"The Impact of Stock Market Shocks on Macroeconomic Variables of Pakistan (An Application of SVAR Methodology)"

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"The Impact of Stock Market Shock on Macroeconomic Variables of Pakistan (An Application of SVAR Methodology)"

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CERTIFICATE

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In the Name of Allah

Most Gracious, Most Merciful

"Who Create the Heart He Knows about it".

DEDICATION

This humble effort is dedicated to My Parents especially my "Mom, Father and Big brother" For Their Loving Wishes, Support, Patience, Understanding and Guidance.

Acknowledgement

"In the Name of Allah Most Gracious, Most Merciful"

First, I am grateful to Almighty Allah, who gave me ability to undertake and complete this desertion successfully.

Further, most a very special note of thanks goes to my parents whose heart-felt prayers, appreciation and support has always been a valuables asset and a great source of inspiration for me. They always encouraged me whenever I was demoralized during study. They deserve special thanks for enduring all my problems with great patience and love.

Abstract

This study aims to investigate the impact of stock market shock on macroeconomic variables of Pakistan. We took monthly data from IFS on Share prices (SP), Industrial Manufacturing Production Index as a measure of GDP, Exchange Rate (EX), Interest Rate (IR), Money Supply (M2) and Consumer Price Index (CPI) for the Period 1991-1 to 2015-12. Aloof from this, we have applied structural vector autoregressive (SVAR) model proposed by Blanchard and Quah (1989) for imposition of long run restriction on variables. We employed Monthly unit root proposed by Beaulieu and Mirron (1992). Our results found that unit root exist at level but their first differences showed there is no seasonal unit root at zero frequency. We also found that autocorrelation does not exist in the model. our diagnostic tests show that residuals are normally distributed. our impulse response function reported the responses of share prices into macroeconomic variables, that exchange rate and consumer price index are responding negative initially, while other variables are responding positive. Our variance decomposition shows that majority of variation received by interest rate in the short run and in the long run as shock comes from share prices in Pakistan. Finally, our SVAR methodology found that share prices have positive but insignificant impact on supply of money, industrial manufacturing production index and consumer price index, meaning that shocks are not transmitting into these variables. On the other hand, we also found that shock of share prices has negative but significant impact on Interest rate and exchange rate in Pakistan and there is significant transmission mechanism from share prices to interest rate and exchange rate in case of Pakistan.

Key words: SVAR, VAR, Unit Root, Stock Market Shocks, Macroeconomic variables, impulse response, variance decomposition.

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Acronyms

IP	Industrial Manufacturing Index.
IR	Interest Rate.
EX	Exchange Rate.
CPI	Consumer Price Index.
GDP	Gross Domestic Product.
SP	Share Prices Index.
M2	Money Supply.
VAR	Vector Autoregressive.
SVAR	Structural Vector Autoregressive.
IFS	International Financial Statistics.
KSE	Karachi Stock Exchange.
LSE	Lahore Stock exchange.
ISE	Islamabad Stock exchange
FEVD	Forecast Error Variance Decomposition
IPO	Initial Public Offering

CHAPTER 1

INTRODUCTION

1.1: An Overview of the Chapter

This chapter elucidates an introduction to the link between stock market and macroeconomic variables of Pakistan, its importance, theoretical background of stock market and its transmission mechanism to macroeconomic variables. Furthermore, which channels are followed by share prices to link with macroeconomic variables. In addition, it also explores the importance of study among stock market and variables of macro economy for the acceleration of economic growth.

1.2: Introduction

The importance of stock market and financial market are increasing around the world and both are considering the important elements for macro-economic growth. Especially, stock market is considering an important because stock market provides ways to growth of industries and commerce, which leads to economic development of the country in large scale. The concentration on stock market activities are very important but unfortunately our industrialists, government institutions and even central Bank of Pakistan are not taking into account the activities of stock market at which it should be ultimately, because movements of stock market can be occurred from both sides, investors and industrial sides (Ahmed 1999).

The stock market has significant role in the economy because it makes domestic resources valuable into the utilization of economic activities, which further leads to

increase investment in the country. As for as previous studies are concern, the stock market is a significant indicator of the economy and it has relation with aggregate demand in the economy, especially through consumption and investment. Therefore, shock in stock market may have an ultimate impact on CPI, EX, IR, IP and supply of money. In case of Pakistan, the study of stock market relation to macro economy is important because after 1990s several transformations have made in the stock market, like privatizing of companies, trade liberalization of the country and removal of restrictions from foreign exchange. These actions have completely changed the structure of stock market in Pakistan and started to impact economic activities differently (Nazir, *et al*.2010).

Apart from the importance previously discussed, stock market also plays an important role in increasing long-term fund for corporations and primary sectors of economy for increment of trading securities for secondary markets. this procedure leads to expand funds for businesses and other investment purposes. In Pakistan where national saving rate is not good enough to sustain the growth rates, in such a case, stock market helps to increase saving and then provide ways for proper utilization of these saving into domestic investment as well as foreign firms can easily find investment opportunities in different sectors of the economy. On the other hand, stock market gives significant signals for policy makers of the macro economy including how the polices should made for interest rates, exchange rate, inflation and currency volatility also their different dimensions in the economy. In addition, in the past KSE was the best predictor of these variables and growth of economy in Pakistan. (Business record Karachi, 2010).

If we see the direction and moment of return of the stock market and changes in CPI then both are considering as similar. The theme behind this statement can be

understand that mostly shareholders performing the hedging strategies in the stock market. On the other hand, Chatrath, (1990) has examined the negative relationship between returns of stock and CPI in India. Another study backed by Humpe and Macmillian, (2009) that the impact of CPI on stock prices is negative. Furthermore, another study which is backed by Sharma, (2007) showed that this relationship among share prices and CPI existed positively. Fama, (1981) reported the interlink between gross national product, which is sum of (GDP+ Foreign earnings), and share prices are highly significant. Based on previous statement of Fama, a study made by Macmillan, (2009) found that there is significant long run relationship between share prices and gross domestic product (GDP) in United States. In the context of relationship among macroeconomic variables and share prices different economists reported different relationship between share prices and domestic exchange rate, and if any change occurs in exchange rate then it leads to affect the firm's profits in the stock market. Profits of firms affected by some new operations made by firms abroad and that is results to generate variation in domestic share prices. On the other hand, this direction of share prices depends on how firm's nature is present in the stock market. The measurement of monetary supply and stock market reaction is examined for many economists as Sharma, (2007) has reported positive relationship between stock market prices and monetary supply. Nevertheless, study held by Humpe and Macmillan, (2009) have showed that there is negative relationship between stock market prices and money supply in Japan. Many economists observed the relationship between interest rate and stock returns as Ratanapakorn and Sharma, (2007) have showed that there is positive relationship between interest rate and stock return but some have measured that both variables are correlated negatively. (Sohail and Hussain, 2009).

There are variety of research studies conducted in Pakistan especially in the context of relationship between variables of macro economy and rate of return of the stock market. as it has studied by Farooq, Keung et al. (2004) by using indices to encounter the impact of exchange rate on returns of stock, and this suggested that services indices are caused by consumer price index and exchange rate also general prices cause exchange rate.

Many economists have used following macroeconomic variables, industrial production, money supply, CPI and interest rate and measured the relationship with stock market prices and they have found co-integration exist between five variables and reported that there is significant impact of industrial production on stock market prices. Moreover, it is reported that stock market prices effect industrial production as well as some economist suggested that there is positive relationship between stock market development and economic growth Sohail & Hussain, (2009).

1.3: Theoretical Link Between stock market and Macroeconomic Variables

The transmission mechanism of stock market and macroeconomic variables can be understood in such a way that the macroeconomic variables affect stock market in two ways (i) first it affects cash flows of stockholder's and (ii) discount rate. Most importantly, this connection arises through discount dividend model (DDM) and Arbitrage pricing theory (APT). as according to these models any expected or unexpected new information about macroeconomic variables in an economy can effect stock prices and discount rate and expectations about future dividend, or both Arnold & Vrugt,(2006).because investor's sensitivity increases in high uncertainty periods which in turns to increase variation in assets prices. In addition, expected dividend cash flows and discount rate impacts current

prices of stock or returns of stock because logical concept is that conditional variance of current stock returns will be a function of conditional variation of expected future cash flows and discount rate. Therefore, the return/earnings and cash flow of firm's relation to how the macro economy is strengthen in the country. Thus any future change of Industrial production, interest rate, exchange rate and consumer price creates volatility in stock returns Chinzara, (2010). Furthermore, to understand the origin of stock market volatility we should understand actual story of policy makers and practitioners prevailing behind it. Whereas policy makers wish to know, the actual determinants of stock market volatility, how its impact transmit into macroeconomic variables. In this connection, if policy makers are confident enough to formulate policies that enables financial and macroeconomic stability, then market practitioners want to find this new knowledge according to their interest and they come to know variation in stock market effect on asset prices. on the basis of this information they are moving towards hedging strategies by applying plain Vanilla options and other derivatives (Chinzara, 2010).

Furthermore study backed by Liljeblom and Stenius (1997) reported that conditional volatility in stock market related to volatility in macroeconomic variables like Industrial production, CPI, interest rate, M2 and exchange rate approximated by one sixth and more than two third times. If we look towards empirical findings of link between stock market and macroeconomic variables then we have some studies Gunasekarage, et al., (2004; Sadorsky 1999). They have divided transmission mechanism between stock market and macroeconomic variables into two categories as (i) first moment and (ii) second moment. In first moment, these studies focused on macroeconomic variables and stock market indices or the dividend by applying VAR model as well as Co-integration

techniques. These studies suggested that there exists transmission mechanism between macroeconomic variables and stock market. On the other hand, in second moment they analyzed that how variation/ risk of any macroeconomic variable create volatility in stock market. The theme behind this scenario is that if any shock occurs in any of macroeconomic variable, it helps to create systematic risk which leads to impact market portfolio but it depends on how that portfolio is well diversified (Chinzara 2010).

There are several studies which support for transmission mechanism from macroeconomic variables to stock market which suggests that aggregate equity prices expectedly having link with macroeconomic variables because intrinsic value of shares are dependent on dividend's present value. They are mostly distributed out of deferent markets and their profits are affected by macroeconomic activities so there is link between macroeconomic variables and shares prices because macroeconomic variables effect the ability of generating cash flows of a firm as well as discount rate as according to discount cash flow models (Gunasekarage et al., 2004).

1.3.1: Channels Linking Share Prices to Macroeconomic Variables

The common theory postulates that share price is equal to future dividend, all payments which are discounted to their present value. On the other hand, stocks, dividends are sometimes replaced by earning, which is basis on assumption of dividend payout constant ration. In addition, factor of discounted is divided into two parts (i) Risk Free component (ii) premium of equity risk. Now the model of present value for price of share suggests forward-looking Passive or this is indicator tool for share prices. In this whole scenario, an increase in share prices reflects an increment in expected discounted earnings by providing possible and valuable information regarding the economic growth in future.

Aloof from this share prices have an important role in the growth and development of an economy through different channels. Higher prices of equity provide additional information for Firms as well as households that own indirectly or directly. For example, through funds of pensions of the individuals share via positive effects of wealth that lead to effect economic growth. In addition, stock market of any country is common measure of the economy. Through which prices of shares and stock impact activities of real economy via channel of confidence of household and investors in economy. In an economy, higher prices of share and other stock provides stimulus and increases the level of confidence of firms that tend to reduce uncertainty about future condition of an economy. In such a case investment increases and production capacity as well. An increase in share prices leads to increase ratio between already installed market value of capital and cost of replacement capital. The increment in ration between these two is captured by Tobin's Q coefficient and this motivate firms to invest more in capital market. Increase in share prices also increases expected profits of firms as a source of internal finance that leads to enhance the position of finance of the individuals. This enable firms and investors to borrow easily as well as cheaply which has known as Firm's balance sheet channel. Furthermore, risk premium of an equity also delivers degree of aversion of risk in an economy, which leads to effect real economic activities in which, taking of risk as well as compensation of risk plays role as elements of transmission of the monetary process (ECB, Monthly Bulletin, and October 2012).

There are three also channels, which links share prices to economic production

1. First suggested by Tobin (1969) he reported in detail that share prices affect cost of capital, which leads to increase investment in economy. This detail has

discussed in chapter5 of this study in result interpretation of the coefficient of share prices (α_{51}) in industrial production equation. In addition, Discounted Cash Flow Model also supports this link between share prices and production.

2. Secondly, the channel has presented by Modigliani, (1971) that how share price's impact transmits into gross domestic product. He pointed out that higher share price leads to increase wealth in economy. Moreover, households are consuming this wealth to maximize their utility by increasing consumption patterns in economy which is also supported by permanent income hypothesis.
3. The third link is presented by Bernanke and Gertler, (1989) in which he reported that share prices affects firm's balance sheet due to prevailing of asymmetric information in credit market. Where borrowing of firms depends significantly on the collateral they initiate. This collateral value of firm will be offer while their share prices will be increase. In such a case, there will be higher credit, which can be utilize into different investment purposes, which further lead to enhance economic activities.

Moreover, the link from share prices to macroeconomic variables is concern, this link is possible through consumption and investment of an economy. Especially it affects occurs when individuals, investors in stock market and other financial investors came to know in the fall of share prices. If this falling tendency of share price will be significant then this will lead to effect financial position in stock market including small business. Finally, investors will lose their wealth and tend to decline investment, and then consumer prices will be decrease If there will be permanent increase in share price it may encourage investment spending in stock market and enabling firm to raise their funds by issuing initial

public offering (IPO). As if there is decreasing tendency of share prices it makes firms and investors weak to generate more finance to invest in different securities. In addition, it also effects the IPO of firms and their equities in stock Market. Another link is based on life cycle hypothesis which has developed by Modigliani and Ando, (1963) postulates that as for as share prices change for example, increase in share price leads to increase wealth holding of individual. With respect to time individuals increases their consumptions from this increased wealth. This change the consumptions patterns in an economy and increases aggregate demand and production capacity of the country. (Husain 2006).

Portfolio Balance Models of exchange rate determination also present the theoretical link between share prices and exchange rate. In which this link creates when in an economy individuals are trading domestic assets and foreign asset as well as currencies of both. If domestic share price increases in a country, then domestic individuals start to selling foreign assets. In this case, domestic money demand will be increase again this will lead to appreciate local currency, but here the appreciation is exchange rate of one unit of foreign currency in terms of domestic currency.

1.4: Motivation of the study.

Numerous studies have been examined on stock market in the short run as well as long run between stock prices and macroeconomic variables (Sohail and Hussain 2009) reported how stock price affects the macroeconomic variables. They urge that, if one unit stock market (price) can affect macro-economic variables then ultimately, there is a higher impact of stock market shocks on CPI, EX, IR, IP. In addition, might be a possibility that macroeconomic variables create shocks in stock market. This whole mechanism in our economic system m inspired us to investigate the stock market shock transmission

mechanism into macroeconomic variables. Other studies conducted and encouraged by different researchers Sharma (2007) and showed that there exists relationship between stock prices and money supply, interest rate and exchange rate, but the effects of these variables may differ with respect to countries and may be positive and negative. These studies inspire us to report an impulse response function on stock market shocks and show the effects of stock market on macroeconomic variables through SVAR model and give some suggestions based on results.

1.5: Importance of the study.

In the context of Pakistan, several studies have done on stock market returns and macroeconomic variables but not on impact of stock market shocks to variables of macro economy. The study is first of such a type where we used SVAR methods to measure impact of stock market shocks on macroeconomic variables because when shock occurs in any variable it treats differently as before. Mostly researchers used some of macroeconomic variables, which are affecting by different shocks like monetary policy, fiscal policy shocks in different ways. The present study will explore how stock market shocks affecting macroeconomic variables and shows their significant effects, so this study also investigates the stock market shock on macroeconomic variables and which macroeconomic variable mostly effected by shock of stock market. For this purpose, we have applied Structural vector autoregressive model by imposing restriction on variables according to their respective theories, impulse response function and variance decomposition. We have taken monthly data for analysis and to measure stock market shocks and macroeconomic variables.

1.6: Objectives of the study

This study based on some important questions in the literature of stock market and macrocosmic variables and objectives because of those questions are as.

i. To investigate the impact of stock market shocks on macroeconomic variables in Pakistan.

ii. To determine which macroeconomic variable is affecting more by shock in stock market.

1.7: Hypothesis of the study.

$\mathbf{H_o}$: Shock in stock market significantly transmitting into the macroeconomic variables

$\mathbf{H_1}$**:** Shock in stock market has not significantly transmitting into the macroeconomic variable.

1.8: Organization of the study

Chapter 1 gives the theme and introduction to title, importance of stock market its relationship with macroeconomic variables, data and sample size as well as objectives, motivation and hypothesis of the study. Chapter 2 explores an overview of stock market of Pakistan. Chapter 3 consists with some related literature review to find out literature gap. Chapter 4 presents econometric methodologies and techniques. Chapter 5 present estimated results of different econometric techniques to get required results of the study. Chapter 6 explores conclusion of the study and policy recommendations.

CHAPTER 2

2.1: An Overview of Pakistan's Stock Market.

The Pakistan stock market is explained by main three markets including (KSE), (LSE) and (ISE). From these stock exchanges, Karachi stock exchange is most prominent which has established in 1947, Lahore stock exchange has established in 1971 and Islamabad stock exchange has established in 1997. Securities and Exchange Commission of Pakistan (SECP) which has respectively established in 1997 regulates these markets. KSE is one of the oldest stock exchanges in Pakistan, which deals with high degree of shares and trading volume in the stock market and as for as ISE and LSE are concerned they deal with little shares and trading volume comparatively to KSE. KSE has started in 1949 with 90 members, 13 listed companies, and the numbers of listed companies increased by 318 in 1971 because of the enhancement of industries by the government of Pakistan. The first shock in stock market this raised in 1971 when bad political situation occurred in the country by separation of Bangladesh and that time 60 companies had been delisted which belongs to East Pakistan. Therefor in 1973 and 1974, government of Pakistan started to nationalize all private sectors, industrial and financial sectors that led to elimination of private sectors of Pakistan (Qayyum and Khan, 2014).

In addition, in 1990s the help and guidance of World Bank and Asian Development Bank Kahn, et al, (2005) which mainly focused on influence of international investment in domestic stock market adopt numerous reforms. Including, unrestricting capital gain and dividend transfers and entered foreign investors to enhancement of exports as well as allowing commercial banks to deal with foreign currency accounts etc. This system

promoted stock market performance. Moreover, KSE was responding significantly in capitalization as well as return of shares and it became third ranked in 1991, for the sake of better performance. Qayyum and Hussain, (2006). In 1995, Pakistan's equity market shocked negatively due to political instability and indicated a negative impact on macroeconomic system by decreasing average monthly return to $266.2 million whereas market capitalization has decreased from 24.3 percent to $9.3 billion at last month of that year.

KSE-100 index has increased to 2600 points in 1995. Moreover, KSE has improved in 1996-97 when capital and returns on shares doubled from 5,707 to 11,438 by 1998. Moreover, started to reduced defaulter companies from KSE and at the end of 1998 the listed companies were 126 and then very sharply decreased once again when foreign investors stated to withdraw their investment from KSE and reached to just 879 points low due to nuclear tests in Pakistan. It reached to 10,000 point in 2005, further it also started to increase in 2008 by 15676.3 points but again it has declined due to high bullish market in Pakistan and reached low level of 1296.03 until 2011. These all happened due to weak economic activities and Pak rupee depreciated and created domestic fiscal deficit. Conversely, KSE-100 index started moments by third quarter of 2011-12 and reached to 14744 points by 8th month of 2012. This has recorded growth of 15.33 percent because of reduced discount rate by SBP and increased foreign reserve in stock market. However, the companies have increased to 591 in KSE and capital were 1059.087 in 5th month of 2012. Qayyum and Khan, (2014). These movements in KSE not only impact internal companies but also it has external relation to macroeconomic variables or macro economy because it impacts through different channels but impact may be positive or negative

because Pakistani economy has depended on numerous reforms in the past like institutional as well as financial reforms. On the other hand, these reforms have some objectives including reduction of financial imbalances and improvement in financial market. Meanwhile stock market led to increase portfolio investment of Pakistan and this leads to increased investable fund for macroeconomic growth as well as stock market index. As we have mentioned above that KSE index has increased to 2600 points in 1995 but decreased due to deduction in foreign investment due to crises in financial market of Pakistan at that time.

Upcoming government during 1985 and 1986 further adopted the nationalization policy of 1970s because that time public's sector efficiency has loosed, in this connection government once again started to de-nationalize all those sectors which have been nationalized in 1970s due to political instability of the country. In addition, in 1990s Nemours reforms have adopted by the help and guidance of World Bank as well as Asian development Bank see Kahn, *et al,* (2005). Which mainly focused on international investment in domestic stock market. The financial condition of any economy depends on the capital and stock market that at what extent these markets are improved which can be effected by foreign exchange markets as well, because the depreciation of exchange rate can affect domestic stock market prices on both negative and positive when we deals with exports and imports in the country.

So, improvement in foreign exchange market has significant implications on other economies therefore it is important to understand origin of different shocks and nature of stock market prices from those economies and how these shocks in stock market and stock prices impact macroeconomic variables in the economy Qayyum and Khan, (2014). In the

context of Pakistan in different time periods the shock's effects are measured, and by studying when and how shocks in stock market created we have investigated and came to know that the crises of stock market with huge impact on macro economy in Pakistan was occurred in 2005. On the other hand, due to this effect, it once again shocked in 2nd quarter of 2006 and these shocks affected macro economy on their own ways. In addition, most dangerous shock in stock market of Pakistan was the earthquake of 2008 and in 2009, which has decreased the performance of stock market in this period. In such a case, there has started decreasing tendency in Karachi stock exchange market and it has lost thousand points. On the basis of interlink between stock exchanges LSE also lost more than three thousand points due to these shocks (Sohail and Hussain 2009).

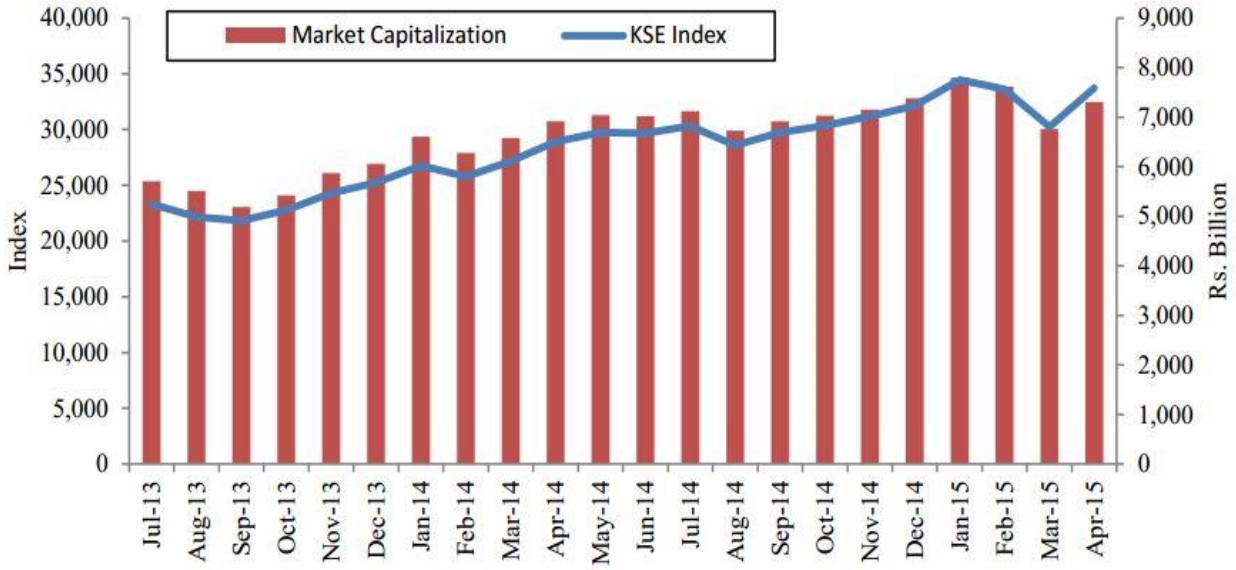
If we look toward the performance of LSE in 2004 it was performing perfectly in trading of different securities but after 2008-9 shocks this increasing tendency has dropped and followed negative trend at that time this market was performing their activities at 3,868.8 points but this figure came down to 2,085.2 points by June of 2008-9. If we consider the capitalization structure of this market, then it has lost 1561.1bn by decreasing from PRs. 3,514.2 to 1,953.1bn by 2009. There were also others main factors to cause this decreasing tendency of stock market including political instability in Pakistan, the bad situation of law and order and especially murder of Benazir Bhutto. These have changed the structure of these stock exchanges in Pakistan. Further first two shocks in stock markets created due to instable governance in Pakistan and as well as huge tendency of money

speculation in the country. So it is now need to understand the reactions of stock market and their impacts on variables of macro economy (Sohail and Hussain 2009).

The KSE Index has increased by 38% and closed at 28913 in April 2014. But due to general election in 2013 and after government of PML (N) 45%, increment has estimated in stock market by April 2014. The reasons behind this increment in the stock market based on foreign interest, good growth of earning as well as improvement in Business scenario. Then after Moratorium of investors is also applied by (SEP) by coordinating with KSE that focused foreign investment in Pakistan by not considering the origin of money and its source. Hence, GDP growth has estimated approximately by 3.7% in 2013 and 4.14 % in 2014 which has showed 1.7% growth in GDP comparatively 2013. Moreover, more than 48bn shares are traded in 2014 and daily volume as average estimated by 237mn against 221mn in 2013. furthermore, 48,494.3 is the estimated volume of share at the end of April in 2014.

The Stock market performance in 2014-15 remained better than 2013-14. Where 4,077 points have increased in KSE 100 index and closed at 33,729.96 against 29,652.53 in 2013-14. In 2014-15 portfolio investment of foreign investors has estimated by 385.92$mn as comparatively 397.50$ at the end of same year. In the same year, the better performance of stock market of Pakistan was attributed to some factors including better environment of stable macro economy, exchange rate stability, speed in the process of privatization, decreasing trend of inflation and sensible monetary policy as well as strengthen growth of the economy. In this connection, we can understand movements of KSE 100 index and market capitalization 2014-15 through below graph.

Fig-1: Movement in KSE Index and Market Capitalization



Economic Survey 2015-16, reports that foreign investment in Pakistan's stock market showed only net flow of 38.5$mn throughout the whole year. It clearly showed that the slowdown of year-on-year decline of 85%. From the first nine months of 2015-16 the stock market remained uninspiring. Due to Bullish, sentiments of the stock market have cover some losses in last some months, which has reflected by 4.8% increment in benchmark index for May and July. This survey also reported the decline in stock indices due to accelerate declines in the price of energy as well as sector of the banking stocks, which account for a substantial share in the market capitalization. However, the stock market of Pakistan improved some better in first 10 months of the year. Because it showed a rise in benchmark index by 0.9% over April-July, which has estimated as fourth highest annual increased in selected 18 economies of the world. The report also showed that government has increased capital gain holding periods as well as their rates, which leads to increase dividend income tax rate from 10% to 15%.

On the other hand, in 2016 growth of economy has increased somehow in Pakistan due macroeconomic and structural reforms initiation program. Accelerated declines in oil prices, improvement in security, outpacing earlier growth forecast despite a major crop failure. The inflation and current account deficit recorded lower than as it was expected before (Asian Development Bank Report, 2016).

2.2: Stock prices and Macro variables in Pakistan for 1990-2016.

The structure of macro variables and stock prices for the time period 1994 to 2005 has been analyzed by Rashid ,(2008) that reports stock prices index ,output index and interest rate were mostly volatile in post-break time period as comparatively pre-break time period. This paper also reports that shares prices have correlated with exchange rate, CPI, output and the rate of interest. Furthermore, there is long run relationship among variables and overall change occurs due to modification in structural change without any time trend. The reason for long run relationship between macroeconomic variables and share prices is explained in such a way that it strengthening the economy, which leads to rise share prices.

A fluctuation of stock market varies from economic, political, social and cultural dimensions of any country. KSE also response positively or negatively as other stock markets are responding across the world because there are large number of issues creating with as well as without economic structure. Furthermore, stock market is an organized body in which shares, securities, bonds and derivatives are trading by listed companies. Therefore, this whole system changes when any factor regarding stock market changes. The behavior of stock market were observed in previous decade as for 2001-10 a study by Haroon and Jabeen, (2013) showed reaction of stock market and macroeconomic variables and how stock market changes when macroeconomic variables; interest rate, exchange rate

and consumer price index are changing in their own ways. They found that consumer price index is negative correlated with Karachi stock exchange by 0.11 % and wholesale price index is negative correlated with KSE by 0.09. On the other hand, their regression analysis found that CPI as an independent variable causes KSE 100 share index to create variation by 1.28%. Another study backed by Khalid, Altaf *et al.* (2012) for the time period 2000 to 2010, they analyzed co-movements of macroeconomic variables like exchange rate, T-bills rate CPI and share price's relationship existed. On the other hand, they affect most variables but only T-bill rate pressurized by exchange rate and inflation. Furthermore, variation occurred in returns created by itself as well as exchange rate.

CHAPTER 3

LITREATURE REVIEW

3.1: Introduction to Chapter

A literature review is a brief explanation of relevant information in the literature, which is most relevant to our chosen area of study. It provides foundation to develop hypothesis regarding area under consideration. This chapter comprises a review of the literature related to this study on of stock market and macroeconomic variables of Pakistan.

(Muhammad, Rasheed et al. 2002) have analyzed the relationship between share prices and exchange rate for the countries Pakistan, India, Sri-Lanka and Bangladesh by taking monthly data from 1994:1 to 2000:12. They have used co-integration and error correction model to detect long and short run relationship among share prices and exchange rate. Their methodology suggested that there is no short run relationship between selected two variables in all four countries. They also found that in India and Pakistan both variables have no long run association. Meanwhile, in Sri-Lanka as well as Bangladesh both have uni-directional causality exists. But most importantly thy have reported in their study that there is negative relationship between share prices and exchange rate and this relationship exists from share price to exchange rate. Because domestic individuals holding domestic and foreign assets as well as currencies. If share prices increase it increases demand of share assets instead of foreign asset. Now the wealth of investors in stock market will increase due to higher prices and they demand money that is more domestic. Now the appreciation of domestic currency occur but this appreciation. Here appreciation means that exchange rate as one unit of price in terms of domestic currency and ultematly this

also means the decreasing exchange rate and finally results exist negative between share prices and exchange rate.

(Keung) has analyzed the linkage between share prices and exchange rate for Pakistan's stock market by using co-integration and Granger causality tests to detect short and long run relationship among them. Their methodology found some unique cointegrating vector that there is no long run association between stock prices and exchange rate in Pakistan. Both are not moving together in the long run. They also applied granger no-causality test through this he found that causality runs from share prices to exchange rate. In addition, they found that exchange rate causing services indices. As Per their analysis exchange rate is effected by share prices in short run. But their results are also supported by portfolio balance model for exchange rate determination which also support uni-directional causation from share prices to exchange rate. He also reported that currency fluctuation effect index of services in Pakistan and the index of services is prerequisite to gain economic c growth rate. He also suggested that exchange rate should use as a policy tool for the improvement of services as well as stock market stability.

(Duca 2007) has reported the causal relationship between share prices and Gross Domestic product in developed countries. Further, they investigated how these two variables are moving together over the period. Especially they have mentioned that there should be an economic theory, which links share price to macro economy. In addition, in this paper they have postulated that stock prices are present discounted value of firm's payouts. If in an economy these payouts will be function of economic activities then link can exist. Thay have also mentioned that the discounted cash flow models show a link between share prices and gross domestic product. In which share prices leads to increase

real activities of economy if firm's payouts expectation about future is correct on its average. In this paper they have also postulated that there are three theoretical links including (i) suggested by Tobin (1969) in which share prices impact cost of capital. (ii) Presented by Modigliani in which he reported that individuals are increasing smooth consumption from their increased wealth and (iii) presented by Bernanke and Gertler, (1989) as well as Moore, (1997) in which they have reported the channel of share prices to macroeconomic variables in which share prices impacts firm's Balance sheet. Finally, their results showed that results are differing with respect to country. They also found that causality runs from share prices to gross domestic products excluding Germany, but not granger cause from gross domestic product to stock prices and they concluded that there is unidirectional causality in which share prices causes Gross Domestic Product.

(Chakravarty and Mitra 2013) have investigated the relationship between share prices and inflation. However, in the literature there is possibility of both negative and positive relationship between share prices and Consumer price index. They suggested that the impact of share prices on consumer price index. Their results of impulse response function showed the relationship is negative. Whenever share prices are low the firms in capital market are hesitating ill bank's finance will be adequate for capital market for the planning of firm's investment. If this does not meet then it will hit the plans of firm's investment and that will lead to decrease level of output then aggregate demand will exceed aggregate supply then price tend to be increase. On the other hand, the positive relationship runs from share prices to consumer price index as if investors are net debtors in stock market this will be a result of the higher value of firm's equity this will lead to increase expected inflation. Similarly, if there is tight monetary policy in an economy this can

reduce both consumer price index as well as share prices because of low money to buy stocks and other good in an economy.

(Alam and Uddin 2009) have investigated the relationship between share prices and interest rate by taking data from 1988:1 to 2003:3 in some selected developing countries. They have also investigated change of share prices as well as change of interest rate and their impacts on each other to find reasons for market inefficiency in both time series and panel data. Their methodology suggested that change in interest rate is negative and significant when share price changes. Because when share prices decreasing in an economy then investors in stock market afraid to invest in stock market and same time if Banks increases interest rate to their depositor then the increased wealth due to fall in share prices will switch to the Banks. On the other hand, this increased interest rate also increase lending rate leads to decrease investment in stock market. This result also tends to decrease the demand of share in stock market and finally tend to decrease share prices.

Basnet and Upadhyaya, (2015) have analyzed the effect of oil price shocks on macroeconomic variables for some asian countries, including Thiland, Malaysia, Singapor, Philpine and Indoneshia on their domestic output, inflation and the real exchange rate by applying stuctrual vecror autoregressive (SVAR) model. They imposed ristriction on the basis of following conditions (i) all countries are small open economies and price takers because demand and supply is deternimes from abroad (ii) they assumed that output does not effect simluntanaeously to any changes in the their domestic varables (iii) there is an assumption that all countries price level do not influanced by all variables excluding the exchange rate. Finally they did not imposed any ristriction on exchange rate because exchange rate assumed to be effect all variables. Their cointagration test suggested that the

respectives countrie's macroeconomic variables are cointegrated and having common trends in the long run. Furthermore their impuls response function showed that fluctuations in oil price did not effect all five Asian countries in long run because the effect has been absorbed in five to six quarters. They used variance decomposition to check significant variation of oil price shocks on remainning variables of their respective countries but the result was insignificant under considration, but they found that the oil price shocks responded between Malaysia and Singapor and between Thiland. Emperically they also argued that oil price shocks are very sensitive and impact in the short run, especially on investment and unemployment rate in all countries.

Nasir and Wasim (2011) have examined the structural decomposition of exchange rate movements for Pakistan by using SVAR methodology, where their main purpose was to decompose the nominal as well as real exchange rate movements into the mechanism brought by real and nominal shocks. After that, they followed the well-known method of Blanchard and Quah (1989) methodology for the period 2000-2001 to 2009-2012. Their SVAR methodology suggested that real shocks effect both real and nominal exchange rate while nominal shocks have permanent effect on nominal exchange rate but having temporary effect on real exchange rate. In such a case, the speed of convergence is different in both exchange rates affected by same shocks, which predict that the nominal devaluation does not; followed by real devaluation and it not leads to improve in trade balances.

Emanuele and Fanelli (2015) have investigated the purpose and new usage of SVAR models for the U.S Monetary Policy that when the structure of economy changes in different volatility regimes. They focused on standard assumption of SVAR method, which has reduced form unconditional error covariance matrix, varies while the structural

parameters are constant or restricted. On the other hand, their standard hypothesis is that, there is possibility for identification of SVAR without any additional restrictions on parameters, in this connection the used necessary and sufficient rank condition for both error covariance matrix and structural parameters. Which allowed varying over volatility regimes. Their generalized approach is on existing theories which were "Identification through change in regimes "But their main contribution is to relaxing assumption of restrictions. Commonly that the data have no impact in the transmission mechanism of shocks. In addition, by focusing previous common statement they developed new theory of structural parameters may be vary across volatility regimes and change at time "t".

Arshad and Ayaz (2001) have studied following financial variables, output, Exchange rate, consumer price index, money supply. Oil price and food price as major macroeconomic fluctuations. They took monthly data from 1990M1 and 2001M7. After that, they used approach based on Sims (1999) as well as Gordon and leper (1994) method for Pakistan to analyze transmission channels of oil price and food price. They used Structural VAR (SVAR) methodology and treated Oil price and Food price as exogenous variables and other all are as endogenously. The recommendation of SVAR methodology suggested that oil price and food price have different inflationary impacts and adversely effect on consumer and producers. Their impulse response function shows that there is downward trend from second to fourth month and again increased by 13^{th} month. From the method, they have concluded that oil price and food price shocks effect output, short-term interest rate money supply, CPI and Exchange rate. In addition, Exchange rate is dominated source of variation in Pakistan.

Fry et al., (2008) have analyzed equity shocks of domestic and foreign on the Australian economy by applying 5–variate SVAR model. They have achieved identification by restricting structural parameters based on natural rate hypothesis, neutrality of money, long-term portfolio balance and Purchasing power parity (PPP). The SVAR showed the value of real equity has been undervalue by 19 % by June 2005. They also suggested that the reason behind this equity undervaluing was the foreign crises. Moreover, financial and goods market prices are significantly impact by the real effects of equity shocks and the have examined SVAR method is also able to report puzzles that exists in structural vector auto regression model.

Lutkepohl (2014) has estimated SVAR for checking Identification of Long run ristrictions VIA hetrosekdasticity which is based on identifying structural shocks in vector auto regresseive analysis. He focused mostly such a ristrictions that are just identifying so it can be checked by using in volitality chages. He has used basic three approaches including (i) changes of exogeneous effects in the unconditional error covariannce matrix (ii) changed volitality modelling by Morkov switching system, which is use for endogenous effects of variables and (iii) Multivariate GARCH models to measure different volitality and how additional effect can be captured in SVAR models he has checked long run identifying ristrictions in SVAR model by using changing in volatility that leads to further identify basic components of stock market prices. In addition he followed identifying stuctural shocks by impelementation of long run ristriction which is further possible for the combination on imposing ristrictions on short run effects. In such a case if we consider the conventional ristrictions which are commomnly just identifying could not be formally tested in standrad system because it lead to different conclusion in two models regarding

the effect of basic shocks of the stock prices, But they may have same conclusions, in this connection they have used GARCH model because we know that VAR coeffecients are assmued to be constant.

Evans and Marshall (2009) have studied fundamental economic shocks relation to macro economy, means how financial variables and macro economy measures shocks when technological progress, supply of labor and monetary policy response occurred and that leads to fluctuates output, production capacity and monetary tools or policy. For this measurement, they have applied SVAR methodology and SVAR suggested that only technology has permanent effect on economic processes on the other hand labor inputs have little response towards technological shock as well as monetary policy also has a minor response towards technological shock. They also measured that cyclical labor shock is more sensitive and this shock impact interest rate highly that leads to stock prices respond to affect all variables.

The discuusion paper " Are the stock prices follow bubbles?" fundamental checking for shocks by Anton Velinov & Wenjuan Chen, (2014) by taking variables Industrial production and stock prices also applying SVAR methodology follwed by Binswanger (2004) and Groenewold(2004) for this analysis they imposed ristrictions on accurate lable for the shocks. They also follwed by the method of Marcov switiching structural vector autoregressive (MS.SVAR), and taking data for US, United Kingdom, Japan, Italy and Germany. Their suggested method found that for the Italy ristriction is rejected, and the ristriction has responed at 1 % level of significant for the Japan as well as remainning countries were suported at 5% level of significance. They also used variance decomposition which showed that the stock prices are undervalued during one decade from

1970 to 1980 and it had become correct in mid of 1990 itself, after that it has strated to move upward. By investigating their purpose of Paper they did not favor stock prices bubbles in all invested countries.

Mercan (2014) conducted a study by using bi-variate and tri-variate SVAR methodology he examined the impact of fundamental shocks on stock prices for the Turkey and investigated following variables for Bursa Istanbul stock prices and macroeconomic shocks. From the methodology, he found that there is strong relationship between real economic activity variables and stock prices rather than basic investment and stock prices. Furthermore, results indicates that real GDP and leading variables or indicators index are better explains of stock price dynamically than U$, Gold and interest rates. Moreover, he found that through fundamental shocks are more important to measure stock price rather than non-fundamental shocks to measure stock prices movements.

Mehmet and Zekriya (2013) have examined the monetary policy shocks and macroeconomic variables for fastest growing economies in some selected Asian countries. They estimated concern variables such as Money, Exchange rate, treasury bills rate, exports, imports , Exchange rate , CPI, PPI, world interest rate and world oil price by employing SVAR methodology as some variables exogenous, they found monetary policy shocks are very sensitive in Short run. They also found contractionary monetary policy is main factor to appreciate domestic currency in foreign exchange market from both sides Real and Nominal term in all countries.

Ibrahim (2001) studied monetary shocks and stock return in emerging markets for two sample sizes 1977.1 to 1997.6 and 1977.1 to 1998.8 by using VAR methodology. The applied methodology suggested that the stock price is unidirectional caused by monetary

shocks. In addition, when he expended the sample size to 1998.8 he found that there is no effect of this sample size pattern on other interacting variables and stock prices movements are driven by nominal effect rather than real effects in Pakistan.

Shabri (2007) analyzed the behaviour of the stock return and macroeconomic variables for the Malaysian economy after the crises of stock market in 1997 by using Auto Regressaive Distributive Lag Model (ARDL) and this methodology suggesting that Exchange Rate (REE) industrial production, money supply as well as fedral funds are best measuring targets to the policy makers to enhance performance of the stock market and also increase cash flows in the stock market. This methodolgoy also showed even US monetary policy has an ultimate impact the stock market of Malaysia in concern period.

Kirui et al., (2014) have typically investigated relationship between stock returns, volatality and macroeconomic varaibles by focusing following varables GDP, T.bills rate, Exchange rate, CPI and stock market returns for Keynian economy for time period 2000 to 2012 by using Engle granger cointegration method . their method analyzed that all macroeconomic variables are shocked by response of stock market returns. Furthermore they used (TGARCH) to see the effect of levrage and volatality in their stock market and emperically showed that exchage rate has significant effects on stock market returns and when their currency is depreciated by one percent then stock market return has decreased more than one as 1.4% but all remaning variables showed insignificant relationship with stock market return. They checked by giving one standrad deviation shock to all macroeconomic variables that predicted exchange rate shock is negative.Moreove (TGARCH) results showed that effcet of information in the market is asymmetric.

Hussain and Mahmoud (2001) have reported the causal relationship between consumption, investment, economic activities and stock market prices for Pakistan by taking annual data for the period 1959 to 1999. Their co-integration and error correction model showed that there is long run relationship exists between stock prices and macroeconomic variables. They also reported the uni-directional causation between stock prices and macroeconomic variables which is macroeconomic variables to stock market prices but not evident of bi-directional causality between them. Their analysis further suggested that the correlation between stock prices and macroeconomic variables is very low but this correlation is significant when reforms have introduced in Pakistan, which links positively between stock market prices and macro economy.

Chinzara (2010) has studied Macroeconomic uncertainty and emerging market stock market volatilitcase for South Africa for the time 1997 to 2008. The study revels GARCH AR- GARCH measure the volitality between macroeconomic variables stock market. The also have followed by divdend discont model and arbitrage ricing theory to look out transmission machansim between macroeconomic variables and stock market. Their methodology suggested that stock market volitality is significantly created by Macroeconomic variables. This stdy also rerted that in the short run exchane rtate and interest rate is very imortant due to these two variables they commented that soth African financial market is becomin indeendent. Finally this paper also suggested that any of financial crises leads to create olitality in the stock market.

CHAPTER 4

DATA AND METHODOLOGY.

4.1: Overview of Chapter

In the previous chapter, we reviewed the related literate on stock market and macroeconomic variables from Pakistan as well as over the entire world, which made us, enable to develop methodology for empirical estimation through which we will get our prior objectives of the study. This chapter also provides an econometric method, as Unit root, VAR and SVAR, which has followed by Blanchard and Quah (1989). Therefore, this research study uses Structural Vector Autoregressive model through it we estimate variance decomposition and impulse response function.

The basic purpose of this chapter is to develop SVAR model for Pakistan. This method supports theoretical interpretation and imposes restrictions based on theories to identify the system and interpret shocks to explain the obtained results. This chapter consists with three sections. First explains Econometric methodology and techniques to get study objectives. Second section presents procedures to estimation and finally third section describes data source, sample size, descriptive statistics and graphical representation of variables

4.2: Econometric Methodology

Before describing the econometric methodology of SVAR model, it is necessary to describe the preliminary requirements of the data that is stationary and non-stationary of the data series.

4.2.1 Seasonal Unit Root test for Monthly Data

Monthly unit root has been used to tests the stationary of selected variables on following variables IP, CPI, EX, IR, SP, M2 and here industrial production(IP) is monthly index of GDP . The method of Beaulieu and Miron, (1993) is as follow

$$\varphi(B)Y_t = \mu_t + \varepsilon_t \quad \ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots \; 4.1$$

In which ε_t is a white noise error term and $\mu_t = \alpha_0 + \alpha_1 t + \sum_{k=2}^{12} \alpha_k D_{kt}$, is the deterministic term including constant term as well, a linear trend as well as dummies for seasonal effect. In the case of monthly data, the characteristic equation $\varphi(B) = (1 - B^{12}) = 0$ associated with the seasonal differencing which have twelve roots in unit circle, *i.e.* which is also given below

$$\pm 1; \pm i; -\frac{1 \pm i\sqrt{3}}{2}; \frac{1 \pm i\sqrt{3}}{2}; -\frac{\sqrt{3} \pm i}{2}; \text{ and } \frac{\sqrt{3} \pm i}{2}$$

Here the $+1$ is a root corresponding to the frequency at zero, when only no seasonal root. The -1 which corresponding only seasonal root at zero frequency.π represents six cycles per year, and the five pairs of conjugate complex roots which correspond to {3,9}, {8,4}, {2,10}, {7,5}, {1,11} cycles per year with frequencies as follow.

$$\pm \frac{\pi}{2}, \mp \frac{2\pi}{3}, \pm \frac{\pi}{3}, \mp \frac{5\pi}{6}, \text{ and } \pm \frac{\pi}{6}$$

So we are interested in, whether the polynomial in the backshift operator, $\varphi(B)$, has roots equal to one in absolute value at the zero or seasonal frequencies. Particularly goal is to test hypotheses of unit root without considering on whether other seasonal unit root at zero frequency in variables or not.

For this purpose, we have an auxiliary regression model that allows us to performing the test, which has given by the following equation.

$$\varphi(B)^{*} Y13_{t} = \alpha_{0} + \alpha_{1} t + \sum_{K=2}^{12} \alpha_{k} D_{kt} + \sum_{k=1}^{12} \pi_{k} Yk_{t-1} + \varepsilon_{t} \quad \text{…….. …...……4.2}$$

Where $y_{t1} + y_{t2} \ldots\ldots\ldots\ldots\ldots y_{t13}$ are, all Auxiliary variables use for the detection of seasonal and non-seasonal unit root.

(See appendix 1 for the construction for the auxiliary variables.

The variable which defines as $Y13_{t} = (1 - B^{12}) Y_{t}$, is the dependent variable in equation (4.2). The $\varphi(B)^{*}$ is polynomial with roots not in the unit circle which make us enable the augmentation is important to blanch the errors in the estimation of equation 4.2 and after the estimation of the equation 4.2, so will test the roots of monthly data as follows. Here H_O for the presence of a unit root at the zero frequency is tested with the "t" statistic and hypothesis is $H_o: \pi_1 = 0$ which is (proposed by B&M, 1993). The H_O regarding the presence of seasonal unit roots are have been tested in all frequencies on the basis of the "t" statistic related to $H_o: \pi_1 = 0$ for *i = 2,3 and 12* also " statistics for testing of joint hypothesis corresponding to $H_o: \pi_i = \pi_{i+1}$ and here *i* ={3,5,7,9 and 11} and these all take into account all pairs of conjugate complex root. The importance and significant test for π_1 and π_2 are one sides tailed test and those consistent with $\pi_{3,4}\ to\ \pi_{11,12}$ are all two tailed tests. If $\pi_1 = 0$, then the existence of root +1 (zero frequency) cannot be rejected. This means that there no seasonal unit root. If π_2 through π_{12} are significantly different from zero. When only some pairs of π 's are equal to zero, one should consider using the corresponding implied operators.

We can now test the following hypothesis proposed by (B&M, 1990).

1- The null hypothesis regarding existence of a unit root at the zero frequency is tested with the "t" statistic of the hypothesis

   H_O: $\pi_1 = 0$ there exist unit root at zero frequency.

   H_1: $\pi_1 < 0$ does not existence of unit root at zero frequency.

2- The joint hypotheses which consider all pairs of conjugate complex roots are tested by means of the "F" statistic associated with

   $H_o \coloneqq \pi_i = \pi_{i+1} = 0$ And for i = {3, 5, 7, 9, 11} and alternative is given as

   H_1: at least one of them is not equal to zero

We compared the calculated and critical value proposed by (B&M, 1990) and results are presented in next chapter. In the presence of zero frequency unit root the appropriate filter to make the series stationary is first difference, whereas, in case of seasonal unit root either twelve differencing or seasonal differencing at respective frequency is proposed**.**

4.3: Model Specification and method of analysis.

4.3.1: Estimation of VAR.

Christopher Sims (1980) gave new econometric modeling framework for economic interpretation as Vector Autoregressive VAR models. VAR model is n-equation and n-number of variables linear model in which dependent variable is determined by its current and lagged values of remaining n-1 variables. It captures the different dynamics in multiple time series. For data description and forecasting of variables the VAR model is somehow good but structural inference and policy analysis are more problematic because we must distinct correlation and causation in this case so this is problem of identification cannot be

able to overcome through VAR model because it needs to be interpret according to economic theories. Stock and Watson (2001)

In economics, sometimes, we are dealing with simultaneous equation modeling, which has two-way causality of variables mostly (bi-directional causality) because we are dealing dependent variables as independently and independent variables as dependently one by one. In this connection, joint dependency occurs. For the solution of this joint dependency in system, one can use simultaneous equation modeling in which it is important to determine which is dependent and independent variable. However, Sims, (1980) has rejected this concept of differencing between the dependent and independent variables. In such a case to he suggested that if simultaneous problem occurred in variables then it should be treating in same way and all variables as endogenously. This gives us same a theme towards toward development of VAR model which is pronounced as Vector Auto Regression Stock and Watson, (2001). The model of VAR as initially we test all variables by taking their log at level as well as first difference.

All six variables are stationary at first difference then we estimate VAR model as follow.

$$\begin{bmatrix} \Delta IP \\ \Delta CPI \\ \Delta IR \\ \Delta REER \\ \Delta MS \\ \Delta SMP \end{bmatrix} = \begin{bmatrix} \alpha_{11}(l) & \alpha_{12}(l) & \alpha_{13}(l) & \alpha_{14}(l) & \alpha_{15}(l) & \alpha_{16}(l) \\ \alpha_{21}(l) & \alpha_{22}(l) & \alpha_{23}(l) & \alpha_{24}(l) & \alpha_{25}(l) & \alpha_{26}(l) \\ \alpha_{31}(l) & \alpha_{32}(l) & \alpha_{33}(l) & \alpha_{34}(l) & \alpha_{35}(l) & \alpha_{36}(l) \\ \alpha_{41}(l) & \alpha_{42}(l) & \alpha_{43}(l) & \alpha_{44}(l) & \alpha_{45}(l) & \alpha_{46}(l) \\ \alpha_{51}(l) & \alpha_{52}(l) & \alpha_{53}(l) & \alpha_{54}(l) & \alpha_{55}(l) & \alpha_{56}(l) \\ \alpha_{61}(l) & \alpha_{62}(l) & \alpha_{63}(l) & \alpha_{64}(l) & \alpha_{65}(l) & \alpha_{66}(l) \end{bmatrix} * \begin{bmatrix} \Delta IP_{t-1} \\ \Delta CPI_{t-1} \\ \Delta IR_{t-1} \\ \Delta REER_{t-1} \\ \Delta MS_{t-1} \\ \Delta SMP_{t-1} \end{bmatrix} + \begin{bmatrix} e_{1t} \\ e_{2t} \\ e_{3t} \\ e_{4t} \\ e_{5t} \\ e_{6t} \end{bmatrix}$$

There are three types of VARs

1- Reduced form VAR model, which represents each variables linearly of its lagged value and the lagged values of all remaining variables have considered uncorrelated with error term.

2- Recursive form of VAR model presents in every regression model's error term to be uncorrelated with errors of preceding equations.

Third, one is structural VAR model, which has explained below.

4.3.2: 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.

4.3.3: Impulse Response

Impulse response explains if there is one standard deviation, shock is given by any variables then for the time being how other variables are responding.

It also explains the dependent variable's response in the vector auto regressive model when there is shock to error term in the system.

4.4: Structural VAR Model.

A structural VAR model follows economic theories to find out the contemporaneous effects between variables as according to Bernanke (1986), Blanchard and Watson (1986) and also Sims, (1986) examined that SVAR model need to be identifying assumption and those assumption should be on the basis of economic theories. Stock and Watson (2001)

The implication behind the SVAR methodology is that we should define first VAR method which analyzing relationship between set of variables that leads to help for

forecasting of concern variables. Vector auto regressive Model estimates only β_o and β_i for explanation purposes and it is useful when each of variables are known. When model is undefined, then it is biased and having no minimum variance, we forecast when it is unbiased and having minimum variance. In this connection, we can reduce error forecast variance. On the other hand, when we forecasting variables through VAR model it is just extension of auto regression forecasting so it has criticized because of lacking of any economic concept but the main role of economists is to explain variables in appropriate way where economic theories should relate to that explanations (Applied time series econometrics by Walter Andres).

Structural model can be identified by reduced form of VAR model because Cholaski decomposition has not interpretation economically. Now suppose we have α_{ij} parameters of Y_t and $Z_t$variables and with two error terms as $e_{1t}\ and\ e_{2t}$ are underlying shocks as $\varepsilon_{1t}\ and\ \varepsilon_{2t}$ so these shocks are single step to forecast Y_t and Z_t but not structural interpretation. If we want to get results from impulse response function or using variance decomposition to find effect of the shock then we should use SVAR $\varepsilon_{1t}\ and\ \varepsilon_{2t}$, which are not forecast errors. The main purpose of using SVAR methodology by considering economic theories to overlap the structural shock from the residuals $e_{1t}\ and\ e_{2t}$. If the correlation between $e_{1t}\ and\ e_{2t}$ is low, then there is no need to ordering. Moreover, in VAR model with some variables it is not possible that all correlation between errors or variables is also low and when the errors of VAR model are correlated then other all practical usage of ordering is useless (Applied time series econometrics by Walter Andres).

Sims (1986) and Bernanke (1986) presented new modelling the shocks by usage of economic theories analysis to understand this process or relationship between forecast

errors and structural shocks in any N number of variables VAR model. Since this relationship is considered as time invariant to their lags. Below model is first order n number of variables and also by using algebra matrix.

$$B_{Zt} = \gamma_o + \gamma_1 Z_{t-1} + \varepsilon_t \quad \ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots 4.3$$

Where B is element of diagonal box and all elements are unity.

Now by Multiplying B^{-1} on both sides we obtain

$$Z_t = A_o + A_1 Z_{t-1} + \varepsilon_t \ldots\ldots\ldots\ldots\ldots\ldots\ldots 4.4$$

Where:

$$A_o = B^{-1}\,\gamma_o,\ A_1 = B^{-1}\,\gamma_1 \quad \text{and } e_t = B^{-1}\,\varepsilon_t \quad \ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots 4.5$$

Here B elements of diagonal box are all unity and also B consist of (n^2 – n) unknown values furthermore there are n unknown values and var (ε_t) for total (n^2) unknown values in the structural model that is n^2 – n values of B plus n values var (ε_t) now the identification problem is simple. To identify n^2 unknown from the known (n^2 + n)/2 independent elements of sum, it is important to impose additional restrictions that is $n^2 - (n^2 + n)/2 = (n^2\text{-}n)/2$ restriction on the system. To estimate structural model from VAR model we need to impose (n^2 –n) / 2 restrictions on SVAR model. Hence, if we have (n^2 – n)/2 number of restrictions then it is just identified.

We have used SVAR modeling for six variables that was basis on Blanchard and Quah (1986) Also Kim and Roubani (2000), to measure stock market prices shocks on macroeconomic variables and reverse effect of macroeconomic variables to create stock market prices bubbles for Pakistani economy. So, we have the system of structural equations are as follow.

$$A1Y_t + A2Z_t + V_t \ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots \quad (4.6)$$

$$BY_t = AY_{t-1} + CZ_t + V_t \ldots\ldots\ldots\ldots\ldots\ldots \quad (4.7)$$

$$Y_t = B^{-1}AY_{t-1} + B^{-1}CZt + \beta^{-1}V_t \ldots\ldots\ldots\ldots\ldots\ldots \quad (4.8)$$

Where A1, A2, B, C, are coefficients of matrix. And Y_t is n x 1 vector of endogenous variables in the system as well as Zt is k x1 vector of exogenous variable (stock market prices shock) and finally v_t is n x 1 vector of structural parameter with zero mean and variance (vt) = m where m is a diagonal matrix. All The diagonal values are representing variance of structural disturbances so we can assume that not all structural disturbances are correlated with one another. We have reduced above equation 3 into reduced form model for structural equation as

$$A(L)Y_t = B(L)Z_t + \mu_t \ldots\ldots..$$

(4.9)

A(L) and B(L) are representing matrix polynomial of the lag operator and μ_t shows error term of VAR model with identical independent distribution with zero mean and variance constant ii~ ND (0,1). Because of reduced form model, we would estimate structural parameter in numerous ways. In this connection, we need to impose some restriction on elements of matrix and estimating structural VAR model based on economic theories. Different group of studies have done on the imposition of restrictions as Cholaski decomposition, these methods only accept recursive method. In such a case mostly results depending on the ordering of variables which are under considered. Now applying SVAR method which supports non-recursive approach in which we impose restrictions on structural parameters see Sim, (1986) Blanchard and Quah (1989), Blanchard and Watson (1986). By applying ordinary least square OLS method we have estimated μ_t from equation

(2) and the coefficient matrix D have not contemporaneous coefficient in the structural form equation and this relationship has showed through below model.

$$A(L) = I + B^{-1}\,A(L)\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots \quad 4.10$$

The correlation between reduced form equation and structural form equation has shown as below.

$$B(L) = B^{-1}C \quad 4.11$$

Now in addition association between residual of VAR model and disturbances of structural equations given by following models.

$$Ut = B^{-1}Vt \quad (4.12)$$

$$E(u_t, u'_t) = B^{-1}E(V_t, V'_t)B^{-1} \quad 2.13$$

$$E(u_t, u'_t) = B^{-1}D.B^{-1} \quad 4.14$$

$$\Sigma = B^{-1}DB^{-1} \quad 4.15$$

B^{-1} Is constant estimate and D is coefficient matrix and both are estimated by sample estimate of Σ through maximum likelihood function. we have estimated n(n1) free parameters in equation (4.12) and the Σ contains only n(n1)/2 parameters so we also need to impose additional restriction on the system. So finally, we need to impose restriction by n (n-1)/2 for the element of B to be unity.

4.5: Non-Recursive Method.

In this method, we have applied the restrictions on variables according to their theoretical perspective has given in below matrix.

$$\begin{bmatrix} V_{SP} \\ V_{M2} \\ V_{IR} \\ V_{IP} \\ V_{EX} \\ V_{CPI} \end{bmatrix} = \begin{bmatrix} 1 & 0 & \alpha_{13} & 0 & \alpha_{15} & \alpha_{16} \\ 0 & 1 & \alpha_{23} & \alpha_{24} & 0 & 0 \\ 0 & \alpha_{32} & 1 & 0 & \alpha_{35} & 0 \\ \alpha_{41} & 0 & 0 & 1 & 0 & \alpha_{46} \\ \alpha_{51} & \alpha_{52} & \alpha_{53} & \alpha_{54} & 1 & \alpha_{56} \\ 0 & 0 & 0 & \alpha_{64} & \alpha_{65} & 1 \end{bmatrix} * \begin{bmatrix} u_{SP} \\ u_{M2} \\ u_{IR} \\ u_{IP} \\ u_{EX} \\ u_{CPI} \end{bmatrix}$$

Where V_{sp} V_{ex} V_{cpi} V_{ip} V_{m2} V_{ir} are stock market price shock, Exchange rate shock, consumer price index shock, industrial production shock, money supply shock and interest rate shock. While u_{sp} u_{er} u_{cpi} u_{ip} u_{m2} and u_{ir} are all reduced form residuals which shows, shocks are occurred in their respective independent variables in the system.

First equation in above matrix is share prices equation, which represents stock market, and we assume that exchange rate, interest rate and consumer price index have contemporaneous impact on share prices. 2nd and 3rd equations represent money market equilibrium and theoretically we assumed that money supply is contemporaneously effected by industrial production (IP) and interest rate(IR) also see Kim and Roubini, (2000). the theoretical relationship between money supply, industrial production and interest rate.

In addition, interest rate is specifically money supply equation and this is reaction of monetary policy, and theoretically, we assumed that money supply and exchange rate have conterminously effect on interest rate. This identification is like Tylor rule identification.

Moreover, fourth and 6th equations of industrial production and consumer price index are representation of goods market equilibrium theory for the Pakistan's economy and we assume that M2, IR and ER have not contemporaneous impact on Industrial production on the other hand industrial production is contemporaneous effect by share price and consumer price index. The economic reason behind this assumption is that as

unexpected change in financial signals firms do not change their prices and output level in short period due to cost adjustment, delays of planning and inertia, in this regard some studies backed by Bagliano and Favero (1998), Cheng, (2006), Kim, (2003). Our exchange rate equation in the system representing the financial market equilibrium of the economy and we have assumed that exchange rate is effected by all variables in the system because this is forward looking asset price.

4.6: Recursive Method.

In this method, we do not impose structural parameters as exogenously. This reflects that matrix say (D). This approach also includes causal order of variables in the model which has been suggested by Shaheen, et al (2010) especially five variables SVAR. In such a case these results show the relationship between structural disturbances and reduced form disturbances.

4.7: Lag selection Criteria.

We applied likelihood ratio test as follow

$$LR = (T - m)(\ln|\Sigma_r| - \ln|\Sigma_u|) \sim \chi^2(q) \quad \ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots 4.16$$

Here T represents observations and m is the estimated parameter of unrestricted system including constant. $\ln|\Sigma_r|$ The natural log of determined covariance matrix of residual in the restricted model. q Is the total number of imposed restrictions in the whole system (n^2 time's number of lags) as well as n shows number of variables in the system? In such a case if our LR stats value is less than its critical value then in the restricted model we reject null hypothesis. This method is presented by Lutkepohl (1991) by taking large number of lags. If we have k number of lags then we compare k^{th} lags covariance matrix

wit k-1 lag. In this connection if LR stats value is less than its critical value then we reject null hypothesis of k-1 over k lags.

4.8: Information criteria.

To select maximum lags for our parsimonious model we used following criteria. As we know that in multiple regression model decreases the residual sum of square and R2 further increases so this loss is however in degree of freedom rather than adjusted R2 and allowing multiple independent variables to change when we addressing goodness of fit for different criteria for model selection and comparison such as AIC, SBC, and HQ. (Applied econometrics by Asteriou, 2006).

4.8.1: Akaike Information criteria (1970).

$$AIC = (RSS/n)e^{2k/n} \text{.....4.17}$$

The finite prediction error is also again developed by Akaike (1970) which is as follow.

$$FPE = (RSS/n)\ \frac{n+k}{n-k} \text{.....4.18}$$

4.8.2: Schwarz Bayesian Criteria (1978)

$$SBC = (RSS/n)e^{k/n} \text{ .....4.19}$$

4.8.3: Hannan and Qunin (1979).

$$HQ = (RSS/n)(ln, n)^{2k/n} \text{ .....4.20}$$

There are many others criteria but most used in econometrics are above three. We select that information criteria in our model which having minimum value or minimizes those statistics comparatively to other criteria. SBC penalizing model and creating complexities than other criteria and provides different results.

4.9: Diagnostic tests.

Our residuals follow the assumption of no autocorrelation and no heteroskedasticity and follow the normal distribution.

4.10: Diagnostic Testing for Residuals

4.10.1: Residual Serial Correlation LM Tests (BG-LM Test)

There are several drawbacks of Durbin Watson test when we testing residuals as (i) it might provide inclusive results (ii) when we are sing lagged dependent variables it is not applicable for that (iii) it does not measure high order serial correlation. For this purpose (Asteriou and Hall 2007) developed a test which has ability to measures above three problems of DW test. Breusch and Godfrey follow two models as

$Y_t = \beta_1 + \beta_2 X_2 \dots \dots \beta_k X_k + \theta_1 \mu_{t-1} + \theta_2 \mu_{t-2} \dots . \theta_p \mu_{t-p} + \epsilon_t$ …….. 4.21

Then Null and Alternative hypothesis are as follow

H_o: $\theta_1 = \theta_2 \dots . \theta_p = 0$ Then there is no autocorrelation

$H_1 =$ At least one of the θp is not zero then there exist autocorrelation.

4.10.2: Residual Normality Tests.

In the regression model, we ha residuals as $\mu_1 \dots \dots \dots \dots . \mu_N$ and assumed to be identically independent and distributed with zero mean. If suppose we have parameters $\beta_1 , \theta_o , \theta_1 \ and \ \theta_2$ and $\mu_i = \gamma_i - X'\beta_i$ then we define $\varphi_1 = (\beta', \theta_o)$ and $\varphi_2 = (\theta_1, \theta_2)$. Now to test normality of residuals which is also equal to test the hypothesis that $H_o = \varphi_2 = 0$ where our $\mu_i = {\sum \mu i}/{N}$ and i= 1……N and μ_i are all OLS residuals. If H_o is asymptotically distributed as Chi- square, then it is efficient and normal.

4.11: Data source and variables.

This section explains all variables used in measurement or see the relationship between share price's shocks and macroeconomic variables. These variables are suitable when we measure any shock's effect on macroeconomic variables in any economy see Subrahmanyam and Titman, (2013). We used monthly data of Pakistan from IFS for the time 1991-1 to 2015-12. We used industrial production as monthly proxy of GDP. All concerned variables are transformed into log form. all variables are exogenous as well as endogenous for VAR and SVAR model because we have six variables so we need to be six equations in the system.

Table 1 Data Measuring and Source

Variables	Measuring	Source
Output	industrial production	IFS
Exchange rate	Rupees/ Us$	IFS
Interest rate	Call Money Rate	IFS
Money supply	M2	IFS
Price	Consumer price index	IFS
Stock Market Shock	Share prices	IFS

Table 1 shows data structure, its measurements and source. as unavailability of monthly GDP, we took industrial manufacturing production index data instead of GDP. We took all the variables based on empirical evidences. International Financial statistics (IFS) is used for data collection and this data is secondary form.

4.12: Data and 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. All variables have converted into natural logarithm to determine the growth rates. Table 2 shows descriptive statistics of all variables and it is reported that the mean of share prices is 3.81793 and median is 3.57808 this tell us that where falls the center of data in the location. The highest value of this share prices is 5.8529 and minimum value is 2.10425 shows the range of data. Skewness of share prices is 0.18384, which is greater than zero so its distribution fall towards right. The kurtosis value of share prices is 1.99099 which is less than 3 its means that this data has not kurtic distribution because the value of mean is greater than median so it is leptokurtic distribution. The value of Jarque-Bera is not much more and their probability values are less than0.05 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. Jarque-Bera showed that the data is not normal, in such a case we need to difference all variables to make normal distribution.

Table 2 Descriptive Statistics

Variables	LNCPI	LNEX	LNGDP	LNIR	LNM2	LNSP
Mean	3.98718	4.3728	4.23172	2.0879	14.5911	3.81793
Median	3.84619	4.40045	4.25221	2.22326	14.5482	3.57808
Maximum	4.99849	5.10426	4.89561	2.99723	16.2804	5.8529
Minimum	2.94983	3.43645	3.4728	-0.3011	12.7573	2.10425
Std. Dev	0.59021	0.46906	0.40791	0.54829	0.99191	1.06258
Skewness	0.18384	-0.2475	-0.1417	-1.7908	-0.042	0.2902
Kurtosis	1.99099	2.01671	1.55278	6.67942	1.87481	1.75595
Jarque Bera	14.4161	15.1481	27.1845	329.581	15.9139	23.5564
Probability	0.0001	0.0233	0	0.0101	0.01	0.0345

4.13: Graphical Representation of the Data

This section describes the nature of variables through graphical representation. Meanwhile it also explores original description of data and properties. This representation of data is presented in below figures.

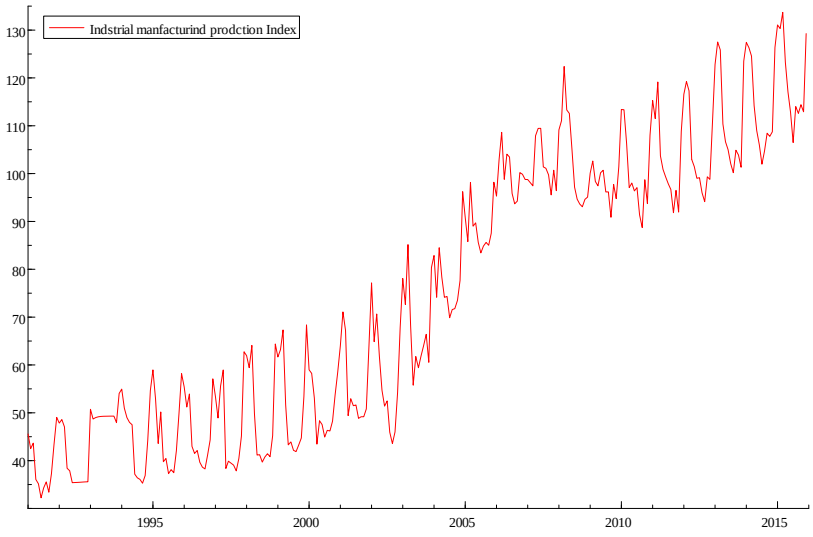


Figure 1 Industrial Manufacturing Production Index

Figure 1 shows that the data description of industrial production, that has trend and seasonal effect, on the other hand its means that the variance and mean of industrial production is not constant over the period, so it is time variant increasing trend. In this connection, we cannot use this data for further analysis without converting it into first or second difference.

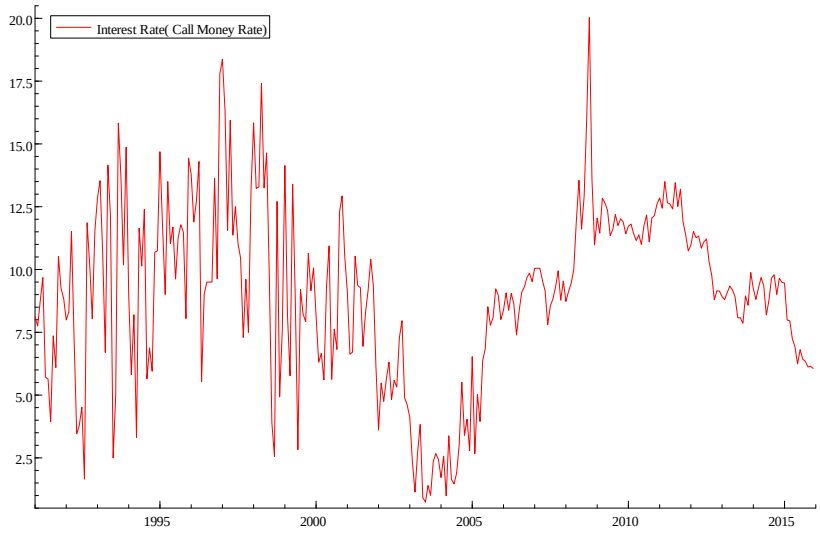


Figure 2 Interest Rate

From the above figure 2 we can see that interest rate involves time trend and seasonal effect, also it shows high rate of decline in 2001 to 2004. And then it stated to increasing trend but after 2010 once again it has decreasing trend. So, we need to convert it into first difference to make it smooth for further analysis because mean and variance are not constant over the period.

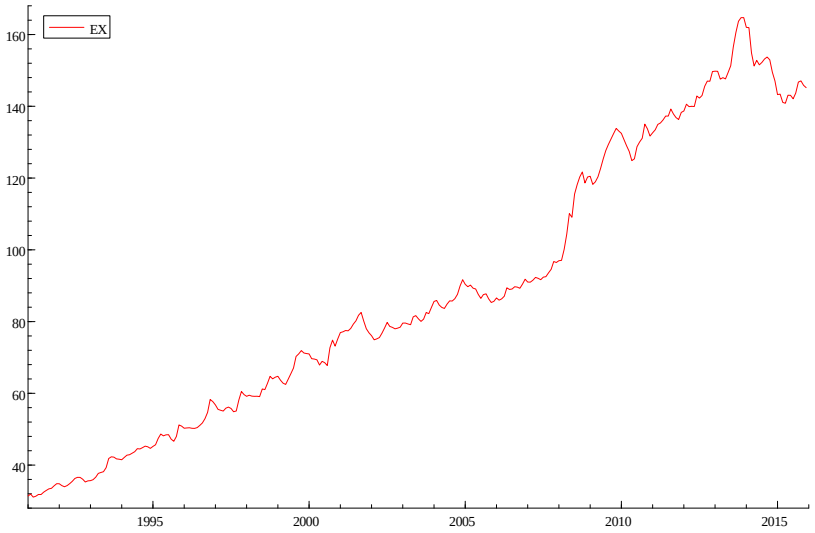


Figure 3 Exchange Rate

As from the above figure 3 we can see that exchange rate has increasing time trend and seasonal effect as well. By taking this data we cannot forecast further so we need to take difference to overcome this time trend and seasonal effect.

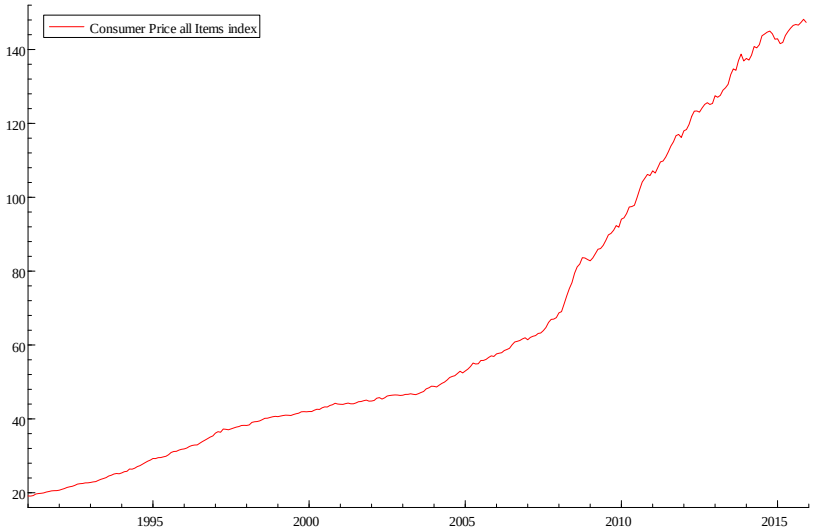


Figure 4 Consumer Price Index

Above figure 4 shows that consumer price index in Pakistan has smoothly increasing trend over the period it has not good enough time trended but mean and variance

are time variants. Based on this pattern it is difficult to estimate because it is not identically independent normally distribute with mean and constant variance i.e.$ii{\sim}ND(0,\sigma)$.

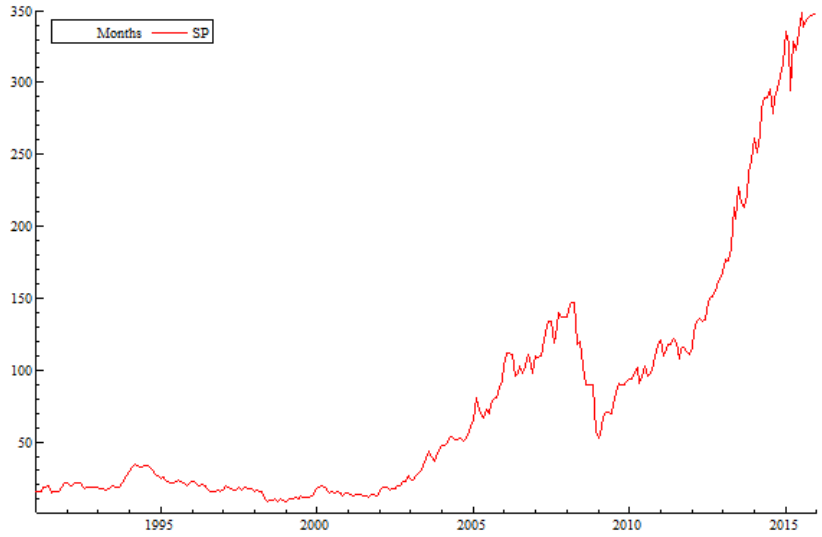


Figure 5 Share Prices

From the above figure 5 we can see that mean and variance of share price in Pakistan are somehow constant over the period 1991-1 to 2004. But after this time its mean and variance are not constant means it is not $ii{\sim}ND(0,\sigma)$ and it also shows increasing trend after 2010. So, stationary is need for estimation of this variable.

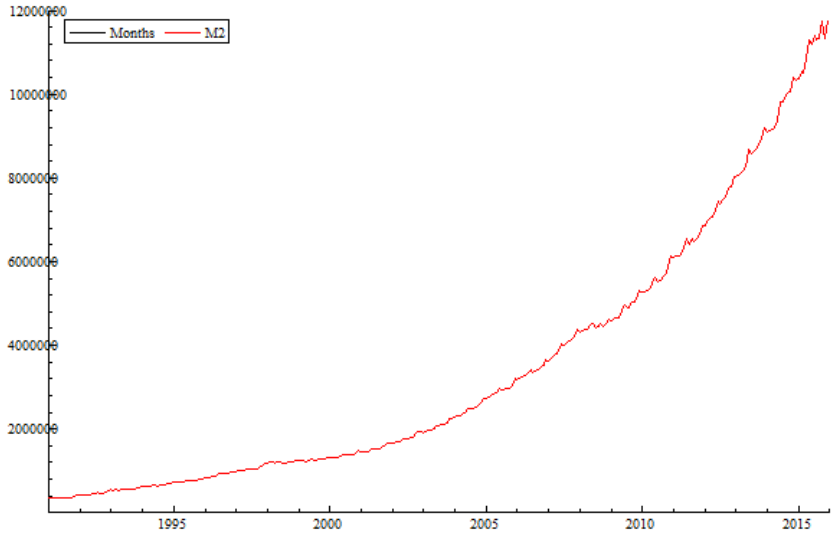


Figure 6 Money Supply

From the above figure 6 we can show that money supply has increasing trend over the period 1991 to 2015. The variance and mean also increasing with respect to time. In such a case, we cannot estimate empirically without converting it into first or second difference. The pattern of these variables shows not independently identically distributed with zero mean and constant variance$ii \sim ND(0, \sigma)$.

As from all above figure we found that all variables are need 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.

CHAPTER 5

RESULTS AND DISCUSSION

5.1: Overview of Chapter

This chapter reports the empirical results of the data under the framework of SVAR methodology. This chapter uses following variables for the estimation of SAR model. Share Prices (SP), Industrial Manufacturing production index as a measure of GDP, Exchange rate (EX), Interest rate (IR) Money supply (M2) and Consumer Price Index. All variables have transformed into natural logarithm. As 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 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 SVAR model.

5.2: Beaulieu and Miron Monthly Unit Root Test

Most of the time series data have 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, two different methods are used in literature.

5.2.1: Beaulieu and Miron (1992) Monthly Seasonal Unit Root Test

Table 3:Results of Seasonal Unit Root Test Using Beaulieu and Miron approach

Hypothesis	SP	M2	IR	IP	EX	CPI	ΔSP	ΔM2	ΔIR	ΔIP	ΔEX	ΔCPI
$t:\pi_1=0$	-2.02	-2.76	-1.84	-0.48	-1.93	-0.60	-4.31**	-3.84**	-6.20**	-7.21**	-4.10**	-3.14**
	(-3.19)	(-3.19)	(-2.76)	(-2.76)	(-2.79)	(-2.76)	(-1.91)	(-2.76)	(-2.76)	(-2.76)	(-2.79)	(-2.76)
$t:\pi_2=0$	-4.96**	-5.68**	-5.79**	-5.66*	-4.83**	-5.34**	-4.70**	-4.53**	-5.27**	-4.58**	-3.92**	-5.46**
	(-2.76)	(-2.76)	(-2.76)	(-2.76)	(-1.88)	(-2.76)	(-1.88)	(-2.76)	(-2.76)	(-2.76)	(-1.88)	(-2.76)
$F:\pi_3=\pi_4=0$	24.94**	30.27**	26.81**	17.83**	21.86**	22.58**	22.42**	16.32**	26.07**	14.16**	15.88**	31.14**
	(6.24)	(6.24)	(6.27)	(6.27)	(3.03)	(6.27)	3.05	(6.27)	(6.27)	(6.27)	(3.05)	(6.27)
$F:\pi_5=\pi_6=0$	34.74**	34.86**	17.91**	18.44**	35.17**	39.98**	24.27**	21.69**	15.28**	15.11**	22.9**	22.89**
	(6.26)	(6.26)	(6.28)	(6.28)	(2.99)	(6.28)	(3.01)	(6.28)	(6.28)	(6.28)	(2.99)	(6.28)
$F:\pi_7=\pi_8=0$	26.22**	33.24**	23.53**	31.96**	25.09**	47.47**	21.75**	22.26**	21.72	17.11**	17.62**	38.40**
	(6.18)	(6.18)	(6.21)	(6.21)	(3.02)	(6.21)	(3.05)	(6.21)	(6.21)	(6.21)	(3.02)	(6.21)
$F:\pi_9=\pi_{10}=0$	30.91**	25.03**	45.74**	47.27**	48.16**	33.88**	22.43**	13.15**	36.23**	22.53**	33.73**	27.42
	(6.24)	(6.24)	(6.22)	(6.22)	(3.04)	(6.22)**	(3.06)	(6.22)	(6.22)	(6.22)	(3.04)	(6.22)
$F:\pi_{11}=\pi_{12}=0$	42.55**	33.19**	22.43**	11.27**	14.78**	17.15**	28.16**	18.23**	20.46**	10.14**	10.69**	32.10**
	(6.24)	(6.24)	(6.21)	(6.21)	(3.06)	(6.21)	(3.09)	(6.21)	(6.21)	(6.21)	(3.06)	(6.21)
Auxiliary Regression	C, D, T	C, D, T	C, NT, D	C, NT, D	C, NT, ND	C, NT, D	NC,NT ND	C,D,NT	C,D,NT	C,D,NT	C,ND, NT	C,D, NT

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

Table-3 shows the results of the Beaulieu and Miron seasonal unit root test both at level and at first difference. We consider 5 percent significance level using Frances and Hobijin (1997) critical values for detection of seasonal unit root. The results show that at level the calculated values of the t-statistics of π_1 are -2.02 for Share prices, -2.76 for money supply, -1.84 interest rate, -0.48 for industrial production, -1.93 for exchange rate and -0.60 for consumer price index. These calculated values at zero frequency unit root are greater than their critical values, so null hypothesis cannot be rejected which implies the presence of unit root at zero frequency i.e. series of SP, M2, IR, IP, EX and CPI rates are non-stationary at level. Therefore, we have transformed the variables by using first difference filter at zero frequency that is $(1-B)y_t = y_t - y_{t-1}$. After transforming, the calculated values of t-statistics for all variables π_1 and π_2 are less than their critical values for all variables. 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, SP, M2, IR, IP, EX and CPI are all become stationary at first difference. These calculated values are less than the critical value at 5% significance level, which implies that all variables contains no unit root at zero frequency. Also the calculated values of π_2 for all variables are less than their critical value and the F-statistics values are greater than their critical values which leads to the conclusion that all variables contains no unit root at First difference.

5.3: 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 Table 4.

Table 4 Lags Selection Criteria

Lag	Log-L	LR	FPE	AIC	SC	HQ
0	3021.348	NA	4.03e-17	-20.72404	-20.64830*	-20.69370
1	3098.491	150.5752	3.03e-17	-21.00681	-20.47664	-20.79442*
2	3147.197	93.06067	2.78e-17	-21.09414	-20.10954	-20.69970
3	3177.441	56.53844	2.90e-17	-21.05458	-19.61555	-20.47810
4	3217.811	73.80323	2.81e-17	-21.08461	-19.19115	-20.32608
5	3258.085	71.96736	2.74e-17	-21.11399	-18.76609	-20.17341
6	3316.528	102.0240	2.36e-17	-21.26823	-18.46591	-20.14561
7	3349.680	56.50647	2.41e-17	-21.24866	-17.99190	-19.94399
8	3393.822	73.41749*	2.30e-17*	-21.30462*	-17.59342	-19.81790

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

By applying least square method from the above Table 5 we showed that three criteria's suggesting us to select 8 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 8 lags, but the model is selected because of minimum value of AIC.

5.4: Estimation of VAR Model.

We made all variables stationary as accordance with their order of integration to estimate VAR model. The optimum lag which has been suggested by AIC and LR is 8 here also there is no autocorrelation in the model. We have estimated VAR model with 8 lags and the interpretation of VAR model and its diagnostic testing of residuals are given below.

5.5: Diagnostic Tests on VAR Model

We used diagnostic tests to detect the residuals normality for the estimation of VAR model, it including VAR residuals Serial correlation LM Test and Jarque-Bera test.

5.5.1: VAR Residuals Normality Test

For the testing of normality of the residuals we used following two tests. First serial correlation LM test and Jarque-Bera normality test and results are presented in below Tables 6 and complete information about residuals normality is mentioned in chapter 4.

Table 5 VAR Residuals Serial correlation LM Test

Lags	LM-Stat	Prob
1	22.94548	0.9551
2	64.87755	0.0322
3	52.77046	0.0352
4	43.88901	0.1719
5	58.21436	0.7130
6	45.36473	0.1354
7	47.60532	0.0934
8	52.20466	0.0395
Probs from chi-square with 36 df.		

Above Table 6 shows taht 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.

Table 6 VAR Jarque-Bera Normality Test

Component	Jarque-Bera	Df	Prob.
1	6.1514	2	0.0643
2	3.5136	2	0.1345
3	5.83313	2	0.0641
4	0.189666	2	0.9095
5	4.904277	2	0.1192
6	1.804487	2	0.4057
Joint	22.39656	12	1.6973

In the above Table 7 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.

5.6: Impulse Response Function.

The Impulse response function refers to the systematic and dynamic response of any variable in reaction due to some change in external variable or shock. In addition, impulse response function make us enable to understand the effect of external shock or giving one standard deviation shock to any one variable on remaining variables for being time that how these remaining variables are responding from this external shock. In this section we present impulse response function on the basis of choleskey decomposition. The blue line within two red line represents estimate of response from share prices to other remaining variables. As according to our objectives we want to see by giving one standard deviation shock to share prices and its response on remaining variables over the time.

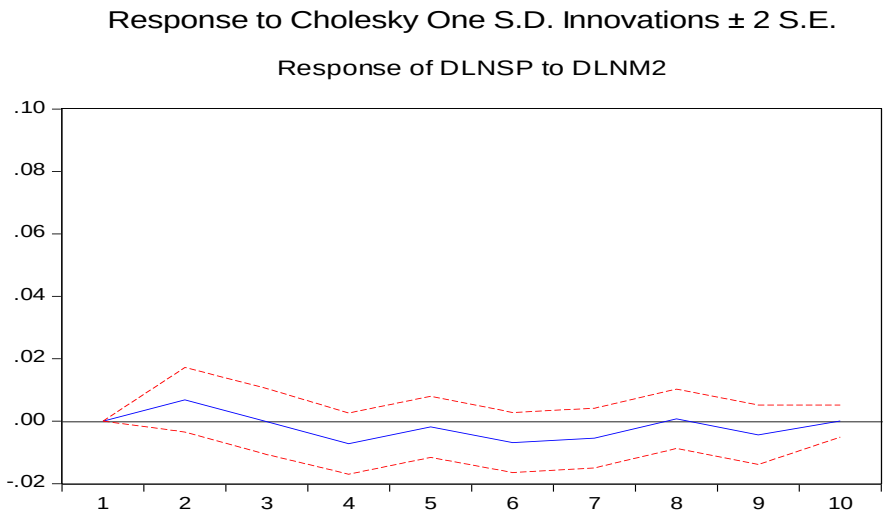


Figure 7 Shock of Share prices into Money supply

Figure 7 shows that responses of money supply as from shock of the share prices is positive in first year. After 3rd year it responses negatively till 8th year and then it becomes stable for a short period but again it responses negatively.

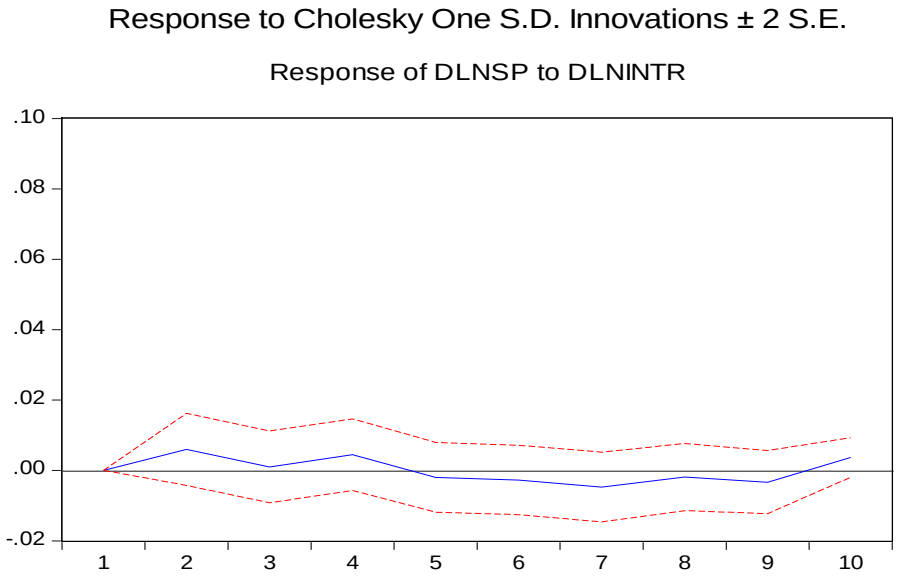


Figure 8 Shock of Share prices into Interest Rate

Figure 8 show that interest rate response from share prices shock is positive initially from 1st to 5th year after that it responding negatively till 9th year and once again response positively after 10th year.

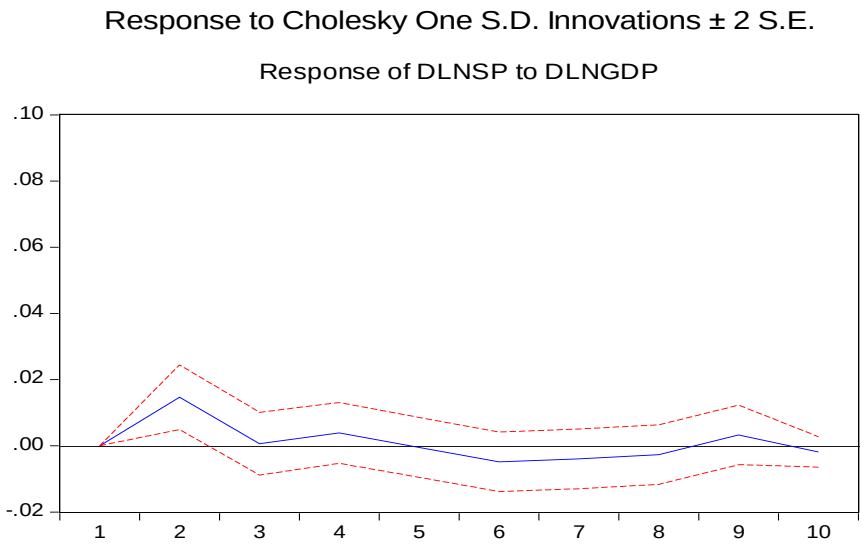


Figure 9 Shock of Share prices into industrial Manufacturing Production index

Figure 9 show the response industrial manufacturing index as one standard deviation shock in share prices. It response positively in first year till 4th year after that for the long time it responding negatively. Furthermore, it has positive response after 8th year but once again it tend to be negative after 9th year.

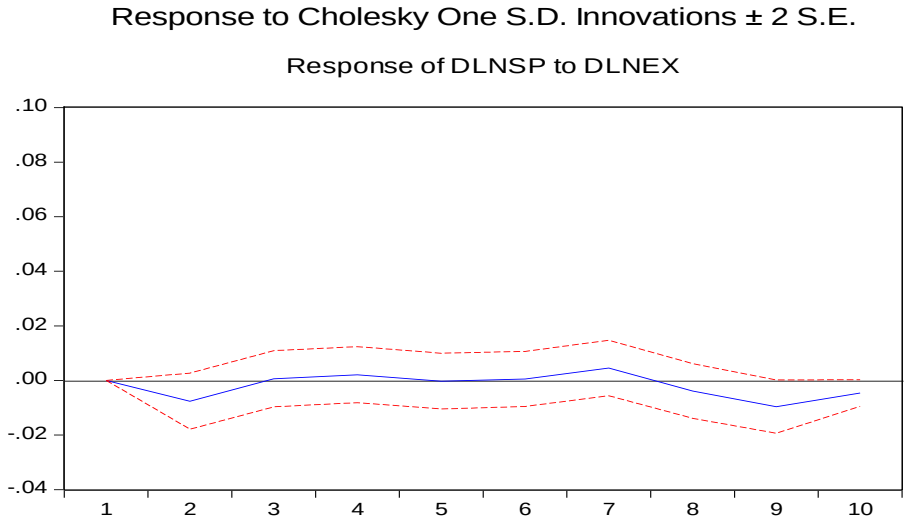


Figure 10 Shock of Share prices into Exchange Rate

As from Figure 10 we can show that one standard deviation shock in share price and response of exchange rate is negative from first to 3rd year. After that it is stable till 6th year but after 7th year it responding negatively.

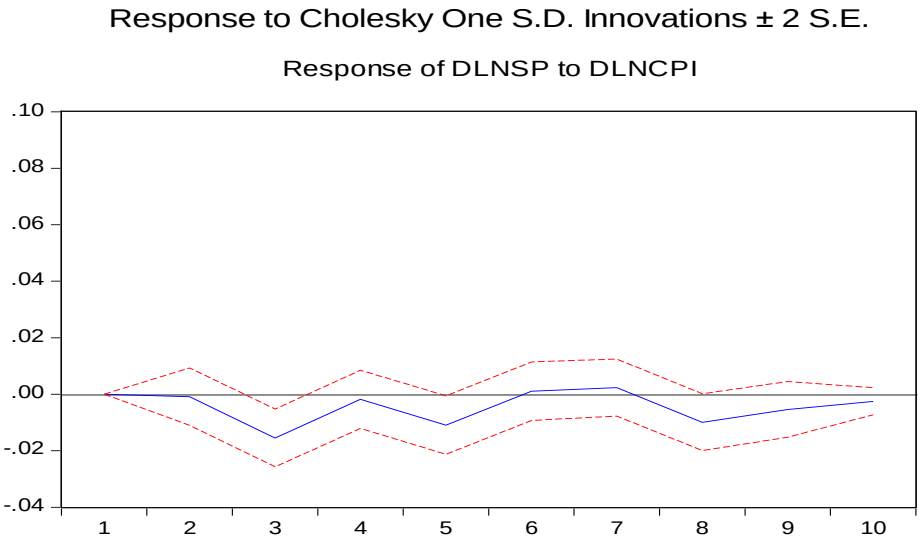


Figure 11 Shock of Share prices into Consumer Price Index

The response of consumer price index due to shock in share prices is reported in Figure 12 that show CPI responding negative initially from 1st year to 6th year for a long time, but it is positive and stable for short time say for one year. After that it once again responding negatively.

5.7: Variance Decomposition

Table 8 shows the estimated results of variance decomposition. This test is used to report variances of selected variables are in more informative detail. The method of forecast error variance decomposition is also used to decide variability proportion of errors for the sacking to forecast variables at current time as well as in the long run. Because the variability proportion changes when structural shocks occur.

Table 7 Variance decomposition Test

Shock of share prices into Macro Variables					
Years	ΔM2	ΔIR	ΔGDP	ΔEX	ΔCPI
1	1.832271	2.302806	0.303599	0.963068	0.172939
2	1.731615	1.721254	0.289613	1.038368	0.412086
3	2.339107	1.800583	0.27416	1.073923	0.458792
4	3.178885	1.782903	0.82926	1.164789	0.425765
5	3.117088	2.585417	0.989348	2.124092	0.687112
6	3.126655	2.53019	1.11104	2.329633	1.129957
7	2.820007	2.462247	1.954652	2.405041	1.174503
8	2.909347	3.240776	2.761176	2.344649	1.236599
9	3.096029	3.784968	3.333333	2.306881	1.421785
10	3.065026	3.795405	3.237461	2.387119	1.429027

Above Table 8 shows the forecast error variance decomposition of money supply, interest rate, industrial production, exchange rate and consumer price index due to shock in share prices. Money supply is responding 1.83% in first the month and 3.06 % and in the 10^{th} year. Variance decomposition of Interest rate shows that in the first month 2.3 % variation is explained by shock in share prices but it decreases in 2^{nd} month and after that, it tends to increase, so in the long run interest rate variation is reported by 3.795 % due to stock market shock. On the other hand, variance decomposition of GDP (industrial production) shows that shock in share prices explains GDP by 0.30 % in first month but in the long run, it explains by 3.2 %. In addition, variation in exchange rate has explained by 0.96 % by innovation in share prices but in the long run, it explains exchange rate by 2.3 %. Finally, variance decomposition of consumer price index has explained by share prices is 0.17 % in first month as well as 1.42 % in the long run. Hence, we concluded that interest rate is highly sensitive by share prices in Pakistan because shareholders initially look out

market interest rate, in this connection majority of variation occurred in interest rate as when shocks occur in share prices.

5.8: Estimation of Structural VAR Model

This study uses non-recursive approach to estimate the SVAR model by imposing theoretical restrictions on contemporaneous coefficient in the system, the imposition of restriction based on theories is given in chapter 4 of Non-Recursive method, and estimated coefficients are presented in Table 9.

Table 8 Estimated Coefficients when Matrix is theoretically restricted

	Coefficient	**S.Error**	**z-Statistic**	**Prob.**
α_{51}	-0.39396	0.00693	-56.8467	0.0000
α_{32}	-2.26629	0.007721	-293.526	0.0000
α_{52}	0.645429	0.004081	158.1578	0.0000
α_{13}	0.058214	0.077717	0.749055	0.4538
α_{23}	-0.38325	0.003586	-106.859	0.0000
α_{53}	-0.27573	0.033576	-8.21227	0.0000
α_{24}	-0.02444	0.008192	-2.98329	0.0029
α_{54}	-0.6847	0.005588	-122.532	0.0000
α_{64}	-0.57092	0.002718	-210.086	0.0000
α_{15}	-2.40781	0.009776	-246.295	0.0000
α_{35}	0.102095	0.008958	11.3972	0.0000
α_{65}	0.047707	0.001246	38.29167	0.0000
α_{16}	-0.11427	0.172147	-0.6638	0.5068
α_{46}	-1.76801	0.00615	-287.479	0.0000
α_{56}	1.317896	0.067768	19.44726	0.0000

In the above Table 9 α_{51} is coefficient of share prices in exchange rate equation, which is significant statistically. Negative coefficients show that shock to share prices appreciate currency as exchange rate one unit of foreign in terms of local currency. On the other hand, as we can say that boom in stock market effects the decisions of monetary

policy makers, because stock market has positive impact on aggregate money demand and this tendency also increases money supply that leads to depreciate domestic currency. Which is also reported by (Dimitrova 2005). α_{32} is coefficient of money supply in interest rate equation. The coefficient of money supply is negative but significant statistically, which confirms the theory of liquidity frame. It also shows that if money supply increases it leads to decrease interest rate in the short run because Income, prices and prices expectation effects are not much strong in the short run so policy makers should maintain short run interest rate by maintaining money supply. These results are also reported by (Yunana, Chenbap et al. 2014). In addition, α_{52} is coefficient of money supply in exchange rate equation, which is significant and positive means that an increase in money supply depreciates domestic currency and we must pay higher exchange rate in currency exchange Market.

As $\alpha_{13}$is coefficient of interest rate in share prices equation, which is positive but insignificant means that as interest rate increases. it will lead to increase cost of shares in stock market so share prices will automatically increase. On the other hand theoretically both relationship is inverse because as interest rate goes up performance of stock market goes down this is also backed by (Alam and Uddin 2009).

α_{23} is coefficient of interest rate in money supply equation which is significant but show inverse relationship between interest rate and money supply as interest rate increases it will decrease money supply because higher interest rate leads to less availability of funds for investment in such a case money supply falls. α_{53} is coefficient of interest rate in exchange rate equation which is negative and significant statistically because when depreciation of currency is from expansionary then it can be negative so this result also

supports the findings of (Sánchez 2008). Furthermore α_{24} is coefficient of industrial production in money supply equation is negative and significant. α_{54} Is coefficient of industrial production in exchange rate equation, which is also negative, means that an increase in industrial production leads to decrease exchange rate. α_{64} Is coefficient of industrial production in consumer price index, which is statistically significant this explores that an increase in industrial production decreases consumer price index because of more goods availability. α_{15} Is coefficient of exchange rate in share price equation, which is also significant but negative. According to the portfolio approach mostly individual investors holding currencies of foreign, as well as domestic in their own portfolio. Moreover, we know that for the balance of demand, supply of assets, exchange rates play a vital role, and apart from this individual's demand for domestic assets increases when stock prices increase in such a case domestic investors are starting to sell foreign assets this action leads to appreciate domestic currency. Hence this appreciation of currency also leads to decrease exchange rate so this relationship exist negative see (Muhammad, Rasheed et al. 2002).

As α_{35} is coefficient of exchange rate in interest rate equation which is positive and significant because this is the case of contractionary depreciation means that sometime output cost associated with depreciation of currency. because if uncertainty occurs in exchange rate it leads to reduce investment and increasing addition cost of production and decrease investment rate and this decline is also a function of increased interest rate, in this connection this relationship exists positive and significant. α_{65} is coefficient of exchange rate in consumer price index equation which is positive and statistically significant this relationship can be understand when in 2006-7 exports of Pakistan were decreased. In

addition, this reduction in exports led to increase imports and currency became depreciated in the country, this overall caused to increase CPI in Pakistan see this relationship by (Thaddeus and Anyaogu, 2014). In addition, α_{16} is coefficient of consumer price index in share prices equation, which is negative and insignificant because in stock market investor's expected value of stock is based on their future real earning? In such a case if inflation raises it makes the value of stock decrease. α_{46} Is coefficient of consumer price index in industrial production equation, which is negative and significant as it indicates if CPI increases it decreases goods and services demand this process leads to decrease production capacity. α_{56} is coefficient of consumer price index in exchange rate equation which is positive and statistically significant, shows that as price increase causing deprecation of domestic currency because demand for domestic currency falls and value of money, hence exchange rate tend to be increase.

Table 9 Estimated Coefficients Matrix when Share Prices are not restricted

	Coefficient	**Std. Error**	**z-Statistic**	**Prob.**
α_{21}	0.065312	0.085461	0.764231	0.4447
α_{31}	-0.96187	0.150124	-6.40714	0.000
α_{41}	0.043441	0.155535	0.279299	0.7853
α_{51}	-0.98593	0.429587	-2.29506	0.0217
α_{61}	0.030829	0.109687	0.281065	0.7787

In the above Table 10 we have estimated the coefficients of share prices to macroeconomic variables like industrial production, exchange rate, interest rate, consumer price index and money supply to determine whether shock of share prices into macroeconomic variables are significant or not. In such a case α_{21} is coefficient of share prices in money supply equation and it is positive but insignificant means that it increases money supply. On the other hand stock market responses are more better when money supply increases see

(Maskay 2007). Moreover, according to real activity economists if share prices are increasing, is the result of higher cash flows in the economy and higher cash flows are possible when there are higher economic activities. And further economic activities is the result of increase in money demand and finally the increment in money demand is the function of increment in money supply so the channel is positive from share prices to money supply (Talla 2013).

α_{31} is coefficient of share prices in interest rate equation which is significant but negative meaning that transmission mechanism from share prices to interest rate is significant in Pakistan. However, its negative relationship is concern if shock comes from share prices and share prices goes down then this will lead to switch investors towards Banks and the same time if Banks increases interest to their depositors. As we know theoretically if investment increase, it will also decrease the rate interest. On the other hand, decrease in interest rate will also lead to decrease lending interest rate, which further increases investment in the economy by increasing demand of shares and decreasing prices of shares. While there is also possibility of above channel vice-versa as if banks are paying good interest for their depositors, they will switch from stock market to Banks. Resulting decrease in investment in stock market and lead to decrease aggregate demand for shares and share prices. Finally, if there is permanent increment in interest rate by Banks to their depositors will also increase lending interest rate and this will further decrease investment. in such a case the negative relationship can exist between share prices to interest rate (Alam and Uddin 2009). α_{41} Is coefficient of share prices in industrial production equation is positive but insignificant means shock of share price into industrial production is insignificant. On the other hand, share price is leading indicator of economic growth as

positive shock of share prices leads to increase industrial production. According to Discounted Cash Flow Model share prices impact cost of capital, which has captured by Tobin's Q coefficient (1969). Which is equal to the ratio of the market value of current capital to the cost of replacement capital.in this connection if share prices are increasing it leads to increase cost of replacement capital. Which further leads to increase investment and result to enhance production capacity in an economy. Aloof from this, permanent income hypothesis increment in share prices increases wealth holding of individuals and they are starting to increase their consumption smoothly to maximize their utility, it changes the patterns of consumption in an economy resulting in increment in the ratio of investment and production level. α_{51} Is coefficient of share prices in exchange rate equation that shows negative and significant relationship and this means that shock of share price is transmitting into exchange rate. There is no theoretical consensus between the relationship between share prices and exchange rate either, on the other hand portfolio Balance Model of determination of exchange rate captured the negative association, which runs from share prices to exchange rate. This model postulates that in portfolios individuals keeping domestic as well as foreign assets including their currencies. Now if the share price of domestic increases it leads to more demand of domestic assets by individuals, to purchase domestic assets domestic investors starting to sell foreign asset this causes to appreciate domestic currency. "But most importantly the currency appreciation means, it defines exchange rate as a price of one-unit foreign currency in domestic currency terms. This means that decrease in exchange rate. hence, we can say that share prices have negative relationship with exchange rate and this increased prices of share leads to increase wealth of investors and it also raises money demand of investors, thus domestic interest

rate will be increase. In such a case, once again appreciate domestic currency which, has been also reported by (Muhammad, 2002). Finally, α_{61} is coefficient of share prices in consumer price index equation is positive and insignificant, meaning that as share price's shock does not transmits into CPI but it has positive impact as share prices increases consumer price index also increases. There is possibility of both positive and negative relationship between share prices and consumer price index. Positive relationship runs from share prices to CPI as if firms are net debtors in stock market then their equity value will also be increase. Therefore, this will lead to increase expected inflation. On the other hand, according to Fama, (1981) high inflations predict downturns of economies over the time. Based on this tendency in an economy firms are starting to sell their stock by increasing supply of stock, result will be decrease in share prices.

CHAPTER 6

CONCLUSION AND RECOMMENDATION

6.1: An Overview of Chapter

This part concludes the important findings of research questions and objectives of the study entitled *impact of stock market shocks on macroeconomic variables of Pakistan by using SVAR methodology.* The sample size for this study have taken from Month of 1991.1 to 2015.12. The selection of this period based on most volatility of stock market and many stock markets' vicissitudes during this period. In addition, we have selected macroeconomic variables based on their theoretical as well as empirical importance and we have tried to determine the impact of stock market shocks on macroeconomic variables, in the context of Pakistan on which variables this shock transmit more. More importantly, we have taken share price as stock market shocks.

6.2: Conclusion

The importance of this study authenticate is the shock of stock market into macroeconomic variables that how stock market changes affect macroeconomic variables. We have applied SVAR methodology to capture those dynamics into macroeconomic variables. To find the shock of stock market into macroeconomic variables detailed introduction, its significance as well as its objectives are given in chapter one for better understanding and its importance for macro-economy of Pakistan and how this transmission mechanism happens also mentioned in same chapter. To understand stock market shocks, we have mentioned detailed information about history and overview of

stock market, its performances and relation with macroeconomic variables of Pakistan in chapter two. After reviewing most relevant studies, we have found that historically Pakistani stock market has faced many ups and down. These ups and downs have occurred due to country's instability, natural disasters, law and order and other many issues related to economy and stock market. In this connection, we have tried to detect the impact of these ups and downs of stock market in Pakistan that how our macro-economy receiving these actions from stock market. In such a case, we have followed by many theories on interest rate, exchange rate, Consumer price index, money supply and industrial production including Dividend Discount model (DDM), Arbitrage Pricing Theory (APT), Discounted Cash Flow Model (DCM), Portfolio Balance Model of Exchange Rate Determination as well as some common theories and channels to link share price to macroeconomic variables in Pakistan. We have done brief and relevant literature review to understand the transmission mechanism of stock market and macroeconomic variables. Moreover, to detect research gap which is mentioned in chapter three that tell us there have been done large studies to determine shocks of macroeconomic variable to stock market .so this has made us enable to study stock market shocks into macroeconomic variables for Pakistan.

The methodology based on our objectives to encounter empirical results, including procedure of study, collection of the data and its empirical estimation. In addition, we have applied econometric techniques to get required results and to test research hypothesis. Techniques including Monthly Unit root proposed by Beaulieu and Miron, (1992) Autocorrelation and normality of the residuals in the system, diagnostic testing of vector auto regressive (VAR) model, impulse response function, variance decomposition and Finally SVAR to capture the impact of stock market shocks.

The results of auto-correlation show that all variables have problem of autocorrelation at their level. So, we have taken first differences of all variables to remove autocorrelation from model and we found that there is no autocorrelation at first differences. To test unit root we followed (Beaulieu and Miron, 1992) for seasonal unit root and we included seasonal dummies and trend to capture seasonal unit root at zero frequency, the results of unit root showed that unit root exist at level because the calculated values are greater than their critical values results have presented in Table: 3. To overcome this problem we took first differences of all variables and we found that there is no unit roots at zero frequency at first difference because calculated values are less than their critical values and results are presented in same Table. Next we moved towards Lags length criteria of Likelihood ration (LR) and Alike Information criteria, these suggested us to take 8 lags for the model because of minimum value of AIC and Maximum value of LR at 8 lags for the VAR model, so we estimated the results with 8 lags because of no existence of the autocorrelation, heteroskedasticity. We also reported the results of VAR model's diagnostic testing by using both serial correlation LM and Jarque-Bera tests we found that residuals are normally distributed as it shown from there probability values which are greater than 0.05. In such a case, we could not reject the null hypothesis (Ho: residuals are normally distributed). Our impulse response function showed that money supply is responding positive as innovation occurs from share prices. In addition, response of interest rate is also positive initially but negative after some months. On the other hand, industrial production responding positive at first month but after that it responding negative and then positive over the time. The response of exchange rate is negative initially but it becomes stable for long time. Finally, the response of consumer price index is also negative as a

shock comes from share prices, for long time it responding negatively. Our variance decomposition results reported forecast error variance decomposition of money supply, interest rate, industrial production, exchange rate and consumer price index when shock occurs in share prices and this showed that shock of share prices effecting interest rate highly than other macroeconomic variables in the short run as well as in the long-run in Pakistan. The second variables which is mostly effecting from shock in share prices is money supply in the short run but its long run effect is not much more. Thirdly, Variance decomposition of industrial manufacturing production index shows that it is not much more explained by shock in share prices in the short run but huge variation occurs in the long run. Furthermore, exchange rate variation is also high in the short run as well as in the long run. Finally, consumer price index is not much more explained by shock of share prices because variation is small in the short run and in the long run. Therefore, it is concluded that in Pakistan the shock of share prices is transmitting highly in the interest rate.

By using SVAR methodology we found that share prices shock in money supply is positive but insignificant meaning that shock does not transmits into money supply but when it increases money supply also increases. On the other hand, share prices shock to interest rate is significant but negative meaning that shock of share price transmitting and both have inverse relationship. Meanwhile share price's shock to industrial production is positive but shock does not transmit into industrial production. Share price being a leading indicator of economic growth leads to increase industrial production.

We also found that share price's shock in exchange rate is negative and significant means shock of share price transmits into exchange rate. Because due to increase in share prices, domestic investors are selling foreign currencies and assets and this process makes

domestic currency to appreciate and tend to decrease exchange rate of one unit foreign currency in terms of domestic currency. We found that shock of share prices does not transmit into consumer price index and we showed that as share prices increases consumer price index also increases. We cannot reject our study hypothesis that share prices have significantly impact on macroeconomic variable. Finally, interest rate is the variable which showed high variation in short run as well as in the long run in Pakistan from shocks of share prices.

6.3: Recommendations

Our empirical results showed that there is strong interrelationship between stock market and macroeconomic variables. But if we look towards our economy, it does not ultimately improve which supports to improve stock market activities in the country. Because law and order situations, corruptions, mismanagement of economic policies and so many other factors which make investors to restrict from invest in the stock market. The role of stock market, most importantly financial markets are crucial in the growth and development of an economy because these markets make resources available to the process of investment and also increasing the ratio of saving to channelize them into productive investment. On the basis of above arguments and empirical findings of our study we put some policy recommendations which are as follow.

- In our findings shock of share prices affecting interest rate mostly other than macroeconomic variables. In such a case, monetary authorities should have better hedging policies towards interest rates against share prices. Therefore, if interest rate will be control in

Pakistan it will be great benefit for stock market of Pakistan in two ways. (i) more investors in share market through demand pull way and (ii) extensional investment of companies through supply push way.

- By appreciating domestic currency and increasing money supply, government should increase price of those goods which are demanded by foreigners or trading with foreign countries. This will lead to appreciate currency as exchange rate of foreign currency in terms of domestic currency.
- Inflation is one of the major problems in Pakistan as from many decades, it has increasing trend over the time and it makes domestic currency to depreciate. So, government should try to control inflation through which money supply will be control and currency will tend to appreciates and it is better for enhancement of stock market activities.
- Correct information about any change of decision by authority of stock market must be available to the investors of shareholders.
- Since, our findings and previous related studies, it is suggested to the investors of stock market that they should have complete knowledge about the patterns of macroeconomic variables especially they should set an expected exchange rate on which they can maximize their profits.

- When tendency of foreign investment in domestic stock market increases, this process leads to increase loaning of domestic currency and charging high interest rates in this connection domestic investors cannot invest due to high interest rate so authorities should focus domestic investors as well to promote domestic investment in stock market.

REFERENCES

Abdullah, D. A. and S. C. Hayworth (1993). "Macroeconometrics of stock price fluctuations." Quarterly Journal of Business and Economics: 50-67.

Ahmed, M. F. (1999). "stock market, macroeconomic variables, and causality: the bangladesh case/bourse des valeurs, variables macroéconomiques et causalité: le cas du bangladesh."Savings and Development: 109-130.

Alam, M. M. and M. G. S. Uddin (2009). "Relationship between interest rate and stock price: empirical evidence from developed and developing countries." International journal of business and management **4**(3): 43.

Amarasinghe, A. (2015). "Dynamic Relationship between Interest Rate and Stock Price: Empirical Evidence from Colombo Stock Exchange." International Journal of Business and Social Science **6**(4).

Arnold, I. J. and E. B. Vrugt (2006). "Stock market volatility and macroeconomic uncertainty: Evidence from survey data." Available at SSRN 896720.

Asteriou, D. and S. G. Hall (2007). Applied econometrics: A modern approach using eviews and microfit revised edition, Palgrave Macmillan.

Bacchiocchi, E. and L. Fanelli (2015). "Identification in Structural Vector Autoregressive models with structural changes, with an application to US monetary policy." Oxford Bulletin of Economics and Statistics 77(6): 761-779.

Bailey, K. (2001). "Macroeconomic Fluctuations, Economic Policy and the Jamaican Stock Market (1991-1999)." Social and Economic Studies: 173-207.

Basnet, H. C. and K. P. Upadhyaya (2015). "Impact of oil price shocks on output, inflation and the real exchange rate: evidence from selected ASEAN countries." Applied Economics 47(29): 3078-3091.

Bhuiyan, R. (2008). Monetary transmission mechanism in a small open economy: a Bayesian structural VAR approach, Queen's Economics Department Working Paper.

Chinzara, Z. (2010). "Macroeconomic uncertainty and emerging market stock market volatility: The case for South Africa." Economic Research Southern Africa.

Dimitrova, D. (2005). "The relationship between exchange rates and stock prices: Studied in a multivariate model." Issues in Political Economy **14**(1): 3-9

Eun, C. S. and S. Shim (1989). "International transmission of stock market movements." Journal of financial and quantitative Analysis 24(02): 241-256.

Evans, C. L. and D. A. Marshall (2009). "Fundamental economic shocks and the macroeconomy." Journal of Money, Credit and Banking 41(8): 1515-1555.

Farooq, M. T., et al. (2004). "Linkage between Stock Market Prices and Exchange Rate: A Causality Analysis for Pakistan [with Comments]." The Pakistan Development Review: 639-649.

Fry, R., et al. (2008). "The role of portfolio shocks in a structural vector autoregressive model of the Australian economy*." Economic Record 84(264): 17-33.

Gallagher, L. A. and M. P. Taylor (2002). "Permanent and temporary components of stock prices: Evidence from assessing macroeconomic shocks." Southern Economic Journal: 345-362.

Gallegati, M. (2005). "A wavelet analysis of MENA stock markets." Department of economics.

Greenwald, D. L., et al. (2014). Origins of stock market fluctuations, National Bureau of Economic Research.

Gunasekarage, A., et al. (2004). "Macroeconomic influence on the stock market: evidence from an emerging market in South Asia." Journal of Emerging Market Finance **3**(3): 285-304.

Haroon, M. A. and H. Jabeen (2013). "Impact of Macro-economic Variables on Share Price Behavior of Karachi Stock Exchange." Pakistan Journal of Commerce and Social Sciences **7**(3): 493-504

Hatipoglu, M., et al. (2014). "The Impact of Fundamental Shocks on Stock Prices: Evidence from Turkey." Research in Applied Economics 6(1): 61.

Ibrahim, M. H. (2000). "Cointegration and Granger causality tests of stock price and exchange rate interactions in Malaysia." ASEAN Economic Bulletin: 36-47.

Ibrahim, M. H. (2001). "Monetary shocks and stock returns in an emerging market: a VAR analysis."Savings and Development: 439-456.

Javid, A. Y. (2007). Stock market reaction to catastrophic shock: Evidence from listed Pakistani firms.

Khalid, M., et al. (2012). "Long-run relationship of macroeconomic variables and stock returns: evidence from Karachi stock exchange (KSE) 100 index." The Journal of Commerce **4**(3): 45-59.

Khan, M. A. and A. Ahmed (2011). "Macroeconomic effects of global food and oil price shocks to the Pakistan economy: a structural vector autoregressive (SVAR) analysis." The Pakistan Development Review: 491-511.

Liljeblom, E. and M. Stenius (1997). "Macroeconomic volatility and stock market volatility: empirical evidence on Finnish data." Applied financial economics **7**(4): 419-426.

Lütkepohl, H. and A. Velinov (2014). "structural vector autoregressions: checking identifying long-run restrictions via heteroskedasticity." Journal of Economic Surveys.

Maskay, B. (2007). "Analyzing the effect of change in Money supply on stock prices." The park place economist **15**(1): 72-79.

Muhammad, N., et al. (2002). "Stock Prices and Exchange Rates: Are they Related? Evidence from South Asian Countries [with Comments]." The Pakistan Development Review: 535-550.

Muradoglu, G., et al. (2000). "Causality between stock returns and macroeconomic variables in emerging markets." Russian & East European Finance and Trade 36(6): 33-53.

Nasir, M. and W. S. Malik (2011). "Structural Decomposition of Exchange Rate Shocks in Pakistan: An Empirical Investigation using SVAR Methodology." Transition Studies Review 18(1): 124-138.

Pindyck, R. S. and J. J. Rotemberg (1993). "The comovement of stock prices." The Quarterly Journal of Economics: 1073-1104.

Qayyum, A. and A. R. Kemal (2006). "Volatility spillover between the stock market and the foreign exchange market in Pakistan."Rahim, R. A., et al. (2008). "International transmission of stock market movement: evidence from the Islamic Equity Markets." Jurnal Pengurusan 27: 49-68.

Ramey, V. A. (2015). "Macroeconomic shocks and their propagation." Handbook of Macroeconomics, forthcoming.

Rashid, A. (2008). "Macroeconomic variables and stock market performance: Testing for dynamic linkages with a known structural break." Savings and Development: 77-102.

Romer, C. D. and D. H. Romer (2003). A new measure of monetary shocks: Derivation and implications, National Bureau of Economic Research.

Sadorsky, P. (1999). "Oil price shocks and stock market activity." Energy Economics **21**(5): 449-469.

Sánchez, M. (2008). "The link between interest rates and exchange rates: do contractionary depreciations make a difference?" International Economic Journal **22**(1): 43-61.

Sohail, N. and Z. Hussain (2009). "Long-run and short-run relationship between macroeconomic variables and stock prices in Pakistan: The case of Lahore Stock Exchange." Pakistan Economic and Social Review: 183-198.

Subrahmanyam, A. and S. Titman (2013). "Financial market shocks and the macroeconomy." Review of Financial Studies 26(11): 2687-2717.

Velinov, A. and W. Chen (2014). "Are there bubbles in stock prices? Testing for fundamental shocks."

Yunana, T. W., et al. (2014). "The Effect of Money Supply on Interest Rate in Nigeria." Online Journal of Social Sciences Research **3**(6): 146-152

Yunana, T. W., et al. (2014). "The Effect of Money Supply on Interest Rate in Nigeria." Online Journal of Social Sciences Research **3**(6): 146-152.

Yusof, R. M. and M. S. A. Majid (2007). "Macroeconomic variables and stock returns in Malaysia: An application of the ARDL bound testing approach." Savings and Development: 449-469.

Chakravarty, S. and A. Mitra (2013). "Stock prices and inflation: relationship revisited." World Journal of Modelling and Simulation **9**(3): 201-215.

Alam, M. M. and M. G. S. Uddin (2009). "Relationship between interest rate and stock price: empirical evidence from developed and developing countries." International journal of business and management **4**(3): 43.

Muhammad, N., et al. (2002). "Stock Prices and Exchange Rates: Are they Related? Evidence from South Asian Countries [with Comments]." The Pakistan Development Review: 535-550.

Duca, G. (2007). "The relationship between the stock market and the economy: experience from international financial markets." Bank of Valletta Review **36**(3): 1-12.

Keung, W. W. "Linkage between Stock Market Prices and Exchange Rate: A Causality Analysis for Pakistan."

Appendix: 1

$Y1_t$ = lncpi+ lncpi(-1)+ lncpi(-2)+lncpi(-3)+ lncpi(-4)+lncpi(-5)+lncpi(-6)+lncpi(-7)+lncpi(-8)+lncpi(-9)+lncpi(-10)+lncpi(-11)

$Y2_t$ = -(lncpi- lncpi(-1)+ lncpi(-2)-lncpi(-3)+ lncpi(-4)-lncpi(-5)+lncpi(-6)-lncpi(-7)+lncpi(-8)-lncpi(-9)+lncpi(-10)-lncpi(-11))

$Y3_t$ = -(lncpi(-1)-lncpi(-3)+lncpi(-5)-lncpi(-7)+lncpi(-9)-lncpi(-11))

$Y4_t$ = -(lncpi-lncpi(-2)+lncpi(-4)-lncpi(-6)+lncpi(-8)-lncpi(-10))

$Y5_t$ = -0.5*(lncpi+ lncpi(-1)-2*lncpi(-2)+lncpi(-3)+ lncpi(-4)-2*lncpi(-5)+lncpi(-6)+lncpi(-7)-2*lncpi(-8)+lncpi(-9)+lncpi(-10)-2*lncpi(-11))

$Y6_t$ = (sqrt(3)/2)*(lncpi- lncpi(-1)+lncpi(-3)- lncpi(-4)+lncpi(-6)-lncpi(-7)+lncpi(-9)-lncpi(-10))

$Y7_t$ = 0.5*(lncpi- lncpi(-1)-2*lncpi(-2)-lncpi(-3)+ lncpi(-4)+2*lncpi(-5)+lncpi(-6)-lncpi(-7)-2*lncpi(-8)-lncpi(-9)+lncpi(-10)+2*lncpi(-11))

$Y8_t$ =-(sqrt(3)/2)*(lncpi+lncpi(-1)-lncpi(-3)- lncpi(-4)+lncpi(-6)+lncpi(-7)-lncpi(-9)-lncpi(-10))

$Y9_t$ = - 0.5*(sqrt(3)*lncpi- lncpi(-1)+lncpi(-3)-sqrt(3)* lncpi(-4)+2*lncpi(-5)-sqrt(3)*lncpi(-6)+lncpi(-7)-lncpi(-9)+sqrt(3)*lncpi(-10)-2*lncpi(-11))

$Y10_t$ =0.5*(lncpi-sqrt(3)*lncpi(-1)+2*lncpi(-2)-sqrt(3)*lncpi(-3)+ lncpi(-4)-lncpi(-6)+sqrt(3)*lncpi(-7)-2*lncpi(-8)+sqrt(3)*lncpi(-9)-lncpi(-10))

$Y11_t$ = 0.5*(sqrt(3)*lncpi+ lncpi(-1)-lncpi(-3)-sqrt(3)*lncpi(-4)-2*lncpi(-5)-sqrt(3)*lncpi(-6)-lncpi(-7)+lncpi(-9)+sqrt(3)*lncpi(-10)+2*lncpi(-11))

$Y12_t$=-0.5*(lncpi+sqrt(3)*lncpi(-1)+2*lncpi(-2)+sqrt(3)*lncpi(-3)+lncpi(-4)-lncpi(-6)-sqrt(3)*lncpi(-7)-2*lncpi(-8)-sqrt(3)*lncpi(-9)-lncpi(-10))

$Y13_t$ =lncpi-lncpi(-12).