after the announcement of MPS have been analyzed. The word-count result shows that, on aggregate level, monetary policy statements influenced market discussion to a significant level Figure (1). For instance, before publication of MPS market has been giving greater weightage of its discussion to inflation. However, after publication of MPS market changed their concern towards growth as well as other sectors, as shown in the Figure 1. Likewise, on disaggregated level, it has been observed that MPS of other months also changed the focus of market discussion almost in line with MPS (for details see Appendix D: Figure A1-A8).

While analyzing tone of the documents, before publication of MPS, element of uncertainty dominates the market discussion before the policy announcement whereas MPS mostly consists of positive arguments. However, after the publication of MPS, market reaction reports adopted the tone of monetary policy statement to some extent (for details see Appendix D: A9-A16).

On aggregate basis (Appendix B for disaggregated analysis), market showed uncertainty over the policy decision and economic conditions while discussing inflation concerns mostly whereas MPS kept positive outlook over growth and within the target inflation, specifically (Figure 2). It is important to note that the sample period analyzed, consists of stable, uncertain and challenging economic environment.

Figure 1: Weightages of Sectors in Discussion

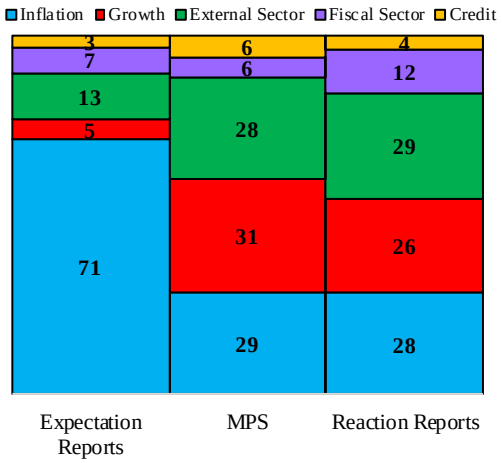
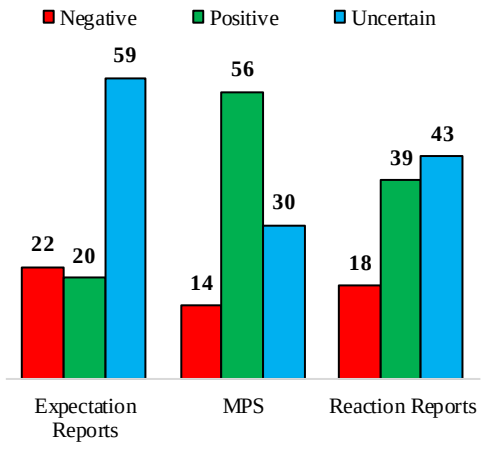


Figure 2: Weightages of Tone in Discussion



Thus, dictionary based text mining suggests a) market analysts focus on inflation dynamics as their major concern while commenting on the expected policy outcome before the announcement of MPS, b) MPS tries to discuss all five sectors of economy while deliberating for the policy decision, with a greater focus towards, inflation, growth and external sector developments, c) before the announcement of policy rate, market analysts mostly exhibit uncertainty in their discussion, d) the tone of the MPS is relatively positive, e) Market perception changes in line with the MPS to a certain extent, i.e. the extent of positivity increases while that of uncertainty and negativity falls (Figure 2).

Going forward, in presence of higher content and importance to inflation concerns of the market as well as central bank, in their discussions as per the adopted approach, there seems to be a greater scope of flexible inflation targeting regime that requires strong communication for anchoring expectations. Though the conclusion is insightful, caveats of the methodology, such as only examining predefined words and ignoring the context of discussion, as discussed earlier as well, need to be kept in perspective while devising policy.

3. The Voting Record and Future Policy Stance

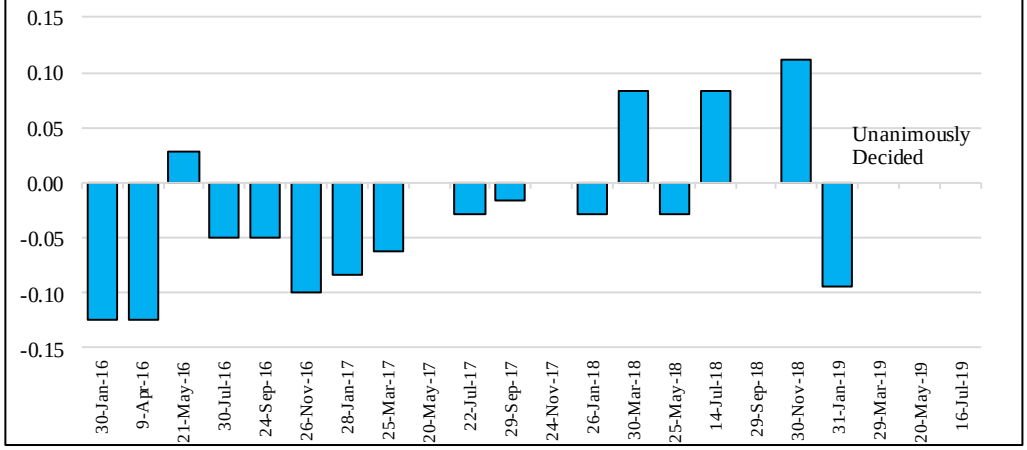
Minutes of the MPC is the second important document regarding monetary policy communication and contain important information of voting pattern of the MPC

members. This section attempts to analyze the question whether the publication of voting record contain useful information about future policy/interest rate changes.

Given the importance of central bank's clear communication and transparency, Buiter (1999) links the transparency of a central bank to publication of minutes. While justifying the need for disclosure of voting pattern and individual's preferences, most voting records provide practical information on diversity in a monetary policy committee, even though they do not provide readily accessible information on policymaker's individual preferences (Jung, 2011). On the other hand, opponents of publication of voting pattern argue that the broadcast of the information regarding the dissents may create confusion among the general public with reference to the policy stance (Issing 1999) and that publication of minutes may be uninformative for the market as substantial information already exists in the market (Bini-Smaghi and Gros, 2001). In the given perspective, we attempt to contribute to the existing literature on the subject by investigating the voting records of MPC of the State Bank of Pakistan.

Figure 3: Skew

Difference between Policy Rate and Average rate voted for



Among prominent studies on impact of disclosure of voting patterns on future interest rates, Shagi and Jung (2015) analyzed minutes of MPC and their impact on future course of monetary policy for Bank of England using Ordered Probit model. Their research favored the premise that voting pattern does have an impact on expectation formation regarding future policy direction. Riboni and Ruge-Murica (2014) estimated regression for the Bank of England showing that recent disagreement by a committee member can be useful in predicting the forthcoming votes of other members. Horváth et al. (2012) explored that information about disagreement amount MPC members, called skew, contains important information regarding future changes in the policy rate for five inflation-targeting central banks. Reeves and Sawicki (2007) estimated that minutes affect only short-term interest rates expectations for Bank of England. Gerlach-Kristen (2004) pointed out that skew calculated from MPC's voting information encloses important hints for the future interest rates. Studies conducted

for US (Kohn and Sack (2003)) and Bernanke, Reinhart and Sack (2004)) advocates that interest rate expectations are transformed by publication of minutes.

Econometric Specification and Findings

The voting pattern in MPC minutes shows the view of *each* committee member regarding the suitable level of interest rate for the economy. Policy Rate (PR) is decided by the *majority* votes of Monetary Policy Committee. The Monetary policy stance is communicated to the public through announcement of the PR. The difference between the average votes of the committee members and policy rate settled by the majority votes in the meeting can be shown through an indicator called *'skew'*. This indicator reflects the skewness in the voting pattern and is defined as follows

$$\text{Skew} = \frac{\sum_i^n PR_i}{n} - PR \tag{8}$$

PR_i is vote of i^{th} committee member for appropriate level of monetary policy rate. If all MPC members vote for the same policy rate, then the skew is zero as the general assessment concerning the suitable level of the policy rate corresponds with the policy rate decided in the meeting. Conversely, if some committee members vote for a lower policy rate, the average of PRi proposals is below PR leading to a negative skew. The larger the minority favoring a lower policy rate differs from the rate maintained by the majority, the more the average departs from the policy rate. Thus the skew is a measure of disagreement and takes negative (positive) value when the average stands below (above) the policy rate. In this study, skew lies between -12 to + 11 basis points during the period starting from January 2016 to July 2019 (Figure 3**)**.

We follow Gerlach-Kristen (2004) to check that whether voting disagreement (skew) contains evidence about fluctuations in future policy rate and estimate the following specification.

$$\Delta PR_{t+1} = \alpha Skew_t + \beta \Delta PR_{t-1} + e_{t+1} \tag{9}$$

We specify the date of the interest rate decision as t - 1 and the date of publication of the minutes after lag of around a month as t. In Pakistan, MPC meets bi-monthly to decide the change in policy rate, if any. Since policy is adjusted every eight weeks, the next policy rate decision in this framework is announced at time t+1, therefore the change in policy rate is the difference between the policy rate between t+1 and t-1 and denoted by ΔPR_{t+1}. The specification (9) also controls for the autocorrelation in the policy rate changes. The signs of α and β are expected to be positive. If some members of the MPC favor higher policy rate, i.e. a positive skew and α is positive, future policy rate is likely to increase. A positive β reflects the attempt of central bank to avoid any sudden policy reversals.

Three different mutually exclusive decisions can be made by the MPC: a policy rate hike, a cut in the policy rate or a status quo. The dependent variable ΔPR_{t+1} in (1) is a discrete variable and, as defined by El-Shagi and Jung (2015), has been categorized as: -1: interest rate decrease, 0: no policy change, 1: interest rate hike. We estimate specification (9) for the sample period starting from January 2016 to September 2018. As done in previous studies we use the Ordered Probit technique, which is econometrically suitable for the discrete changes in the policy.

The sign of α shows the direction of the change in the probability of falling in the endpoint rankings (in our, case a cut or a hike) when skew changes. Probability of policy rate cut changes in the *opposite* direction of the sign of *alpha* and probability of policy rate hike changes in the *same* direction as the sign of *alpha*. Analogously, the coefficient for other explanatory variables can be interpreted.

Table 1: Voting Record and Prediction of Policy Rate Changes
Dependent variable is ΔPR_{t+1} i.e. change in policy rate in period t+1.

Variable	Baseline Model	Baseline Model without lag dependent
$Skew_t$	11.46** (5.810)	9.1*** (3.59)
ΔPR_{t-1}	8.89** (3.43)	
$\gamma = 0$ (Status Quo)	-2.7*** (0.71)	-2.56*** (0..55)
$\gamma > 0$ (Rate Hike)	1.53*** (0.40)	0.71*** (0.23)
Pseudo R-squared	0.57	0.14

Note: The parameters $\gamma = 0$ and $\gamma > 0$ are switching points for policy rate stance of status quo and rate hike. ***, ** and * reflects significance at 1 percent, 5 percent and 10 percent levels respectively. Standard errors are mentioned in the parenthesis.

The estimation results of equation (9) are presented in Table 1. The estimates of baseline model advocate that the voting record is positively useful about changes in future policy. The coefficient for skew i.e. α, is positive and significant at 5 percent level. This means that if some MPC members propose a higher policy rate than average; it is indication of a policy rate hike in future.

In other words, up to an extent, contradicting votes possess some predicting power over future votes of majority of committee members. The lagged dependent variable is positive and significant, signifying that generally monetary policy aims at smoothing interest rates and avoids abrupt changes in the course of interest rates. We also obtain the switching point estimates of $\gamma < -0, \gamma = 0 \; and \; \gamma > 0$ for policy rate stance of status quo and rate hike. The switching points are significant at 1 percent level. The estimates indicate that the probability of a cut is given as:

$$F(\hat{\gamma} < 0 - \hat{\alpha} Skew_t - \beta \Delta PR_{t-1}) \qquad (10)$$

where F denotes the cumulative density function of the normal distribution. With an assumption that there is no change in the last policy rate and with a $Skew_t$ of -10 basis points, the probability that there is a cut in next monetary policy decision is 7.90 percent. Similarly, the probability of a status quo and a policy rate hike is respectively determined by

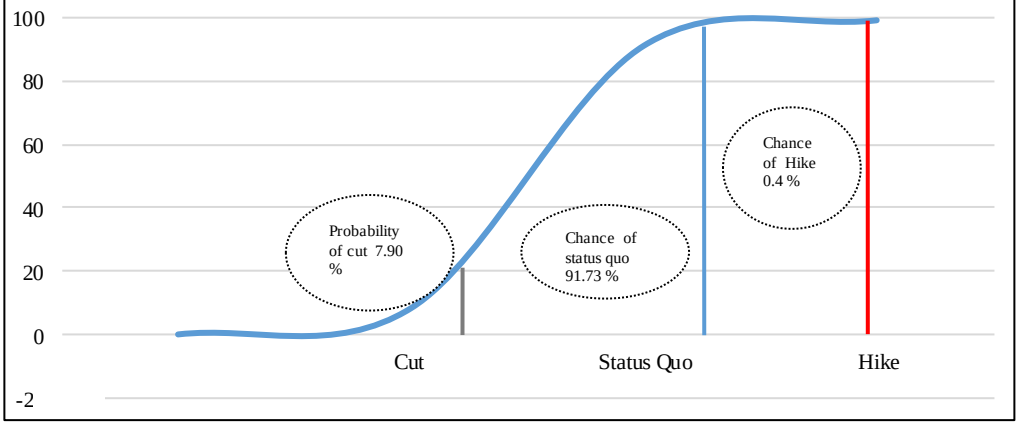
$$F(\hat{\gamma} = 0 - \hat{\alpha}Skew_t - \beta\Delta PR_{t-1}) - F(\hat{\gamma} < 0 - \hat{\alpha}Skew_t - \beta\Delta PR_{t-1}) \quad (11)$$

and

$$1 - F(\hat{\gamma} = 0 - \hat{\alpha}Skew_t - \beta\Delta PR_{t-1}) \quad (12)$$

With the previously mentioned assumptions, the probability of a status quo and a rate hike is respectively 91.73 percent and 0.4 percent. We also estimate the baseline equation without lag dependent. Overall, results remain unchanged.

Figure 4: CDF for Montary Policy Decision
With an assumption that there is no change in the last policy rate and with a $Skew_t$ of -10 basis points



Robustness

Financial markets use the available information on macroeconomic variables. The slope of the term structure of interest rates may indicate the expectations future course of policy rate if the market uses the same data as the MPC. Hence, it is possible that voting record will not reveal any extra information in addition to that presented in the market expectations. Therefore, we also control for the market expectations regarding the policy rate change in future. Expectations of a hike in policy rate are reflected in an upward-sloping term structure reflecting higher longer-term market rates. Since publication of the minutes affects the market interest rates, we use the market rates prevailed one day before the broadcast of the minutes. Following Gerlach-Kristen (2004) we use overnight, one-month, three-month, and twelve-month rates from the day before release of voting record and estimate equation (13):

$$\Delta PR_{t+1} = \alpha Skew_t + \beta \Delta PR_{t-1} + \delta Spread_{t-1} + e_{t+1} \quad (13)$$

We control for different spreads. Specifically, we employ the 1 month -7 days, 3 months -7 days and 6 months -7 days spreads.

Table 2: Voting Record and Prediction Policy Rate Changes in the Presence of Market Expectations

Dependent variable is ΔPR_{t+1} i.e. change in policy rate in period t+1.

Variable	With (1 Month-7 Days) Spread	With (3 Months-7 Days) Spread	With (6 Months-7 Days) Spread
$Skew_t$	11.62**	11.30*	11.46*
	(5.83)	(5.92)	(6.04)
ΔPR_{t-1}	8.39**	8.14**	8.29**
	(3.54)	(3.55)	(3.68)
Interest Rate Spread	-0.47	0.20	0.001
	(1.87)	(1.31)	(1.17)
$\gamma = 0$	-2.76**	-2.66**	-2.7***
(Status Quo)	(0.74)	(0.76)	(0.79)
$\gamma > 0$	1.46***	1.59***	1.53*
(Rate Hike)	(0.47)	(0.58)	(0.59)
Pseudo R-squared	0.57	0.57	0.56

Note: The parameters $\gamma = 0$ and $\gamma > 0$ are switching points. ***, ** and * reflects significance at 1 percent, 5 percent and 10 percent levels respectively. Standard errors are mentioned in the parenthesis.

Table 2 shows the estimates of specification (2). The results suggest that even after controlling for the market expectations, the coefficient for skew remains significant at 5 percent level while pseudo R^2 remains 0.57. The coefficients for interest rate spreads are insignificant. It suggests that market sentiments regarding policy rate changes in subsequent monetary policy are different from the information contained in the voting record about future policy. This may be due to the fact that MPC use richer data set than the market to decide about the future policy rate. The overall findings indicate that skew is very informative about the future changes in policy rate even after controlling for market expectations. Hence, the broadcast of minutes of MPC meetings and voting record increases the transparency of monetary policy. Moreover, the information regarding the voting pattern also affects the market yields if the number of dissents increases in the MPC minutes (for details see Appendix C).

4. Conclusion

The objective of the paper was to examine the impact of monetary policy communication of SBP, particularly, the monetary policy statements and voting records of the minutes of MPC. First, we analyze monetary policy statements and market reaction using textual analysis and present market aligned discussion to monetary policy statements. Moreover, we also review the tone of the documents and market commentary. We find that monetary policy statements mostly incorporate positive words in the statements and the markets generally follow the trend. Transition of market's choice of words post MPS discussion suggest that positive tone in the MPS alleviates the uncertainty in the market, noticeably prevailing before the

policy announcement. Second, we investigate the prediction power of voting records for future interest rates and the market behavior over the publication of minutes. The findings suggest that the voting record provided by the SBP in the minutes of the MPC is insightful about changes in future policy. The results are robust to inclusion of market expectations in the econometric specification. Our findings imply that transparency of the actions of central bank is very important in the monetary policy effectiveness.

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Appendix A: Word Lists Across Monetary Policy Statement and Market Reports in Sample for Textual Analysis

Table A: Word Lists Across Monetary Policy Statement and Market Reports in Sample for Textual Analysis

Inflation	Real Sector	External Sector	Fiscal Sector	Monetary Sector
Inflation	Crops	Export/s	Fiscal	Credit
Price/s	GDP	Import/s	Debt	Consumer Financing
CPI	LSM	Remittance/s	Tax/es	
	Services	External	Budget	
	CPEC	Trade		
	Investment/s	Depreciation		
		Inflow/s		
		BOP		
		Reserve/s		

Appendix B: Disaggregated Analysis of MPS and Market Reports

The sample monetary policies episodes (September 2017-November 2018) choosen for textual analysis consists of stable, uncertain and challenging macroeconomic conditions as policy rate, during this period, was stable initially then started to incresae gradually according to macroeconomic conditions.

Period from September 2017 to December 2017 can be considered stable , specifically September 2017, when SBP maintained staus quo with positive real sector dynamics coupled with within the target inflation. However, concerns over external sector sustainibility started to emerge. Same message can be drawn from Figure A1, A9. Figure A1 depits market expectation bar giving more weight to inflation discussion whereas MPS emphais was more on the positive growth aspects. Following MPS direction, market commented positively on the decision as well as macroeconomic conditions.

In January 2018, when SBP rose the policy rate by 25 bps after 13 quarters spell of status quo, market's much focus was increasing inflation having pessimistive cannotation, whereas, MPS maintained its balance discussion with increased focus on external and fiscal sectors vulnerbilities. This was aided by increased use of words sending gloomy picture of the economy (Figure A11). The decision of increase in the policy rate was percieved positively by the market as is also visible from the Figure A11. Usage of positive words increased accordingly.

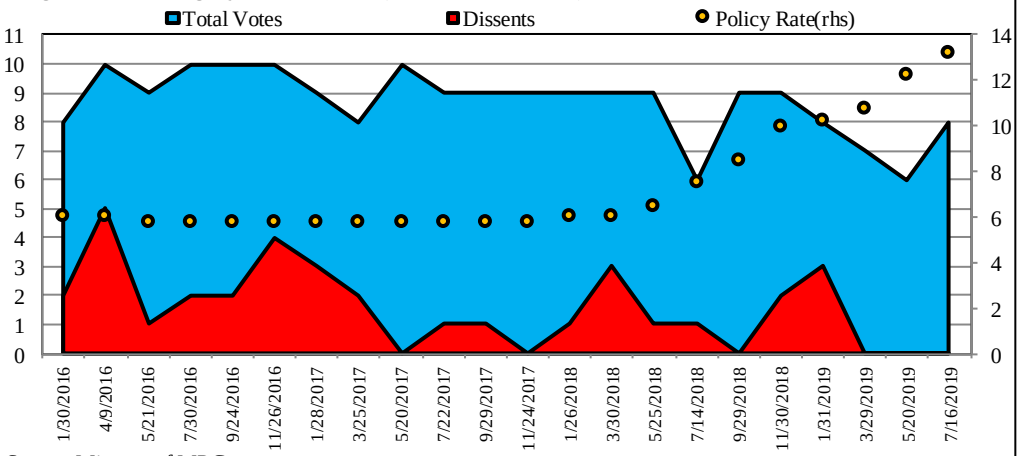
In March 2018, market expressed much uncertainity over the increase in core inflation and expected change in the policy rate as well (Figure A4 & A12). Whereas, MPS remained much optimistic about the growth prospects and achieveing an 11 year high growth rate and with in the band inflation rate. Market somehow aligned its discussion accordingly.

In July 2018, when interest rate was increased by 100 bps, much emphaisi was given to fiscal sector imbalances compared to previous MPS along with increase in the inflation and external sector vulnerbilities. Usage of negitive words increased in the MPS which in turn effected the positive perspective of the market and increased uncertainity amid sudden rise of 100 bps in the policy rate.

During September and November 2018 MPS, increased use of pessimistive words was observed in MPS due to escalating challenges at external, fiscal and inflation front. Which, in turn, diverted the post MPS discussion accordingly. Similarly, increased external sector vulnerbilities also changed the MPS focus more towards external sector discusssion. Market accordingly aligned its discussion to theses sectors after the annoucement of MPS. During this perios, policy rate was increased by 250 bps.

Appendix C: Voting Pattern and Market Sentiments

Figure C1: Voting Dynamics-MPC (Jan 2016-Jul-2019)



Source: Minutes of MPC

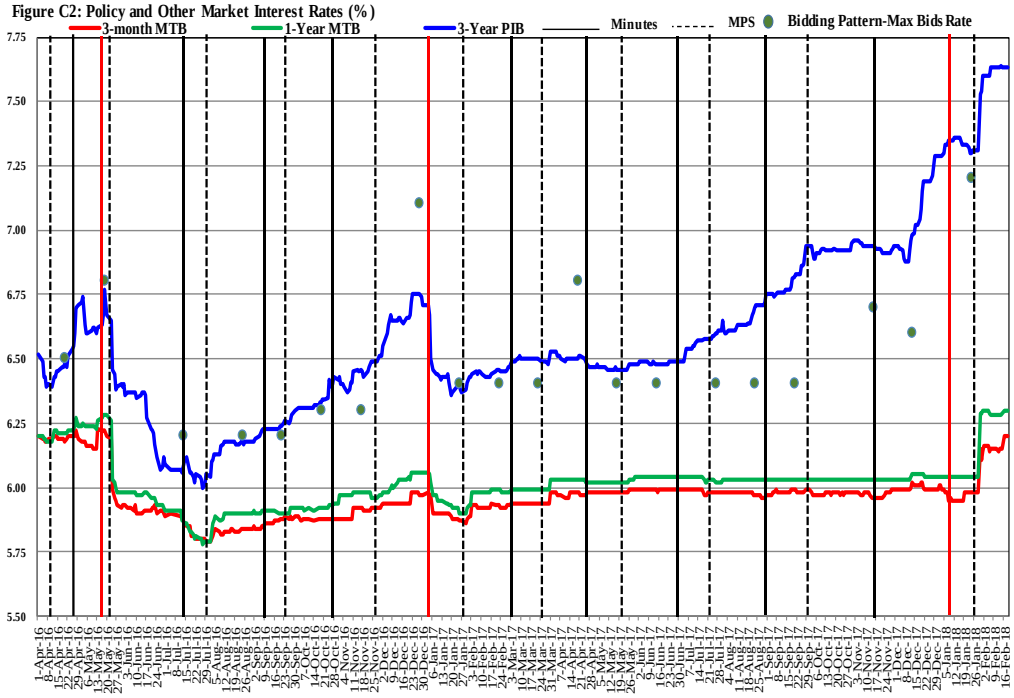
The SBP started publication of MPC minutes in April-2016 and voting pattern of the MPC meetings. Figure C1 and Table C1 broadly depicts the dynamics of MPC members, including presence and voting behavior of the MPC members since the publication of MPC minutes. From the given figure, five major events can be identified associated with the maximum and minimum percentage of dissents. The most important event was of January 3, 2017, when minutes for MPS November 2016 were published. The information of 40 percent dissents to the decision of status quo impacted the market yields significantly. In December-2016, the yields in both primary and secondary money markets inched up initially owing to market expectations about higher future course of interest rates and sentiments concerning rise in inflation in the face of increasing international oil prices. These sentiments were reflected in the bidding behavior of the primary dealers in the auctions of Market Treasury Bills (MTBs) and PIBs, whereby, the banks demanded significantly higher yields. However, soon after the publication of minutes, market yields in the secondary market dropped sharply (Figure C2).

This signifies that market changed its perspective about future interest rate hike owing to minute's results and improved inflation outlook. Interestingly, monetary policy decision of status quo could not affect the increasing trend in yield curve but the minutes altogether changed the yield curve scenario.

Another important event is publication of minutes for MPS held on 9th April, 2016 which revealed that 50 percent of the votes were casted against the status quo decision and chairman casted his vote for the final decision to keep the status quo whereas 50 percent of the members wanted cut in the interest rate. This message clearly signaled the market about the future interest rate decision. The higher volatility in the MTBs

and PIBs rates was observed post minutes publication and rates started to decline before the announcement of next monetary policy, which was in favor of 25 bps cut in the interest rates.

Figure C2: Policy and Other Market Interest Rates (%)



Sources: SBP

Table C1 : Voting Information

Date-MPC	Votes for Status quo	Votes for Increase	Votes for Decrease	Policy Rate
30-Jan-16	6	0	2 (50bps)	6
9-Apr-16	5	0	5(25 bps)	6
21-May-16	1	0	8	5.75
30-Jul-16	8	0	2(25bps)	5.75
24-Sep-16	8	0	2(25bps)	5.75
26-Nov-16	6	0	4(25bps)	5.75
28-Jan-17	6	0	3(25bps)	5.75
25-Mar-17	6	0	2(25bps)	5.75
20-May-17	10	0	0	5.75
22-Jul-17	8	0	1(25bps)	5.75
29-Sep-17	8	0	1(15bps)	5.75
24-Nov-17	9	0	0	5.75
26-Jan-18	1	8	0	6
30-Mar-18	6	3(25 bps)	0	6
25-May-18	0	9(8 for 50,1 for 25)		6.5
14-Jul-18	0	6(5 for 100, 1 for 150)	0	7.5
29-Sep-18	0	9	0	8.5
30-Nov-18	0	0	0	10
31-Jan-19	3	5	0	10.25
29-Mar-19	0	7	0	10.75
20-May-19	0	6	0	12.25
16-Jul-19	0	8(5 for 100, 2 for 75, 1 for 150)	0	13.25

Data source: Minutes of MPC Meetings

Minutes published for MPS held on 21st May, 2016 registered lowest percentage of dissents to the decision of policy cut and market exhibit somewhat volatility in the government securities rates as the yield curve further shifted down.

Fourth major event was observed in the minutes of monetary policy held on 20th May, 2017 with zero percentage of opposition to the decision of status quo. Accordingly, volatility in the MTBs and PIBs, post minutes publication, was low as the decision was aligned with market expectations.

Publication of MPC minutes on 9th January 2018, again reinforced the importance of voting pattern over market response. Similar to the incident of 3rd January 2017, in December 2017, the yields in both primary and secondary money markets inched up initially owing to market expectations about higher future course of interest rates and sentiments concerning rise in inflation. However, with the release of meeting minutes showing unanimous consensus of the MPC members on status-quo over the last decision altered the market perception of hike in the interest rate in the upcoming monetary policy decision despite all dynamics supporting the rise in the policy rate. Resultantly, the market yields got stable until the decision of rise in the policy rate by 25 bps.

The brief analysis suggests that voting pattern, particularly, percentage of dissents affect the market sentiments about the future interest rates.

Appendix D: Weightages of Economic Sectors & Tone in the Discussion

Weightages (%) of Economic Tone in the Discussion of Market Analyts and SBP

Figure A1: September 2017

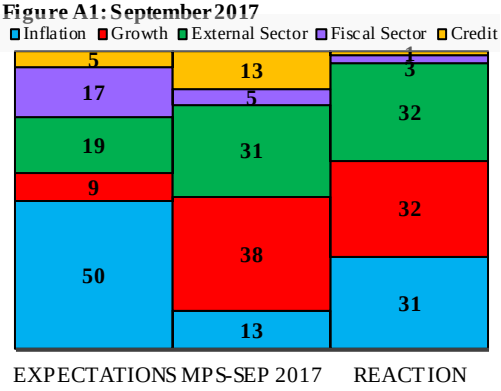
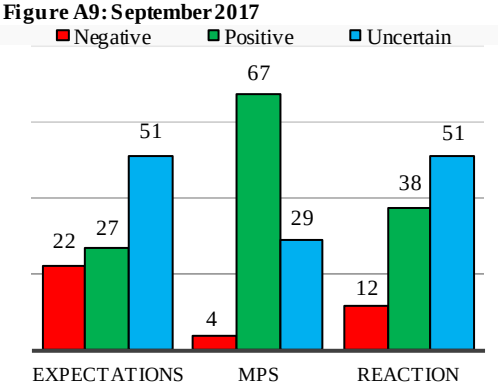


Figure A9: September 2017



Pre-MPS Sample: Shajar Capital, Optimus, Elixer Securities, InvestCapital
Post MPS Sample: Elixer Securities, Shajar Capital, JS Research

Figure A2: November 2017

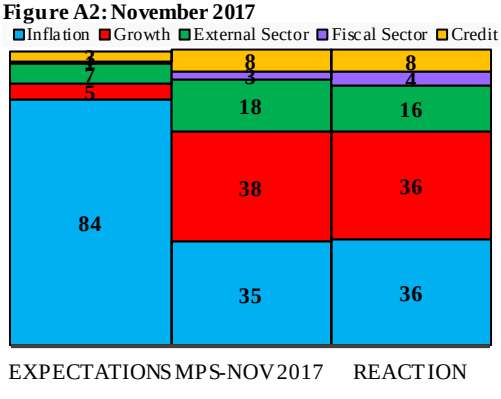
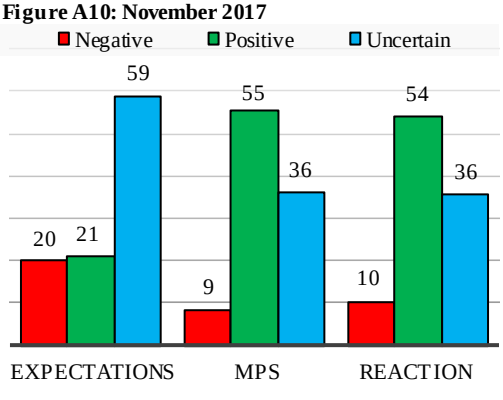


Figure A10: November 2017



Pre-MPS Sample: BMA Capital, Business Recorder, IGI Securities
Post MPS Sample: Daily Times, Pakistan Observer, Pakistan Today, The Nation, The News

Figure A3: January 2018

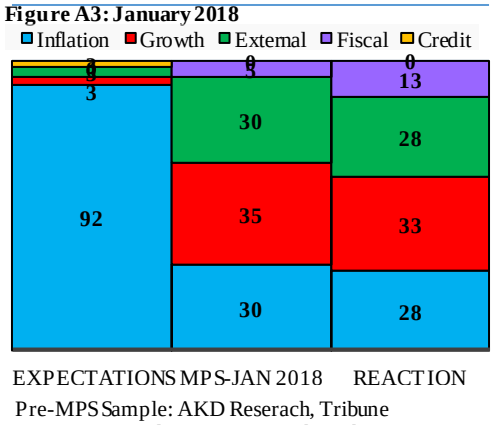
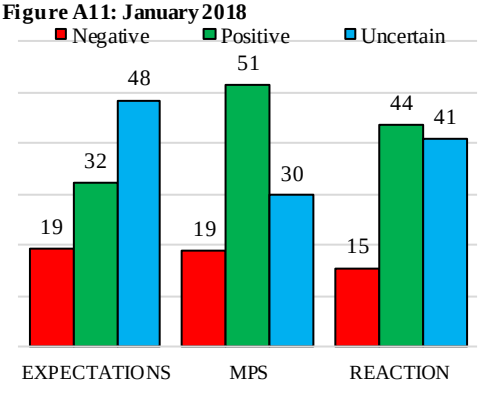


Figure A11: January 2018



Pre-MPS Sample: AKD Reserach, Tribune
Post MPS Sample: AKD Reserach, Tribune, Dawn

Figure A4: March 2018

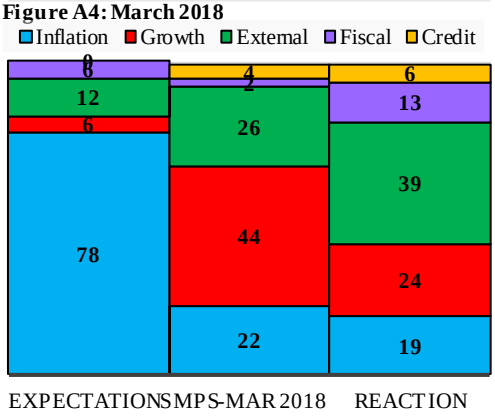
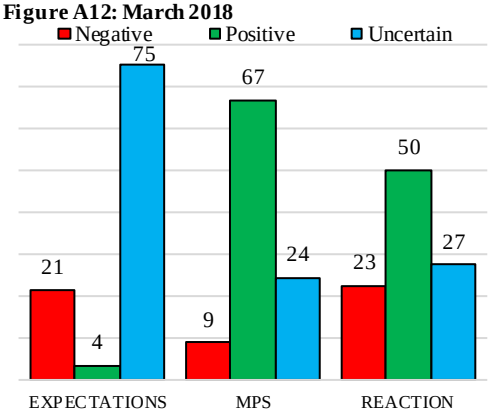


Figure A12: March 2018



Pre-MPS Sample: BMA Capital, Business Recorder, The Financila Daily, Elixer Securities, Shajar Capital
Post MPS Sample: Business Recorder Item 1, Business Recorder Item 2, Business Recorder Item 3

Figure A5: May 2018

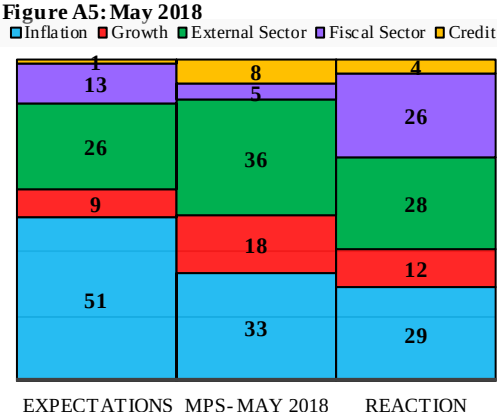
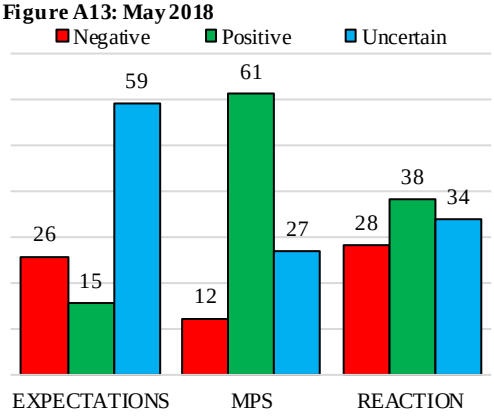


Figure A13: May 2018



Pre-MPS Sample: AKD Reserach 1, AKD Reserach 2, Business Recorder, BMA Capital 1, BMA Capital 2, Elixer Securities, The News, Optimus Capital
Post MPS Sample: AKD Reserach, BMA Capital, Business Recorder 1, Business Recorder 2, Business Recorder 3, Dawn, JS Research, The News, The Nation, Express

Figure A6: July 2018

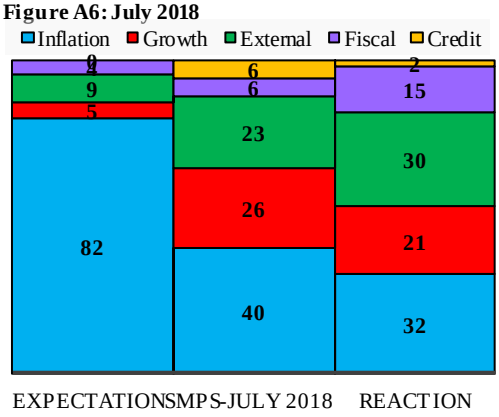
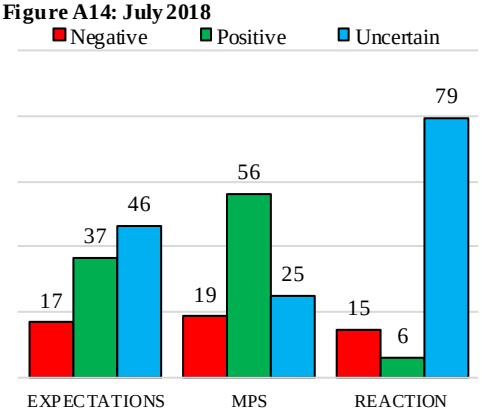


Figure A14: July 2018



Pre-MPS Sample: BMA Capital, Dawn 1, Dawn 2, Dunya News, Express, AKD Research
Post MPS Sample: Elixer Securities, Express, Shajar Capital, The News 1, The News 2, Topline Reserach

Figure A7: September 2018

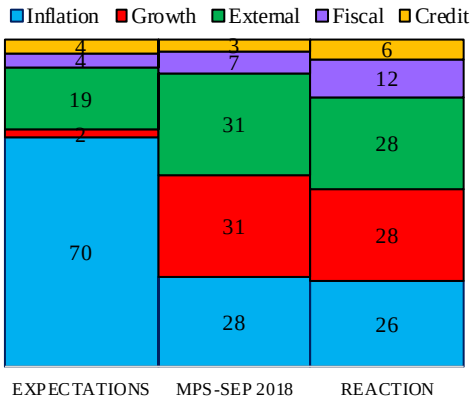
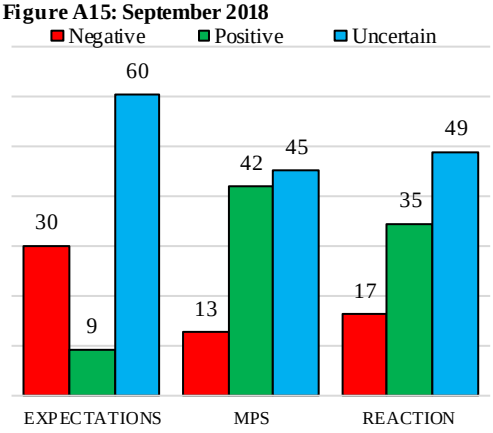


Figure A15: September 2018



Pre-MPS Sample: AKD Reserach, The News, Pakistan Observer, Pakistan Today
Post MPS Sample: BMA Capital, Business Recorder, Daily Times, Dawn, Express, JS Reserach, Pakistan Observer, AKD Reserach, Pakistan Today,The Nation, The News-1, The News-2

Figure A8:November 2018

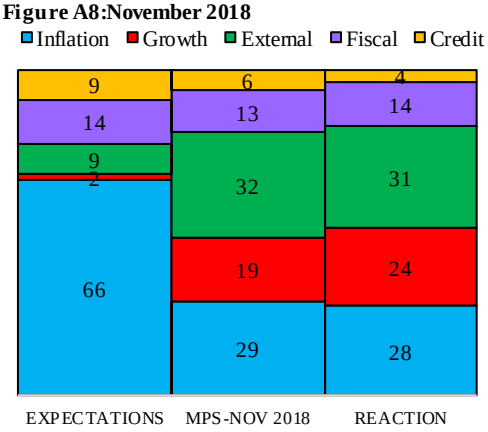
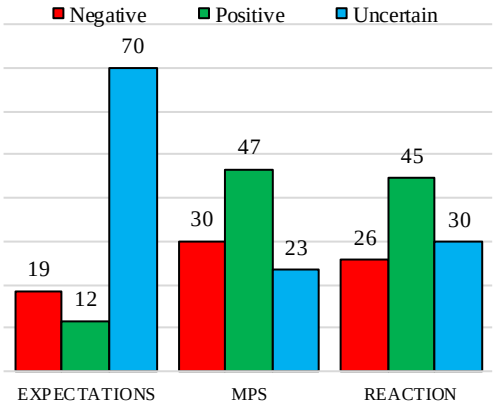


Figure A16:November 2018



Pre-MPS Sample: Business Recorder 1, Business Recorder 2, Dawn Express, Pakistan Observer, The News
Post MPS Sample: Business Recorder, Daily Times, Express, Pakistan Observer, Pakistan Today, The Nation, The News

Appendix E: Loughran McDonald Dictionary (2014 Version)

NEGATIVE	NEGATIVE-Cont.	POSITIVE	UNCERTAIN
abandon	alienation	able	abeyance
abandoned	alienations	abundance	abeyances
abandoning	allegation	abundant	almost
abandonment	allegations	acclaimed	alteration
abandonments	allege	accomplish	alterations
abandons	alleged	accomplished	ambiguities
abdicated	allegedly	accomplishes	ambiguity
abdicates	alleges	accomplishing	ambiguous
abdicating	alleging	accomplishment	anomalies
abdication	annoy	accomplishments	anomalous
abdications	annoyance	achieve	anomalously
aberrant	annoyances	achieved	anomaly
aberration	annoyed	achievement	anticipate
aberrational	annoying	achievements	anticipated
aberrations	annoys	achieves	anticipates
abetting	annul	achieving	anticipating
abnormal	annulled	adequately	anticipation
abnormalities	annulling	advancement	anticipations
abnormality	annulment	advancements	apparent
abnormally	annulments	advances	apparently
abolish	annuls	advancing	appear
abolished	anomalies	advantage	appeared
abolishes	anomalous	advantaged	appearing
abolishing	anomalously	advantageous	appears
abrogate	anomaly	advantageously	approximate
abrogated	anticompetitive	advantages	approximated
abrogates	antitrust	alliance	approximately
abrogating	argue	alliances	approximates
abrogation	argued	assure	approximating
abrogations	arguing	assured	approximation
abrupt	argument	assures	approximations
abruptly	argumentative	assuring	arbitrarily
abruptness	arguments	attain	arbitrariness
absence	arrearage	attained	arbitrary
absences	arrearages	attaining	assume

NEGATIVE	NEGATIVE-Cont.	POSITIVE	UNCERTAIN
absenteeism	arrears	attainment	assumed
abuse	arrest	attainments	assumes
abused	arrested	attains	assuming
abuses	arrests	attractive	assumption
abusing	artificially	attractiveness	assumptions
abusive	assault	beautiful	believe
abusively	assaulted	beautifully	believed
abusiveness	assaulting	beneficial	believes
accident	assaults	beneficially	believing
accidental	assertions	benefit	think
accidentally	attrition	benefited	may
accidents	backdating	benefiting	expect
accidents	bad	benefitted	anticipate
accidents	bail	benefitting	believe
accuse	bailout	better	maybe
accused	balk	growth	compared
accuses	balked	good	guess
accusing	bankrupt	strong	knowledge
acquiesce	bankruptcies	opportunities	expected
acquiesced	bankruptcy	opportunity	expectations
acquiesces	bankrupted	improvement	assumptions
acquiescing	bankrupting	positive	assume
acquit	bankrupts	grow	assuming
acquits	bans	growing	projections
acquittal	barred	improved	forecast
acquittals	barrier	improve	fairly
acquitted	barriers	grew	generally
acquitting	below	ability	perhaps
adulterate	challenging	strength	roughly
adulterated	challenge	gain	reasonable
adulterating	challenges	success	plans
adulteration	decline	favorable	efforts
adulterations	declines	advantage	preliminary
adversarial	declines	outstanding	possible
adversaries	declining	improving	planning
adversary	decrease	improvement	expecting

NEGATIVE	NEGATIVE-Cont.	POSITIVE	UNCERTAIN
adverse	decreased	confident	estimates
adversely	difficult	successful	predict
adversities	difficulty	stronger	forecasting
adversity	inaccuracies	comfortable	forecasts
aftermath	incorrect	excellent	pretty
aftermaths	loss	nice	approximately
against	losses	confidence	might
aggravate	lost	profitable	wondering
aggravated	negative	attractive	enough
aggravates	negatively	optimistic	hope
aggravating	pressure	benefited	potential
aggravation	problem	exciting	comparison
aggravations	problems	wins	assumption
alerted	reduce	safe	
alerting	risk	successfully	
alienate	risks	grown	
alienated	slowdown	strength	
alienates	tough	encouraging	
alienating	uncertainties	perfect	
	uncertainty		
	volatility		
	weakness		
	worse		

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Asymmetric Pass Through of Global Oil Prices to Macroeconomic Variables of Pakistan

Kalim Hyder and Syed Qamar Hussain [1]

Abstract: *This study presents a multivariable threshold analysis of global oil price movements for Pakistan's economy. Instead of imposing exogenous thresholds for global oil prices, we apply threshold vector autoregressive approach to identify the thresholds endogenously. On the basis of statistical significance, we identify two thresholds of global oil prices, which define immensely declining, declining and increasing oil prices regimes. The study confirms the existence of asymmetries and nonlinearity among oil price shocks and real effective exchange rate, real interest rate, inflation and output of manufacturing sector. These variables respond differently in terms of magnitude, direction and adjustment period in various regimes. Real effective exchange rate depreciates in response to increase in global oil prices in all the regimes. Real interest rates witnesses decline in the first and third regimes but increases in the second regime. This may be due to intensity of the reaction of the monetary authorities to anchor the inflation expectations. In the second and third regimes, economic activity plummets in response to the increase in global oil prices but witnesses expansion in the first regime, which may be due to the negative real interest rates. Pass through to inflation of global oil prices is positive in the first and third regimes whereas the inflation declines in the second regimes, which may be due to aggressive monetary stance.*

JEL Classification: C19, E37, E52, Q43

Keywords: Multivariate Threshold Models; TVAR; Local Projections; Oil Shocks; Inflation; Real Exchange Rate; Interest Rates; Pakistan

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1. Introduction

The hike in crude oil prices during 1970s resulted in stagflation in the oil importing economies that was characterized by declining growth and higher inflation. This garnered the attention of researchers regarding the quantification of the impact of oil price movements on the key macroeconomic variables. Mork et al., (1994), Barsky and Kilian (2004) and Hamilton (2005) examine the impact of oil price shocks on economic activity, trade balances, inflation, exchange rates and other key macroeconomic variables in the oil importing and exporting countries after the pioneer contribution of Hamilton (1983, 1988, 1996). Bruno and Sachs (1982), Hooker (1996), Hamilton (1996) and Brown and Yucel (2002) identify transmission channels through which oil prices impact economic activity. Mory (1993), Lee et al. (2001), Lee and Ni (2002), Cunado and Gracia (2003), and Lardic and Mignon (2006) estimate these theoretically developed channels and quantify the relationship between international oil prices and aggregate economic activity. Further, Chuku (2012), Mordi (2010), Markwardt et.al. (2008), Huang et al. (2005), Bhattacharya and Bhattacharya (2001), Hooker (1999), Sadorsky (1999), Hamilton (1996), Lee et al. (1995), Mork (1989) add value by concluding that the oil price changes have asymmetric impact on economic activity. In this regard, there are four possibilities. The pass through of oil prices to domestic consumer prices and macroeconomic variables could either be linear or nonlinear and symmetric or asymmetric depending upon the structure of the economy. In the case of Pakistan, Afia (2010), Sidra (2011), Khan and Ahmad (2011), Sidra and Abdul (2014), Sultan and Waqas (2014), and Chughtai and Kazmi (2014) quantify the impact of global oil prices on macroeconomic performance of Pakistan. However, these studies assume linear pass through of oil prices in Pakistan. Linearity assumption may lead to misspecification bias if there exists asymmetries and nonlinearities in the pass through of changes in global oil price to domestic economy. Therefore, there is a need to re-examine the pass through of global oil prices to Pakistan's economy with the consideration of asymmetries and nonlinearities. With this motivation, we quantify the impact of oil price movement on key macroeconomic variables.

In the developing countries like Pakistan, governments administered the energy prices to limit the pass through of global oil prices to domestic prices. In the case of massive increases in oil prices, the fiscal burden limits the capacity of the governments to subsidize the consumers. However, small increases in oil prices may be subsidized by the governments depending on fiscal situation and investment priorities. Therefore, there is possibility that intensity of increase in the international oil prices may determine the pass through to the consumer. On the other side, slight decline in the global oil prices may not be passed on to the consumers due to fiscal revenues concerns of the governments but political pressures may demand cut in domestic energy prices in the case of massive decline in international oil prices. The fiscal behaviour regarding administering the domestic energy prices leads to the asymmetries and nonlinearities in the pass through of international oil prices to consumer prices.

Huang et al. (2005), Sadorsky (1999) and Tsay (1998) present the methodology of incorporating asymmetries and nonlinearities in the estimation of pass through of global oil prices by various threshold levels. We adopt their methodology and compute various

threshold levels of global oil price for Pakistan. In doing so, we identify immensely declining growth, declining growth and increasing growth of global oil prices as three statistically significant threshold levels. Further, we quantify pass through of each threshold level to (i) real effective exchange rate, (ii) interest rate, (iii) industrial production and (iv) inflation in Pakistan. The responses of macroeconomic variables to the shocks in global oil prices within each regime is computed by applying local projection procedure of Jordà (2005). The second threshold of declining global oil prices (between -3.4 to -6.6 percent) have no significant impact on the inflation in consumer prices, however, rest of the two threshold levels of immensely declining (below -6.6 percent) and increasing (above -3.4 percent) global oil prices have significant impact on inflation. All the threshold levels of global oil prices have symmetric impact on real effective exchange rate and industrial production. The monetary authority increases interest rates in the increasing oil prices regime.

After presenting the motivation of the study in the introduction, next section discusses the literature review. Global oil prices and Pakistan's energy scenario are discussed in third section. Fourth and fifth sections present theoretical framework and methodology of the paper. Data sources, variable construction and stationarity of data are discussed in sixth section. The discussion on the results of estimation are presented in seventh section. Final section concludes the paper.

2. Literature Review

Since the largest oil price shocks of the century in 1970s, Hamilton (1983, 1988, 1996) initiates the research on impact of oil prices on economic activity. After his pioneering contribution, Mork *e. al.*, (1994), Barsky and Kilian (2004) and Hamilton (2005) quantify the impact of oil price shocks on economic activity, trade balances, inflation, exchange rates and other key macroeconomic variables in oil importing and exporting countries. Bruno and Sachs (1982), Hooker (1996), Hamilton (1996) and Brown and Yucel (2002) develop transmission channels of pass through of international oil prices to domestic economies. Mory (1993), Lee *e. al.* (2001), Lee and Ni (2002), Cunado and Gracia (2003), and Lardic and Mignon (2006) estimate these theoretical channels. Further, Chuku (2012), Mordi (2010), Markwardt et.al (2008), Huang et al. (2005), Bhattacharya and Bhattacharya (2001), Hooker (1999), Sadorsky (1999), Hamilton (1996), Lee *et. al.* (1995), Mork (1989) explore the asymmetric impact of oil price changes on economic activity by considering exogenous thresholds.

Hamilton (1983) finds strong correlation between the changes in crude oil prices and some, if not all, of the U.S. economic recessions during 1948-1972. Mork (1989) extends the study of Hamilton (1983) and investigates if Hamilton's results hold in periods of price decline as well. He confirms negative correlation of oil price with economic activity in the case of increase in oil prices and finds no correlation between U.S. economic activity and oil price declines. He validates the asymmetric pass through of oil prices to economic activity. Hooker (1999) estimates the consequences of oil price changes on U.S. inflation by using

Phillips curve framework. He concludes that the oil price changes contribute to core inflation substantially before 1980, however, after that there is negligible pass-through.

Leduc and Sill (2004), Huang *et al*. (2005) and Cologni and Manera (2008) examine the role of macroeconomic policies in coping with the oil price shock. They explore the possibilities regarding the weakening of the association between oil price variation and aggregate economic activity. Given that the deceleration in economic activity and rise in inflation are two unavoidable impacts of oil price shocks, the studies of this strand are looking for a befitting monetary policy that intend to cope with the oil supply shock. Although there are arguments if oil shocks are the major hinder for economic slowdown, it is broadly acknowledged that oil price shocks partially transmits into inflation (Bohi, 1989).

IMF (2000) ascertains that persistent oil prices increase builds inflationary pressures and can shrink the global demand and production because the reduction in aggregate demand of oil importing economies offsets the rise witnessed in oil exporting countries. Moreover, the disruption depends upon the status of the business cycle, response of macroeconomic policies and responsiveness of the economies. In order to handle the oil price shock , IMF (2000) suggest that monetary policy formulation should minimize the second round impact of oil price increases, prevailing fiscal policies should stay unchanged and greater flexibility of labour markets.

The focus towards nonlinearity and asymmetry of oil price shocks in the oil exporting and importing countries become more important after the large fluctuations of oil prices during 1980s. Mork (1989), Lee *et al.* (1995), Hamilton (1996), Sadorsky (1999), Bhattacharya and Bhattacharya (2001), Markwardt *et. al.* (2008), Mordi (2010), Chuku (2012) differentiate the regimes of oil price shocks based on positive and negative changes in oil prices to examine the asymmetry. They conclude that rising oil prices are the primary cause of inflation whereas declining oil prices have no favorable impact on price levels. Furthermore, it is not necessary that every rise in oil prices, whether a little or significant, may have a similar impact on economic variables. Therefore, the pass through of oil prices varies from country to country depending on the market characteristics and policy responses in each country. However, these studies consider the decline and increase of oil prices as two different regimes exogenously whereas threshold levels to which domestic variables react need to be derived endogenously. Huang et al. (2005) address this issue by using Tsay (1998) approach and identify different thresholds of oil price changes for US, Japan and Canada.

In the case of Pakistan, Afia (2010), Sidra (2011) and Sidra and Abdul (2014) and Chughtai and Kazmi (2014) use simple causality analysis and linear specifications to quantify the impact of oil price shocks to macroeconomic variables of Pakistan. Khan and Ahmad (2011) derive the exogenous threshold by considering the increase and decline of global oil prices. Afia (2010) examines the impact of oil price on real effective exchange rate, debt–GDP ratio, real foreign exchange reserves and economic growth of Pakistan. She considers an IS function for an open economy, Phillips curve and monetary policy reaction function. Her results suggest a strong association between oil prices and output. She considers quadratic specification to isolate the impact of slight and large movements in oil prices on the

macroeconomic variables. Sidra (2011) and Sidra and Abdul (2014) perform multivariate analysis and conclude that the oil prices changes significantly impact balance of payment in Pakistan. Sultan and Waqas (2014) conclude that oil prices have a minimum impact on the economic activity in the short run and a significant impact in the long term by applying Granger Causality in error correction model. Chughtai and Kazmi (2014) conclude that oil prices significantly affect the economic growth of Pakistan.

Khan and Ahmad (2011) examine the macroeconomic effects of global food and oil prices shocks to inflation, interest rate, money balances, output and real effective exchange rate of Pakistan. They find that the oil price shocks negatively affect the industrial production, positively affect the inflation and appreciates real effective exchange rate symmetrically but have an asymmetric effect on the short-term interest rates.

In the case of Pakistan, there is a lack of studies that are geared towards pinning down endogenous threshold. Therefore, considering the oil price changes as a threshold variable in this paper, we perform the multivariate threshold analysis of Pakistan. We follow the methodology of Huang et al. (2005) for testing the nonlinearity and identification of thresholds.

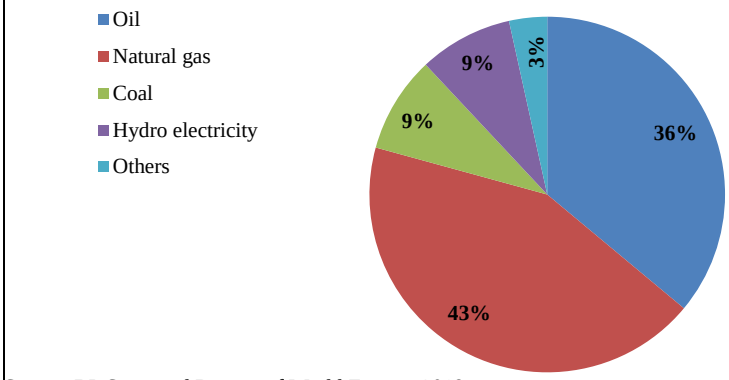
3. Global Oil Prices and Pakistan's Energy scenario

In Pakistan's energy mix, though the major share in total energy consumption is of indigenous natural gas, oil still has a large share of around (36%) in the total primary energy consumption (Figure 1). The domestic production of crude oil remains well short of the demand. As much as around 70 percent (average of FY06-FY15) of the total crude oil processed by refineries is imported from abroad. Due to this fact, Pakistan's economy is vulnerable to global oil price shock like every other oil importing economy.

Figure 2 presents the global oil prices, policy rate and domestic inflation. The unchanged policy rate during 1980-1993 indicate that the monetary policy was not responding to the pass through of global oil prices to the domestic economy. After that, monetary authority started to control inflation through monetary targeting till 2002. In the last two decades, the interest rates are setting under monetary policy help in anchoring of inflation expectations and control the pass through of oil prices to the domestic economy.

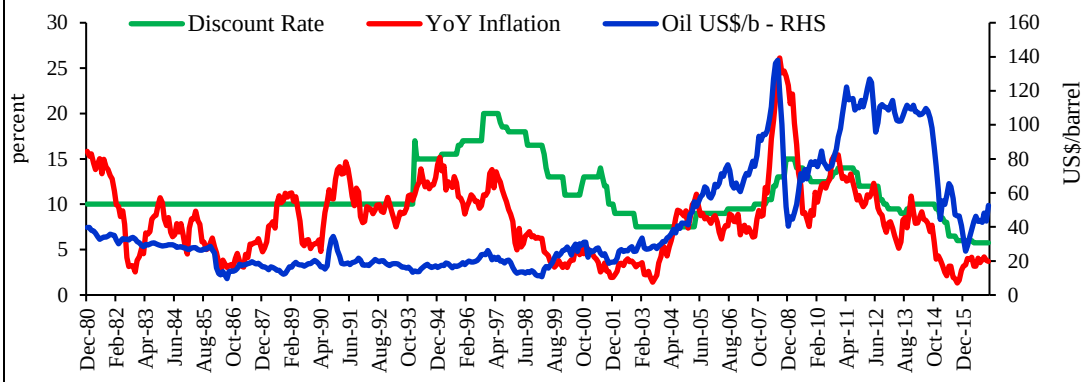
Figure 3 presents dynamic correlations of global oil prices with the lead of domestic inflation in consumer prices in Pakistan. The highest pass through of growth of global oil prices is observed after six months in the inflation. Bernanke (2013) mentions that the immediate impact of global oil prices on the domestic consumer prices is due to the expectation channel whereas the increase in marginal costs and consumer prices require adjustment lag.

Figure 1: Pakistan's Energy Consumption in 2017 (share)



Source: BP Statistical Review of World Energy, 2019

Figure 2: Historical Analysis of Global Oil Prices, Discount rate and Inflation



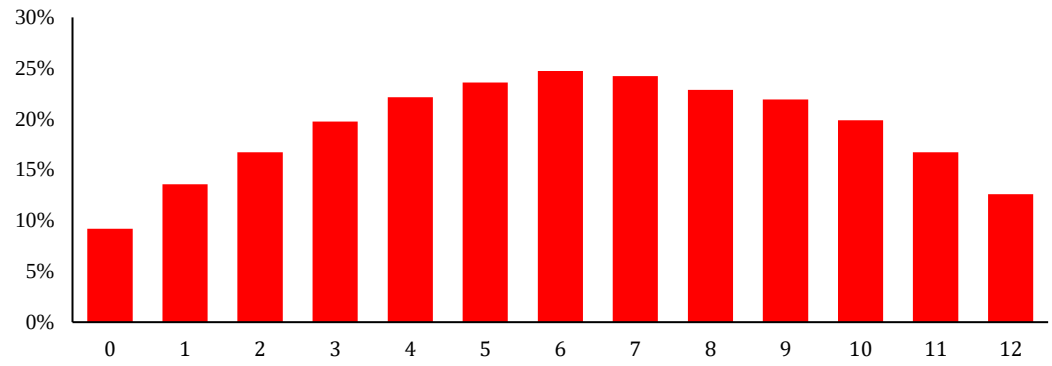
Source: Bloomberg, SBP

Theoretical Framework

There are three main transmission channels (fiscal, prices and trade) of pass through of global oil prices. In developing economies, governments usually intervene through administered prices to limit the pass through of global oil price increases to domestic energy prices. Some prefer to intervene through complete subsidizing the oil price increase, which results in minimum pass through. Whereas some governments do not afford higher subsidies due to predetermined budgets. Hence these governments adopt market based pricing mechanism, which results in complete pass through of global oil prices. Another category of government subsidize a proportion of the changes in oil price, which results in incomplete pass through to domestic prices. Therefore, the fiscal priority of subsidizing the domestic consumers determines the level of pass through to the economy.

However, the government decision to partially subsidize the rampant increase in global oil prices have two implications on the fiscal account of the economy. Firstly, the indirect taxes would be increased for improving the government revenues and secondly the provision of subsidies increases the government expenditures, which increase public debt and squeezes other government spending. Generally, this unforeseen additional expenditure enhances the government fiscal deficit. Bacon and Kojima (2006) present that the countries, which administered the fuel prices and adopt subsidizing strategy, witness strong retaliation from public when the prices adjust upwards. Indonesia, Nigeria, and Venezuela has faced violent protests against the hike in fuel prices. Several governments have tried to reduce subsidies since 2003 but only a few manage it smoothly. Such subsidies are, helpful for the poor, but cost a lot to the society as a whole and to the governments as well. These apprehensions lead to the intervention of governments and delayed incomplete pass through of global oil prices.

Figure 3: Dynamic Correlation of Global Oil and Domestic Consumer Prices



Source: Authors' calculations

On the other hand, once the international oil prices elevate the domestic oil demand may go down and hence the total volume of oil imports decline with a higher quantum impact. However, in the case of inelastic oil demand, the price impact becomes higher and the total volume of oil imports is increased. Consequently, an economy is more likely to face trade deficit having a colossal burden on import payments due to which balance of payment get out of order and deterioration in the level of reserves is clearly reflected in the sharp depreciation in exchange rate. Such considerable depreciation in currency leads to higher inflation.

Bernanke (2013) mentions that oil price impacts the inflation from two perspectives. Firstly, oil price changes immediately pass through to the domestic prices due to expectation formation of the agents. Secondly, considerable lag is involved in the pass through of oil prices, which is dependent on the structure of the economy and fiscal behaviour. In terms of emerging economies, Alom (2011) concludes that oil price increase is detrimental for the industrial output, and a decline in industrial output may result in a rise in inflation. Reserve Bank of India (2011) estimates that a 10 percent increase in global crude prices, may directly increase the overall inflation by 1 percentage point, if fully passed through to domestic

prices. While the total impact may be higher as input cost increases overtime and could translate to higher output prices. Jamali et. al. (2011) show that a rise in oil prices translates in to higher cost of production and reduces the industrial production, which indirectly increases inflation. In addition, the prices of imported goods and petroleum products also increase directly. The likely rise in headline and core inflation due to the oil price increases may trigger the tightening of monetary policy (Hunt, Isard and Laxton 2001). In a developing country like India, if the oil price increase transmits without any hindrance, it may increase the general price level directly through the rise in domestic fuel prices and also indirectly because of increase in costs of production of goods (Bhanumurthy et. al. (2012).

Threshold models have become popular due to the consideration of nonlinear and asymmetric behaviour among variables. Nonlinear specifications may also be adhere for data generation processes due to the predictability in economic and financial data. Stock returns for instance have a high correlation during the low volatility periods as compared to the times of high volatility. Franses and Dijk (2000) suggest a similar behavior for exchange rate, which is kept within predetermined limits. Therefore, we adopt threshold model for computing the nonlinear and asymmetric pass through of oil prices to domestic economy.

4. Methodology

Sadorsky (1999) investigates the nonlinearity between oil price changes and economic activities through a two-regime model. However, his study is based on exogenous threshold that defines arbitrary regimes of increase and decrease in oil prices, without testing for the need of non-linearity. Huang *et. al.* (2005) argue that it is not necessary that slight movements in oil prices possibly will have an impact on economic variables and it may require a bigger change to respond. Therefore, they follow Tsay (1998) approach in which the nonlinearity among the variables is tested on the basis of statistical significance.

We adopt the methodology of Huang *et. al.* (2005) to test the nonlinearity in the impact of oil price changes to domestic variables. We use statistical approach to identify the threshold levels and regimes of significant oil price movements. After the identification process, multivariate threshold model is used to examine the responses real effective exchange rate, real interest rate, industrial production and inflation to the impulses in the various identified thresholds of international oil price changes.

Tsay (1998) provides the methodology for the threshold models. He gives the representation as follows;

Consider a $l-$ dimensional time series, $y_t = (y_{1,t}, \dots\dots\dots, y_{l,t})`$ and $m-$ dimensional exogenous variables, $x_t = (x_{1,t}, \dots\dots\dots, x_{m,t})`$. Let $-\infty = r_0 < r_1 < \dots < r_{s-1} < r = \infty$, subsequently, y_t follows a multivariate threshold model with a threshold variable z_t and a delay d if it satisfies $-\infty = r_0 < r_1 < \dots < r_{s-1} < r = \infty$.

$$y_t = c_a + \sum_{i=1}^{e} \emptyset_i^{(j)} y_{t-1} + \sum_{i=1}^{qf} \beta_i^{(j)} x_{t-1} + \varepsilon_t^{(j)} \quad \text{if} \quad r_{a-1} < z_{t-d} \leq r_a \quad (1)$$

Where, a $= 1, \ldots, s$, c_a are constant vectors, e and f are non-negative integers. The threshold variable z_t is assumed stationary and having a continuous distribution. Within the threshold space z_{t-d}, the above model is a piecewise linear model and has s regimes, but it is nonlinear in time when $s > 1$.

The monthly changes in the log of oil price is consider as threshold variable to confirm the existence of nonlinearity in the multivariate VAR model. With the confirmation of nonlinear relationship among variables, it is important to distinguish the regimes based on the threshold levels of oil price. This identification of the regime will help in recording the responses of domestic variables to the shocks in thresholds of oil price changes. The linearity is tested by extending the linearity test of Hansen (1999) to multivariate specifications as proposed by Lo and Zivot (2001). Hansen (1999) introduces F-test that compares the residual sum of square (SSR) in the case of linear models and Lo and Zivot (2001) apply the Likelihood Ratio (LR) test to compare the covariance matrix computed in the case of multivariate models.

$$LR_{ij} = T(\ln(det \sum i) - \ln(\det \sum j)) \quad (2)$$

$\sum i$ is the estimated covariance matrix of the model with i regimes and $i-1$ thresholds, Threshold Vector autoregressive likelihood ratio (TVAR.LR) test is used to confirm the presence of nonlinearity in VAR model and to identify three significant regimes.

The VAR of global oil prices, real effective exchange rate, policy rate, industrial production and inflation can be specified as follows;

$$\begin{bmatrix} OIL_t \\ E_t \\ R_t \\ Ym_t \\ Infm_t \end{bmatrix} = \begin{bmatrix} C_{OIL} \\ C_E \\ C_R \\ C_{YM} \\ C_{Infm} \end{bmatrix} + \begin{bmatrix} B_{OIL,OIL}(L) & B_{OIL,E}(L) & B_{OIL,R}(L) & B_{OIL,YM}(L) & B_{OIL,Infm}(L) \\ B_{E,OIL}(L) & B_{E,E}(L) & B_{E,R}(L) & B_{E,YM}(L) & B_{E,Infm}(L) \\ B_{R,OIL}(L) & B_{R,E}(L) & B_{R,R}(L) & B_{R,YM}(L) & B_{R,Infm}(L) \\ B_{YM,OIL}(L) & B_{YM,E}(L) & B_{YM,R}(L) & B_{YM,YM}(L) & B_{YM,Infm}(L) \\ B_{Infm,OIL}(L) & B_{Infm,E}(L) & B_{Infm,R}(L) & B_{Infm,YM}(L) & B_{Infm,Infm}(L) \end{bmatrix} \begin{bmatrix} OIL_{t-1} \\ E_{t-1} \\ R_{t-1} \\ YM_{t-1} \\ Infm_{t-1} \end{bmatrix} + \begin{bmatrix} e_{OILt} \\ e_{Et} \\ e_{Rt} \\ e_{YMt} \\ e_{Infmt} \end{bmatrix}$$

5. Data sources, Variables and stationarity tests

Pass through of global oil prices to inflation starts immediately by inflation expectation formation, therefore, it becomes prime concern for policy makers at central banks and require policy actions by changing policy rate to respond to such changes of inflation expectations. Krugman (1983) and Golub (1983) argue that an oil prices may also lead to changes in exchange rates. Any rise in oil prices worsens the current account deficit of an oil importing country with an inelastic demand. Therefore, changes in international oil prices impact the inflation, exchange rate and interest rates in the economy. In this study, we estimate the impact of global crude oil prices on real effective exchange rate (REER), consumer price index (CPI), policy rate and large scale manufacturing index (LSM, an indicator of economic activity). Data on monthly frequency from January 1980 to January 2017 of these variables is collected. For global crude oil price, Arab Gulf and Dubai Fateh average monthly crude price (US$/barrel) is taken from the Bloomberg. Haver Analytics is the source of real effective exchange rate (REER) and consumer price index (CPI). The data on discount rate and spliced series of LSM (2005-06=100) is taken from statistical appendix

of various issues of Annual report of State Bank of Pakistan. All the variables except policy rate are logarithmic transformed. Policy rate is converted in to real by adjusting it with lead of CPI inflation.

In order to test the time series properties of the data, we perform unit root tests (Table 2). The results of Augmented Dickey–Fuller (ADF) and Phillip-Perron (PP) tests indicate that all the variables are stationary at level with constant. To be further sure, we also checked stationarity by using Kwiatkowski-Phillips-Schmidt-Shin (KPSS) test that confirms the stationarity of the variables.

Table 2: Unit Root Tests

		Monthly growth of global oil prices (OIL)	Monthly growth of REER (E)	Monthly changes in real policy rate (R)	Monthly growth of production LSM (YM)	Monthly growth in Consumer prices (P)
a)Augmented Dickey-Fuller (ADF) - Null Hypothesis: the variable has a unit root						
With Constant	t-Statistic	-10.00	-10.39	-2.40	-4.14	-3.19
	Prob.	0.00	0.00	0.14	0.00	0.02
b) Phillip-Perron (PP) - Null Hypothesis: the variable has a unit root						
With Constant	t-Statistic	-392.89	-15.07	-3.29	-28.34	-17.72
	Prob.	0.00	0.00	0.01	0.00	0.00
c) Kwiatkowski-Phillips-Schmidt-Shin (KPSS) - Null Hypothesis: the variable is stationary						
With Constant	t-Statistic	0.10	0.63	0.23	0.07	0.12

Notes: Lag Length based on AIC, Probability based on MacKinnon (1996) one-sided p-values for ADF and PP tests. : Probability based on Kwiatkowski-Phillips-Schmidt-Shin (1992, Table 1)

6. Results

This section starts with the discussion on the identification of threshold levels of global oil price movements. We identify tow thresholds that lead to three regimes of immensely declining, declining and increasing oil prices. Finally, within each regime, the impact of movements in global oil prices on the domestic variables is discussed.

7.1 Threshold identification process

First step is the search for the statistical significant threshold values of global oil price changes that will determine the regimes of oil price movements. There will be i regimes in the case of i-1 thresholds, which are statistically significant. We apply threshold Vector Autoregressive Likelihood Ratio (TVAR-LR) test to find statistical significant levels of thresholds. Hansen (1999) introduces the grid search process of minimizing the sum of squared of residuals (SSR) for the identification of the threshold in linear models. The F-test is applied to the SSR of different models for confirming the statistical significance of

identified threshold in the linear threshold models. Lo and Zivot (2001) extend this process to the nonlinear models and suggest the comparison of the covariance matrix of different model with Likelihood Ratio (LR) test.

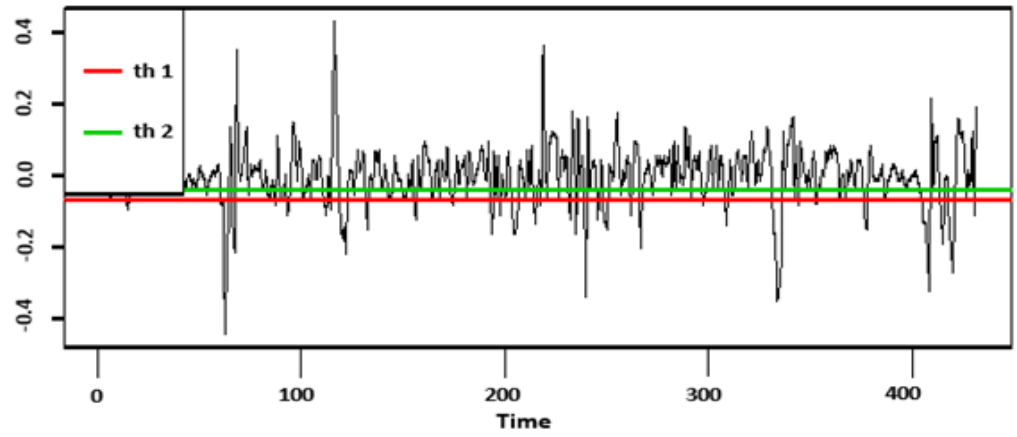
Table 3: Threshold identification and Regime determination

	1vs2	1vs3	2vs3
Threshold VAR likelihood ratio Test	916.49 (0.00)	1496.92 (0.00)	897.30 (0.00)

Test 1vs2: Linear VAR versus 1 threshold VAR,
Test 1vs3: Linear VAR versus 2 threshold VAR
Test 2vs3: 1 threshold TAR versus 2 threshold VAR
Probabilities are given in the parenthesis.

The LR test is applied on the covariance matrix of simple VAR and TVAR models, which yield the statistically significant regimes and first threshold. The conditional search with one iteration is performed to identify the statistical significance of other regime and identification of second threshold. We identify two statistical significant threshold levels that define three regimes of the global oil price movements. Growth in global oil prices of -6.6 and -3.4 percent are the statistically significant threshold levels. Therefore, immensely declining growth of oil prices of lower than -6.6 percent is the first regime, declining growth of global oil prices lower than -3.4 percent and higher than -6.6 percent is the second regime and increasing growth of oil prices above -3.4 percent is the third regime. The growth in global oil prices is plotted against time in Figure 4. Two parallel lines are the statistically significant threshold levels (-6.6 and -3.4 percent) that distribute the data into three regimes.

Figure 4: Regimes and Threshold of Global oil price movements



After the identification of regimes and thresholds of movements in global oil prices from the TVAR-LR test, we estimate the relationships of global oil prices with domestic macroeconomic variables. For this purpose, we estimate the local projections VAR and derive the responses of the macroeconomic variable to shocks in each threshold of global oil prices.

7.2 Local Projections based Impulses

The Impulse Response Functions (IRF) measure responses of domestic variables to the shocks in various threshold levels of growth in global oil prices. These IRF may yield biased and inconsistent results if VAR procedure is unable to capture the underlying data generating process (DGP). Therefore, we apply local projection method of Jordà (2005), which is not sensitive to misspecification in the estimation of an unknown true multivariate system. The impulse responses in the simple VAR extrapolate the higher distance horizons whereas the local projections VAR estimate at each period of interest. Simplicity of estimation, more robust to misspecification, analytic inference and accommodative to highly nonlinear and flexible specifications are the main advantages of local projections

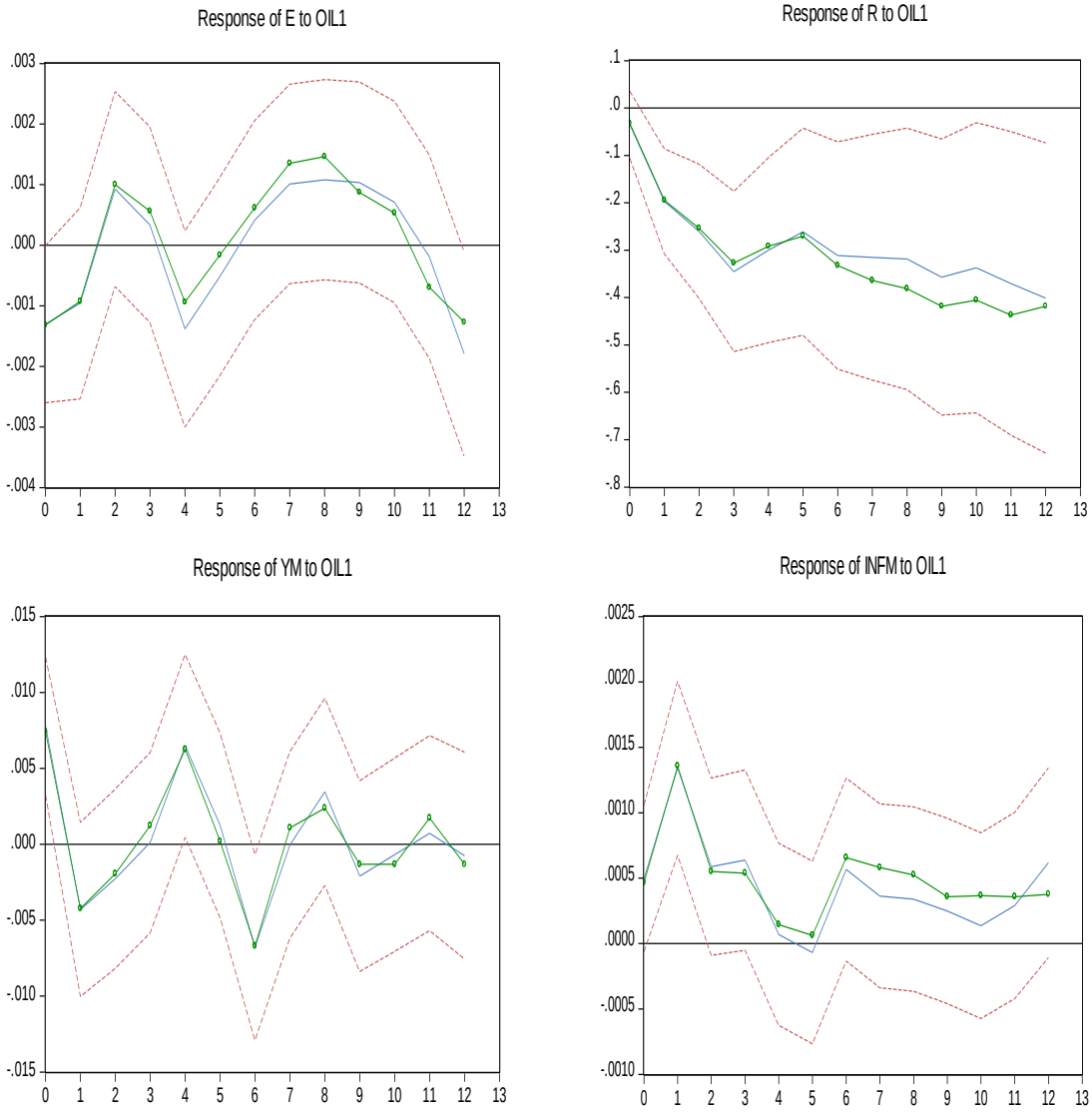
One standard deviation shock is introduced in innovations of threshold levels of global oil price changes and the responses of domestic variables are presented in the Figures 5-7. In all the regimes of global oil prices, real effective exchange rate witnesses depreciation in response to a shock in global oil prices. However, the depreciations of the real effective exchange rate are more pronounced and significant in the third regime of increasing growth in global oil prices. In the first regime of immensely declining global oil prices, real interest rate declines significantly in response to the a shock in global oil prices. Real interest rate increases in the second regime of slight movements in the global oil prices and decline slightly in the third regime of increasing global oil prices. The production of large scale manufacturing sector – an indicator of economic activity, record favorable growth in response to a shock in global oil prices in the immensely declining regime. However, economic activity plummets in the rest of the regimes of global oil price changes. Finally, the core macroeconomic variable of inflation in consumer prices witness positive growth in the case of exogenous shock in global oil prices and immensely declining oil prices regimes. Whereas the inflation declined in second regime of slight movements in the global oil prices.

The responses of the domestic macroeconomic variables to the shocks in the global oil prices vary across regimes confirming the existence of asymmetries. In the first regimes of immensely declining global oil prices (less than -6.6 percent), exogenous increase in the oil prices result in higher inflation in consumer prices which is an indication that government passes on the burden to the consumers. However, central bank may not response to the increase in global oil prices in this regime, which reduces the real interest rates in the economy. This may cause favorable impact on the economic activity. Therefore, active response of fiscal authorities and sluggish response of the monetary authorities can be inferred from the impulse response analysis in the first regime.

Central bank respond aggressively to the oil price increases in the second regime (monthly growth of oil prices are between -6.6 and -3.4 percent) that results in higher real interest rates, contracting economic activity and declining inflation. Therefore, the inflation in consumer prices observed decline that may be due to sluggish response of the fiscal authorities and well anchored inflation expectations. In the third regime of monthly growth of above -3.4 percent in global oil prices, real interest rates decline slightly indicating

Regime 1: Immensely declining growth of oil prices

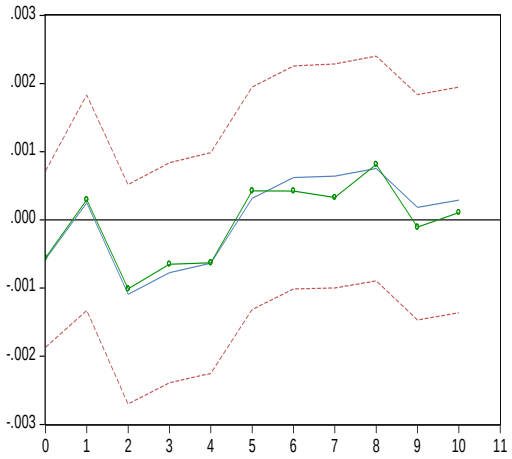
Global oil price witnesses monthly growth below -6.6 percent



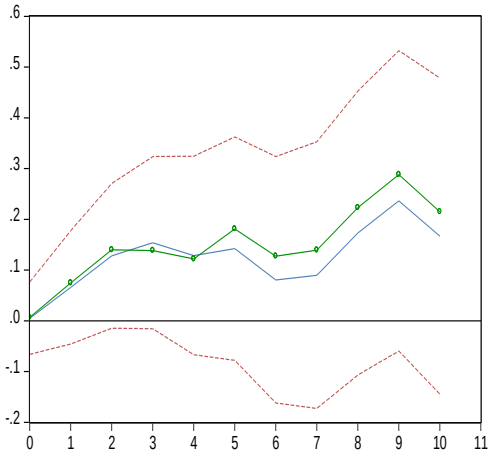
Regime 2: Declining growth of oil prices

Global oil price witnesses monthly growth above -6.6 and below -3.4 percent

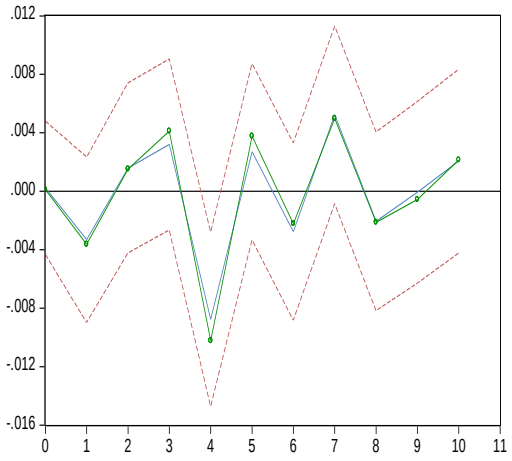
Response of E to OIL2



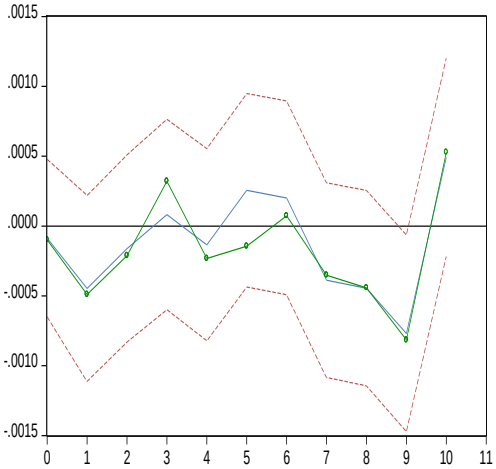
Response of R to OIL2



Response of YM to OIL2

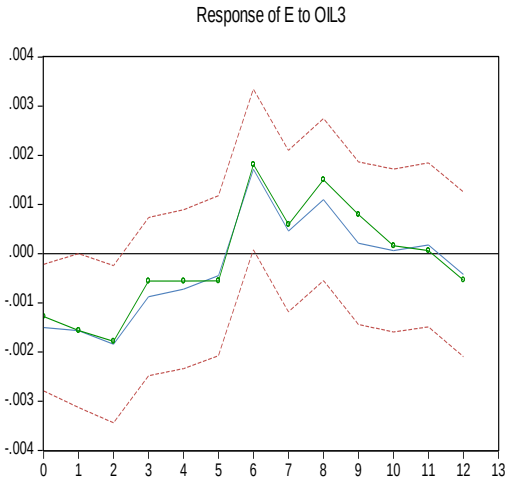


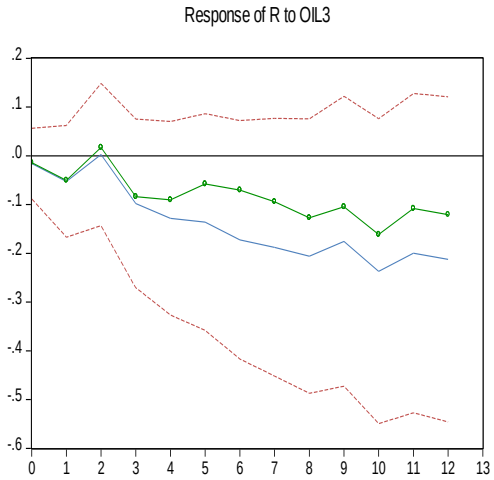
Response of INFM to OIL2

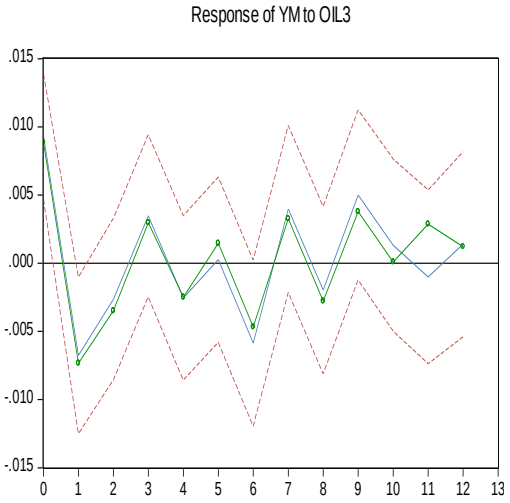


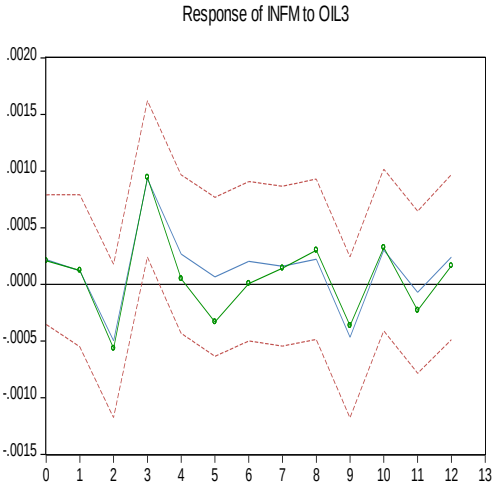
Regime 3: Increasing growth of oil prices

Global oil price witnesses monthly growth above -3.4 percent









sluggish response of the monetary authorities. This results in positive growth in the consumer prices and contraction in economic activity.

Despite asymmetries in the magnitude and directions of the responses of macroeconomic variables to the shocks in various threshold of oil prices, there are also differences in the period of pass through of oil prices to the macroeconomic variables across thresholds. Sadorsky (1999) finds that the economy responds to a favourable oil price change with a lag. In the case of Pakistan, inflation responds to the increase in global oil prices immediately in first and second regime whereas inflation takes three months to responds to the oil price shock in the third regime. The response of the real effective exchange rate is similar in the first and second regime. Most asymmetric responses are observed in the case of real interest rate and economic activity.

7. Conclusion

This study confirms the existence of nonlinearity and asymmetries in the pass through of global oil price shocks on macroeconomic variables of Pakistan. There are two type of differences in the responses of macroeconomic variables to the shocks in various thresholds of global oil prices. Firstly, there is asymmetries in terms of direction and magnitude of the responses of the macroeconomic variables. Secondly, there are differences in the adjustment period of pass through of oil prices to the macroeconomic variables. The adjustment period is lesser in the regimes of declining global oil prices relative to the third regime of higher than -3.4 growth in the global oil prices. Real effective exchange rate depreciates in response to increase in the growth of global oil prices in all the regimes. Real interest rates witnesses decline in the first and third regimes but increases in the second regime. This may be due to intensity of the reaction of the monetary authorities to the anchor inflation expectations. In the second and third regimes, economic activity plummet in response of increase in global oil prices but witnesses expansion in the first regime, which may be due to the negative real interest rates. Pass through to inflation of global oil prices is positive in the first and third regimes whereas the inflation declines in the second regimes, which may be due to aggressive monetary stance.

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Should Central Bank Forget Reserve Requirements? Analysis of Policy Tool's Pass-through in Pakistan

Muhammad Omer[1]

Abstract: *We investigated the effectiveness of the monetary policy tools, the discount rate and the reserve requirement ratio, in Pakistan by studying their pass through to the retail interest rates and the exchange rate. We find that the pass-through of the required reserve ratio to the retail rates and exchange rate is significant but incomplete. The pass through of discount rate; to the lending rate is complete; to the deposit rate is incomplete and; to the exchange rate is insignificant. Our results suggest that the required reserve is a more powerful tool for managing the lending rate and stabilizing the exchange rate shocks, than discount rate. We, therefore, recommend central banks to not to ignore the reserve requirement ratio as an active policy tool, specifically when exchange rate is under speculative attack.*

JEL Classification: E5, E52, E58

Keywords: Required Reserves, Monetary Transmission Mechanism, Pakistan, Vector Auto Regressive

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1. Introduction

Recent global financial crisis allowed central banks to experiment with the unconventional monetary policy tools such as quantitative easing and negative interest rate policy (Sharpe and Watts, 2013). This crisis, however, also has renewed interest in exploring the effectiveness of conventional monetary policy tool like reserve requirement ratios and policy interest rates. Often, effectiveness of the central bank's policy rate (discount rate) is scrutinized through interest rate channel of monetary transmission mechanism; the debate on the effectiveness of the reserve requirement is a more recent phenomenon. For example, findings of Glocker and Towbin (2012) suggests reserve requirements become more effective when there is foreign currency debt in an small open economy with sticky prices and financial frictions. While discussing the results of the Glocker and Towbin (2012), Walsh (2012) notes that the loss function of the central bank reduces on using reserve requirements as an instrument of the monetary policy. Moreover, the optimal coefficients in a basic Taylor rule for the interbank rate are very little affected when the reserve requirement is allowed to respond optimally to inflation and output.

Conventionally, central banks are cautious on frequently using the reserve requirement ratios. The notion was that the frequent change in the reserve requirements may be disruptive and costly for the banks as they are forced to hold a prescribed fraction of the deposits in the form of government papers and currency or deposits with the central bank. Reserve requirement ratios act as a tax, which constraints profit maximization objective of banks. Moreover, it promotes financial disintermediation, constrains monetary management and thus may amplify central bank's loss function.

This paper contributes to the debate on effectiveness of reserve requirement using information from financial market of Pakistan. Specifically, this study attempts to answer the research questions: what is the impact of the changes in reserve requirements on lending rate, deposit rate and exchange rate? Moreover, this paper extends the analysis to other monetary policy tool, discount rate. Pakistan provides a special opportunity to assess the effectiveness of the two policy instruments that is central bank's policy rate and the reserve requirement, as State Bank of Pakistan (SBP) imposes separate reserve requirements for time and demand liabilities (detail is in Section 2).

We further extend this analysis to exchange rate as central banks often aim to stabilize the volatility of exchange rates. An analysis of the response of the exchange rate to a monetary policy shock improves further the understanding of monetary transmission mechanism (Disyatat and Vongsinsirikul, 2003; and Aleem, 2010). Like other central banks, SBP does not openly pay attention to the exchange rate however, McKinnon (1995), Clarida and Gertler (1997), and Clarida (2001) documented the interest of the central banks' in the exchange rate developments. The use of monetary policy tools in tandem with the speculative pressure on the Pakistan rupee-US dollar exchange rate often fuels perception of (de facto) fixed exchange rate policy employed by SBP. Our study evaluates the

effectiveness of required reserves ratio and discount rate in managing the exchange rate, which may improve further our understanding of the exchange rate channel of monetary policy pass-through in Pakistan. The interest rate channel of monetary policy is also explored in this study to the extent of pass-through of the policy rates to the retail rates in Pakistan.

We use monthly data from July 2004 to September 2015 and Vector Auto Regression (VAR) methodology to assess the effectiveness of monetary policy tools. Our findings suggest that the pass-through of the required reserve ratio to the retail rates and exchange rate is significant but incomplete. The pass-through of discount rate to lending rate is complete while the same to deposit rate is found to be incomplete. Our results suggest that a required reserve is a more powerful tool for stabilizing exchange rate shocks than the use of discount rate. Even if SBP is not actively changing reserve requirement ratio, the changing composition of banks' liabilities may have prevented speculative attack on the exchange rate in Pakistan. Besides exchange rate, the discount rate become endogenous to the lending rate in the long run, which limit its effectiveness as a central bank's policy tool. We, therefore, conclude that it is not advisable for the state Bank of Pakistan to overlook the reserve requirement ratio as a policy tool. Moreover, our results indicate that structural shifts have occurred in the interbank market of Pakistan in June 2008 and in September 2011. Ignoring these breaks can bias the results.

Rest of the paper is structured as follows. The next section discusses monetary policy in Pakistan, while section 3 reviews the relevant literature. Section 4 outlines the methodology and section 5 describes the data employed. Section 6 analyzes the results obtained and section 7 concludes.

2. Monetary Management in Pakistan during 2004-2015

SBP's main policy tool is discount rate (policy rate) which is also known as reverse repo rate. In May 2015, SBP replaced the discount rate with a new policy rate 'SBP target rate', which moves within SBP's defined interest rate corridor. We use 6-month treasury bills rate to proxy discount/policy rate for analysis. Reserve requirement ratio will be discussed subsequently in more detail with the deliberation on the policy initiatives.

Until November 2008, SBP actively used reserve requirement as a policy tool. Reserve requirement is composed of Cash Reserve Requirement (CRR) and Statutory Liquidity Requirement (SLR). Cash reserve requirement consists of non-remunerated deposits that banks have to keep at the central bank to back up their deposit holdings. This ratio is typically used to manage the interbank liquidity. Statutory liquidity requirements (SLR), on the other hand, refers to fraction of deposits that banks are required to maintain in the form of government securities or securities of government-owned enterprises. Though the objective of SLR is to provide direct financing to the government, both ratios primarily aims at securing the solvency of the banks. The compulsory reserve requirement imposes an

implicit tax on the banking system as it could provide the public sector an indirect source of financing, often at below market rates (Molho, 1992).

Practically, an increase in the reserve requirements reduces the availability of the liquid cash with the banks for retail business. The reduced liquidity may impact the profitability of the banks, as greater volume are required to be allocated as non-earning CRR or low earning SLR. Besides, this increases the price of the available liquidity in the interbank market. Increase in the interbank market rate, thus, forces the banks to increase their retail rates accordingly. For this reason reserve requirement is viewed as a direct policy tool, which policy makers restrain from using frequently due to its implication on the profitability of the financial intermediaries.

Figure 1A: Changes in Req. Reserves and demand & Time Liabilities Ratios

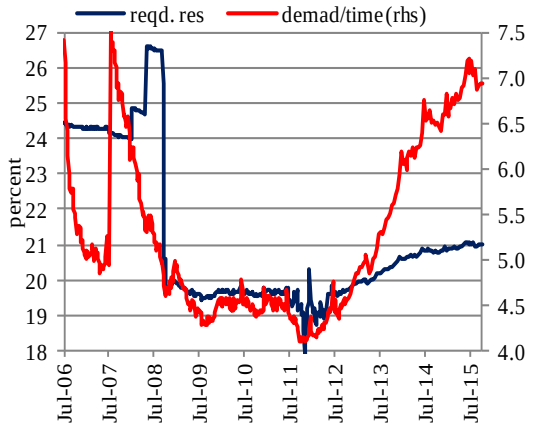
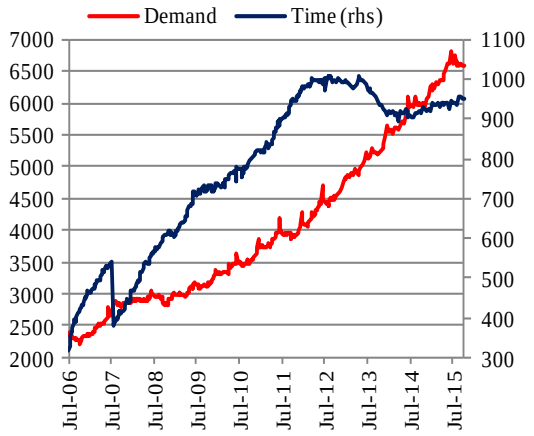


Figure 1B: Time & Demand Liabilities in Pakistan
(billion rupees)



Despite the fact that both CRR and SLR remained unchanged since November 2008, effective reserves requirement (weighted average of reserve requirement ratios on demand and time liabilities), keep changing almost every second week as shown by the Figure 1A. Since 22nd July 2006, SBP imposed separate reserve requirements for time and demand liabilities to encourage banks to mobilize long-term time deposits, and to put upward pressure on the money market rates (SBP, 2006).[2] To supplement its initiative, SBP exempted time liabilities from cash reserve requirement from 4th August 2007. The time liabilities, since these policy initiatives increased substantially, however the unexpected 150 bps cut in discount rate in October 2011 invoked a reversal (Figure 1B). Perhaps, market read the October 2011's discount rate cut as the end of tightening phase of monetary policy, thereby instilling expectation of the interest rate reversal. Consequently, banks became less interested in raising term deposits to avoid higher borrowing costs (Figure 1B). Also declining time deposit and increasing demand deposit sharply increased the demand to time

[2] See Table A1 in Appendix

liability ratio (Figure 1A). This changed liability composition, once again, pushed the effective reserve requirements of banks substantially higher (see Figure 1A).

Nevertheless, the effectiveness of the SLR declined in recent years when banks parked their funds, more than the statutory requirements, in the government securities.[3] Private sector's perceived credit default risk increased as Pakistan experienced slowdown in economic activity after the global financial crisis. Consequently, instead of lending to the private sector banks preferred investing in the risk free government securities. Therefore, we used SLR for computing effective reserve requirement to attain actual variability in the reserve requirement.

In Pakistan's case, even it is possible that retail rates may have influenced the effective reserves requirement. For example, as time deposits are exempted from reserve requirements, increase in the deposit rate may increase the demand deposit and hence increase the effective reserve requirements for the banks.

In contrast to the reserve requirement, the policy rate passed through various phases between 2005 and 20015. Theoretically, increase in the policy rate is likely to increase the borrowing cost of the banks in the interbank market. This increase in the borrowing cost translates into the lending and the deposit rates. In short, SBP tightened aggressively its monetary policy till September 2008 when required reserve ratios and the discount rate were raised on a number of occasions (see Table A1 in Appendix). However both policy instruments witnessed a gradual decline in their magnitude since then. Moreover by 1st November 2008, reserve requirement ratios were relaxed to end December 2005 level; when monetary policy stance was easy. Since November 2008, SBP kept the reserve requirement ratios unchanged and conducted the monetary policy using the discount rate only.

3. Literature Review

In line with the scope of this paper, the review of literature is confined to the financial part of the monetary policy transmission mechanism. That is, how changes in the required reserve ratios and the policy interest rate effects retail lending and deposit interest rates, and exchange rate in the economy.

Recently, a number of studies, such as Lim et al. (2011), Glocker and Towbin (2012), Palley (2004), and León and Quispe (2010) evaluated the effectiveness of the reserve requirement as a macro prudential instrument in reducing the systemic risk in developing economies. However, studies evaluating the reserve requirement as a monetary policy tool are not in abundance. Among the available studies, Vargas et al. (2010) finds that in Colombia the pass-through from reserve ratios to deposit and lending interest rates is important. Their finding suggests that in an inflation-targeting regime, reserve requirements plays effective role in reinforcing monetary policy transmission and should be used as a policy instrument

[3] For detail see Omer *et al.* (2015).

by the inflation targeting central banks. Moreover, they justify the use of required reserves when standard and less costly policy instruments become ineffective in maintaining price or financial stability.

Table 1. Literature on interest rate pass through to retail rates in Pakistan

Study	Period	Instrument	Method	Pass through estimates			
				Short run		Long run	
				Lending rate	Deposit Rate	Lending rate	Deposit Rate
Fazal and Salam (2013)	2005:06 - 2011:05	6-m TB rate	VECM	0.3727*	0.3058*	0.887*	0.657*
Hanif and Khan (2012)	2001:07 - 2011:08	1-wk KIBOR	ARDL	0.3	0.13	0.91	0.64
Mohsin (2011)	2001:11 - 2011:03	DR	PC	0.1	0.16	0.2	Nil
Khawaja and Khan (2008)	1991:06 - 2008:06	TB rate	TFA	Nil	Nil	0.43[3]	0.164
Qayyum et al. (2006)	1991:03 - 2004:12	TB rate	TFA	Nil	0.18	0.41[2]	0.223[1]
SBP (2005)	1999:07- 2006:06	TB cut-off rate	ARDL	0.198	0.044	0.987	0.444

*significant at 5 percent.
TB: Treasury Bill, DR: Discount Rate, KIBOR: Karachi Interbank Offered Rate, ARDL: Auto Regressive Distributed Lags, TFA: Transfer Function Approach, PC: Panel Cointegration. VAR: Vector Auto Regression, VECM: Vector Error Correction Mechanism, Nil indicates no pass through detected.
[1] Pass through to the saving deposit rate (deposit with less than 6-month maturity), while long-run pass through takes around 3 years to complete. [2] No short-run pass through and long-run pass through requires one and half to two years to complete. [3] Long-run pass through requires one to one and half years. [4] Long-run pass through requires one year.

Montoro and Moreno (2011), while discussing the recent experience of three Latin American economies, notes that the adjustment in reserve requirements may have helped interbank rates to stabilize and influenced market rates in a way that moderated the capital flows in the respective economies. The reserve requirement adjustment may also have smoothened the credit growth during the expansionary and contractionary phases of the economic and financial cycle. However, these authors view reserve requirement with caution due to its distortionary effect. In contrast, Evandro and Takeda (2011) conclude that the policy induced change in reserve requirements leads to a contraction in credit to households, especially from smaller banks in Brazil.

Glocker and Towbin (2012a) use a structural vector auto regression (SVAR) framework to identify policy interest rate and reserve requirements shocks. They find that the discretionary tightening of either instrument leads to a decline in domestic credit, but their effects on macroeconomic aggregates differ. The study argues that the tightening of reserve requirements induces a depreciation of the exchange rate and has inflationary effects. Walsh (2012) on deliberating the findings of the Glocker and Towbin (2012a), notes that the loss function of the central bank reduces on using reserve requirements as an instrument of the

monetary policy. Moreover, the optimal coefficients in a basic Taylor rule for the interbank rate are hardly affected when the reserve requirement is allowed to respond optimally to inflation and output.

Literature on monetary transmission mechanism in Pakistan is confined mostly to studying the interest rate channel. Majority of these studies reported complete pass-through of SBP policy rate to the lending rate and no or incomplete pass-through to the deposit rate (see Table1). The findings of these studies, except for Mohsin (2011), suggest that the discount rate pass-through in the long run is almost complete for the lending rate, but sticky and often incomplete for the deposit rate. Interestingly, findings of recently concluded studies [Fazal and Salam (2013) and; Hanif and Khan (2012)] are consistent in reporting around 90 percent pass through of interest rate to the lending rate and around 60 percent pass through to the deposit rate in the long run. In contrast, the studies concluding in 2000s or earlier reported much lower estimates of interest rate pass through indicating that perhaps these pass through are strengthening over time due to imposition of regulatory deposit rate. SBP advised the banks to pay a minimum return of five percent on all savings products from 1st June 2008. The regulatory deposit rate increased to 6 percent on May 01, 2012.

4. Model and Methodology:

Time series data are generally subjected to unit root tests to the data generating process of the variables involved in the model (Doojav and Kalirajan, 2016). Often policy intervention causes structural shift due to which conventional unit root tests may fail to reject the null hypothesis. To ascertain the stationarity of the series, all variables are subjected to unit root tests with structural shifts, as well.

Given the time period considered for this study, we suspected that more than one ship may have occurred in our data sample. For this reason, we opted for Clemente et al. (1998), which provides a robust unit root test that allows for two structural breaks. This test distinguishes two types of outliers: an additive outlier and an innovative outlier. The additive outlier test checks if there is a sudden change in the mean, while the innovative outlier test assess if the change is gradually taking place.

We employ the vector auto regressions (VAR) for estimating the relationships between the policy tools (the required reserves and the discount rate) and the impact variables [the lending rate, the deposit rate, and the (growth rate of) exchange rate]. All variables in the VAR employed at level. As VAR methodology presumes that all regressors are endogenous and explained by their lags, an N variable VAR with p order can be is written in simplest form as,

$$Z_t = \mu + \Psi(L) Z_{t-p} + \xi_t, \qquad (1)$$

where $Z_t = (z_{1t}, z_{2t}, ..., z_{Nt})'$ represents a vector of (Nx1) variables, $\Psi(L)$ is a lag polynomial of order p, while ξ_t is (*Nx1*) unobservable zero mean white noise vector process. The optimal lag length *k* is selected using the HQ criterion (Lütkepohl and Kratzig, 2004).

The coefficients of the first lag of the policy tools of the VAR estimates show the short run pass-through of policy tools. However, we are interested in the long run coefficients as the policy shock transmits to the longer end of yield curve with some lags. Moreover, it is permanent impact of the policy shocks on the long term interest rates which helps households and the businesses to make their saving and investment decisions. The long-run pass-through coefficient $\hat{\beta}$ for the retail rates is found by aggregating and normalizing the short-run coefficients. To illustrate this for a bivariate VAR system with two lags, such as

$$\begin{pmatrix} Z_{1t} \\ Z_{2t} \end{pmatrix} = \begin{pmatrix} \mu_1 \\ \mu_2 \end{pmatrix} + \begin{pmatrix} \Psi_{11}^1 \Psi_{12}^1 \\ \Psi_{21}^1 \Psi_{22}^1 \end{pmatrix} \begin{pmatrix} Z_{1t-1} \\ Z_{2t-1} \end{pmatrix} + \begin{pmatrix} \Psi_{11}^2 \Psi_{12}^2 \\ \Psi_{21}^2 \Psi_{22}^2 \end{pmatrix} \begin{pmatrix} Z_{1t-2} \\ Z_{2t-2} \end{pmatrix} + \begin{pmatrix} \xi_{1t} \\ \xi_{2t} \end{pmatrix},$$

we compute the long-run coefficient by:

$$\hat{\beta} = \frac{\sum_{p=1}^{2} \Psi_{12}^p(L)}{1 - \sum_{p=1}^{2} \Psi_{11}^p(L)} \quad , \qquad (2)$$

where $\Psi_{11}(L)$ are the coefficients of the lagged dependent variable and $\Psi_{12}(L)$ are the coefficients of the explanatory variables of interest.

5. Data

Generally, monetary policy instruments lack variability which limits their use in a meaningful empirical analysis. Reserve requirements as well as discount rate, typically suffer from this problem. We use the effective reserve requirements as a proxy which is a weighted average of the cash reserve requirements and the statutory liquidity requirements. Following the literature on monetary policy transmission in Pakistan, we use the 6-month Treasury bill rate as a proxy for the monetary policy rate (Agha et al.,2005; Qayyum et al., 2006; Khawaja and Khan, 2008; Omer et al., 2015).[4]

[4] Speeches of Dr. Ishrat Hussain, former Governor of SBP, suggest that 6m Treasury bill rate was used for benchmarking purposes during his tenure; which also substantiate its use as a proxy for the policy rate.

Table 2. Result of Unit root test

	Without structural break tests				With structural break					
	Dickey-Fuller		Philips-Perron		Additive outlier test			Innovative outlier test		
	No trend	Trend	No trend	Trend	Stats	No. of Breaks	Dates	Stats	No. of Breaks	Dates
Lending rate	-1.812	-1.360	-2.391	-1.557	-3.505	2	Jul-08, May-12	-3.999	2	Mar-08, Jun-12
Deposit rate	-2.9*	-2.139	-2.752**	-1.87						
Discount rate	-2.107	-1.460	-2.988*	-1.783						
Required reserves	-1.949	-2.207	-2.142	-2.408	-3.492	2	Nov-08, Apr-13	-5.518*	2	Mar-08, Aug-08
Exchange rate growth	-2.823**	-2.831	-9.272*	-9.24						
**5% Critical Value*										
No Break	-2.911	-3.476	-2.9	-3.463						
2-breaks					-5.490			-5.490		
***10% Critical Value*										
No Break	-2.590	-3.166	-2.585	-3.158						
2-breaks					-5.24			-5.24		

Notes: the null hypothesis of unit root tests is that the series has a unit root. Unit root test with structural breaks assumes either additive outlier (sudden break) in the series, or innovative outlier (break in trend). Break dates are given in the column Dates and should be read as month and year.

We use monthly data from July 2004 to September 2015 as data on the incremental lending and deposit rates are available since July 2004 only. The lending and the deposit rates are reported by SBP as weighted averages of rates offered by banks on fresh loans and deposits. The volume of loan disbursed or deposit raised in any given month are used as weights. Moreover as variables used in the pass-through estimation are required to have same unit of measurement, we use the growth rate of the exchange rate.

6. Results:

The results of the conventional unit root tests and unit root test with structural breaks are reported in Table 2. The results suggest that except for lending rate all variables are level stationary. For instance, the null hypothesis of unit root is rejected at five percent level of significance for the deposit rate (Dickey-Fuller test) and for the required reserves (innovative outlier test). However, the null hypothesis of unit roots cannot be rejected for the lending rate. This is in contrast to the widely accepted notion that interest rates are level stationary. To test the robustness of the result, we dropped a few observations and then conducted the

test again. The result suggests that the DGP of the lending rate series is stationary.[5] Therefore, for our full sample analysis, we treat lending rate as a stationary series.

Unit root test with structural breaks identified different breaks for different variables indicating that the central bank's different policy moves may have effected these variables differently. We incorporate only two shifts, the breaks in June 2008 and September 2011. Anecdotal evidences suggest that Pakistan's financial system may have witnessed a structural shift on these dates. For instance on 1st June 2008, SBP imposed a five percent minimum regulatory deposit rate, to be paid to the depositors, on all savings products. Moreover after May 2008, SBP relaxed the reserve requirements, which remains almost unchanged since November 2008 (Omer et al., 2015). The central bank is conducting its monetary policy since then using the discount rate only (see Table A1 in Appendix).

The second break date captures the impact of surprise cut in the discount rate by 150 bps, by SBP, in October 2011. As SBP mostly focuses on the demand management, this 150 bps cut was related to relaxing the supply side constraints, which led to the reversal in the financial market's interest rate expectation (see Section 2 for details). Moreover following the improvements in the macroeconomic indicators, this cut may have forced banks to revise theirrisk perception of public and private credit. We include both shift and pulse dummies (change in the shift dummy) for incorporating these structural shifts in our models, following the recommendation of Glynn et al. (2007).

The detailed VAR estimates are provided in Tables A2, A3, and A4 (in the Appendix), showing the short-run (the upper panel) and long-run (the lower panel) impact of the changes in policy rates on the lending rate, the deposit rate, and the exchange rate respectively. We used various diagnostic tests to validate our results, the detail of which is provided in Table A5, also in the Appendix. Though normality test rejected the null hypothesis that residuals are normal in most of the cases, the finding is not surprising given the limitation of these tests for short sample. We used non-parametric Kernel density estimation procedure to analyze the deviations from normality.[6] The kernel density estimates suggest that the residual's deviation from normality is generally marginal and can be ignored without significant implications on inferences.

The long-run pass-through estimates are provided in Table 3 and will be discussed in sub-sections, subsequently. The upper panel shows the estimates for the required reserves while the lower panel shows the estimates for policy interest rate. It is important to note that the dummies for the structural breaks are significant in most of the cases supporting our argument that structural shift had occurred in the interbank market of Pakistan in June 2008 and in October 2011. Though Omer et al., (2015) have identified and highlighted the

[5] Philips-Perron unit root test on data 2004:07 -2011:07 suggest that the lending rate is level stationary at 10 percent level of significance.

[6] Kernel density estimator uses histograms to approximate the density $f(x)$ from observations on x. The data are divided into non-overlapping intervals, and counts are made of the number of data points within each interval.

importance of the structural shift in June 2008, this study has identified another shift that occurred in October 2011 in financial market of Pakistan. This latter shift has changed the bank's perception of the risks related to the interest rate and private sector credit. Despite its significant role, this behavioral shift otherwise remained unnoticed until now. Ignoring these shifts may produce consequences on inferences on monetary transmission in Pakistan, if the data span covers 2008 and 2011.

6.1 Pass-through to the lending rate

Model (1) in Table 3 shows the estimate for the long-run pass-through from required reserves to the lending rate. The required reserve coefficient is 0.48 and significant only at 10 percent level, indicating that only 0.48 percentage point of the unit shock to the required reserves is weakly transmitted to the lending rate in the long run. The low and incomplete long-run pass-through of required reserves to the lending rate is understandable.

Intuitively, the lending rate should be more responsive to the changes in the operational cost i.e., the required reserves. However, the above result suggests that banks preferred absorbing increase in the reserve requirement instead of passing to the consumers. As discussed in Section 2, change in the reserve requirement is sourced from the changing composition of demand and the time liabilities. More precisely, effective reserve requirement increases when demand liability increases and/or time liability decreases. Banks prefer demand deposits and control the inflow of the time deposits in a declining interest rate environment, though it increases their operational cost. Moreover, banks may be finding it hard to sell to the increase in cost to the retail consumers as declining interest rate instills an expectation of lower retail price on loanable funds.

The coefficient of models (4) in Table 3 shows the long run discount rate's pass-through to the lending rate. The pass though of policy interest rate to the lending rate is complete and significant at the five percent level. Nearly 0.91 percentage-points of a unit shock to the discount rate significantly passes to the lending rate in the long run.

Importantly, our result also provides evidence of the long run pass-through of lending rate's shocks to the discount rate. The lower panel of Table A2 [model (1), and (4) in grey] shows the result for the model, in which lending rate explains the discount rate. This result suggests that the discount rate may not remain exogenous in long run when it comes to lending rate. Contrary to the discount rate, the reserve requirement ratio appears exogenous to the lending rate, as long run impact of the lending rate cannot be substantiated.

6.2 Pass-through to the deposit rate

Model (2) in Table 3 shows the long-run pass-through of required reserve to the deposit rate is low and significant. Almost 0.30 percentage point of a unit shock to required reserves passes to the deposit rate in the long run. Our deposit rate's pass through estimate is consistent with the findings in literature as detailed in Table 1.

Table 3: Long run Estimates for Interest Rate Pass Through For Policy Tools

Dependent Variable	**Lending Rate**	**Deposit Rate**	**Exchange Rate**
Policy Tool: Required Reserve			
Model #	**1**	**2**	**3**
Required reserve ratio	0.4792**	0.3018*	-0.3249*
	[0.085]	[0.002]	[0.000]
Intercept	0.752	-1.5703	7.1036*
	[0.901]	[0.467]	[0.001]
Break Dummy – June 2008	3.952*	3.1397*	-1.2191*
	[0.000]	[0.000]	[0.008]
D(Break– June 2008)	12.6964**	-0.427	1.6487
	[0.065]	[0.811]	[0.397]
Break Dummy – Aug 2011	-5.2921*	-1.9715*	0.2764
	[0.000]	[0.000]	[0.461]
D(Break – Aug 2011)	1.452	1.3877	1.8587
	[0.732]	[0.411]	[0.297]
Policy Tool: Interest Rate			
Model #	**4**	**5**	**6**
Discount rate	0.9037*	0.4892*	-0.0226
	[0.000]	[0.001]	[0.876]
Intercept	2.8089**	1.0297	-0.1205
	[0.016]	[0.422]	[0.921]
Break Dummy – June 2008	0.0629	0.6359	-0.1941
	[0.924]	[0.396]	[0.806]
D(Break– June 2008)	7.7251*	3.9208**	-1.7914
	[0.016]	[0.098]	[0.400]
Break Dummy – Aug 2011	-1.693**	-0.9455	0.0826
	[0.006]	[0.133]	[0.889]
D(Break – Aug 2011)	-0.7656	0.8407	2.5141
	[0.676]	[0.694]	[0.252]

Notes: *, **, indicates significance at 5 and 10 percent levels respectively. The coefficients are estimates of long-run pass-through of policy shocks on the impact variables i.e., lending rate, deposit rate, and exchange rate, as shown by Equation 2.

Models (5) in Table 3 show that the pass-through of the discount rate to the deposit rate is significant at five percent level. The result suggests that almost 49 percentage point of a shock to the discount rate passes to the deposit rate. Our result of discount rate's pass through to deposit rate is consistent with the findings of Fazal and Salam (2013); and Hanif and Khan (2012), which reported significant but relatively higher pass through. Moreover, these results suggest that the pass through of the discount rate may have improved in Pakistan over the years perhaps, due to imposition of the regulatory deposit rate. The low

pass-through of the reserve requirement ratio also substantiates the role of the regulatory deposit rate.

Our result do not find any long run impact of the deposit rate on either required reserve ratio or discount rate, as shown in the lower panel of Table A3 [model (2), and (5) in grey].

6.3 Pass-through to the exchange rate

The pass-through of required reserves to the (growth in) exchange rate is shown with Model (3) in Table 3. A growth in exchange rate suggest deprecation in Pak rupee while a decline in the exchange rate indicates the appreciation of the Pak rupee against US dollar. The coefficient is significant at the five percent indicating that one percent increase in required reserves ratio appreciates Pakistan rupee against the US Dollar by 0.33 percentage point. This result is very different from the findings of Models (6) in Table 3 which show the insignificant long-run pass-through of the discount rate to the exchange rate. More precisely, the discount rate has no influence on the exchange rate in the long run.

The lower panel of Table A4 (model (3), and (6) in grey) shows the results for the long run impact of the exchange rate on the monetary policy tools. These estimates failed to provide any significant evidence of long run pass-through in this reverse direction, like deposit rate.

Given its significant impact, the reserve requirement is better tool to deal with the speculative pressure on the exchange rate from policy perspective, whereas the discount rate appears completely ineffective in preventing such attacks. We do not see this dynamics changing anytime soon with the introduction of the interest rate corridor and new 'Target policy rate'. At least in its philosophy, interest rate targeting is least concerned with the volatility in the exchange rate. Moreover, our result is in sharp contrast to the widely perceived notion among the policy makers that monetary tightening by raising discount rate (policy interest rate) helps in stabilizing the exchange rate.

7. Conclusion

We investigated the effectiveness of the monetary policy tools in Pakistan by studying their pass- through to the retail interest rates (the lending rate and the deposit rate) and the exchange rate, using data from July 2004 to September 2015. Our findings suggest that the pass-through of the required reserves to the retail rates is significant but incomplete. However, required reserves ratio's pass through to the lending rate is weakly significant indicating that banks prefer absorbing the shocks to the reserve requirement. Not surprisingly, the pass through of the discount rate to the lending rate is complete while the same to deposit rate appears incomplete. Nevertheless, the discount rate also become effected due to the movement in the long run, which limit its effectiveness as a central bank's policy tool.

Besides, our results suggest that the required reserve is a more powerful policy tool for

stabilizing exchange rate shocks than the discount rate, specifically for Pakistan. Pakistan has limited capital account convertibility, which limits banks' ability to invest in the foreign assets. When the SBP increases reserve requirements, anecdote suggests that the banks substitute their foreign currency holdings with cash liquidity or government securities. This limits room for banks' to maneuver in the foreign exchange market. Even if the central bank is not actively changing the reserve requirement ratio, the changing composition of liabilities influences the effective reserve requirements. Probably, this ingrained reserve requirement effectiveness may have prevented speculative attacks on the exchange rate in recent past. It is not surprising that exchange rate remained more or less stable since 2008. We, therefore, conclude that it is not advisable for the state Bank of Pakistan to overlook the reserve requirement ratio as a policy tool.

Our result indicates that structural shifts have occurred in the interbank market of Pakistan in June 2008 and in September 2011. More specifically, this study has identified the significant shift that occurred in October 2011 in financial market of Pakistan which may have changed the bank's perception of the risks associated with the banking sector. Ignoring these important shifts may produce misleading inferences on monetary transmission in Pakistan if their data span covers 2008 and 2011.

Finally, some caveats are in order. First, our results do not show an isolated picture of the impact of any of the monetary policy tool when both instruments are used simultaneously. We believe that the conditional estimates of the pass-through will be not be very different from ours. Second, the literature on monetary policy pass-through suggests that pass-through is often different for positive and negative changes in the policy tools. We leave this issue of asymmetric pass-through for future research.

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Appendix

Table A1. Changes in policy instruments since 2005

Date	CRR				SLR		Discount Rate
	Demand liabilities		Time liabilities		Demand liabilities	Time liabilities	
	Weakly average	Daily minimum	Weakly Average	Daily minimum			
31-Dec-05	5.0	4.0	5.0	4.0	15.0	15.0	9.0
22-Jul-06	7.0	4.0	3.0	1.0	18.0	18.0	
29-Jul-06							9.5
19-Jan-07	7.0	6.0	3.0	2.0			
1-Aug-07							10.0
4-Aug-07	7.0	6.0	0.0	0.0	18.0	18.0	
2-Feb-08	8.0	7.0					10.5
24-May-08	9.0	8.0			19.0	19.0	12.0
30-Jul-08							13.0
11-Oct-08	8.0	7.0					
18-Oct-08	6.0	5.0					
1-Nov-08	5.0	4.0					
13-Nov-08							15.0
21-Apr-09							14.0
15-Aug-09							13.0
25-Nov-09							12.5
2-Aug-10							13.0
30-Sep-10							13.5
30-Nov-10							14.0
1-Aug-11							13.5
10-Oct-11							12.0
13-Aug-12							10.5
8-Oct-12							10.0
12-Oct-12	5.0	3.0					
17-Dec-12							9.5
11-Feb-13							9.5
24-Jun-13							9.0
16-Sep-13							9.5
18-Nov-13							10.0
17-Nov-14							9.5
26-Jan-15							8.5
24-Mar-15							8.0
25-May-15							7.0
14-Sep-15							6.5

Notes: The figures in CRR and SLR columns are percent of time and demand liabilities while figures with discount rate are in percent.

Table A2: Estimates of Policy Impact on Lending Rate

Model #	(1)	(1)	(4)	(4)
Dependent variable	**Lending rate**	**Required reserve**	**Lending rate**	**Discount rate**
Policy tool	Required reserve	Lending rate	Discount rate	Lending rate
Lag selection criteria	HQ	HQ	HQ	HQ
No of lags	(1,1)	(1,1)	(3,3)	(3,3)
Lending rate (-1)	0.9245*	-0.0301	0.8272*	0.2565*
	[0.000]	[0.579]	[0.000]	[0.002]
Lending rate (-2)			-0.1489	-0.0937
			[0.181]	[0.389]
Lending rate (-3)			0.1480**	-0.0759
			[0.074]	[0.348]
Discount rate (-1)			0.3617*	1.0752*
			[0.000]	[0.000]
Discount rate (-2)			-0.0904	-0.4305*
			[0.458]	[0.000]
Discount rate (-3)			-0.1142	0.1953*
			[0.200]	[0.025]
Required reserves (-1)	0.0362	0.8725*		
	[0.030]	[0.000]		
Intercept	0.0568	3.3778*	0.4882*	0.5652*
	[0.904]	[0.000]	[0.013]	[0.003]
Break_1	0.2983*	-0.5419*	0.0109	0 .2481*
	[0.018]	[0.038]	[0.924]	[0.027]
D(break_1)	0.9583*	0.8937	1.3427*	0.6887*
	[0.005]	[0.202]	[0.000]	[0.023]
Break_2	-0.3994*	0.1066	-0.2943*	-0.2244*
	[0.000]	[0.625]	[0.002]	[0.018]
D(break_2)	0.1096	-0.1364	-0.1331	-0.8080*
	[0.738]	[0.840]	[0.670]	[0.008]
Long run Pass-Through Coefficients				
Discount rate			0.9037*	
			[0.000]	
Required reserves	0.4792**			
	[0.085]			
Lending rate		-0.2357		0.5430*
		[0.582]		[0.002]

Notes: Auxiliary regression showing the reverse direction of relationship is shown in Gray columns. No. of lags should be read as (dependent variables and policy/impact variable). * and ** indicates 5 and 10 percent level of significance, respectively. HQ and AIC are Hannan-Quinn and Akaike Information Criteria, respectively. Equation 2 shows the calculation of long-run pass-through.

Table A3: Estimates of Policy Impact on Deposit rate

Model #	(2)	(2)	(5)	(5)
Dependent variable	**Deposit rate**	**Required reserve**	**Deposit rate**	**Discount rate**
Policy tool	Required reserve	Deposit rate	Discount rate	Deposit rate
Lag selection criteria	HQ	HQ	HQ	HQ
No of lags	(1,1)	(1,1)	(2,2)	(2,2)
Deposit rate (-1)	0.7614*	-0.0247	0.5288*	0.0366
	[0.000]	[0.760]	[0.000]	[0.597]
Deposit rate (-2)			0.2750*	0.0201
			[0.002]	[0.773]
Discount rate (-1)			0.2069**	1.1448*
			[0.051]	[0.000]
Discount rate (-2)			-0.1109	-0.2544*
			[0.284]	[0.002]
Required reserves (-1)	0.0720*	0.8758*		
	[0.001]	[0.000]		
Intercept	-0.3746	3.1164*	0.2021	0.7395*
	[0.447]	[0.000]	[0.371]	[0.000]
Break_1	0.7491*	-0.5806*	0.1248	0.2324*
	[0.000]	[0.045]	[0.396]	[0.045]
D(break_1)	-0.102	0.922	0.7695**	0.7258*
	[0.813]	[0.191]	[0.057]	[0.022]
Break_2	-0.4704*	0.161	-0.1856**	-0.2900*
	[0.000]	[0.394]	[0.089]	[0.001]
D(break_2)	0.3311	-0.1771	0.165	-0.8030*
	[0.428]	[0.795]	[0.691]	[0.014]
Long run Pass-Through Coefficients				
Discount rate			0.4893*	
			[0.001]	
Required reserves	0.3018*			
	[0.002]			
Deposit rate		-0.1985		0.5164
		[0.767]		[0.108]

Notes: Auxiliary regression showing the reverse direction of relationship is shown in Gray columns. No. of lags should be read as (dependent variables and policy/impact variable). * and ** indicates 5 and 10 percent level of significance, respectively. HQ and AIC are Hannan-Quinn and Akaike Information Criteria, respectively. Equation 2 shows the calculation of long-run pass-through.

Table A4: Estimates of Policy Impact on Exchange Rate

Model #	(3)	(3)	(6)	(6)
Dependent variable	**Exchange rate**	**Required reserve**	**Exchange rate**	**Discount rate**
Policy tool	Required reserve	Exchange rate	Discount rate	Exchange rate
Lag selection criteria	HQ	HQ	HQ	HQ
No of lags	(1,1)	(1,1)	(2,2)	(2,2)
Exchange rate (-1)	0.1748*	-0.0487	0.1838*	0.0148
	[0.045]	[0.282]	[0.033]	[0.454]
Exchange rate (-2)	0.1282	0.1185*	0.1751*	-0.0476*
	[0.136]	[0.008]	[0.042]	[0.016]
Discount rate (-1)			-0.0608	1.1598*
			[0.861]	[0.000]
Discount rate (-2)			0.0463	-0.2276*
			[0.887]	[0.002]
Required reserves (-1)	-0.7076*	0.9330*		
	[0.000]	[0.000]		
Required reserves (-2)	0.4812*	0.0464		
	[0.004]	[0.594]		
Intercept	4.9512*	2.7658*	-0.0773	0.6503*
	[0.003]	[0.001]	[0.921]	[0.000]
Break_1	-0.8497*	-0.5715*	-0.1245	0.2069**
	[0.014]	[0.001]	[0.806]	[0.075]
D(break_1)	1.1491	0.9215	-1.1486	0.6961*
	[0.385]	[0.180]	[0.406]	[0.028]
Break_2	0.1927	0.1631	0.0529	-0.2733*
	[0.464]	[0.233]	[0.889]	[0.002]
D(break_2)	1.2955	-0.1636	1.612	-0.8395*
	[0.286]	[0.796]	[0.240]	[0.007]
Long run Pass-Through Coefficients				
Discount rate			-0.0226	
			[0.876]	
Required reserves	-0.3249*			
	[0.000]			
Exchange rate		-0.8587		-0.4842
		[0.259]		[0.237]

Notes: Auxiliary regression showing the reverse direction of relationship is shown in Gray columns. No. of lags should be read as (dependent variables and policy/impact variable). * and ** indicates 5 and 10 percent level of significance, respectively. HQ and AIC denotes respectively Hannan-Quinn and Akaike Information Criteria. Equation 2 shows the calculation of long-run pass-through.

Table A5. Diagnostic Checks of the Estimated Relationship

Model #	(4)	(5)	(6)	(1)	(2)	(3)
Dependent variable	**Lending rate**	**Deposit rate**	**Exchange rate**	**Lending rate**	**Deposit rate**	**Exchange rate**
Policy instrument	Discount rate			Required reserve		
Serial correlation	3.599	1.59	1.857	0.732	1.808	0.813
	[0.462]	[0.810]	[0.762]	[0.947]	[0.770]	[0.937]
Normality	19.453	21.623	286.061	11.383	22.126	48.892
	[0.000]	[0.844]	[0.000]	[0.003]	[0.000]	[0.000]
EV Stability Condition	Yes	Yes	Yes	Yes	Yes	Yes

Notes: For serial correlation, Breusch-Godfrey test, up to 12 lags is used. The stability of coefficients in VAR model is checked with Eigen value stability conditions, which requires the Eigen value of matrix A to be strictly less than one (Lütkepohl, 2005). The normality of residuals is tested using the Jarque-Bera test. The kernel density estimates suggest that the residuals deviation from normality is generally marginal and can be ignored without significant implications on inferences.

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The Euro and the Battle of Ideas (2016)

by Harold James,[1] Jean-Pierre Landau,[2] and Markus Brunnermeier[3]

Book Review by

Ahmad Mobeen[4]

"Elections change nothing. There are rules."
Wolfgang Schäuble, German Finance Minister, 31 January 2015

"We will never have a strong, sovereign Europe if it is not united and coherent in itself… Our challenge is to remain united without chasing uniformity."
M. Emmanuel Macron, President of France, 26 September 2017

If an individual were tasked to identify the root cause of the Eurozone's response ambivalence towards addressing its crisis and the inability to formulate a shared identity, these words spoken by the then German Finance Minister, and Emmanuel Macron, currently the President of France, would not be too far off in explaining it.

Ever since its inception, the European Union has struggled unnervingly to showcase and – to a large extent – underscore the vitality of the envisioned inseparability as a base on which the Maastricht Treaty's superstructure was to be erected. The word *struggled* is there to emphasize the ironic manner in which the aspired image has not yet materialized – and may not do so at all. This is because the principal factor responsible for the lack of fruition of the aforementioned collective vision and, by effect, the enervating of the masses, stems from the stark ideological contradictions existing between the member states; and here, the core is perhaps more to blame than the periphery.

Making this argument the basis of their 2016 book "*The Euro and the Battle of Ideas*", Harold James, Jean-Pierre Landau, and Markus Brunnermeier weave a narrative of (predominantly) two uncompromising standpoints in the sphere of international political

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economy governing the functioning of the European Union: those of Germany and France.[5] The differences constitute four separate yet mutually inclusive stances.

Rules vs Discretion

The debate encapsulated in the caption above is familiar to every student and practitioner of the discipline of economics; that there always be a case for one over the other or vice versa has also become a well-established submission by now. However, preferences can become sticky once evolved, and one way of dissecting the chasm between the ideologies of Germany and France is to observe how the former stresses upon a principled approach towards the monetary union while the latter emphasizes the compensations afforded by flexibility.

According to the German economic philosophy prevalent today, there exists a genuine case of erecting rules-based institutions to insulate the economics from the politics and – more urgently, to resist as far as possible from exceptions to the laid principles lest a one-time affair morphs into a tradition of caution-lapses and moral hazard.

The French, by contrast, deem discretion as a suitable prong by which to inspect economic challenges, and champion flexibility in addressing the underlying causes, particularly in case of what they regard as "temporary liquidity problems". For in doing so, the knock on effects may as well be crucial in determining the overall stability of the union by minimizing contagion.

Solidity vs Social Solidarity

The German viewpoint emphasizes solidity of the state of an economy as a vital ingredient in limiting mismanagement and the resulting turmoil. Self-sufficiency in governance is to be strived for to ensure that the sins of resource misallocation, over or under-investment, and excessive risk taking are contained autonomously. The following words of Johann Wolfgang von Goethe, the 19th century German writer and statesman, are regarded as an aphorism and often referred to in the country's policy circles: "Let everyone sweep in front of his door and every city quarter will be clean". This has been the basis of *Haftungsprinzip* (the "liability principle") supported by the Germans: entities with the liberty to self-carve a trajectory must also be prepared to stand liable for its consequences.

France, in stark dissimilarity, advises solidarity: mistakes are imminent, and leniency coupled with a collaborative response is to be the way forward. This viewpoint takes its inspiration from the slogan of the French Revolution, which still looms large in terms of its influence on the Franco ideology: "liberty, equality, *fraternity"*.[6]

[5] The ideological standpoints of other member states (such as the UK and Italy) are also provided in the book; however, the authors deem their influence on the overall EU policies and regulations to be substantially narrower compared to the two core states of Germany and France. For the purpose of concision, the review focuses on the latter only.

[6] As stated in the book, Paragraph 21 of the 1793 Declaration of the Rights of Man and the Citizen—the ultimate statement of the ideals of the French Revolution—states that "Public relief is a sacred debt. Society owes

Solvency vs Liquidity

Extending the narrative further, the German policy makers discourage intervention to address the temporary fluctuations in an economy. According to their viewpoint, it is the solvency that is the holy grail of stability and, therefore, deserving of protection. As the authors state, Germans remain fearful that facilitating other nation states against short-term problems may foster an environment where a "bad habit" is developed to regularly cede mishap-control missions to the supranational authority. This is unadvisable on two accounts: a) avoiding the development of homegrown policies would increase the dependence of nation states on supranational assistance; and b) the development would violate the doctrine of self-sufficiency, without which for the Germans, the monetary union would not survive.

Again, the French regard intervention as necessary and adhere to the concept of liquidity support administration. Here, the notion of multiple equilibria is of particular importance. At a certain point of time, there exist two broad trajectories for the economy in light of an economic event: a good one and a bad one. Given the costs are not excessively high (or in other words, the "bail-out multiplier" is positive and greater than one), intervention by monetary and fiscal authorities may help attain the better of the potential economic outcomes. The higher the credibility of the institutions, the more akin multiple equilibria theory becomes to self-fulling prophecies.[7]

Austerity and Reforms vs Economic Stimulus

Capturing the hitherto debate are the for and against stances of the Germans and French towards austerity. The German tradition, as we have seen, stresses upon the probability of unsustainable economic growth resulting from a stimulus and hence advises self-correction. In other words, austerity in times of economic stress to push for unpopular reforms so that resilience is breathed into a nation state. The French school of thought, meanwhile, recognizes active demand management as the way forward and skewing reform implementation towards economic upswings when conditions are more conducive in order to make the economy capable of withstanding the winds of the next downturn.

The historical roots of the ideological conflict and its repercussions in the European sphere

The authors trace back the origins of the distinct ideological standpoints between the two countries in the events of World War II. The unprecedented scale of human misery that was witnessed during the war led Germany to believe that strict adherence to rules must become the precondition to any restructuring of the economy so as to avoid another violent and arbitrary government formation. Meanwhile, the fall of France in 1940 led the policy makers

maintenance to unfortunate citizens". It is the attempted application of this stance by France *across* national frontiers that the German ideology cautions against.

[7] The opposite is also true. For example, Brunnermeier and Oehmke (2013) argue that issuing long-term debt can become relatively fruitless for a government if investors over time become aware that previous long-term obligations are being diluted by the issuance of short-term debt. Hence, the "maturity rat race "ensues and ultimately only short-term instruments remain in demand, with long-term financing becoming increasingly impossible for the government.

of the country to conclude that perhaps too little flexibility in their ruling structure was the deciding factor in the outcome of the war.

To be clear, the federal and central models of the states of Germany and France, respectively, since well before the advent of the Second World War, are proof that ideologies are shaped and entrenched over time. The authors put it aptly that "federations are mechanisms for preserving differences while minimizing conflict, while central states repress conflict by overriding differences through the assertion of authority. Federations thus need rules as a way of dealing with substantial differences in outlook".[8]

This necessitation of the ruling structure – *the rule of rules* – also surfaces in the domain of monetary and fiscal. The efforts to limit the centrist activism, particularly with regards to fiscal affairs, gave rise to the *Finanzuasgleich* in Germany: a dense set of regulations governing the inter and intra government transfers which are so complex that revisions or renegotiations become very difficult. On the other hand, in France, the passing of legislations can be, and often has been, enforced by means of a decree. The authors highlight how this constitution provision (Article 49-3) on *vote bloqu*e has been used fifty times since 1958.[9]

Pillars too fundamentally different to be parallel shoulder the European Union. This makes its foundations weak

According to the authors, the Maastricht Treaty of 1992 – the base of the European Union – "assumed too simply that price stability was sufficient to ensure financial stability and that fiscal policy had no role to play in the provision of price stability". Disagreements over the subject along the Rhine Divide is evident across every element of the European (mis)management.

For instance, the no bailout rule that Germany so passionately fought to be included in the treaty of integration is the backdrop of the Stability and Growth Pact (SGP). Under the agreement, every fiscal authority is advised to practice solidity and not breach the 3 percent budget deficit rule for the fiscal year. However, market participants and financial institutions did not take the concept of no-bailout too seriously and leaned towards the French ideology of fraternity. Accordingly, under the Basel framework, banks are required to cushion up against risky positions; however, all euro-area government debt carries a zero-risk weight. Similarly, the ECB allows all euro-area government debt as acceptable collateral deposit without any risk-associated interest rate differentials. Brunnermeier et al are right in stating, "Both rules were in direct contradiction to and undermined the principle of the no-bailout clause". This contradiction played into the euro crisis, as essentially the no differential rule

[8] The authors give an example of the railway track structures of both the countries to observe the aforementioned governance contrast. In Germany, there exist multiple "nodes", all interconnected, while the French railway tracks have Paris as the overarching central node from which all other tracks are connected.

[9] On the finance front too, France is home to a very concentrated banking market, within which the banks were also nationalized to facilitate in the careful construction and tweaking of the country's economic planning.

was incentivizing financial institutions to lend to other member states after incorporating credit and liquidity risks plus the inflation levels.[10]

On the international economics front, too, the two ideologies collide. The German philosophy explicitly supports free trade, undistorted competition and frictionless capital markets, with controls being considered as a form of potential lobbying that may result in moral hazard down the road. French, on the other hand, favor a relatively Keynesian position of "fixing exchange rate, controlling capital flows, and fostering multilateral adjustment via inflationary policies in surplus countries".

In other words, if one considers the *trilemma* or the *impossible trinity*, the two countries are on the opposite sides of the triangle, with Germans picking the capital flow side and France preferring the fixed exchange rate one. This is important as the third side of the triangle – with fixed exchange rates and free capital mobility – puts a significant constraint on the formulation of the monetary policy, especially when country's debt is denominated in foreign currency and is exactly what most economists refer to about what happened during the brink of the European crisis.

The foundations of this trilemma standoff between the two countries date back to the gold standard era (when the "price species" flow mechanism led to an inflow of gold into surplus countries and, given the gold inflows were not sterilized, increase in the prices) and continued into the Bretton Woods period (which was also essentially a gold-backed mechanism as the benchmark currency, the US dollar, was pegged to gold). With Germany accumulating trade surpluses on the back of increased labor productivity and contained wage inflation, the deficit countries were feeling the heat. As capital controls were present, financing even small deficits was becoming difficult. The only recourse left to the deficit countries was hence the application of fiscal brakes. The preferred alternative for the deficit countries, particularly France, was German growth and inflation expansion, which Germany was against given the legacy of hyperinflation and the presence of a strong and independent central bank.[11]

During the 1970s, the capital flows from creditor to debtor countries started increasing substantially. On the face of it, it was a welcome development for the French and other deficit countries. This is why the insistence of such countries to enforce tighter controls and even "penalize" the inflows may seem as counterintuitive. However, what was happening was that the cross border flows were financing mostly domestic focused sectors rather than export-oriented ones. This was resulting in increased wage differential without the

[10] A common narrative in most periphery-origin (and even international) books is indeed the surplus liquidity vs deficit borrower countries. Taking the case of Greek, for example, Yanis Varoufakis (2016) stresses how excess liquidity with the core countries' banks, coupled with the higher interest rates and low credit penetration in the deficit countries, led to a fueling of first the private and then the public debt of the periphery countries amidst a "frenzy" of inflows

.

[11] For a long time in France until the mid-1990s, central bank independence was considered undesirable in a "unitary republic' as it could break free of the political oversight. The book cites Christaian Noyer, a former governor of the Banque de France, as stating that the French republic was "one and indivisible" and hence monetary independence is incompatible with the political system in place.

accompanying improvement in competitiveness of the products in the international market. Adding to this was the phenomenon referred to as the Walter's critique: with a fixed exchange rate regime and an expansionary demand shock fueling inflation, real interest rates in deficit countries were becoming lower relative to the debtor countries, thereby exacerbating the skewed credit flow situation. Notably, a similar development was also witnessed during the euro crisis with the periphery countries piling up debt from the core countries and disguising their weak economic situation in the "miracle" debt-fueled import-fed growth during the years prior to the crisis.

Ultimately, the Bretton Woods system collapsed, giving rise to free capital flows and flexible exchange rate regimes in line with the neo-liberal Washington Consensus. Within Europe, however, quasi-Bretton Woods structure by the name of European Exchange Rate Mechanism (ERM) was erected, and the ideological clashes persisted. Germany obstinately called for routine realignments and France insisted instead on wage growth regulation in the surplus countries. In 1986, the associated single currency market also got established, with France battling hard but eventually acquiescing to the demands of Germany to liberate the capital flows. In the end, the authors note, this development partly resulted in the two big exchange rate crisis of 1992 and 1993 leading the UK and Italy to withdraw from the ERM. The German and French policymakers had to resort to firewall efforts to rescue the free-falling system by strengthening the franc, lowering German interest rates, and widening the ERM exchange rate corridor from 4.5 percent to 30 percent.

Optimum Currency Area (OCA) without Fiscal Union – Is there a way forward?

Chapter 6 of *Euro and the Battle of Ideas* is perhaps the most interesting, as it strives to gauge the resilience of a monetary union without the presence of a complementary fiscal coordination. Debating first on the notion of free labor mobility within the union as a panacea for the vicious debt trap for the deficit countries, the authors then structure the debate towards its eventual futility. Echoing the US scholars from the 1990s, Brunnermeier et al state that free worker mobility of the scale of the US is impossible given the different cultural, linguistic and societal barriers amongst the EU countries. Furthermore, the so-called "brain drain" leaves the burden of the debt to be borne by a "smaller, less productive and aging population" as the young and skilled depart to the core.

On the capital front too, the same conclusion is reached via the *volatility paradox* (referred to above as the selective investments made by surplus countries' capital in the deficit states). Excessive capital, particularly of a smaller horizon, can potentially reverse just as quickly (if not more). Resultantly, discretionary/distortionary taxes on inflows to certain sectors are not effective, given that political lobbying may prevent this on the domestic level; while on the EU level, this may be seen as against the whole spirit of having a union.

Even if one allows for free capital and labor mobility, the reduced trade barriers would lead to increased specialization amongst the member states, making the absence of diversity within an economy a stress signal in the face of asymmetrical, industry-specific shocks. Furthermore, the deficit countries would have to face a trade-off between fading

competitiveness and swelling debt – the undesired outcome of the "original sin" of having a greater share of foreign currency denominated debt in the country's total debt stock.

As mentioned earlier, for peripheral countries, excessive public debt and higher increases in prices and wages relative to core countries would leave no choice but to "internally devaluate" (as exchange rate flexibility is absent in this scenario). This may be achieved via low wage growth and economic slowdown; however, this would make more difficult for the workers to service debt obligations, which may turn into additional financial stability problems for the union. The only alternative is higher wage inflation in the core, which Germany would never agree to given its hard stance on self-sufficiency.

In sum, after presenting an adequately disinterested assessment of the (mainly) two ideologies governing the intricacies of the European Union, the authors conclude the inevitable as expected from economists: it depends whether rules, solidity and self-sufficiency are better or whether discretion, solidarity and flexibility pave the way forward. "For extreme adverse events, excessive emphasis on individual liability is counterproductive; in such circumstances, the solidarity principle should dominate". However, a threshold "needs to be identified, agreed upon, clearly communicated, and enforced in future crises". Furthermore, cries for common liability may only be heeded to when budget discipline in the euro area can be enforced credibly. Lastly, debt restructuring should occur only in extreme events, and must follow clear rules in order to limit economic disruption. The authors here are less convincing (or at times, silent) about how, if at objectives may not be achieved.