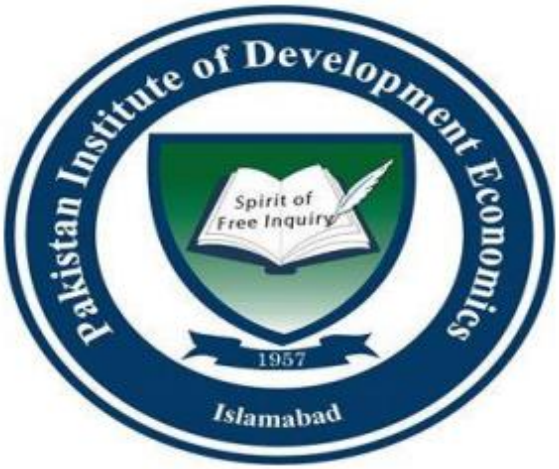
Effects of Monetary Policy on Stock Price Bubble: The case of Pakistan



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CERTIFICATE

This is to certify that this thesis entitled **"Effects of Monetary Policy on Stock Price Bubble: The Case of Pakistan"** submitted by **Mr. Salman Javed** is accepted in its present form by the Department of Business Studies, Pakistan Institute of Development Economics (PIDE), Islamabad as satisfying the requirements for partial fulfillment of the Degree of Master of Philosophy in Economics and Finance.

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STATEMENT OF AUTHORSHIP

*I, **Salman Javed** hereby declare that this dissertation is the result of my own work. Material taken through some published or unpublished work of other authors, referred in the dissertation has been credited to the original author in the given text.*

Salman Javed

DEDICATION

*I dedicate my thesis to **my parents and my teachers**, whose love, unselfish support and example over years laid the foundation for discipline and application required to complete this work.*

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*First of all, I would like to thank Allah Almighty for his countless blessings upon me, so that I could complete my work on time. I would also like to thank several other people, without whom I could not have complete this work. I would like to thank my Mother Fakhira Javed, who was my constant support system throughout my academic career. I would like to express my special marks of gratitude to my Supervisor Dr Saud Ahmed Khan, who provided me the wonderful opportunity to do this project (**"**Effects of Monetary Policy on Stock Price Bubble: The case of Pakistan"). He helped me in doing a lot of research and helped me to explore new things. I am really thankful to him for this. I am also obliged to Mam Hafsa Hina, as I learned a lot from her in my entire coursework.*

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Salman Javed

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ABSTRACT

Monetary policy is an important tool of central bank that is used to stabilize inflation and target growth of country. But in literature role of monetary policy in case of stock prices bubble is widely discussed. From this prospect, this research study finds the impact of monetary policy on stock price bubble for Pakistan economy on the monthly data from 2001-12 to 2019-10. The results of this study indicate that the monetary policy, specifically interest rate play an important role in both boom and burst of stock market and the result also indicate that the increase in interest rate may eliminate the stock price bubbles. However, the negative and significant impact of interest rate shows that when interest rates are high, investors move out of stocks into bonds, and average price-earnings ratios contract. Moreover, the response of the state bank rate indicate that the monetary policy has not been successful at distinguishing between price movements due to fundamentals and speculative price movements due to stock bubbles.

CHAPTER 1

INTRODUCTION

1.1 Background

The financial and economic crisis of 2008 to 2009 has been linked to instant decline in housing costs, followed through the boom in protracted real estate. This has basically caused increased interest in the relationship between asset price bubbles and monetary policy. It has resulted into reviving the debate that how monetary policy should make response to the assumed deviations of asset costs through fundamentals. Before crisis, the consensus view implied that central banks must target over the stabilization of inflation and over output gap. The fluctuations should be ignored in costs of assets, even if at some later stage, these are identified as getting driven through bubbles (Campbell & Robert, 1998). The consensus has got challenged through the crisis and it has therefore empowered the perception that central banks should focus and should respond to the growth within asset markets. Supporters who agree with this perception that monetary policies policy should increase the rate of interest for counteracting the bubble-driven part of stock price inflation. Any such loss linked with such deviations, would be more as compared to the offset through avoidance of circumstances of future bubble's burst. Borio and Lowe (2002) believed that any losses related to these anomalies would be more than marginal by minimizing the effects of a potential bubble burst. The main assumption of this argument "leaning against the wind" in monetary policy is the premise that an increase in interest rates would shrink the size of bubble. Although this hypothesis has become part of information, its proponents seem to have given little empirical and theoretical support. Gali (2014) has challenged over the theoretical grounds, the association in between stock price bubbles and has considered the conventional approach. According to Gali (2014), when referring to rational stock price bubble, the bubble should develop at an equilibrium rate with the interest rate. In such scenario, the increment in interest rate outcomes into increasing the bubble size. In addition to this, the rationale bubbles theory means that influences of monetary policy over the perceived asset costs should be based over the bubble size. More particularly, an increment in the interest rate should cause a negative influence over the asset's costs at times, where the component of bubble is smaller when compared with the fundamental one. The major rationale is that an increment in rate of interest

always decreases the cost of asset. It is an effect having more dominancy in normal times, where there is non-existent or small component of bubble. However, in case of larger size of bubble, the hike of interest rate can end up in enhancing the cost of perceived asset, because of its positive influence over the bubble. In accordance with Borio and Lowe (2002), the change in supply of money or monetary policy is the most effective tool to countries' central banks in relationship with affecting the actual activity of economy. Bernanke (1999) and Gertler (2000) stated that money supply is the major part of monetary policy and it mainly affects the development and behavior of stock prices. Gali (2014) identified that stock market is the major indicator of the development and condition of economy strongly affecting and preceding it. Money supply can mainly influence the cost of stock in a direct way. In case of presence of more money within economy, then these can be assigned towards investments. According to Cuthbertson (1996), macro-economic factors that affect the growth of stock prices mainly take into account the monetary policy to be the most significant aspect. The supply of money can mainly be used in order to predict the growth of stock markets. The investigation related to this identifies that around 59 percent of the stock value indices can be assumed using money supply. Gambetti (2014) supported this statement, who in his analysis targeted over the prediction of development of stock market through making the use of macroeconomic factors in around 12 countries. It was concluded that for making predictions of stock market, the macro-economic factor that can be trusted the most is the rate of interest. Central banks that tend to make immediate response to this development through increasing the rates of interest, outcome into decreasing the stock prices. It is because of the reason that investors look forward to such substitutes that are not too risky for investment. According to Bhar & Hamori (2005), there are different influences of non-anticipative and anticipative money supply over the growth of prices of stock.

The stock market is a non-negligible part of global economies that plays a pivotal role in development of economy within Pakistan. Ups and downs in stock markets greatly affect the economies of countries that's the important reason, performance of stock market is monitored by government, industries and regulators. Therefore the primary function of stock market of Pakistan is to help industries to raise funds for the growth or extension of their projects. This is the reason upward movement of stock market is the symbol of development of industrial sector and growth in economy of Pakistan. Therefore, it is important to investigate the impact of monetary policy over the stock price bubble in Pakistan. In Pakistani stock market, Al-Anaswah & Wilfings (2011)

did an analysis of the link in between stock prices and money supply, and identified a co-integration of longer time period in between money aggregates and stock prices through performing co-integration test. The positive association in between macroeconomic factors (like money supply) is also given by Bhar & Hamori (2005) who assured a positive link in between stock prices and money supply in Central Europe. During last few decades, stock markets have experienced different bubbles. Bubbles in the stock market can have a great economic impact on the individual investors and country. Garber (1990) has defined the bubble as the asset price movement that is unexplainable by fundamental. While in meantime, it has been argued that rational bubbles can be defined as an endeavor to recognize the irrational behavior of investors. Over the previous last two decades, Pakistan stock market faced a number of severe swings. Just after the last stock market disaster in May 2002, PSX has faced a steady bull run as revealed in both the trading volumes and PSX index. Such subsequent crash and sharp rise is not explained by change in fundamentals, it is indicative of non-fundamental part of asset in equity market hitch is termed as "Speculative bubble". History is witness of bubbles which are Mississippi bubble (1719 – 1720), South Sea bubble (1720), Bull Markets of US in Twenties (1924 – 1929) , Asian financial crisis (1997) and Dot Com Bubble (1995 – 2001) and the most recently of financial crisis of 2008-09. A large increase in the fluctuation of stock prices mentioned above cannot be credited to market fundamentals. For example, argued that over the previous century, contrary to expected dividends stock price had been five to fourteen times more volatile. After the failure of simple present model in explaining the stock price volatility a substantial effort has been made for an alternative model which leads towards the two approaches about how to change the simple present model. First one is discount rate, fundamental price has been determined by discounted value of the expected future dividends. Although it has been revealed that discount value only partially determines the stock price volatility (Campbell & Robert, 1998). (Campbell & Shiller, 1997)

While in second approach, the stock price deviate from the fundamental price by involving the bubble component and this volatility in stock price has been explained successfully with the help of asset price theory for example (Wu Y. , Are there rational bubbles in foreign exchange markets?, 1995), (Bhar & Hamori, 2005), or (Al-Anaswah & Wilfings, 2011).

The purpose of most central banks is price stability. There are different opinions among researchers that in which way monetary policy should response to stock price bubbles. (Orphanides, 2010) has argued that proposed monetary policy reacts differently to bubbles by

changing inflation target by changing the stability of prices. While misalignment in stability of prices are not reacting from bubbles (Bernanke & Gertler, 2001).

1.2 Problem statement

During the last three decades Pakistan Stock market has oscillated number of times. Markets are normally follow the regional, domestic and international dynamics but there is non-fundamental part asset price which is called as a bubble. The purpose of most central banks is price stability. According to my best knowledge, there is not study in case of Pakistan that has endeavored to explore the non-fundamental part of asset prices and considered the effect of monetary policy. Thus, the aim of current study is to investigate how monetary policy is effective in its avocation to stable prices in terms of being able to influence the non-fundamental part of asset prices that is bubble.

1.3 Research Questions

1. What is the effect of monetary policy on stock price bubble?
2. How we can determine the internal relations between monetary policy and Pakistan stock exchange.

1.4 Research Objectives

1. To provide the insight about the Effect of monetary policy on stock market bubble.

1.5 Significance

Many studies available in literature that discuss the relationship between monetary policy and stock market but as per my best knowledge there are very few studies that find the impact of monetary policy on stock market bubbles in case of Pakistan. Therefore, the current study is helpful to better understand about non-fundamental part of asset price termed as “Bubble”. Which is one of the reason for the failure of simple present-value model. Furthermore, to see the effect of monetary policy on stock price bubbles, the literature has considered extensively whether monetary policy could cause asset price boom and bust. For academic point of view this study is helpful for researchers to have in depth knowledge about the monetary policies, stock volatility and the Bubble estimation.

CHAPTER 2

THEORY AND LITERATURE REVIEW

2.1 Theory of Asset Price Bubbles

The discussion about the asset price bubble started since the organized market began. Bubbles are usually associated with a dramatic rise in price of asset followed by the sudden slump. Asset price bubbles emerge when price of stock exceeds the fundamental value. This occurs when traders hold the stock because they assume, they can trade the asset at higher value to another trader even though the value of asset is higher than its fundamental value. Researchers define the term bubble differently but they agree on a common point that it is deviation of price from "fundamentals" (Kindleberger & Aliber, 2011)

The well-known historic examples of asset price bubbles includes Tulip Mania of the Netherland (1634-37), the South Sea Bubble in the 18th century (1720), the Mississippi bubble (1719-20) and the Roaring Twenties (1929). Recent example of bubble include the share prices of Internet (CBOE Internet index that rose to astronomical levels until March 2000, before it dropped more than 75% by the end of 2000s

Since the prices of asset affects the actual distribution of the economy, so it's necessary to understand such circumstances in which prices drift from their basic value. Economists are much fascinated by these bubbles and this led to numerous models, various experimental and empirical studies.

The following sub-section is designed to summarize the different theories related to the price bubbles of asset, including various models.

2.2 Different Models for Bubbles

Individual opinions on the emergence of price bubble differs because of different causes of the occurrence and methods used to identify the bubbles in real time. In literature, there are four major categories of the models for price bubble that differs on the basis of emergence (Brunnermeier & Oehmke, 2012). The first two categories of the models are built on rational investor's assumption but they vary on the basis of symmetric and asymmetric information. The third category of the model is related to the theory of behavioral finance. In this category, bubble

can persist for a longer time, as arbitrage limits prevent the rational investors from eliminating the price effect. Unlike the last two, this category is not entirely based on rational investors, but it emphasized on the interaction of rational and irrational investors. The fourth category presumes that price bubbles emerge due to heterogeneous beliefs of the stockholders (Komarek & Kubicová, 2011).

2.2.1 Rational Price Bubbles under Symmetric Information

Asset prices have a rational price bubble when investors agree to pay more for the asset than the justified discounted value of expected future dividend, because they expect that they will be able to trade this asset at higher prices in the future. The main characteristic of speculative price bubble is that the resultant inflated prices are still at equilibrium point and are rational, since arbitrage opportunities are not available.

Tirole (1982) was the one who first introduced the theoretical concept of the stock price bubbles involving rational expectations and symmetric information. The essential condition for the existence of such type of bubble is that the economic state in which price bubble happens must not be Pareto efficient. As in Pareto efficient economy, a price bubble that makes the trader better, the same bubble worsens the purchaser of the asset. Therefore, nobody would be willing to purchase the bubble asset.

Rational price bubble models are usually based on the *present-value model* of the asset prices, which is also known as *market fundamentals model* or simply called *standard model.* In such models, value of the assets is determined exclusively through the discounted fundamentals. In its simplest version for the asset prices, the current price of an asset is equivalent to the present value of future expected dividends (Wöckl, 2019).

The present-value model is based on four major assumptions. First, all investors in the market are rational and take risk as neutral. This indicates that such models doesn't include risk premium. Secondly, the discount rate is constant across all periods, which is used to measure the present value of future expected dividends. Thirdly, there should be no change in dividend making process. And fourthly, all investors must have symmetric information (Gürkaynak, 2008).

Many studies (for instance, Schiller (1981) and LeRoy and Porter (1981) have shown that present-value models are not able to measure the fluctuations in asset prices. Therefore, rational

bubble models were introduced to measure such fluctuations in asset prices. Rational price bubble models are unique case of present-value model that considers another component to measure the deviation between the asset prices and the discounted fundamentals.

Blanchard and Watson (1982) states that rational bubbles are raised by the extraneous incidents and the dispersal of rumors. The reason behind the occurrence of these bubbles is the self-fulfilling expectations of investors regarding the future growth in asset prices which is not directly linked with the fundamentals. The rational asset price bubble must be grow at a rate that generates the return at the expected rate. It grows in size as the sellers expect the asset to be sell profitably in the future.

The advent of the rational price bubble as explained above is not directly associated with the fundamental factors and because of such non-fundamental factors, the bubble component begins outside the context of these factors (Komarek & Kubicová, 2011). Therefore, Froot and Obstfeld (1991) presented the idea of intrinsic bubbles, where the bubble component presumed to follow a stochastic dividend process in a deterministic manner. Intrinsic bubbles are also relied on the self-fulfilling expectations just like all other rational bubbles. The bubble component in intrinsic bubble model is the fundamental's deterministic function, not the function of time. Having this kind of bubble component has some advantages. First, the bubble of an asset can overreact to deviations in fundamentals. Secondly, it does not need to burst with regard to its fundamental value and thirdly, it can even disappear completely.

The fact that each bubble must rise at the expected rate of r excludes several rational price bubbles. For instance, positive price bubble cannot arise if the size of the bubble has an upper limit, such as the occurrence of potential price bubbles on goods having close substitutes. The rising *"commodity bubble"* makes the good too expensive, so it must be replaced with some other commodity (Tirole, 1985). Similarly, if the desired return rate surpasses the growth rate of the economy then price bubble cannot emerge on a non-zero supply stock, as the stock value goes beyond the wealth of the economy. Therefore, price bubbles only exists in a region where the desired rate of return is equal to or less than the growth rate prevailing in the economy. Moreover, rational bubbles can also arise if the presence of the price bubble allows opportunities for trading, which results in different equilibrium point. In overlapping generations model (OLG), fiat money is perhaps the most well-known example of this type of bubbles (Tirole, 1985). A negative price

bubble does not arise on asset of limited-liability because the bubble implies that the expected asset value has to be negative at some times. This finding suggests that if rational bubble bursts at any time, it cannot be started again. This means that within asset pricing model, rational price bubble can never be emerged. They must be present at that time when the trading of the asset starts.

This characteristic of the rational bubble has criticized by Weil (1990) who states that, on theoretical basis, assets can be undervalued. Weil (1990) identifies a bubble that can raise the interest rates. Such proliferation is reflected in discount rate employed in the model of asset pricing and hence lower the asset's fundamental value. Therefore, a positive rational price bubble can indeed reduce the asset's price as a whole.

There is another approach that allows the price reduction of the bubbles, is to apply the logarithmic estimation. As in logarithmic approximation, the logarithmic component of bubbles can turns to negative at any time because it never leads to a negative prices of asset. Furthermore, a bubble described in this way can oscillate continuously from negative to positive. Wu (1995), Wu (1997), Kizys & Pierdzioch (2011) and Kim & Min (2011) used this type of model specification in their estimations.

2.2.2 Asymmetric Information Rational Bubbles

This kind of price bubbles occurs when investors who are rational have different information about the asset price. In such models, asset prices play a dual function, as prices provides information signals to investors and it also considered an index of scarceness (Brunnermeier M. , 2001). Unlike the case of symmetric information, the incidence of the price bubble generally does not need to be known. For instance, it is known by everyone that price goes beyond the basic value of the asset but it is not true that everyone in the market are aware that all other agents or investors have information about this fact (Allen, Morris, & Postlewaite, Finite Bubbles with Short Sale Constraints and Asymmetric Information, 1993). Due to the lack of such higher-order mutual information, bubble can also arise in the price of finite stocks under certain circumstances. Allen and Gorton (1993) studied such types of bubble, who presented the idea of the *churning bubbles*. Moreover, fund manager having limited liability may also trade the bubble stocks because of risk-shifting benefits, as they only take part on the potential upper side of the selling not on the downside of the selling.

According to Allen et al. (1993), for the occurrence of this types of finite bubbles there are numerous essential conditions. First, it is imperative that investors still have asymmetric information even after deducing the information from net trading and prices. This means that prices should not be fully exposed. Secondly, agents must be restricted from the short selling of assets in the states where the price bubble occurs. Thirdly, all investors must have some additional information which is not known to other investors. Traders always wants to hold that stock which are overvalued as they hope for gaining higher return by reselling these stocks to another traders who value the assets more in some states due to his personal information. Kindleberger and Aliber (2005) called this belief as *"the greater fool theory"* as agent is still confident that he can resell the stock to an even bigger fool.

2.2.3 Bubbles Due to Limited Arbitrage

This model is related to the theory of behavioral finance. In this category, bubble can persist for a longer time, as arbitrage limits prevent the rational investors from eliminating the price effect. This category is not entirely based on rational investors, but it emphasized on the interaction of rational and irrational investors. According to this model, there is a group of economic agents known as behavioral traders, whose trading is affected by behavioral factors and some constraints such as agents who make systematic errors and are therefore partially rational. So in such models, price bubble arises when rational, experienced and well informed traders interact with the behavioral traders. (Barberis & Thaler, 2003).

One way to clarify the emergence of price bubbles is to consider the theory of behavioral finance. This implies a belief that mispricing of a stock is not due to the exclusion of fundamental variable from the stock price equation but it arises because of irrational behavior of some investors. If rational investors recognized the mispricing of stock, then it can be theoretically eliminated by arbitrage. Arbitrageurs should acquire a position that eliminates the overvaluation of assets and consequently no price bubbles emerge. But these traders may have different incentives and also face some limitation in eliminating the mispricing of assets (Komarek & Kubicová, 2011).

According to theory of behavioral finance, functioning of the arbitrageur is affected by different types of costs, including transaction costs, identification costs and holding costs, and different types of risks presumed by the arbitrageurs. And for such reasons, arbitrageurs are unable to eliminate the over-pricing of assets. There are three main risks that prevent the arbitrageurs to

eliminate the over-pricing of assets, which includes fundamental risk, noise trade risk and synchronization risk. Following subsections provide the detail of each type of risk.

Fundamental Risk

Fundamental risk is faced by the arbitrageurs when they are erroneous about the position of arbitrage and thereby faced a loss. The essential condition of such risk is that there must be no perfect substitutes of assets in a given asset class. For example, an arbitrageur purchases an asset X and at the same time he sells asset Y, which is the perfect substitute of X. Since arbitrageur is well aware of the downside risk of asset X, thus, he creates hedging position in asset Y. However, it is not necessary that asset X is the perfect substitute for asset Y and asset Y might be mispriced, so it's difficult to eradicate all the fundamental risk (Barberis & Thaler, 2003).

Noise Traders Risk

Rational investors also face the risk of noise trader. Leaning against the price bubble can be dangerous even if fundamental risk not prevails there, as noise trader may raise the price more in the future and for the time being broaden the mispricing of asset. According to De Long et al (1990a) arbitrageurs cannot completely reverse the mispricing of assets triggered by the noise traders. Because the arbitrageurs are risk averse and are active only in the short run. The decision made by noise traders is not based on fundamental analysis and they have misconception that they have some additional information about the future prices of the stock that other investors not know. In such circumstances, arbitrageurs are unable to eliminate the mispricing of the assets and therefore bubbles emerge.

Shleifer and Vishny (2012) describes why arbitrageurs operate in the sort run as explained by De long et al. (1990a). Arbitrageurs usually handle the funds of several investors and creditors that's why they are active only in the short run. Their performance is valued on the basis of short term returns, therefore they focus more on short term selling. Secondly, there are few arbitrageurs who are specialized in such money trading of other traders and it probably develops the agency relationship. Therefore, the specialized arbitrageurs avoid such extreme volatile positions even if they get attractive return of transaction.

Synchronization risk

Synchronization risk is another type of risk faced by the rational traders according to Abreu & Brunnermeier (2003). Coordination between investors is required as individual trader usually cannot bring downfall in the market and therefore, a problem of synchronization arises. Every rational investor has to deal with the following tradeoffs: If he burst the bubble of prices too early, he renounces the profits generates because of behavioral traders; And if he bursts so late and continue to invest in a bubble stock, he will bear the loss from the consequent smash. Every investor tries to predict, when some other rational investors starts trading against the price bubble. It is difficult for an agent to match the timing with other agents' moves, because agents turn out to be aware of a price bubble sequentially and don't identify where they are in the queue. And because of such sequential awareness, price bubble emerges.

2.2.4 Heterogeneous Beliefs Bubbles

Heterogeneous believes can also create bubble which may leads to overpricing as the pressure created by optimists cannot be offset by pessimists. The heterogeneous beliefs when combined with short-selling constraints can lead to overpricing, as the optimists pull the stock prices upward, whereas pessimist cannot offset the price effect because they have to face the short-selling constraints (Miller, 1977). Heterogeneous believes are the reality of life. It is very common for the individuals to have different opinions on practically everything, from the results of sports competitions and political elections to future economic growth and inflation (Xiong, 2013)

Harrison and Kreps (1978) was probably the first paper that describes how heterogeneous believes leads to the speculation, thus creating the price bubble. The main idea is that the investor who owns the stock today may be able to sell the same asset tomorrow at comparatively high price to the investor who is more optimistic. The theory of trading volume on financial markets, developed by Harris and Raviv (1993), is based on the assumption of heterogeneous beliefs. This model provides the series of empirical projections on the dynamics of the trading volume

2.3 Empirical Literature

There is a lot of evidence that suggest that asset price is affected by monetary policy, however, there is also a vigorous evidence that point out that contractionary monetary policy(i.e increase in interest rate) reduces the return on asset and expansionary monetary policy increases the return asset. The empirical research did by Cook and Hahn (1989) was the first research, who observed the significant interdependence between the monetary policy (i.e. change in interest rate)

and the bond yields by employing the method of event study to examine the daily impact of monetary policy on prices of asset. Kuttner (2001) expanded the research work of Cook and Hahn (1989) by dissembling the changes in interest rate into anticipated and unanticipated changes and observed a significant response from the asset market to unanticipated change in monetary policy.

Furthermore, Thorbecke (1997) addresses that how monetary policy effect the data of stock return. They assessed monetary policy by non-borrowed reserves and innovation in the rate of Federal funds, by analyzing the policy changes of the federal reserves and narrative indicators. By using the above mentioned monetary policy measures and several empirical technique the study present that ex-post and ex-ante stock returns considerably influenced by monetary policy exposures. Additionally, they also shows that small firms are largely influenced from the positive and negative shocks of monetary policy than large firm.

Filardo (2001), investigate the optimal monetary policy with bubbles of asset price in an economy. The main finding of this study is that, if the role of asset price is not significant in determining inflation and output then monetary authority may act in response to change in bubbles of asset price specifically and change in asset price generally. The inference stay on the line when prices of asset are quite volatile. Secondly, even though monetary authority is not sure about the identification of component of bubbles, in spite of this, the overall movement of asset price may contain constructive information to which monetary authority possibly want to strike. Thirdly, the asset price variability and monetary authority's interest rate smoothing preference critically determine the desirability of using information of asset prices and lastly, if monetary authority is not certain regarding the macroeconomic role of asset price bubbles and price of asset, then the expected cost confronts in term of responding to price of asset and asset price bubbles may surpass the benefits.

Ioannidis and Kontonikas (2008) examine the correlation between stock return and monetary policy and such correlation has important implication for both central bank and participant of stock market. The important results of this paper indicate that, the change in interest rate significantly affect the return on stock, this finding also support the idea of monetary policy transmission through stock market. Another, important implication of this analysis is that change in monetary policy not only effect the stock return of that period but also effect the future stock return, which means that interest rate measure of monetary policy holds a considerable information

that can be helpful in forecasting expected return of stock. Finally, the also account the rocketing co-movement between international stock market.

Gerlach and Assenmacher (2008) use panel VAR and VAR on quarterly data (1986 to 2006) and studied that how inflation, asset price and output is affected by monetary policy. The results of this study suggest a number of tentative conclusions concerning the ability of monetary policy usage to "lean against" the stock price boom and residential property prices. First, the result of panel VAR indicate that residential property prices are largely affected by monetary policy and these effects are equivalent with its effects on real economic activity. Second, the analysis also shows that equity price depressed by monetary policy shocks roughly to the extent they depressed prices of residential property, as a result of this disparity in timing, it is impossible to stabilize both equity prices and residential property prices by using monetary policy. Third, the single-country VAR estimates are consistent with the argument of Kohn (2006), that is the central bank may avoid to operate asset price because of the highly uncertain impact of monetary policy on asset price. Finally, the penal VAR indicate that the impact of monetary policy on asset price influenced by financial structure, its significance seems to be limited.

Similarly, Bordo et al. (2008) represent an empirical model that permits to assess the relationship between monetary policy, inflation and stock market in case of United States. They provide evidence that supports to the view that the unexpected change in interest rate and inflation play a critical role In the key movement of stock market of US. Further, they find the large negative effect of interest rate and inflation on condition of stock market as well as, on real stock prices. Finally they argue that, the inflationary shocks can play a role in explaining the bust whereas disinflationary shocks contributed in explaining and promoting market booms.

In the same year, Wadhwani (2008) also shed light on the critical role of decisions of central banks to price of asset. The finding of the paper suggest that central bank decisions should lean against the wind during the period of asset price bubbles. They argue that if monetary policy, act in response of asymmetric movement of asset price, fixed the sphere of inflation forecasts then the macroeconomic stability may enhance and microeconomic distortion may reduce. The paper also argue that this response of monetary policy may well decrease the probability of rising bubbles.

Moreover, Fischbacher et al. (2013), introduce the investment possibilities in the interest bearing bonds and examine whether bubbles in experimental asset market can be alleviated by active monetary policy. They specifically, analyze the effect of reserve requirements and monetary policy on stock market bubble (price and liquidity) and trading behavior that are widely used in experimental asset market. The results of this study indicate that, the active Monetary (interest rate) policy has clear but limited impact in mitigating bubbles, because this effect of monetary policy is only significant if fundamental values, modified by intervention of interest policy does not account. They also find that the effect of policy of active interest rate on stock market volatility and volume of the trade. While concerning the requirement of reserve, they find that reserve requirement has strong impact on price or it also seem to be more effective approach in order to reduce stock price bubble than using the policy of active interest rate.

Gali (2013) make an effort to enhance the understanding of the relationship between stock price bubbles and monetary policy specifically the alternative monetary policy or possible underpinnings of "leaning against the wind" policies. This study use the overlapping generation model, both the general equilibrium framework and partial equilibrium clearly comprise that the economic theories do not support all the times regarding the conventional wisdom that is relationship between monetary policy and stock price bubbles. There are two main results of this study, First the increase in interest rate as a result of growing bubble triggered the fluctuations because of its positive impact on the growth of bubble in the latter. Second, the optimal policy of interest rate strike balance among the stabilization of aggregate demand and stabilization of stock price bubbles itself.

In the similar vein, Gali and Gambetti (2014) also investigate the traditional assumption that the increase in exogenous interest rate decline the stock price bubbles by using vector autoregressive model together with time-varying parameters. They use evidence to empirically evaluate the merits of conventional view that is, the component of bubbles of stock prices shrinks in response of increase in interest rate. The results of this study are inconsistent with the conventional view and point to prolonged episodes where stock price persistently increase after a short run decline in response of monetary policy tightening. Additionally, they also argue that the response of equity premium to shocks of monetary policy needs to be accounted for such evidence.

Husain and Mahmood (2001) used error correction analysis and co-integration on annual data and investigate the casual relationship among the stock price and macroeconomic variable such as investment spending, consumption expenditure and economic activity in case of Pakistan. The result of the paper shows presence of long run relationship among macroeconomic variables variable and stock price. However, concerning the effect and cause relationship, the analysis specifies that fluctuation in macroeconomic variable effect the stock price. They also argue that in Pakistan stock market does not influence the aggregate demand because stock market is not much developed in Pakistan.

Jansen and Zervou (2017) uncover the significant variation on strength of transmission of monetary policy through stock market over the period of time and suggested that during 1990's the impact of shocks of monetary policy on return of the stocks was usually weak while during 2000s these effects were strong and significant. The important results of this paper is that the contemporaneous impact of monetary policy shocks on asset prices throughout the episode of large bubbles was insignificant and weak. They also suggest that such effects are restored after the burst of the bubbles.

Summary

Bubbles are mainly linked with the dramatic increment in asset cost that gets followed through the slump. Asset price bubbles get emerged in case when the price of stock gets exceeded in the value. Asset prices tend to have rationale price bubble where investigators agree paying more for asset as compared to the justified disconnected value of the dividend. It is because of the reason that they expect the trading of asset at higher costs in future. Trader always wish to hold such stock that get overvalue, as they hope to get more return through reselling the stocks to other trades who give more value to asset because of the personal information. The co-integration and correction analysis was done in the past over the data and it was analyzed that there exists a causal link in between macroeconomic variable and stock price like economic activity, consumption expenditure and investment spending in Pakistan. The result of the paper identified the existence of long term association in between stock price and macroeconomic variables. However, when referring to the effect and cause link, the analysis revealed that fluctuation in the variable of macro-economy influences the stock price. Within Pakistan, stock market tends to have no impact over the aggregate demand. It is because of the fact that the stock market of Pakistan still needs to get more

developed. The researches done in the past have discussed the link in between stock market and monetary policy. However, there are some of the researches that have found the influence of monetary policy over stock market bubbles. Therefore, this research will be beneficial to interpret the non-fundamental part of asset price termed as “Bubble” in a better way and will fill the literature gap.

CHAPTER 3

DATA AND METHODOLOGY

3.1 Theoretical Framework

We use a simple partial equilibrium asset pricing model to introduce some key concepts and notation used extensively below. We assume an economy with risk neutral investors and an exogenous, time-varying (gross) riskless real interest rate R_t. Let P_t denote the price in period *t* of an infinite-lived asset.

We interpret that price as the sum of two components: a "fundamental" component, P_t^F, and a "bubble" component, P_t^B. Formally,

$$P_t = P_t^F + P_t^B \qquad 3.1$$

Where the *fundamental* component is identified as the present discounted value of future stock returns:

$$P_t^F \equiv E_t \left\{ \sum_{k=1}^{\infty} \left(\prod_{j=0}^{k-1} 1/R_{t+j} \right) SR_{t+k} \right\} \qquad 3.2$$

How does a change in interest rates affect the price of an asset that contains a bubble? We can seek an answer to that question by combining the dynamic responses of the two components of the asset price to an exogenous shock in the policy rate. Letting that shock be denoted by ε_t^m , we have:

$$\frac{\partial p_{t+k}}{\partial \varepsilon_t^m} = (1 - \gamma_{t-1}) \frac{\partial p_{t+k}^F}{\partial \varepsilon_t^m} + \gamma_{t-1} \frac{\partial p_{t+k}^B}{\partial \varepsilon_t^m} \qquad 3.3$$

Where $\gamma_t \equiv P_t^B / P_t$ denotes the share of the bubbles in the observed price in period *t*.

Using (3.2), we can drive the predicted response of the fundamental component

$$\frac{\partial p_{t+k}^{F}}{\partial \varepsilon_t^m} = \sum_{j=0}^{\infty} \Lambda^j \left((1-\Lambda) \frac{\partial sr_{t+k+j+1}}{\partial \varepsilon_t^m} - \frac{\partial r_{t+k+j}}{\partial \varepsilon_t^m} \right) \quad 3.4$$

Both conventional wisdom and economic theory (as well as the empirical evidence discussed below) point to a rise in the real interest rate and a decline in stock returns (sr) in response to an exogenous tightening of monetary policy, i.e. $\partial r_{t+k}/\partial \varepsilon_t^m > 0$ and $\partial sr_{t+k}/\partial \varepsilon_t^m \leq 0$ for k = 0,1,2,… Accordingly, the fundamental component of asset prices is expected to decline in response to such a shock, i.e. we expect $\partial p_{t+k}^{F}/\partial \varepsilon_t^m < 0$ for k = 0,1,2,…

Under the "conventional view" on the effects of monetary policy on asset price bubbles we have, in addition:

$$\frac{\partial p_{t+k}^{B}}{\partial \varepsilon_t^m} \leq 0 \quad 3.5$$

for k = 0,1,2, … i.e. a tightening of monetary policy should cause a decline in the size of the bubble. Hence, the overall effect on the observed asset price should be unambiguously negative, independently of the relative size of the bubble:

$$\frac{\partial p_{t+k}}{\partial \varepsilon_t^m} < 0$$

As argued in Gali (2014), however, the premise of a decline in the size of the bubble in response to an interest rate hike does not have a clear theoretical underpinning. In fact, the theory of rational asset price bubbles opens the door for a very different prediction. To see this, note that the following difference equation must hold in a rational expectations equilibrium:

$$P_t R_t = E_t\{SR_{t+1} + P_{t+1}\} \quad 3.6$$

It can be easily checked that (3.2) satisfies

$$P_t^F R_t = E_t\{SR_{t+1} + P_{t+1}^F\} \quad 3.7$$

Using (3.1), (3.6) and (3.7), it can be easily checked that the bubble component must satisfy:

$$P_t^B R_t = E_t\{P_{t+1}^B\} \quad 3.8$$

Or, equivalently, in its log-linear version:

$$E_t\{\Delta p_{t+1}^B\} = r_t$$

Hence, an increase in the interest rate will raise the expected growth of the bubble component. Accordingly, and as discussed in GalÌ (2014), any rule that implies a systematic positive response of the interest rate to the size of the bubble, will tend to amplify the movements in the latter - an outcome that calls into question the conventional wisdom about the relation between interest rates and bubbles.

The long rum impact of the monetary policy shock on the price bubble will be positive or negative depending on whether the persistence of the real interest rate response is more than sufficient to offset any eventual negative initial impact. Thus, when considered in combination with the predicted response of the fundamental component, the theory of rational bubbles implies that the sign of the response of observed asset prices to a tightening of monetary policy is ambiguous.

The theory of rational bubbles is consistent with a broad range of responses of asset prices to a tightening of monetary policy. By contrast, the conventional view predicts an unambiguous decline in asset prices, for both the fundamental and bubble components are expected to go down in response to a policy tightening. Accordingly, any evidence of a decline in asset prices in response to that tightening would not be conclusive as to the validity of the two views on the effects of monetary policy on the bubble. On the other hand, any evidence of a positive impact on the asset price at some horizon subsequent to the same policy intervention would be clearly at odds with both the key premise and the implications of the "conventional view," while consistent (at least, qualitatively) with the theory of rational bubbles.

3.2 Methodology

3.2.1 Vector Autoregressive Model

This study employs the Vector Autoregressive (VAR) to study the impact of monetary policy on stock price bubbles. VAR is a solid conduit between economic theory and multivariate

time-series regression analysis in order to determine the time path and hence the dynamic response of variables to various disturbances or shocks that occur within the economy.

A structural form VAR is useful to isolate the purely exogenous shocks from policy and to measure the impact of these shocks on variables included in a VAR model (Sims 1986).

A structural form VAR is written as follows:

$$A_0 Y_t = \alpha_0 + A_1 Y_{t-1} + A_2 Y_{t-2} + \cdots + A_p Y_{t-p} + u_t$$

Where Y_t is a (m x 1) vector of endogenous variable at time t; α_0 is a (m x 1) vector of constants; $A_i \; i = (1,2, \ldots, p)$ is a (m x m) vector of structural parameters and u_t is a vector of structural shocks. The parameters of a structural form VAR in equation 1 cannot be estimated directly. Multiplying equation 1 by the inverse of matrix A_0 yields a reduced-form VAR (equation 2), which can be estimated directly by ordinary least squares.

$$y_t = \beta_0 + \beta_1 y_{t-1} + \beta_2 y_{t-2} + \cdots + \beta_p y_{t-p} + e_t$$

Where y_t (a vector of endogenous variables) depend on the lag of itself and the lag of other endogenous variables, and the forecast error vector e_t; e_t=$A_0^{-1} * u_t$ is a linear combination of structural shocks ut. The next step is to recover the structural parameters of (Equation 1) from the estimated parameters of (Equation 2). This process is called identification (Sims1986). Due to the number of unknown elements of a structural VAR being larger than the number of known elements from an estimated reduced form VAR, the usual approach is to impose restrictions on matrix A_0 (i.e. the matrix of the contemporaneous relationships among endogenous variables of the structural model) guided by economic intuition. If a VAR has m endogenous variables, one needs to impose at least m(m-1)/2 restrictions (Gujarati2009). One popular way of imposing restrictions on matrix A_0 is the Cholesky decomposition, where A_0 is assumed to be a lower triangular matrix. In this identification, the variable ordered first is assumed to have contemporaneous effects on all variables following it, while the variable ordered last is assumed to have effect on other variables ordered before it with a lag. An alternative identification is the structural decomposition (SVAR), in which the matrix A_0 could have any structure, as long as it imposes sufficient restrictions (Kim and Roubini2000).

All seven variables are estimated in VAR model as follow.

$$\begin{bmatrix} \Delta CPI \\ \Delta IR \\ \Delta MBR \\ \Delta IPI \\ \Delta P \\ \Delta CO \\ \Delta SR \end{bmatrix} = \begin{bmatrix} \alpha_{11}(l) & \alpha_{12}(l) & \alpha_{13}(l) & \alpha_{14}(l) & \alpha_{15}(l) & \alpha_{16}(l) & \alpha_{17}(l) \\ \alpha_{21}(l) & \alpha_{22}(l) & \alpha_{23}(l) & \alpha_{24}(l) & \alpha_{25}(l) & \alpha_{26}(l) & \alpha_{27}(l) \\ \alpha_{31}(l) & \alpha_{32}(l) & \alpha_{33}(l) & \alpha_{34}(l) & \alpha_{35}(l) & \alpha_{36}(l) & \alpha_{37}(l) \\ \alpha_{41}(l) & \alpha_{42}(l) & \alpha_{43}(l) & \alpha_{44}(l) & \alpha_{45}(l) & \alpha_{46}(l) & \alpha_{47}(l) \\ \alpha_{51}(l) & \alpha_{52}(l) & \alpha_{53}(l) & \alpha_{54}(l) & \alpha_{55}(l) & \alpha_{56}(l) & \alpha_{57}(l) \\ \alpha_{61}(l) & \alpha_{62}(l) & \alpha_{63}(l) & \alpha_{64}(l) & \alpha_{65}(l) & \alpha_{66}(l) & \alpha_{67}(l) \\ \alpha_{71}(l) & \alpha_{72}(l) & \alpha_{73}(l) & \alpha_{74}(l) & \alpha_{75}(l) & \alpha_{76}(l) & \alpha_{77}(l) \end{bmatrix} * \begin{bmatrix} \Delta CPI_{t-1} \\ \Delta IR_{t-1} \\ \Delta MBR_{t-1} \\ \Delta IPI_{t-1} \\ \Delta P_{t-1} \\ \Delta CO_{t-1} \\ \Delta SR_{t-1} \end{bmatrix} + \begin{bmatrix} e_{1t} \\ e_{2t} \\ e_{3t} \\ e_{4t} \\ e_{5t} \\ e_{6t} \\ e_{7t} \end{bmatrix}$$

3.2.2 Variance Decomposition Test

In mostly multivariate analysis of time series data the variance decomposition has used for the interpretation of vector autoregressive model when it is fitted. Variance decomposition also represents the degree of information that every variable is contributing to other variables. It also explains at what degree forecast error variance of all variables could be described by other variable's exogenous shock.

3.2.3 Impulse Response Function

Impulse response function is used to find the response of variables in a given model if there is one standard deviation shock come in one variable at a given period of time. It is also used to find the response of dependent variable when there is one standard deviation shock in error term of given Vector Auto-Regression system.

3.3 Stationarity Test of Monthly Time Series

In this chapter, it is essential to discuss all those technical steps for the empirical analysis including existence of stationarity in the series. For this reason, inspects the stationarity within dependent and independent variables, whether data has a unit root or data has not a unit root in the given series. Subsequently, in the present research work monthly data is applying and for the monthly series following the techniques expressed by (Beaulieu & Miron, 1993) for the seasonal and non-seasonal unit root for monthly data. To detect the eleven (11) seasonal unit root and non-seasonal unit root for monthly time series data. Finally, (Beaulieu & Miron, 1993) constructed thirteen (13) equations to test unit root for monthly data, equations are given below.

$$Y_{13t-1} = a + \beta_t + \Sigma_{i-1}^{11} \gamma isi + \Sigma_{i=1}^{12} \pi i Y_{it-1} + \varepsilon t \ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots (3.1)$$

These variables are estimated through the following equations

$$Y_{1t} = (1 + \beta + \beta^2 + \beta^3 + \beta^4 + \cdots + \beta^{11})Y_t \ldots\ldots (3.2)$$

$$Y_{2t} = -(1 + \beta + \beta^2 - \beta^3 + \cdots - \beta^{11})Y_t \ldots\ldots (3.3)$$

$$Y_{3t} = -(\beta - \beta^3 + \beta^5 - \beta^7 + \beta^9 - \beta^{11})Y_t \ldots\ldots (3.4)$$

$$Y_{4t} = -(1 - \beta^2 + \beta^4 - \beta^6 + \beta^8 - \beta^{10})Y_t \ldots\ldots (3.5)$$

$$Y_{5t} = -\frac{1}{2}(1 + \beta - 2\beta^2 + \beta^3 + \beta^4 - 2\beta^5 + \beta^6 + \beta^7 - 2\beta^8 + \beta^9 + \beta^{10} - 2\beta^{11})Y_t . (3.6)$$

$$Y_{6t} = \sqrt{\frac{3}{2}}(1 - \beta + \beta^3 - \beta^4 + \beta^6 - \beta^7 + \beta^9 - \beta^{10})Y_t \ldots\ldots (3.7)$$

$$Y_{7t} = \frac{1}{2}(1 - \beta - 2\beta^2 - \beta^3 + \beta^4 + 2\beta^5 + \beta^6 - \beta^7 - 2\beta^8 b - \beta^9 + \beta^{10} + 2\beta^{11})Y_t .. (3.8)$$

$$Y_{8t} = -\sqrt{\frac{3}{2}}(1 + \beta - \beta^3 - \beta^4 + \beta^6 + \beta^7 - \beta^9 - \beta^{10})Y_t \ldots\ldots (3.9)$$

$$Y_{9t} = -\frac{1}{2}(\sqrt{3} - \beta + \beta^3 - \sqrt{3}\beta^4 + 2\beta^5 - \sqrt{3}\beta^6 + \beta^7 - \beta^9 + \sqrt{3}\beta^{10} - 2\beta^{11})Y_t \ldots (3.10)$$

$$Y_{10t} = \frac{1}{2}(1 - \sqrt{3}\beta + 2\beta^2 - \sqrt{3}\beta^3 + \beta^4 - \beta^6 + \sqrt{3}\beta^7 - 2\beta^8 + \sqrt{3}\beta^9 - \beta^{10})Y_t \ldots (3.11)$$

$$Y_{11t} = \frac{1}{2}(\sqrt{3} + \beta - \beta^3 - \sqrt{3}\beta^4 - 2\beta^5 - \sqrt{3}\beta^6 - \beta^7 + \beta^9 + \sqrt{3}\beta^{10} + 2\beta^{11})Y_t \ldots (3.12)$$

$$Y_{12t} = -\frac{1}{2}(1 + \sqrt{3}\beta + 2\beta^2 + \sqrt{3}\beta^3 + \beta^4 - \beta^6 - \sqrt{3}\beta^7 - 2\beta^8 - \sqrt{3}\beta^9 - \beta^{10})Y_t .. (3.13)$$

$$Y_{13t} = (1 - \beta^{12})Y_t \ldots\ldots (3.14)$$

Whereas α = constant, β = Co-efficient of trend, t= Trend, S_t= Denote seasonal effect,

π= Co-efficient of auxiliary variable, Y_{it-1}= Auxiliary variables, γ= Co-efficient of seasonal effect.

3.3 Data and Variables

There are a lot of studies that measures the relationship of monetary policy and stock price bubbles by using different variables. In this section, we explain all the variable that is used to describe the relationship between stock price bubbles and monetary policy.

Table 1 Data Measuring and Source

Variable	Measuring	Source
Stock Price (SP)	Performance of companies	KSE
Stock Return (SR)	Earning on investment	Yahoo Finance
Inflation rate (CPI)	Inflation	Global Economic Indicator
Real Interest rate (IR)	Cost of money	IFS
Monetary base rate (MBR)	Supply of money	IFS
Industrial production (IPI)	Highly manufacturing	Global Economic Indicator

CHAPTER 4

RESULTS AND DISCUSSION

4.1 Overview of Chapter

This chapter captures the estimation and empirical results of the data series under the framework of Vector-Auto-Regressive technique as per the data generating process of time series data. Therefore, in this section of the thesis employs the three types of variables including macroeconomic, financial and monetary variables for the analysis. The variables are consumer price index (CPI), interest rate (IR), monetary base rate (MBR), industrial production index (IPI), stock prices (SP), crude oil prices (CO) and stock returns (SR). As from the previous chapter discussed framework of methodology for data analysis on the other hand this chapter applies those econometric methodologies to fulfill study's objectives and research questions under consideration.

This chapter contains three sections. First section is about the time series properties of data including summary statistics and monthly unit root test. Second section explains Vector auto regressive model, it includes model diagnostic tests, impulse response function and variance decomposition. Finally, third section describes VAR model.

4.2 Descriptive Statistics

The data of stock market and other macroeconomic variables in this desertion are monthly we have taken share price as a stock market shocks. We have chosen macroeconomic variables because of their importance in macro economy. On the other hand, we do not promise that the variables we have chosen in this study present complete picture of macroeconomic performance, but their empirical and theoretical importance. Before econometric regression, it is inevitable to check the descriptive statistics of all variables are used for the analysis. Hence, statistical analysis initially depends upon the nature of the data generating process and it is the basic step for research design, determine, organize raw data for study. Furthermore, the statistical analysis gives some meaningful information and interpretation for the raw data without taking lags or any other mathematical process.

In a particular way to describe the level of significance, otherwise, using statistical analysis like [1]measure of central tendency including mean, median and mode, [2]measure of dispersion i.e. range and variance. Consequently, [3]financial time series data have more volatile as compare to macroeconomic time series data. It has heavy tailed, abnormal changes and leptokurtic financial return series. In conclusion, statistical analysis gives rise to clarity about normality in the whole data set, outliers and extreme values, also gives the information about mean, maximum, minimum, standard deviation etc. As long, for the financial series calculate the kurtosis. Further there are different decades or subsamples for which the standard deviation or stability ratio (coefficient of variation) shows the volatility of variables in each decade. There are different values of the standard deviations and stability ratios and higher value is an indication of higher volatility. . The value of [4]Jarque-Bera is not much more and their [5]probability values are less than 0.05 so it concluded that distribution of this variable is not normal when we did not take natural log of our variable. This same interpretation can be done for all variables; however, we need the data normalize. JarqueBera showed that the data is not normal, in such a case we need to difference all variables to make normal distribution.

Table 1 Summary Statistics

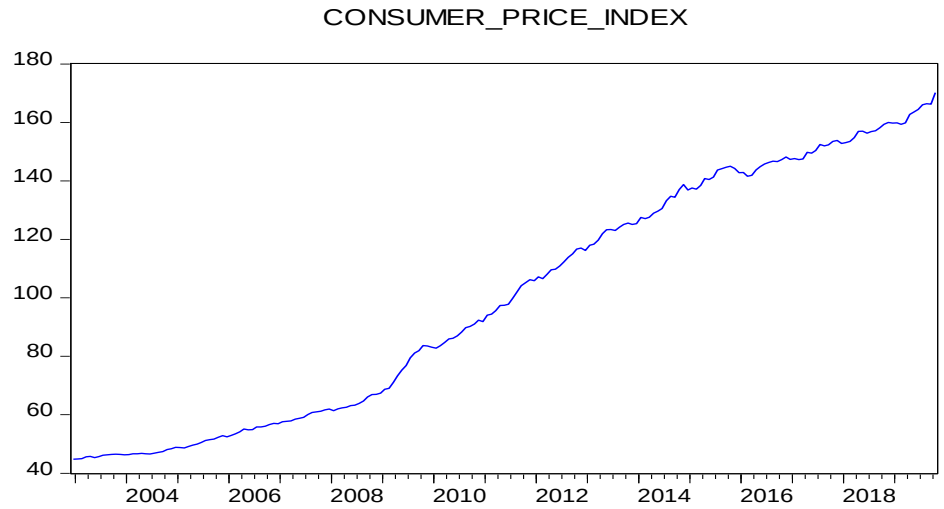
	CPI	IR	MBR	IPI	P	CO	SR
Mean	104.280	9.667	31.689	2920000000	18794.420	5892.436	9.477
Median	105.870	9.500	31.300	2930000000	12289.030	5562.750	9.401
Maximum	191.030	15.000	38.060	4030000000	50591.570	11470.970	10.830
Minimum	44.810	6.250	26.940	1540000000	1273.060	1127.200	7.044
Std. Dev.	44.094	2.488	1.976	576000000	14024.990	2972.672	0.919
Skewness	0.093	0.418	0.763	-0.348	0.679	0.140	-0.515

[1] **Mean:** Average value. **Median:** Middle value after sorting observations. **Mode:** Most repeated value.
[2] **Range:** Difference between the highest and lowest value. **Variance:** How widely observation vary.
[3] **Financial time series** usually exhibit non-stationarity and time-varying volatility. Extraction and analysis of complicated patterns, such as trends and transient changes, are at the core of modern financial data analytics
4 In statistics, the **Jarque–Bera** test is a goodness-of-fit test of whether sample data have the skewness and kurtosis matching a normal distribution.
[5] The null hypothesis for the test is that the data is normally distributed; the alternate hypothesis is that the data does not come from a normal distribution.

Kurtosis	1.572	2.133	3.511	2.534	2.066	1.784	2.676
Jarque-Bera	18.586	13.002	23.181	6.276	24.346	13.956	10.449
Probability	0.000	0.002	0.000	0.043	0.000	0.001	0.005

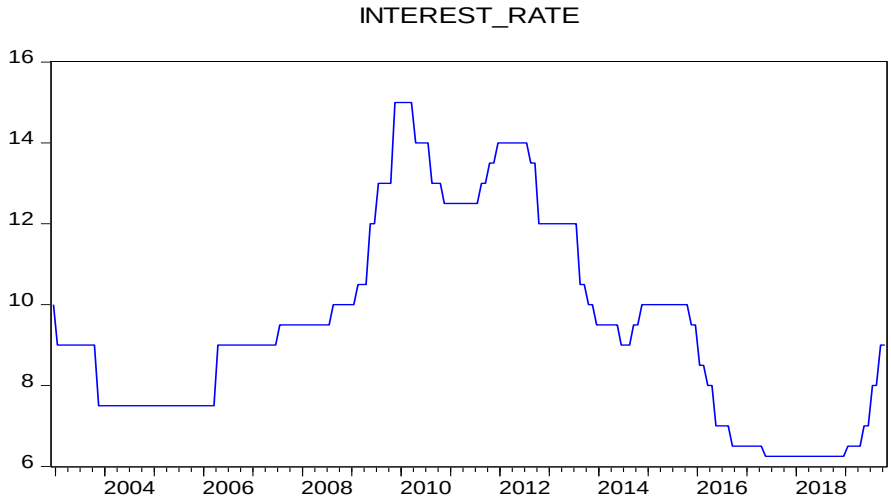
4.3 Graphical representation of the Data

Figure 1 Consumer Price Index



Consumer Price Index calculated on [6]monthly basis the inflation grew up almost 12.6 percent on Y-O-Y basis in October 2019 as compared to previous 3 months of the same year. According to this data set inflation increased over time from 2001-12 to 2019-10. Therefore, in the recent months inflation has rapidly increased for food commodities and for non-food commodities.

Figure 2 Real Interest Rate

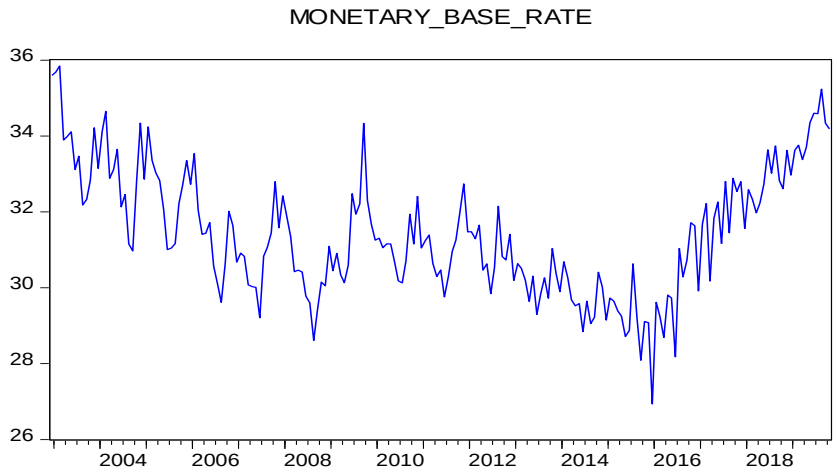


Monetary policy considered to be as one of the most prominent sector of macroeconomic arrangement and its positive and negative impact reflect on economic growth. In the context of Pakistan, higher interest rate increases the cost of money (borrowing) for the private sector as well

[6] Pakistan Bureau of Statistics 2019.

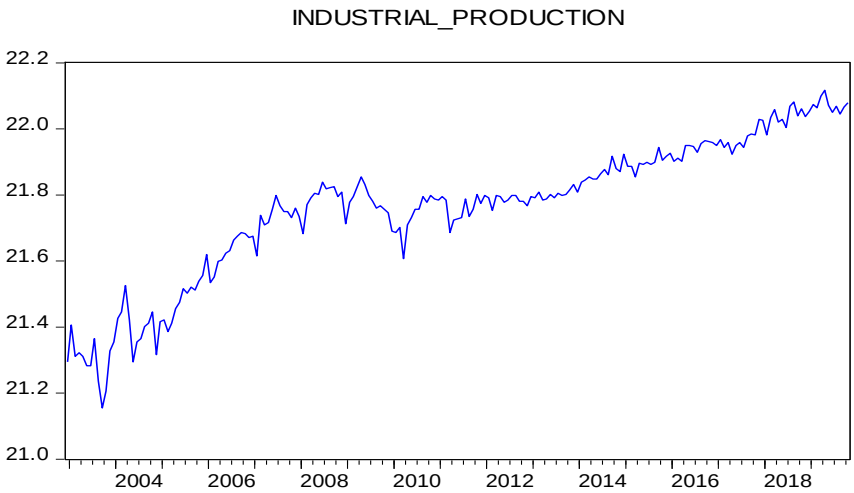
negative impact on public borrowing and for the private sector which discourage the demand for private sector. As from the data series graph shows the abrupt changes in the interest rate but inflation has no affect from policy rate. Meanwhile, inflation and interest rate both increasing over time.

Figure 3 Monetary Base Rate



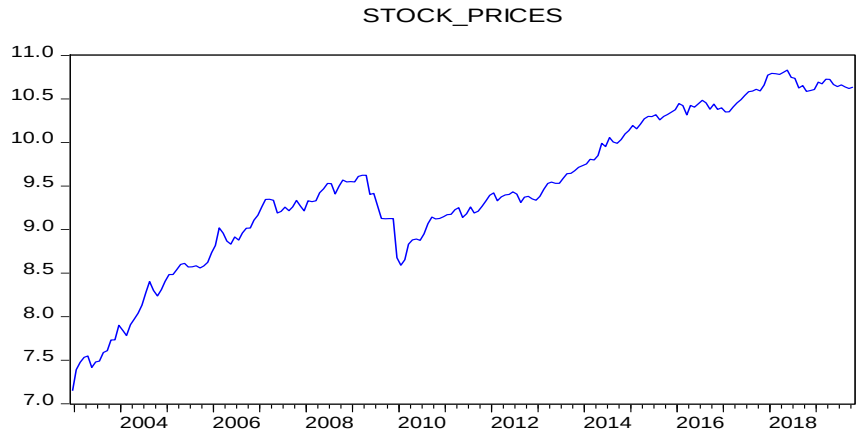
When total amount of money circulating in general public and commercial bank deposits held in central bank reserves. Monetary base measures the supply of money on the basis of most liquid medium of exchange (liquid currency). So, in case of Pakistan no clear trend seems in the above graph.

Figure 4 Industrial Production



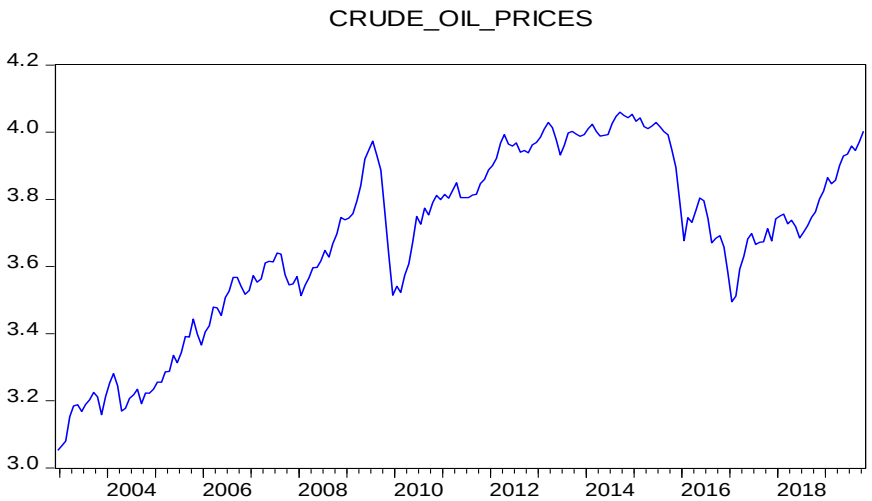
Industrial production in Pakistan continuously low as compare to regional countries including India and Bangladesh. According to the data from State bank of Pakistan (SBP) gives the clear justification of abrupt changes in industrial production. Recently, provision of data illustrates the extreme high and low values for industrial production.

Figure 5 Stock Prices



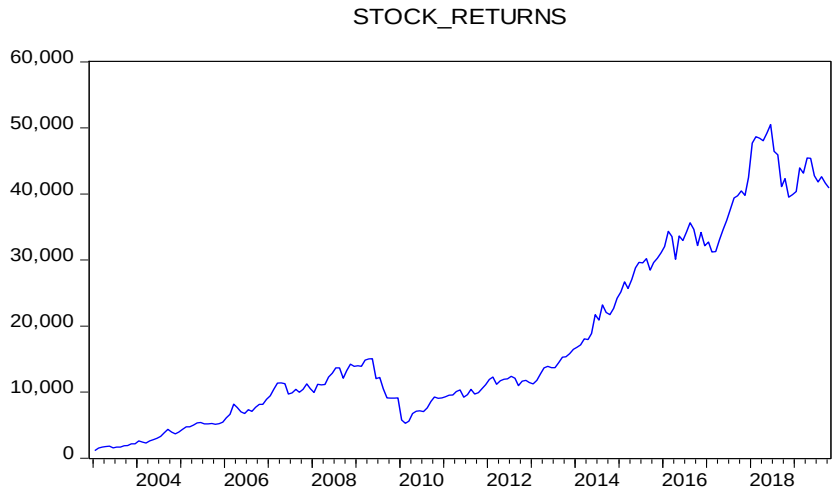
The Karachi Stock Exchange (KSE-100) is a major stock market which tracks the general performance of largest companies by market capitalization from each sector of Pakistani economy listed on Karachi Stock Exchange. Over the period of time it seems up and downs in different regime.

Figure 6 Crude Oil Prices



Prices of petroleum products increased by up to Rs23 per litre during 2019. Whenever, high prices for crude oil disturb the daily routine of citizens because widely used in public transport and agriculture sector.

Figure 7 Stock Returns



Over the time Pakistan stock returns ups and downs from 2001 to 2019 and graph shows that during the start of 2010 stock returns decline rapidly. Comprehensively, stock means that money earn or loss on investment during specific time period. Therefore, return may be positive or negative, hence, positive means profit and negative means loss.

As from all above figure we found that all variables are needed to be converted into first or second difference because these involves time trends as well as seasonal effects. Because until and unless we will not make them stationary, we cannot estimate them with time variant of mean and variance of variables. In this connection, we have taken first difference to make their mean and variance constant over the time.

4.4 Beaulieu and Miron Monthly Unit Root Test

Most of the time series data can be realization of seasonal patterns in quarterly data, different cycles in monthly data and time trend. Therefore, vale of variance between two periods depends on the distance between time and not on the actual data. However, to model the seasonal patterns and time trend it is important to adjust the seasonality and time trend.

In monthly time series data existence of the seasonal unit root in the observations are inevitable and in the seasonal data series have erratic changes because of seasonal shocks. It’s not an

emerging economic problem but remaining as old as economic theories emerged in the economic history. Thus, different statistical procedures presented plausible test for the seasonal unit root. More than this point, in case of having seasonal unit root in the time series data and run regression without knowing or checking the results will be inconsistent, bias or spurious regression.

Stationarity of Monthly Data

Hypothesis	ΔCPI	ΔIR	ΔMBR	ΔIPI	ΔP	ΔCO
t: π_1=0	-5.92**	-6.82**	-8.37**	-9.21**	-5.14**	-4.51**
	(-1.91)	(-1.01)	(-2.24)	(-3.32)	(-2.79)	(-2.22)
t: π_2=0	-7.43**	-8.43**	-5.43**	-4.03**	-4.78**	-4.03**
	(-1.88)	(-1.81)	(-3.78)	(-1.88)	(-1.88)	(-1.88)
F: $\pi_3 = \pi_4 = 0$	5.78**	7.25**	4.77**	23.48**	12.37**	13.42**
	(3.05)	(2.45)	(4.05)	(3.01)	(3.72)	(2.06)
F: $\pi_5 = \pi_6 = 0$	7.32**	5.42**	6.11**	15.87**	22.29**	14.57**
	(3.11)	(1.21)	(1.51)	(3.00)	(3.06)	(3.11)
F: $\pi_7 = \pi_8 = 0$	9.02**	4.02**	2.02**	5.62**	10.82**	5.62**
	(3.05)	(1.10)	(3.05)	(3.02)	(3.02)	(3.02)
F: $\pi_9 = \pi_{10} = 0$	13.43**	13.43**	13.43**	19.65**	18.42**	12.55**
	(3.06)	(3.06)	(3.06)	(3.02)	(3.04)	(3.02)
F: $\pi_{11} = \pi_{12} = 0$	9.21**	9.21**	9.21**	7.78**	6.36**	9.78**
	(3.09)	(3.09)	(3.09)	(3.03)	(3.06)	(3.03)
Auxiliary Regression	**NC,ND,NT**	**NC,ND,NT**	**NC,ND,NT**	**C,ND,T**	**C,NT,ND**	**C,ND,T**

$\boldsymbol{H_0^A}$: $\pi_1 = 0$ (Seasonal Unit root at zero frequency)

$\boldsymbol{H_1^A}$: $\pi_1 < 0$ (No Seasonal Unit root at zero frequency)

$\boldsymbol{H_0^B}$: $\pi_2 = 0$ (Seasonal Unit root at bi-annual frequency)

$\boldsymbol{H_1^B}$: $\pi_2 < 0$ (No Seasonal Unit root at bi-annual frequency)

Critical values given by Franses and Hobijn (1997) are in parentheses and ** shows 5% level of significance

Table shows the results of the Beaulieu and Miron (1992) seasonal unit root test at first difference. The critical values for unit root test in seasonal time series consider only yearly observations; therefore, we have converted monthly observations into yearly observations. The numbers of monthly observations after adjustment are 18 years. We consider 5 percent significance level using Frances and Hobijin (1997) critical values for seasonal unit root detection of 20 years.

The calculated values at zero frequency unit root are greater than critical values, so null hypothesis cannot be rejected which implies the presence of unit root at zero frequency i.e. data series are non-stationary at level. Therefore we have transformed the variables by using first difference filter at zero frequency that is $(1- B)yt = yt - yt-1$. After transforming, the calculated values of t-statistics for both $\pi 1$ and $\pi 2$ are less than the critical values for data series. On the other hand the calculated values of F-test statistics are greater than critical values which lead to the rejection of null hypothesis. Therefore, variables become stationary at first difference.

The [7]Breusch Godfrey serial correlation LM-test has been applied at 1_{st} and 12_{th} lags both for level and at 1_{st} difference. First of all at level, the chi-square calculated values at 1_{st} lag. Are 2.225, 0.008, 0.453, 2.127, 1.265, 3.276 and 1.032 for interest rate, crude oil prices, monetary base, industrial production, consumer price index, stock prices and returns respectively. These values are smaller than the chi-square tabulated value of 3.841. So null hypothesis is not rejected which leads to the conclusion that there is no problem of autocorrelation at 1_{st} lag of the variables. Similarly, the chi-square calculated values at 12^{th} lag are 10.217, 12.334, 8.561, 16.764, 17.005 3.817 and 20.289 for interest rate, crude oil prices, monetary base, industrial production, consumer price index, stock prices and returns respectively. These calculated values are also smaller than the critical value of the chi-square at 12_{th} lag which is equal to 21.026. It also concludes that there is no problem of autocorrelation even at 12_{th} lag for all the variables. At first difference there is neither the problem of autocorrelation nor the problem of unit root for interest rate, crude oil prices, monetary base, industrial production, consumer price index, stock prices and returns rates so we can say that variables are integrated of order 1.

[7] The Breusch–Godfrey serial correlation LM test is a test for autocorrelation in the errors in a regression model. It makes use of the residuals from the model being considered in a regression analysis, and a test statistic is derived from these. The null hypothesis is that there is no serial correlation of any order up to p.

4.5 Lag Length Criteria

We need lags length criteria before estimating VAR model. For this purpose, we have different econometric criteria's including, AIC, SC, HQ, LR and others criteria we followed AIC and LR for the selection of lags, so the results are presented in below table. The selection of lag lengths in AR and ADL models can sometimes be guided by economic theory. However, there are statistical methods that are helpful to determine how many lags should be included as regressors. In general, too many lags inflate the standard errors of coefficient estimates and thus imply an increase in the forecast error while omitting lags that should be included in the model may result in an estimation bias. Estimate an AR(pp) model and test the significance of the largest lag(s). If the test rejects, drop the respective lag(s) from the model. This approach has the tendency to produce models where the order is too large: in a significance test we always face the risk of rejecting a true null hypothesis. The lag order ˆpp^ that minimizes the respective criterion is called the BIC estimate or the AIC estimate of the optimal model order. The basic idea of both criteria is that the SSR decreases as additional lags are added to the model such that the first term decreases whereas the second increases as the lag order grows. Nevertheless, both estimators are used in practice where the AIC is sometimes used as an alternative when the BIC yields a model with "too few" lags.

Table 2 Selection order criteria

Sample: 2002m3 - 2019m10 Number of obs = 212

Lag	LL	LR	Df	P	FPE	AIC	HQIC	SCIC
0	-1307.780	0.001	2.404	12.448	12.514			
1	1352.040	5319.600	49	0.000	0.000	-12.227	-11.868	-11.340
2	1575.690	447.3*	49	0.000	2.2e-15*	-13.8744*	-13.2025*	-12.212*

Note: * indicates Minimum Vales of different methods to select Maximum Lags

By applying least square method from the above Table we showed that three criteria's suggesting us to select 2 lags as AIC, FPE and LR. While SC suggests zero and HQ offers one lag to select. Since, the minimum AIC or maximum value of LR we have selected 2 lags, but the model is selected because of minimum value of AIC.

4.6 Estimation of VAR

Autoregressive pertains that the presence of the lagged of values of the dependent variables on the right hand side of the equation, however, vector represents the system contains a vector of two or more variables. Essentially, VAR technique is suitable if and only if all the variables including dependent and independent are integrated on first difference. So, all the variables are considered to be endogenous in the VAR model no exogenous variable.4.6.1 Interpretation of VAR

Variables	(1) Sp	(2) Sr	(3) Ir	(4) cpi	(5) ipi	(6) mbr	(7) Co
L2.sp	0.870***	1.013***	-0.488	-1.273	0.0790*	-2.265**	0.102*
	(0.099)	(0.0703)	(0.445)	(1.242)	(0.0417)	(1.027)	(0.0575)
L2.sr	-0.0150	-0.0665	0.580	1.547	0.0658*	1.766*	-0.0962*
	(0.0927)	(0.0654)	(0.415)	(1.157)	(0.0388)	(0.957)	(0.0535)
L2.ir	-0.0135***	-0.00742**	0.933***	0.131**	0.00617***	-0.0643	0.00499*
	(0.00497)	(0.00351)	(0.0222)	(0.0620)	(0.00208)	(0.0513)	(0.00287)
L2.cpi	-0.00153***	0.000506*	-0.0130***	0.993***	-0.000359**	0.00571	-4.64e-05
	(0.000418)	(0.000295)	(0.00187)	(0.00521)	(0.000175)	(0.00431)	(0.000241)
L2.ipi	0.173	0.0844	-0.976	-0.178	0.428***	1.948	0.0903
	(0.138)	(0.0976)	(0.618)	(1.726)	(0.0579)	(1.427)	(0.0799)
L2.mbr	-0.0126***	-0.00637**	0.185***	0.200***	0.00210	0.779***	-0.000227
	(0.00428)	(0.00303)	(0.0192)	(0.0535)	(0.00180)	(0.0442)	(0.00248)
L2.co	-0.00120	-0.0298	-1.534***	2.006**	0.0111	-0.725	0.877***
	(0.0664)	(0.0469)	(0.297)	(0.830)	(0.0278)	(0.686)	(0.0384)
Constant	-1.993	-1.215	-31.60***	-19.39	10.95***	-27.94	-1.597
	(2.648)	(1.870)	(11.85)	(33.06)	(1.110)	(27.34)	(1.530)
Observations	212	212	212	212	212	212	212

Standard errors in parentheses

*** p<0.01, ** p<0.05, * p<0.1

Autoregressive pertains that presence of the lagged values of the dependent variable on the right hand side of the equation and vector means system contains a vector of two or more variables. Therefore, VAR model is constructed only if the variables are integrated of order one. All the variables in a VAR system are endogenous and variables are equal to equations. Therefore, start from first equation show that there is positive insignificant relation between stock prices and stock returns because the analysts look at past earnings increases to see if the dividend is likely to be increased as a result of higher earnings. When interest rates are low, price earnings ratios expand. That is because investors move out of bonds seeking better returns on stock. This increases demand for stock and the price of the stock rises relative to its earnings. Also, low interest rates are thought to benefit earnings, so investors are expecting future earnings increases. When interest rates are high, investors move out of stocks into bonds, and average price-earnings ratios contract. Analysts take all this into account when looking at a stock's historical performance and the return that can be expected. Secondly, interest rate shows negative and significant relation between stock prices and interest rate because the stock market doesn't generally like high interest rates. High interest rates can increase costs for companies across a wide range of measures. Increased costs can result in lower profits and subsequently lower stock prices. Inflation and stock market prices have the negative relationship because prices of stock are low firms avoid to enter in capital market until the central bank provide alternate for firm's plan to invest in capital market. Moreover, firm's equity value is also hit by the startling inflation rate. Similarly tightening of monetary policy can reduce inflation and stock prices both as individuals will be left with less money to buy goods or buy stocks. Industrial production and stock prices have insignificant and positive relation between them it is clear when stock index rises then this simply means that manufacturing sector grow gradually. Monetary base rate and stock prices have negative significant relation between them because rapidly increasing supply of money can negatively hurt the stock prices and invites the stock bubbles in the stock market also crude oil price that is a commonly held belief that high oil prices directly and negatively impact the Pakistan economy and the stock market.

As from the second equation interest rate and stock returns negatively contributed each other because stock market doesn't generally like high interest rates. High interest rates can increase costs for companies across a wide range of measures. Increased costs can result in lower profits and subsequently lower stock prices. However, gradually rising interest rates might actually

be beneficial for the stock market, as they may reflect positive trends in the underlying economy. Secondly, there is positive relationship between consumer price index and stock returns. Industrial production on stock returns have positively contributed because changes in Industrial production index is considered as an indicator that reflects similar changes in overall economic activity. An increase in industrial production would raise the expected future cash flows and the profitability of the firms. While negative relationship between monetary base and stock returns because high money supply adversely affect the stock returns. Finally, crude oil prices also shows the negative impact on the stock returns.

From equation three there is also negative relation between stock prices with interest rate because higher interest rates increase the cost of borrowing for companies. This directly reduces corporate earnings. Further, higher interest rates may prevent companies from taking on additional debt for capital expenditures. Without expanding operations, it becomes harder for companies to grow their profits. Both of these factors can trigger lower stock prices. Higher market interest rates can also create a "buyers' boycott" of the stock market. Then, inflation and interest rate show inverse correlation between interest rates and the rate of inflation. Under a system of fractional reserve banking, interest rates and inflation tend to be inversely correlated. This relationship forms one of the central tenets of contemporary monetary policy: Central banks manipulate short-term interest rates to affect the rate of inflation in the economy. Afterward, industrial production and interest rate, so, interest rates influence the level of economic activity in the economy. Higher rates discourage borrowing and encourage saving. Therefore, in countries with high interest rates, consumption and investment tend to be lower. This could reduce domestic demand for manufactured goods. Finally, interest rate and crude oil prices have inversely related with each other.

Autocorrelation Test

Lagrange-multiplier test

	Lag	chi2	Df	Prob>Chi2
	1	3.461	49	0.626
	2	5.155	49	0.154

H0: no autocorrelation at lag order

Table shows that the VAR serial correlation LM test for normality of residuals. In this connection, the null hypothesis tested is (H0: no serial correlation). So we cannot reject null hypothesis of no serial correlation, on the other hand we accept null hypothesis because probability values are greater than 0.05. From the above table shows that there is no problem of autocorrelation because at the 1st and 2nd lag probability value is greater than 5% level of significance and reject the null hypothesis and prove that model is good fitted.

Normality Test:

Jarque-Bera test

Equation	chi2	Df	Prob>Chi2
Cpi	5.797	2	0.155
Ipi	6.466	2	0.634
Sp	12.188	2	0.281
Sr	5.469	2	0.164
Mbr	4.194	2	0.083
Co	1.884	2	0.743
Ir	2.989	2	0.172
ALL	3.987	14	0.306

In the above Table shows Jarque-Bera normality test and we found that probability of all variables is greater than 0.05 including joint probability so we cannot reject the Null hypothesis of normally distributed of residuals. So, it is concluded that residuals are normally distributed So, here from the table shows the normality test we analyze that the errors are normally distributed.

4.7 Impulse Response Analysis

In order to describe the dynamics of the system, the impulse response functions are analyzed. The first observation is that the system is clearly stable. All the impulse responses diminish over the time and converge to zero. The focus here is on studying the impulse responses of the two estimated stock prices to shocks in the interest rate and monetary base. A general observation is that the responses are mild and short-lived. This indicates that monetary policy does

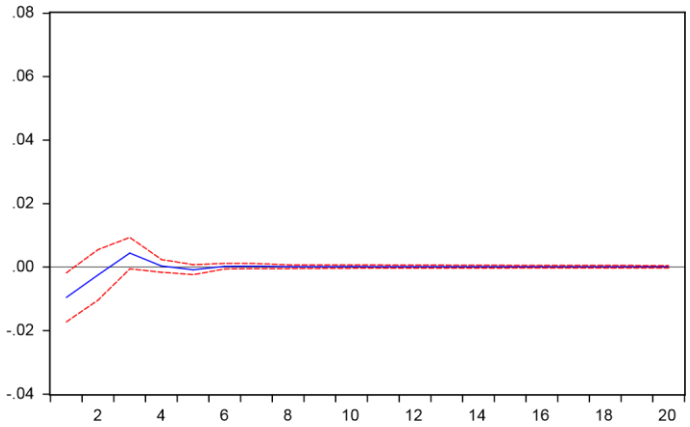
not have any long-term effects on the real asset prices. Nevertheless, it is possible to identify certain significant impulse responses in the short to medium term.

4.7.1 Shocks to the Interest Rate

Below figures present the effects of the shocks to the interest rate. The impulse response of the stock prices are significantly negative in the first quarter after the shock. This result could reflect the following mechanism: a decrease in the nominal short-term interest rates translates into a decrease in the long-term interest rates and the discount rates that market participants use to value the expected future dividend streams. This pushes stock prices up. However, this effect is short-lived and becomes insignificant during the second quarter after the shock.

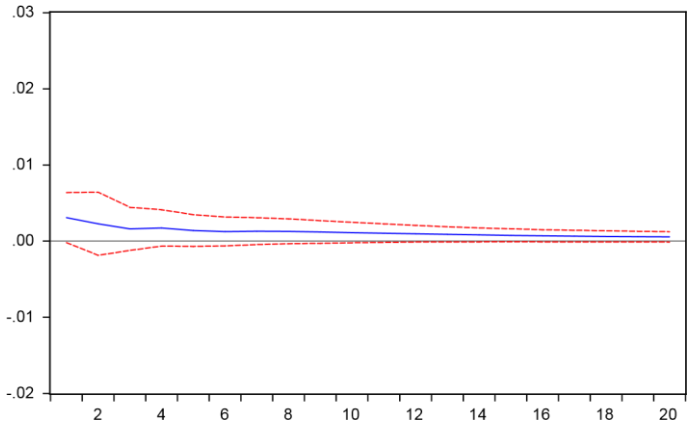
The response of the bubble to the interest rate is insignificant. This suggests that monetary policy pursued by influencing the nominal interest rates is not effective in correcting price misalignment on the stock markets. This result supports some conclusions that were made in previous research concerning the relation between monetary policy and asset prices. Bernanke & Gertler (1999), studying the U.S. and Japanese data, argued that "it is neither necessary nor desirable for monetary policy to respond to changes in asset prices". Bernanke & Gertler (2001) studied the relation between monetary policy and the stock price bubbles on theoretical grounds. The authors used an augmented version of the standard dynamic new-Keynesian, which assumes a non-fundamental component in stock prices. They concluded that the losses resulting from reacting to asset price bubbles outweigh the benefits. The conclusion that interest rate policy should not react directly to asset prices was also reached by Goodfriend (2003) (published in Hunter et al. (2005)). Goodfriend studied this topic in connection with an outbreak of inflation, a profit squeeze, and a productivity growth. More recently, Orphanides (2010), studying the financial crisis of 2008 and 2009, argued that central bankers should not use the interest rate policy to respond to emerging asset price misalignment, above and over what could be justified by pursuing the price stability objective.

Figure 8 Effect of the Interest Rate Shocks on the stock prices



The view presented above is, however, not shared unanimously in the finance literature. For example, Cecchetti et al. (2000) modeled the consequence of the central bank setting the short term interest rate on the economy. The authors argue that "monetary policy that pursues an inflation-targeting strategy should attempt to identify and respond to asset price misalignments". However, the authors admit that identifying asset price misalignments is difficult. The empirical analysis performed in this thesis provides evidence that, indeed, the FED has not been successful at distinguish between stock price movements due to the change in fundamentals and speculative price movements due to the bubble.

Figure 9 Effect of the Interest Rate Shocks on the Stock Bubble



4.7.2 Shocks to the Real Monetary Base

The effects of shocks to the monetary base are plotted on the below figures. The stock market component does not respond significantly to the shocks in the monetary base, suggesting that quantitative easing does not affect the long-term expectations about future dividends. On the other hand, quantitative easing seems to evoke a significant response of the stock market bubble component. The response is significantly positive in the third and the fourth quarter after the shock but significantly negative in the first quarter after the shock. This suggests that the quantitative easing positively influences the size of the bubble in the medium term. The effect is not persistent and mitigates in the long term.

Figure 10 Effect of Monetary Base Shocks on the Stock Market

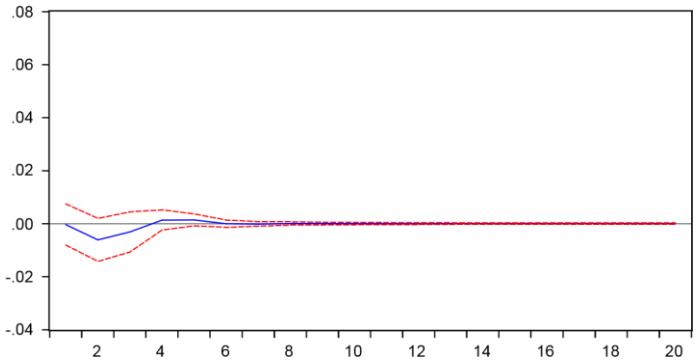
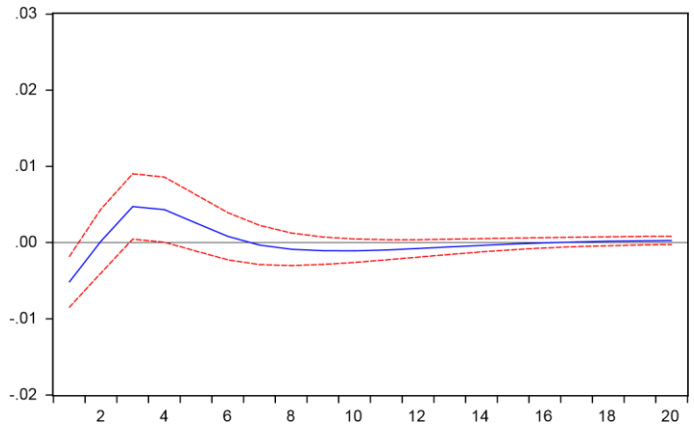


Figure 11 Effect of Monetary Base Shocks on the Stock Bubble



CHAPTER 5

CONCLUSION

The study indorse the impact of monetary policy on stock market or stock price bubbles. As bubbles might have critical role in the swing of stock market that is in stock market collapse and booms. In this study we have applied VAR to obtain the changing aspects into stock prices bubbles. The results of this study indicate that the monetary policy specifically interest rate play an important role in both boom and burst of stock market. One of the several conclusions that we made from VAR analysis is that the increase in interest rate may eliminate the stock price bubbles. However, the negative and significant impact of interest rate shows that when interest rates are high, investors move out of stocks into bonds, and average price-earnings ratios contract.

However, the model combined the estimated stock prices and returns fundamental with the standard macroeconomic and monetary indicators. The state bank monetary policy was divided into two main tools, short-term interest rate influencing and quantitative easing. Nevertheless, the effects of monetary policy on an explicitly estimated stock market and monetary policy does not seem to have long-term effects on any of the stock market price components. Second, the monetary policy pursued by the state bank of Pakistan by influencing the interest rates may have a short-term effect on the fundamental component of stock prices but it does not seem to have any effect on the price misalignment of the stocks. This result supports some conclusions from the related previous theoretical and empirical research. Therefore, quantitative easing seems to have a significant positive short to medium-term effect on the stock market and stock returns fundamental component. Unfortunately, the robustness of the results concerning effects of quantitative easing suffer from the fact that the period when the state bank has been using this tool is short compared to the entire data time span. The results seem to be driven mainly by the recent episodes of quantitative easing. Finally, the impulse response functions of the state bank rate indicate that the monetary policy has not been successful at distinguishing between price movements due to fundamentals and speculative price movements due to stock bubbles. Finally, adjusting the model so that it would be applicable to higher-frequency data could bring valuable results.

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