WHAT DETERMINE INFLATION? AN INVESTIGATION THROUGH STRUCTURAL EQUATION MODELING

By

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Registration No: PIDE2017FMPHILETS07

MPhil Econometrics

A Dissertation Submitted to the Pakistan Institute of Development Economics, Islamabad, in partial fulfillment of the requirements of the Degree of Master of Philosophy in Econometrics

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CERTIFICATE

This is to certify that this thesis entitled: **"What Determine Inflation? An Investigation Through Structural Equation Modeling"** submitted by Mr. Ijaz uddin is accepted in its present form by the Department of Economics and Econometrics, Pakistan Institute of Development Economics (PIDE), Islamabad as satisfying the requirements for partial fulfillment of the degree in **Master of Philosophy in Econometrics**.

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Dedicated

To my Beloved Parents and Wife.

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IJAZ UDDIN

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LIST OF ABBREVIATIONS

SEM	Structural Equation Modeling
ADF	Augmented Dickey-Fuller
JC	Johnson co-integration
ARDL	Autoregressive Distributed Lag
SVAR	Structural Vector Autoregressive
MTM	Monetary transmission mechanism
MS	Money supply
EXP	Exports
C	Consumption
LN	Loan
Y	Output
INF	inflation
WDI	world development indicator
IR	interest rate
PI	Price of imports
PE	Price of Export
Peq	Price of equity
IFS	International Financial Statistics
BD	Bank Deposits
I	Investment
IIP	Industrial inputs prices
ER	Exchange rate
FRED	Federal Reserve economic data
CEIC	Census and Economic Information Center
SBP	State bank of Pakistan

ABSTRACT

The present study is aimed to investigate ‘what determine Inflation? An Investigation through Structural Equation Modeling’ an empirical analysis from the economy of Pakistan. The empirical analysis has conducted by using the technique of Structural equation modeling (SEM) annual time series data is used for the periods from 1975 to 2017. Before estimation, the stationarity of the data is checked by the Augmented Dickey-Fuller (ADF) test. The ADF test finds that all the variables are stationary at first difference i.e. I (1), except inflation and investment. Before applying the SEM all the variables are transformed at difference except inflation and investment. Firstly unrestricted structural equation model (USEM) was estimated. The mostly coefficient of USEM has found to insignificant i.e. their probability value more than 50 percent. To remove the insignificant coefficient we are given these unnecessary coefficients the regression weight is zero for the purpose of getting significant results. Secondly, the restricted structural equation model (RSEM) is estimated. The estimated results reveal that; interest rate has a positive relation with exchange rate and industrial inputs prices, while negative relation with the price of equity and investment. Therefore the exchange rate, price of imports, price of exports and consumption have a positive relation with inflation while investment, loan, and output have a negative relationship with inflation. Finally the interest rate is not a significant determinant of inflation. Therefore the exchange rate and cost channel are responsible for the transmission mechanism of interest rate to inflation in Pakistan. To control inflation the policy of high-interest rate should be avoided.

Keywords: Output, interest rate, MTM, inflation, and Structural Equation Modeling

CHAPTER 1

INTRODUCTION

1.1 Background of the study

The major objective of the central bank of any country to control inflation and maintain the price stability. To achieve these objectives, the monetary authorities use the policy variables (interest rate and money supply etc.) to control inflation and maintain the price stability. As commented by (Svenson, 2000) the central bank looks at every other thing but mainly focused on inflation. The Central bank assumes that inflation can be controlled by adopting a tight monetary policy; therefore they are increasing interest rate to reduce inflation. Case et al., (2012) argued that the standard monetary theory assumes that increasing interest rate to reduce inflation by reducing aggregate demand in the economy. Many central banks are now using Taylor Rule to monitor the interest rate is the major policy variable suggested by this rule.

There are different opinions about how the interest rate affects inflation. The most famous is the so-called Monetary Transmission Mechanism (MTM). According to the demand channel of MTM decrease in money supply will increase the interest rate, therefore the aggregate demand will decrease and finally, the price level will decrease. Most literature worked on the relationship between the interest rate and inflation have focused on Demand-side MTM channel (Rehman & Malik, 2010; and Barth & Ramey, 2001).

However, there are several other channels to link the interest rate with the level of prices, which show that the rise in interest rate would raise the price level. E.g., cost channel states that the rise of interest rate will increase the cost of production, shifting up the aggregate supply curve. This will create a rise in the

general prices level. Many Researcher claims that the rise in interest rate leads to higher inflation; therefore impacts on the cost side of the economy. The monetary tightening will reduce the aggregate supply and further increase inflation. Therefore the indication that monetary tightening increased inflation many years back to 1923 when Gibson (1923) mentioned that the correlation between the inflation and interest rate is positive. Rehman (2013) observed that the rise in interest rate leads to higher inflation; therefore impacts on the cost side of the economy.

Monetary policy has different implications, by using interest rate as a policy tools. When increasing policy rate actually reducing prices that is called Demand channel of MTM is more dominant. Alternative when cost channel is more dominant then interest base policy is counterproductive.

The problem in that, there are many channels of MTM which can be categorized into demand side and supply side. Many researchers take one channel and make single equation, this leads to missing variable bias. Therefore there is need to take them simultaneously which can be done by (SEM) Structural equation modeling.

In previous literature on inflation, different techniques were designed for different economies, i.e. Developed, emerging and developing economies to test their inflation structure. Many researchers have undertaken this issue using various techniques like; Johnson co-integration (JC), Autoregressive Distributed Lag (ARDL), Vector Autoregressive (VAR), ARDL bound test, ARCH and GARCH etc. these result may be misleading due to missing variables. The present study is used to find out; what Determine inflation? An investigation through structural equation Modeling.

Structural equation modeling (SEM) is a multivariate statistical technique that is applied to explain the relationship among variables. It investigates the structural relationships expressed in a series of the equation, alike, the multiple regression analysis. This technique is the combination of regression analysis and factor analysis, and it is used to estimate the structural relationship among dependent variables and explanatory variables. The advantage of SEM is that, it estimates multiple and interrelated dependence in single analysis. (Ullman, 2012).

1.2 Objective of the study

1. To find determinants of inflation using Structural Equation Modeling which takes care of all possible causal channels.
2. To explore dominant monetary mechanism among the cost side and demand side monetary transmission channels.

1.3 Significance of the Study

Different researchers employed different methodologies to empirically investigate the causes, effects, and determinants of inflation. The researcher takes one channel for inflation demand or supply and makes single equation model, but not combines channels which leads to biased results. This research study is very significant and important, because this research combines both demand and supply channel simultaneously, and removes biasedness through (SEM) structural equation modeling. Moreover this empirical study will be helpful for the monetary policy of Pakistan to adopt the correct policy to control inflation.

1.4 Statement of the problem:

Monetary tightening is the most popular tool used by central banks to control inflation throughout the globe. Many researchers found that increasing interest rates will reduce inflation by reducing aggregate demand in the economy, this theory

focusing on the demand-side of the economy. On the contrary, many researchers also found that an increase in policy rate leads to increase prices therefore impacts on the supply side of the economy. The problem is created the researcher only takes only channel demand or supply and makes a single equation this leads to missing variable bias. This empirical study solves the problem and combined demand and supply simultaneously and removes biasedness through structural equation modeling.

1.5 Plan of Study

Chapter 1 is the introductory part of the study. The second chapter provides conceptual and empirical discussion of literature on inflation. The third chapter provides review of how the transmission mechanism of monetary policy works? In the fourth chapter is Research methodology. In fifth chapter empirical results of the study are discussed while chapter six provides conclusion and policy recommendation of study**.**

CHAPTER 2

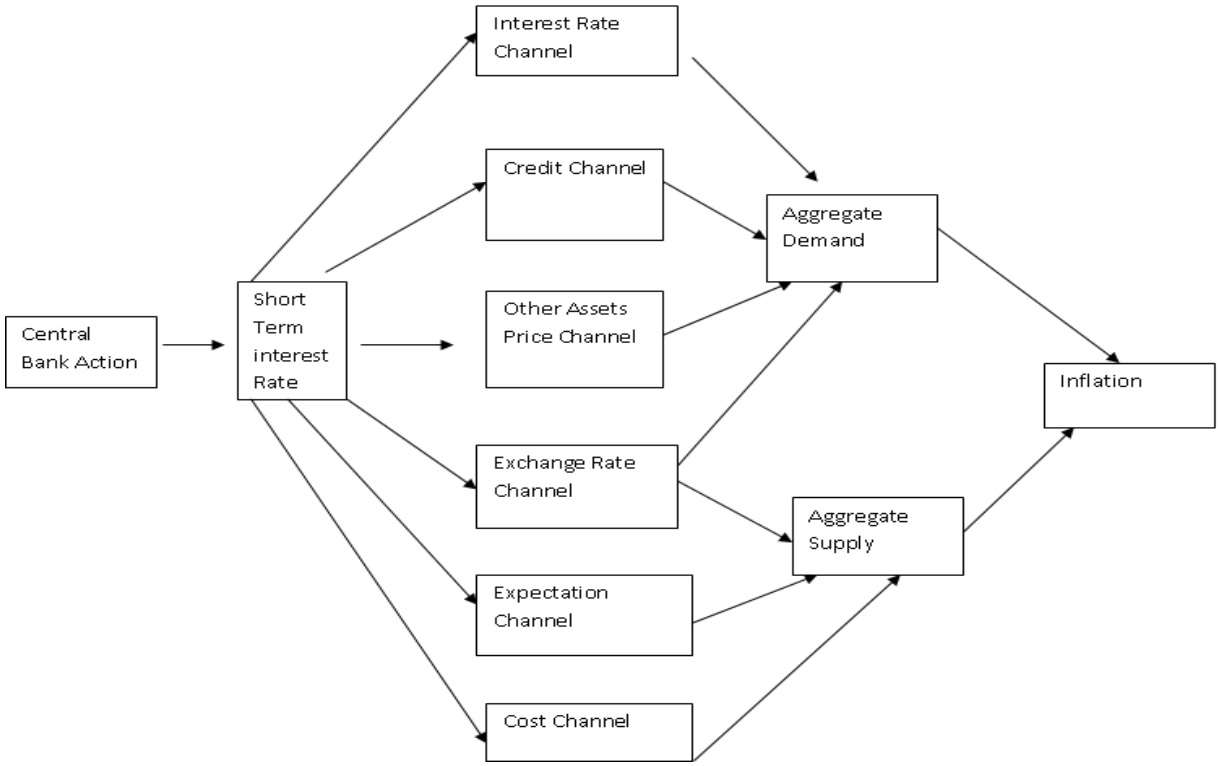
HOW THE TRANSMISSION MECHANISM OF MONETARY POLICY WORKS?

Monetary policy affects the economy and the price level through several channels. The rule by which monetary policy decisions are transferred to the real economy is called the monetary transmission mechanism (MTM). The MTM is the most famous mechanism of the economy. Therefore how varying in the central bank policy rate are transferred through the economy influencing, aggregate supply and aggregate demand, and inflation rate.

2.1 Channels of Monetary Transmission Mechanism:

The monetary transmission mechanism (MTM) has six channels includes; (1) Interest rate channel, (2) Credit Channel (3) Assets Price Channel, (4) Exchange rate Channel, (5) Expectation Channels (6) Cost Channels. These channels are pictured in figure one. The details of these channels are mentioned below:

Figure 1: Channels of MTM



Source: Ghafari & Rehman (2013)

2.1.1 Interest Rate Channel

In this channel the rising interest rate has negative impact on output and inflation. This is because when central bank increase policy rate (**i↑**) consequently rising cost of capital, hitting a brake on investment (**I↓**). Furthermore, increasing saving and consumption decreasing (**I↓**) thereby the aggregate demand to weaken (**Y↓**). Moreover the interest rate has negative relation with investment as well as output of the economy. Smets and Wouters (2002) found that the interest rate channel has an effect on consumption, investment demand and real output for the euro area countries. When aggregate demand sinks below aggregate supply, the expected finding is downward pressure on prices, and therefore inflation is reduce (**$\pi\downarrow$**).

$$\mathbf{M\downarrow \Rightarrow i\uparrow \Rightarrow r\uparrow \Rightarrow \text{cost of capital} \uparrow \Rightarrow I\downarrow \Rightarrow C\downarrow \Rightarrow Y\downarrow \Rightarrow \pi\downarrow}$$

2.1.2 Credit Channel

The second channel of MTM is called the credit channel. The fluctuations in interest rate have an impact on the supply of credit. When central used tight monetary policy (**i↑**) thus the refinancing condition for banks become worse up because of, rises money market rates, banks have to pay more interest on household deposits as well as banks balance sheets deteriorate. The new lending has more tightly, despite it is very difficult for banks to refinance themselves. Therefore the decreasing the supply of credit. The default risk rises because of not repaid some loans. When default risk is high ultimately the banks stop allowing new loans, and the supply of credit decreasing. Bernanke (1995) divided credit channel into two types; firstly bank lending and secondly balance sheets channels.

2.1.2 (i)The Bank lending Channel (the narrow credit)

The bank lending channel hypothesizes that varying in monetary policy will shift the supply of credit, especially credit reached within commercial banks. The Monetary policy actions may influence the supply of loanable funds accessible to banks, bank's liabilities, and consequently the total amount of loans they can make. a bank's assets (Mishkin, 1995).

M↓⇒ i↑⇒ bank deposits ↓ ⇒ bank loans ↓⇒ I↓⇒ C↓⇒ Y↓

Where (**M↓**) shows a tight monetary policy to an increase in real interest rate (**i↑**), impact on slowdown of the bank deposits (**BD↓**), therefore causing a reduce a bank loan, ultimately investment expenditure (**I↓**), and consumption pattern of household also (**C↓**), leading to decline in aggregate demand and output level go down (**Y↓**), Monetary policy influences bank deposits, leading to varying in the amounts of bank loans, investment, and output (Wikipedia, 2017).

2.1.2(ii) Balance Sheet Channels

This channel of the MTM refers to the role of the financial condition of private agents plays in the MTM. It occurs because the changes in policy not only influence the market interest rates but also the financial position of private agents because varying the policy rate affect consumers, cash follows the net worth of companies and bank balance sheets. Higher interest rates **(i↑)** result in reduced cash flow, and reduced net worth of the banks, therefore adverse selection and moral hazard increased (↑)**.** Hence the drop in loans, thus decrease in lending. If lending goes down the investment is reducing (**I↓)** and finally decline in aggregate output **(Y↓).**

M↓⇒ i↑⇒ adverse selection & moral hazards↑⇒ lending ↓⇒ I↓⇒ Y↓

2.1.3. Other Asset Price Channel

The third channel of MTM, concentrate on other asset price channel. This channel reveals, how the monetary policy determine domestic asset prices; such as real estate prices, stock market, and bond. Furthermore, a variation in the securities prices creates a variation in wealth which can influence household consumption.

Tobin's *q* Channel:

$$q = \frac{\text{MVF}}{\text{RCC}}$$

Where the market value of firms (MVF) and replacement cost of capital (RCC). The Tobin **q** Ratio shows the relationship between intrinsic value and market valuation. In other terms, intend to estimate whether a provided business or market is undervalued or undervalued. When the Tobin q value is lies between (0 and 1) suggest that the stock is undervalued, this is because of, and the cost to replace a firm's assets is higher than the value of its stock. On the contrary, when the Tobin q is higher than 1,

indicate that the stock is overvalued because a firm's stock is more costly than the replacement cost of its assets. (Investopedia, 2017).

2.1.3 (i) Equity Price effects on investment

When Central bank used tight (**i↑**) monetary policy that leads to decrease equity prices. The Tobin q value of (**q↓**) is reducing, therefore the stock market value of firm capital reduces as result firms do-not issue new equities which reveal to reduce investment (**I↓**), the aggregate demand is also decreasing (**Y↓**).

$$\mathbf{M\downarrow \Rightarrow i\uparrow \Rightarrow P_e\downarrow \Rightarrow q\downarrow \Rightarrow I\downarrow \Rightarrow Y\downarrow}$$

2.1.3 (ii) Wealth effects on consumption

Wealth effect is introduced by (Modigliani, 1963) in his famous "life cycle hypothesis of consumption", argue that the consumption is the most important mechanism. According to (Ando & Modigliani, 1963) found that when policy rate increase lead to reduce household long term assets, therefore the household wealth reduce, which more reduce consumption expenditure and the output. Considering that tight monetary policy - stock prices, the wealth transmission mechanism works as follows:

$$\mathbf{M\downarrow \Rightarrow i\uparrow \Rightarrow P_e \text{ equity, property \& land} \downarrow \Rightarrow W\downarrow \Rightarrow C\downarrow \Rightarrow I\downarrow \Rightarrow Y\downarrow}$$

Tobin's *q* and wealth mechanisms allow for a general definition of equity that includes properties and land. For example, a decrease in property prices, which reduce their value relative to replacement cost, therefore decrease Tobin's *q* for the property, thereby decreasing its production. Also, a decrease in property and land prices, its result wealth reduce **(*W*↓)**, thereby reduce consumption (***C*↓)** and output (***Y*↓)**.

2.1.4 Exchange Rate Channel

The exchange rate channel explains how monetary policy changes the strength of the currency. the monetary policy rises the policy rate reaches to a strengthening of the domestic currency. despite higher interest rates make domestic assets more attractive than investments denominated in other currencies. The result is a capital inflow and increased demand for domestic currency, which strengthens the exchange rate. The stronger currency means appreciation of domestic currency has two impacts on the economy. The first one is, domestic goods are more costly as compared to foreign goods. It reveals that exports are decreases, while imports are rises. It is a negative impact on economic activity and goes up on the pressure on prices. The second one is the exchange rate effects inflation through varying in the domestic prices of goods for the rest of another country trade. The low payment on imports in this way inflation is controlled. The economy is effected through exchange rate channel via demand side and supply side respectively. (Ireland 2005).

The demand side, the rise of interest rate (**i↑),** leads appreciate the domestic currency. The price of domestic goods increased (**Pdg**), the exports are reduced and finally net exports also (**NX↓**) decreased. When the net exports go down the output is also (**Y↓)** goes down (Norrbin 2000).

$$\mathbf{M\downarrow \Rightarrow i\uparrow \Rightarrow E\downarrow \Rightarrow P^{dg} \uparrow \Rightarrow P^{fg} \downarrow \Rightarrow NX\downarrow \Rightarrow Y\downarrow \Rightarrow \pi\uparrow}$$

The supply side, central bank used loose (**i↓**) monetary policy, To decrease the nominal interest rate which further decreases the real interest as a result domestic currency depreciates due to uncovered interest rate parity. If currency is depreciate ultimately exchange rate increased (**E↑**), lead to increases firm's cost of production and (r**↑)** retail prices of import prices based goods and services and also increase the

price of ($\mathbf{P^{fg}\uparrow}$) imported prices. which further decreases aggregate demand and ($\mathbf{Y\downarrow}$) output and finally increased inflation ($\boldsymbol{\pi\uparrow}$).

$$\mathbf{M\uparrow \Rightarrow i\downarrow \Rightarrow E\uparrow \Rightarrow r\uparrow \Rightarrow P^{dg}\downarrow \Rightarrow P^{fg}\uparrow \Rightarrow Y\downarrow \Rightarrow \pi\uparrow}$$

2.1.5 Expectation Channel

Inflation expectations are the main way for companies and firms to set their prices and wages formation function for their employers and thus inflation. This channel is a very significant role in determining the current as well as future levels of output production. E.g. the companies adapt anchored inflation target explained that companies currently or often not change the prices if in future level the expectation about inflation deviates from the target. Therefore Risk-bank taking action to bring inflation to the target. In this stage, employers have more stable to wage formation. Hence these circumstances the risk bank is easier to achieve price stability. The increasing policy rate is also changing the behavior of the economic agents. If the behavior of the economic agent's changes the economic activity is also varying and prices, this is because of expectation. If the firm expects at future prices goes up due to this reason the firm increase currently prices. Its revels that rising inflation expectation, as well as present prices, also increases.

2.1.6 Cost Channel

This is the last channel of MTM. Normally the researcher reflects that inflation can be controlled by adopting the tight monetary policy. The fore they are increasing the interest rate to reduced inflation. When rising interest rate the investment and aggregate output are declined which leads to reduced inflation, this is the demand channel. The researcher only mentions the on-demand channel of MTM. According to (Lima, 2010) rising policy rate not only affects the aggregate output but

also affect aggregate supply. Goes up policy rate leads to also go up cost of working capital, indusial inputs prices and general cost of production are increasing. Therefore the marginal cost of the firms also rises. When MC goes up the output of the firms are decreasing and finally, inflation is increase.

.**M↓⇒ i↑⇒ cost of working capital ↑⇒ MC ↑⇒ cost of production ↑⇒ Y↓⇒π↑**

Where (**M↓**) shows a tight monetary policy driving to an increase in real interest rate (**i↑**), impact on boosts the cost of production, therefore causing a decline in aggregate demand and output level go down (**Y↓**), and ultimately (**π↓**) inflation is decreasing.

CHAPTER 3

LITERRATURE REVIEW

Many literature discussed the causes, effects and determinants of inflation but we did not find enough literature on demand side inflation and supply side inflation using MTM channel. Our literature review is divided into three parts. Firstly, demand side inflation, Second part is supply side inflation, third part is Structural equation modeling (SEM), and fourth part is literature gap.

3.1 Demand Side Inflation

Demand side inflation occurs when the aggregate demand is more than aggregate supply therefore prices go up. According to (Chaudhry et al., 2015) investigated the relationship between monetary policy and inflationary pressure in Pakistan by using ARDL. Annual data was selected from 1973 to 2013. They found that Money supply is an important variable of controlling inflation. Ahmed (2013) examined Inflation and their determinants in case of Pakistan, from 1971 to 2012 by applying Johansen Co-Integration Approach. They also found that money supply and inflation had positive relation with each other, if 10 percent increase in money supply causes 6.9 percent rise an inflation. There result support demand-side inflation. According to (Khan and Gill, 2010) money supply effects all indicators of inflation.

Higher production leads to reduced unemployment rate, which encourages to increase wages and demand therefore consumer income increases which leads to spend more of the consumers. When Increase in demand is more than supply quickly, it forces prices up leading to demand-pull inflation. Chowdhury and Mallik (2001) examined the nexus between inflation and GDP growth rate for India, Sri Lanka, Bangladesh, and Pakistan economies. They found an increase in inflation brings economic growth and vice versa. Moreover, inflation control policies may reduce the

growth rate. The study suggests that policy makers to devise such policies which can keep growth rate and inflation side by side. Umair and Ullah (2013) claim that there is an insignificant influence of GDP on inflation and unemployment rate. Shams et al., (2013) finally concluded that the local credit was a fiscal determination of inflation and supporting variable GDP had a positive relation with inflation, while the inflation had negative relation with GDP.

Khan et al., (2017) studied Inflation and their determinants by using data from 1972 to 2006. The study concluded that the expansionary monetary policy is increased the GDP and also inflation. The time series data were used by (Subhan & Hayat, 2009) from 1964 to 2007 to check the burden of price instability on unemployment and economic growth in Pakistan. They found GDP had negative significant relation with inflation. According to (Aqil et al., 2014; Amjad, 2005; Akhtar & Shahnaz, 2006) GDP growth rate is the major determinant of unemployment and inflation.

The increase in government expenditure on various project, leads to increase in aggregate demand in economy also rises. Too much demand casts increase in price level. IENG (2017) found that the government expenditure had negative coefficient which is opposite from the economic theory. Since 2014 and 2016 Government wage expenditure to GDP increased from 5.8% to 7.4% respectively. In 2014 and 2015 government capital expenditure to GDP decreased from 8.8% to 7.8 % respectively. Arif and Ali (2012) found that in long run the government expenditure had positive relation to inflation in Bangladesh. Raza et al., (2013) fond in Pakistan, that inflation is caused by current Government expenditures, but inflation is reduced through development expenditure. Johansen Co-integration result showed that Government expenditure and inflation were positively related to each other in Pakistan. Kandil and

Morsy (2009) worked on GCC (oil-rich Gulf Cooperation Council) countries. They found inflation in major trading partners is the dominant factor explaining inflation, and government expenditure contributes to higher inflation in the short-run. To some extent, supply-side bottlenecks put less pressure on inflation although government spending increases. Amit (2016) claimed that government expenditure had positive effect on inflation.

Increase in Exports of goods and services, lead to rise in demand from the economy of foreigners, leading to higher demand with respect to supply, eventually effecting on price level. According to (Bashir et al., 2011; Olatunji et al., 2010) in demand side inflation is effected through exports of goods and services. Nelson (2017) worked on nexus between inflation and exports in case of Kenya. The Johansen co-integration result showed; in long run exports had positive relation with inflation. In Kenya there was 10.39 percent change in inflation due to 10 percent increase in total exports. The inflation and exports have unidirectional causality. In short run inflation is effected through the lags value of exports. Using monthly time series data by (Dewan and shafiullah, 2014) to check the relation of exports and imports with inflation in economy of Bangladesh by using Johnson co integration test. They found 10 percent rises imports contribute exports 30.21 percent rise and 10.91 percent reduce inflation respectively. Inflation rate 0.09 in each year deviated from the equilibrium level claims the value of ECM.

Speedy rising in the population leads to increase in prices. When the population increase, demand for goods and services also rises. If demand rises but supply is constant, it creates unbalance between supply and demand (Wikipedia, 2010). This leads to demand pull inflation. Adam (2016) worked on cross country and U.S metro, using panel regressions analysis. They found population growth was

negatively related to inflation. One percent reduction in population growth decreases inflation by one third to two third percent. According to (Aqil et al., 2014; Amjad, 2005; Akhtar & Shahnaz, 2006) indicated that, population growth rate is major determinants of unemployment and inflation.

3.2 Supply side Inflation

In the long run, rising Imports of goods and services will adversely affect investment. The price level increases if a deficiency of aggregate demand in the economy. Therefore the imports prices increase due to higher demand for imported goods i.e. (raw materials, machinery, technology, etc.) resulting the price level increase (Bashir et al., 2016). Papi & lim (1997) analyzed determinants of inflation in Turkey. The coefficient of import price, was positive meaning that, import prices had positive relation with inflation. By using johaansen co- integration utilizing by (Ahmed et al., 2013) found that import of goods and services was the main reason of inflation. The study of (Khan and Gill, 2010) suggested that imports were directly related to all price indicators (WPI, SPI, CPI, and GDP Deflator). Arif & Ali, (2012); Ellahi (2016) worked on Bangladesh economy and found in long run import of goods and services had direct effect on inflation.

According to (irfan, 2009) aggregate supply is an important reason for inflation. While the view of new Keynesian is when government expenditure are more than their revenue, the government takes deficit financing, therefore, prices level increases and also inflation occurs. Moreover, inflation expectation increases if upgrade level of government debt. (Wikipedia, 2015). Bashir (2016) found the cast went up the goods and services, when refunded the debt. Umaima and Yasmin (2010) examine the effect of public expenditure on the whole economic activity. Their result showed that public debt leads to fiscal expansion leading to a greater vulnerability of

raising inflation which further leads to the higher interest rate. Khan et al., (2016) found that public sector borrowing had a direct effect on inflation in Pakistan.

Our export is less than imports, so when the exchange rate falls (depreciate domestic currency) therefore imports prices increases, but the net exports reduce. Mbongo et al., (2014) examined effect of money supply on inflation in Tanzania from 2000 to 2011. They found, 1 percent decrease of exchange rate against US dollar pushed 0.3 percent of inflation in Tanzania. Moreover exchange rate and money supply directly related to inflation. The study conducted by (Alexander et al., 2015) in Nigeria found in both fiscal and monetary policy affect inflation. Moreover exchange rate influenced inflation in long run. According to (Uddin et al., 2014) present year real exchange rate in Dollar reduced inflation. While former year real exchange rate increased inflation rate. By employing GMM technique (Musa & yousif, 2018) inflation and exchange rate were positively related to each other.

Aslam et al., (2016) fond that government struggled to rise in revenue through rises fee and taxes. The government revenue increase but the problem is cost of production also increases which leads to inflation. In long run 10 percent increase in government revenue lead to 4.5 percent increases in inflation. Arif and Ali (2012) found in Bangladesh inflation is effected through government revenue.10 percent rises in government expenditure leads to increase inflation by 4.66 percent.

Nick (2018) found the Inflation adopt the same direction in case rise or reduce oil prices. Mostly inputs like (machinery, technology, transports etc.) depend on oil prices. Theretofore if oil prices is increased the cost of production is also increased, therefore output decreases and price level increases. Nabila & Tanveer (2015) have empirically tested “pass-through of world oil prices to inflation in a case study of

Pakistan by using Monthly data from 2000 to 2014. They used ARDL and ADF test. The author found inflation occurred due to when oil prices increased.

3.3 Structural Equation Modeling

Many literatures worked on Determinants of inflation? Either using simple regression or VAR and SVAR, but this empirical study justify the methodological gap by answering the above question using a various approach. A VAR system is a multi-equation system there is one equation for each variable being examined. Each variable is explained by its lags and all the lags of all the other variables. The SVAR is the simultaneous family, which explores cause and effect relationship, which display the effect of structural shocks on selected variables by using impulse response function. The problem is generating in SVAR the structural shocks is not random, but this is already in the part of existing information. Also in the conventional technique, there is creating a problem of Missing variable bias. Because of this weakness in the above given traditional approach. The present study answers 'Determinants of inflation? Using structural equation Modeling (SEM). Because SEM is used to explain the relationship between multiples variables. It investigates the structural relationships expressed in a series of the equation, alike, to multiple regression analysis. This technique is the combination of regression analysis and factor analysis, and it is used to estimate the structural relationship between dependent variables and explanatory variables. The advantage of SEM is they estimate multiple and interrelated dependence in a single analysis. (Ullman, 2012). So the methodological contribution of the present study is to find out 'What determine inflation? An investigation through structural equation modeling.

3.4 Literature Gap

There are many channels of MTM which can be categorized into demand side and supply side. Many researchers take one channel and make single equation this lead to missing variable bias. Since there is need to take them simultaneously which can be done by (SEM) Structural equation modeling. In previous literature on inflation, different techniques were used. Many researchers have been undertaking this issue using various techniques were used in their literature[1] like Johanson co-integration, Causality, Impulse Response Functions, correlation, ARDL, VAR, ARDL, ARCH and GARCH etc. these result may be misleading due to not use a Structural Equation Modeling.

[1] See Appendix A: Summary of National And international Literature

CHAPTER 4

RESEARCH METHODOLOGY

It is of immense importance to empirically test the theoretical underpinnings. Without empirical testing, one cannot be sure that whether theory is correct or not. To estimate the model, one need data and has to specify an estimation technique. The present study attempts to explore what determine inflation? An investigation through structural equation modeling in Pakistan.

4.1 Structural Equation Modeling (SEM)

In literature review, we have observed that:

1) The relationship between inputs of monetary policy and output, it cannot be described as a single equation relation. There are number of transmission channels, which transmit the effect of monetary policy variables to the target variables through a separate set of intermediate variables. Each of the policy's inputs described above, effects intermediate variable which simultaneously impact output variables. Therefore, a system of equations is needed to describe relation between monetary policy's inputs and inflation.
2) If any one of the equations from a system of equations is estimated by ignoring the others, then the estimates are subject to missing variable bias.

Therefore, we have chosen Structural Equation Modeling for quantifying the relation between monetary policy and inflation. The structural equation modeling is capable of estimating the system of equation such as the above mentioned system can be estimated simultaneously without the endogeneity or missing variable bias, (Kupek, 2006; Kline, 2011). Structural equation modeling (SEM) is a multivariate statistical technique that is applied to

explain the relationship among multiples variables. It investigates the structural relationships expressed in a series of the equation, alike, to multiple regression analysis.

4.2 Variables of Monetary transmission Mechanism (MTM)

There is a causal chain of monetary policy impacting inflation through different channels. We will use three types of variables.

4.2.1 Inputs variable

Input variables mean the input of monetary policy. These are inputs of monetary policy, namely interest rate (IR) and money supply (MS).

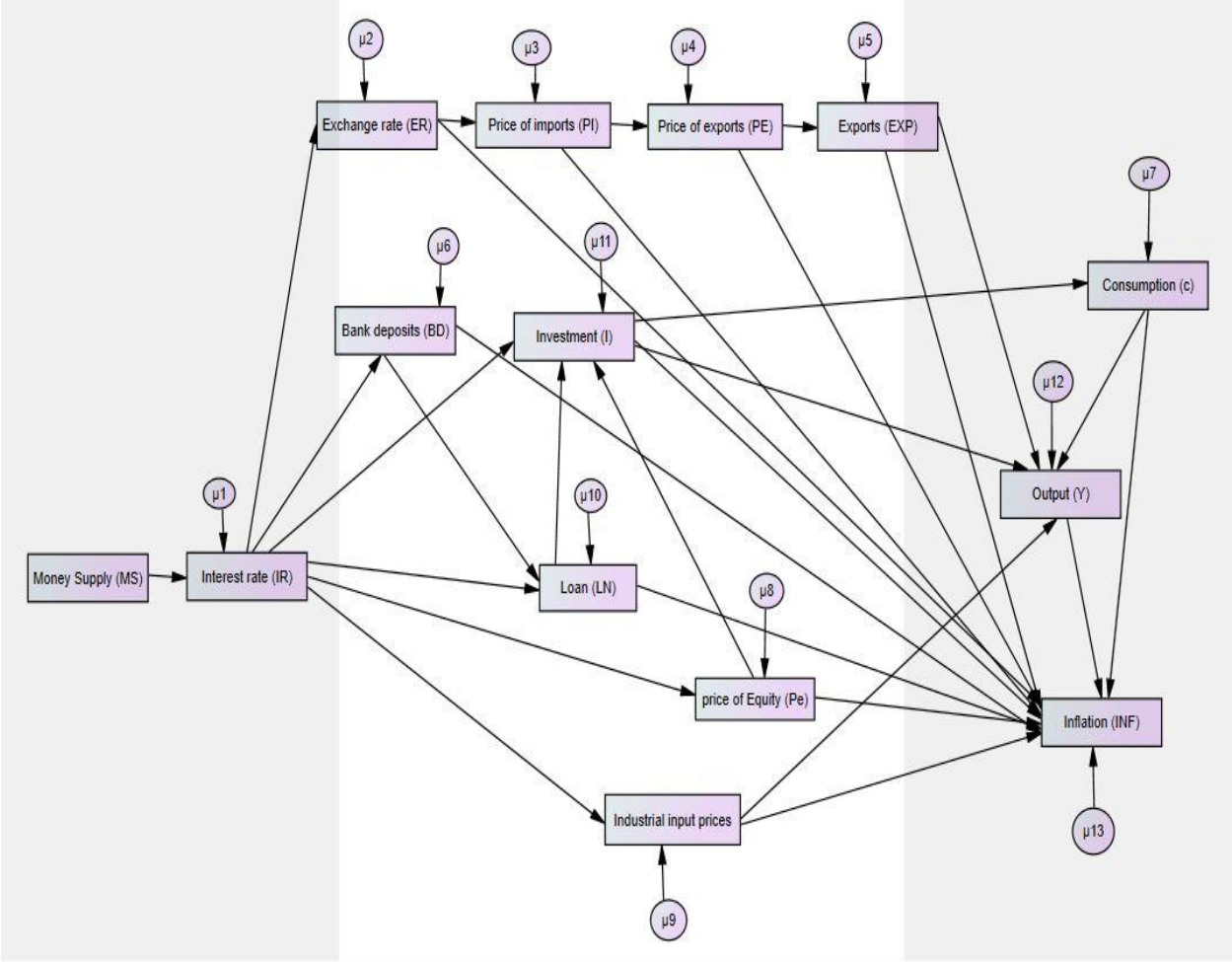
4.2.2 Intermediate Variables

Intermediate variables are those variables which have a relationship with output variables but are not direct inputs of monetary policy. These variables are not the direct input of monetary policy, rather these are consequences of the inputs of monetary policy and may affect the output variables. These include i.e. Exchange rate (ER), Price of imports (PI), Price of Export (PE), exports (EXP), consumption (c), Bank Deposits (BD), Investment (I), loan (LN), Output (Y), Price of equity (Peq), Industrial inputs prices (IIP).

4.2.3. Output Variables

Output variables; which are Inflation (INF). In Figure 2 explains how input variables affect intermediate variables and then output variables. It includes all variables explain above.

Figure 2: Path Diagram of MTM



Source: Author's own computation in SPSS Amos (24)

In figure 2, cover many channels of MTM the demand channel and supply channels. The demand channel includes; interest rate channel, exchange rate channel, credit channel, asset price channel. The demand channel is the following path;

Interest rate channel; Money Supply → Interest rate → Investment → consumption → Output → inflation

Exchange rate channel; Money Supply → interest rate → exchange rate → price of import → price of exports → exports → output → inflation

Credit channel; Money Supply → interest rate → bank deposits → loan → investment. → Output → inflation

Assets price channel; Money Supply ⟶ interest rate ⟶ price of equity ⟶ investment ⟶ output ⟶ inflation

Determinants of inflation in equation form:

The causal paths describes – equations (1 to 13) can be written in the following equation:

Equation (1) describes that interest rate (IR) linearly depends on Money supply (MS) i.e.

$$IR_t = \beta_{11} MS_t + U_{1t} \quad \textbf{(1)}$$

Equation (2) describes that Exchange rate (ER) linearly depends on interest rate (IR) i.e.

$$ER_t = \beta_{21} IR_t + U_{2t} \quad \textbf{(2)}$$

Equation (3) explains that Price of import (PI) linearly depends on Exchange rate (ER) i.e.

$$PI_t = \beta_{31} ER_t + U_{3t} \quad \textbf{(3)}$$

Equation (4) explains that Price of Export (PE) linearly depends on Price of import (PI) i.e.

$$PE_t = \beta_{41} PI_t + U_{4t} \quad \textbf{(4)}$$

Equation (5) shows that export (EXP) linearly depends on Price of Export (PE) i.e.

$$EXP_t = \beta_{51} PE_t + U_{5t} \quad \textbf{(5)}$$

Equation (6) shows that Bank Deposits (BD) linearly depends on interest rate (IR) i.e.

$$BD_t = \beta_{61} IR_t + U_{6t} \quad \textbf{(6)}$$

Equation (7) shows that consumption (C) linearly depends on investment (I) i.e.

$$\boldsymbol{C_t = \beta_{71} I_t + U_{7t}} \quad \textbf{(7)}$$

Equation (8) shows that Price of equity (Peq) linearly depends on interest rate (i) i.e.

$$\boldsymbol{Peq_t = \beta_{81} IR_t + U_{8t}} \quad \textbf{(8)}$$

Equation (9) shows that industrial inputs prices (IIP) linearly depends on interest rate (IR) i.e.

$$\boldsymbol{IIP_t = \beta_{91} IR_t + U_{9t}} \quad \textbf{(9)}$$

Equation (10) shows that Loan (LN) linearly depends on interest rate (IR), Bank deposits i.e.

$$\boldsymbol{LN_t = \alpha_{11} IR_t + \alpha_{12} BD_t + U_{10t}} \quad \textbf{(10)}$$

Equation (11) shows that Investment (I) linearly depends on interest rate (IR), Loan (LN) price of equity (Peq) i.e.

$$\boldsymbol{I_t = \alpha_{21} IR_t + \alpha_{22} LN_t + \alpha_{23} Peq_t + U_{11t}} \quad \textbf{(11)}$$

Equation (12) shows that Output (Y) linearly depends on exports (EXP), consumption (C), Investment (I), industrial inputs prices (IIP) i.e.

$$\boldsymbol{Y_t = \alpha_{31} EXP_t + \alpha_{32} C_t + \alpha_{33} I_t + \alpha_{34} IIP_t + U_{12t}} \quad \textbf{(12)}$$

Equation (13) will show the linear regression of output variable inflation (INF) and all the intermediate variables i.e. Interest rate (IR) have linear relation with intermediate variables i.e.

Exchange rate (ER), price of imports (PI), price of ecports (PE), Exports (EXP), bank deposits (BD), investment (I), consumption (c), price of equity (Peq), loan (LN), Industrial inputs prices (IIP), and Output (Y) i.e.

$$\boldsymbol{INF_t} = \alpha_{40}\boldsymbol{ER_t} + \alpha_{41}\boldsymbol{PI_t} + \alpha_{42}\boldsymbol{PE_t} + \alpha_{43}\boldsymbol{EXP_t} + \alpha_{44}\boldsymbol{BD_t} + \alpha_{45}\boldsymbol{I_t} + \alpha_{46}\boldsymbol{C_t} + \alpha_{47}\boldsymbol{Peq_t} + \alpha_{48}\boldsymbol{LN_t} + \alpha_{49}\boldsymbol{IIP_t} + \alpha_{50}\boldsymbol{Y_t} + \boldsymbol{U_{13t}} \quad \textbf{(13)}$$

4.3 Augmented Dickey-Fuller Test

The rationale of the ADF test is the violation of the Assumption in DF Test. If there is a serial correlation problem in the data generating process of the DF test, then we apply the Augmented Dicky fuller Test to detect the stationarity in the data series. So to deal with this problem we introduce the lag of the dependent variable as an independent variable in the model until the problem of serial correlation is removed. To check the stationarity of variables we will apply the Augmented Dickey-Fuller Test. So the equation we estimate after introducing lag of dependent variables as independent variables is known as Augmented Dickey-Fuller (ADF) regression:

$$\Delta\boldsymbol{X_t} = \boldsymbol{\theta} + \boldsymbol{\beta_t} + \boldsymbol{\rho X_{t-1}} + \sum \boldsymbol{l\, i} = \boldsymbol{1}\, \boldsymbol{\beta i} \Delta\boldsymbol{X_{t-i}} + \boldsymbol{u_t} \quad \textbf{(14)}$$

In the given equation (14), the ΔXt is the dependent variable represents first difference of the data series. The independent variables of the series which are θ, β_t, ρ, βi and u_t. The θ is the constant term, β_t represent trend of the data series, ρ shows

slope of the first difference of X_t series, βi represent coefficient of the i lags of the X_t series and u_t is the error term respectively. The ADF applicable if there error term is white noise i.e. $u_t \sim N(0, \sigma 2)$.

4.4 Data and Sources

The data on Money supply (MS), Exports (EXP), consumption (C), loan (LN), Output (Y), and inflation (INF) have been collected from world development indicator (WDI). The data on interest rate (IR), Price of imports (PI), Price of Export (PE), Price of equity (Peq), have been collected from International Financial Statistics (IFS). While Bank Deposits (BD), Investment (I), Industrial inputs prices (IIP), and Exchange rate (ER), are collected; Federal Reserve economic data (FRED), Census and Economic Information Center (CEIC), Wall Street Journal database, and State bank of Pakistan (SBP). Time series Annual data is used for estimation from time period, 1975 to 2017 with 42 observation, to find out What Determine inflation? An investigation through structural equation modeling in Pakistan.

4.5 Description of Variables

The variable of the study included; Money supply (MS), interest rate (IR), Exchange rate (ER), Price of imports (PI), Price of Export (PE), exports (EXP), consumption (c), Bank Deposits (BD), Investment (I), loan (LN), Output (Y), Price of equity (Peq), Industrial inputs prices (IIP), and inflation (INF). The construction of the variables in the following below:

Table 1: Construction of Variables

symbols	Variables Name	Measurement
MS_t	Money supply:	Rehman (2014) used Broad money supply (M2) as a measure of Money supply. The present study also use.
IR_t	Interest rate	Rehman (2014) used call money rate as a proxy for interest rate.
ER_t	Exchange rate:	Asghar et al., (2011) calculated exchange rate by using ratio of local currency unit to US dollar.
PI_t	Price of imports:	Ahmed (2013) used Import Prices correspond to the rate of change in the prices of goods and services purchased by residents of that country from, and supplied by, foreign sellers.
PE_t	Price of Export	Ahmed (2013) used Export Prices correspond to the rate of change in the prices of goods and services sold by residents of that country to foreign buyers.
EXP_t	Exports	Bashir et al., (2013) used exports of goods and services as a measure of exports.
C_t	Consumption:	Hussain and zafar (2018) used of Household (HH) final consumption expenditure as a proxy for Consumption
BD_t	Bank Deposits	Nawaz et al., (2016) used total deposits as a proxy for bank deposits.
I_t	Investment:	Anwar (2011) used investment percent of GDP as a proxy for investment
LN_t	Loan	Loan is used as a proxy of domestic credit to private sector
O_t	Output	Chaudry and ahmad (1995) used GDP is measured as a proxy for Output
Peq_t	price of equity	Javed et al., (2010) used price of equity is used as a proxy for share prices.
IIP_t	Industrial inputs prices.	Shaikh et al., (2014) used crude oil price as a proxy of industrial inputs prices.
INF_t	inflation	Mehmood el al., (2015) used growth rate of CPI as a proxy for inflation.

CHAPTER 5

RESULTS AND DISCUSSION

The fundamental objective of the present study is answering a question: what determine inflation? The question is modeled by using Structural equation Modeling.

5.1 Results of Unit root Test

In order to Avoid spurious Results, before the estimation whether data is stationary or not? All the variables are transformed into logarithmic form, except inflation, investment and interest rate before applying the unit root test. The Null hypothesis of the ADF test is non stationary, while Alternative hypothesis the data is stationary. The variable of the study included; Money supply (MS), interest rate (IR), Exchange rate (ER), Price of imports (PI), Price of Export (PE), export (EXP), consumption (c), Bank Deposits (BD), Investment (I), loan (LN), Output (Y), Price of equity (Peq), Industrial inputs prices (IIP), and inflation (INF). The ADF results are given below:

Table 2: Results of ADF unit root test

.	Level		1st difference		Level of integration
	intercept	Trent & intercept	intercept	Trent & intercept	
LMS	-1.21	-2.81	-5.42***	-5.36***	**I(1)**
IR	-1.6	-1.64	-5.39***	-5.45***	**I(1)**
LER	-0.34	-2.21	-4.36**	-4.29***	**I(1)**
LPE	-1.88	-1.65	-5.38***	-5.67***	**I(1)**
LPI	-0.71	-1.99	-4.89***	-4.81***	**I(1)**
LEXP	-1.59	-2.05	-7.19***	-7.14***	**I(1)**
LC	-0.43	-1.61	-5.19***	-5.11***	**I(1)**
I	-3.23**	-3.37*	--	-	**I(0)**
LBD	-1.63	-3.05	-5.11***	-4.99***	**I(1)**
LLN	-1.19	-2.02	-5.53***	-5.59***	**I(1)**
LY	-0.94	-2.25	-5.45***	5.37***	**I(1)**
LPeq	-1.88	-1.65	-5.38***	-5.67***	**I(1)**
LIIP	-1.66	-1.95	-6.04***	-5.98***	**I(1)**
INF	-3.714358*	-3.674151**	-	-	**I(0)**

Note: *, **, *** indicates significance at 10%, 5%, 1%

Table 2 present the (ADF) Augmented dickey fuller test. At level mean an original data while 1st difference mean the 1st lag of the series. The variable LMS (log of Money supply), IR (interst rate), LER (log of exchange rate), LPE (log of price of exports), LPI (log of price of imports), LEXP (log of exports), LC (log of consumption), LBD (log of bank deposits), LLN (log of loans), LY(log of output), LPeq (log of price of equity), and LIIP (log of industrial inputs prices) are non-stationary at level but are stationary at the 1st difference, hence I (1). While I (investment), and INF (inflation) are stationary at level, i.e. I (0).

5.2 Results of Unrestricted Structural regression Model

After testing stationarity of the variables. We know all variables of non-stationary at level i.e. I (0) except inflation and investment. To avoid spurious regression and taking meaningful conclusion. We are taking first difference of all the variables, except inflation rate and investment. Now the unrestricted structural equation model are to be estimated to answer the research questions. Unrestricted structural equation model in which all the independent variable are included in the model (stack, 2018). Thirteen equation would be estimated and the results for each model are summarized below:

Table 3: Result of Unrestricted Structural Regression Model A

Unstandardized coefficient							Standardized coefficient
			Estimate	S.E.	C.R.	P.value	Estimate
DIR	<---	DLMS	-1.168	4.389	-.266	**.790**	-.042
DLER	<---	DIR	.004	.005	.797	.426	.123
DBD	<---	DIR	-.059	.144	-.409	**.683**	-.064
DLPI	<---	DLER	-1.247	.287	-4.348	0.001	-.562
DLN	<---	DBD	.069	.120	.578	**.563**	.092
DLpeq	<---	DIR	-.033	.021	-1.570	.116	-.238
DLN	<---	DIR	-.071	.145	-.488	**.625**	-.060
DLPE	<---	DLPI	.256	.137	1.868	.062	.280
I	<---	DIR	-.764	.156	-4.891	0.001	-.605
I	<---	DLN	.080	.099	.806	.420	.125
I	<---	DLpeq	.320	.857	.374	**.708**	.059
DLEXP	<---	DLPE	.756	.082	9.195	0.001	.820
DLC	<---	I	.016	.009	1.749	.080	.263
DLIIP	<---	DIR	.037	.026	1.415	.157	.216
DLY	<---	DLEXP	.002	.002	.634	**.526**	.027.
DLY	<---	DLC	.868	.040	21.930	0.001	.939
DLY	<---	DLIIP	-.028	.010	-2.731	.006	-.113
DLY	<---	I	.100	.027	3.665	0.001	.151
INF	<---	DLY	-1.017	.374	-2.718	.007	-.308
INF	<---	DLEXP	10.242	21.678	.472	**.637**	.189
INF	<---	DLPE	.625	.364	1.719	.086	.234
INF	<---	DLPI	5.350	4.404	1.215	.224	.163
INF	<---	DLER	24.951	9.513	2.623	.009	.342
INF	<---	I	-3.259	1.928	-1.690	.091	-.183
INF	<---	DLC	11.636	7.720	1.507	.132	.299
INF	<---	DLpeq	-8.044	23.975	-.336	**.737**	-.137
INF	<---	DLIIP	1.874	1.698	1.104	.270	.130
INF	<---	DBD	1.780	6.854	.260	**.795**	.050
INF	<---	DLN	-.465	.289	-1.609	.108	-.220

Table 3 shows the result of unrestricted structural regression model (USEM). The above table column number seven the p.value has been shown. The bold p.value is highly insignificant, which have more than 50 percent probability value. The insignificant coefficient of the variables includes; money supply, interest rate, Bank

deposits, price of equity, Exports. The results of standardized unrestricted regression model are given below:

5.3 Result of Restricted Structural equation Model

Restricted Structural Regression Model is one in which coefficient of some independent variable are assume to be zero. This is because in present study the highly insignificant probability value i.e. p.value > 0.50 percent, are removed from the above model. The result Restricted Structural Regression Model (RSEM) are given below:

Table 4: Result of Restricted Structural equation Model B

Unstandardized coefficient							Standardized coefficient
			Estimate	S.E.	C.R.	P	Estimate
DIR	<---	DLMS	.000				.000
DLER	<---	DIR	.004	.005	.797	.426	.123
DBD	<---	DIR	.000				.000
DLPI	<---	DLER	-1.247	.287	-4.348	0.001	-.562
DLN	<---	DBD	.000				.000
DLpeq	<---	DIR	-.033	.021	-1.570	.116	-.238
DLN	<---	DIR	.000				.000
DLPE	<---	DLPI	.256	.137	1.868	.062	.280
I	<---	DIR	-.764	.156	-4.891	0.001	-.605
I	<---	DLN	.077	.099	.772	.440	.120
I	<---	DLpeq	.000				.000
DLEXP	<---	DLPE	.756	.082	9.195		.820
DLC	<---	I	.016	.009	1.750	.080	.263
DLIIP	<---	DIR	.037	.026	1.415	.157	.216
DLY	<---	DLEXP	.000				.000
DLY	<---	DLC	.872	.038	22.738	0.001	.944
DLY	<---	DLIIP	-.027	.010	-2.693	.007	-.112
DLY	<---	I	.100	.027	3.665	0.001	.151
INF	<---	DLY	-1.017	.374	-2.718	.007	-.308
INF	<---	DLEXP	.000				.000
INF	<---	DLPE	.625	.364	1.719	.086	.234
INF	<---	DLPI	7.699	4.596	1.675	.094	.246
INF	<---	DLER	12.537	10.023	1.251	.211	.180
INF	<---	I	-2.915	2.030	-1.436	.151	-.171
INF	<---	DLC	11.636	7.720	1.507	.132	.299
INF	<---	DLpeq	.000				.000
INF	<---	DLIIP	3.238	1.645	1.968	.049	.235
INF	<---	DBD	.000				.000
INF	<---	DLN	-.401	.305	-1.315	.188	-.198

Table 4 shows the (RSEM). The above table column number seven the p.value has empty. This is result of restricted structural regression model because, it is highly insignificant, which have more than 50 percent probability value. The insignificant coefficient of the variables includes; money supply, interest rate, Bank deposits, price of equity, Exports. The results of standardized restricted regression model are given below:

5.3.1 Restricted Standardized Regression Weights

Restricted standardize regression weight is one in which coefficients of some explanatory variable are assumed to be zero. Therefore, any regression with an omitted variable is restricted regression i.e. as coefficients of an omitted variable are assumed to be zero. In given table (3) see bold probability values which is greater than 50%, which is highly insignificant value we can removed from the model by taking some restriction on it. The restriction on βs and αs as; β11 = β61 = α12 = α11 = α23 = α31 = α43 = α44 = α47 = 0. Then estimated RSRM results has given table (4), see standardize coefficient, the standardized coefficients of estimation equations (1 to 13) are given below:

$$\boldsymbol{IR_t = 0.00MS_t + U_{1t}} \quad \textbf{(1)}$$

$$\boldsymbol{ER_t = 0.123IR_t + U_{2t}} \quad \textbf{(2)}$$

$$\boldsymbol{PI_t = -0.562ER_t + U_{3t}} \quad \textbf{(3)}$$

$$\boldsymbol{PE_t = 0.280PI_t + U_{4t}} \quad \textbf{(4)}$$

$$\boldsymbol{EXP_t = 0.820PE_t + U_{5t}} \quad \textbf{(5)}$$

In given Equation (1) the Money supply (MS) coefficient β11 = 0, this is because there probability value is greater than 50 percent which is highly insignificant. In equation (2), the interest rate goes up by 1 SD, the Exchange rate goes up by 0.123 SD. When interest rate increases its lead to appreciate domestic currency, there for more interest rate appeal to foreign capital and accelerate exchange rate. Equation (3), the exchange rate gives a negative impression on the price of imports that is economically not true. The price of imports would reduce by 0.562 SD due to 1 SD higher exchange rate in Pakistan. The results of Equation (4) of the study reveal that the price of imports is found to be directly related to the price of exports in Pakistan. The coefficient is signifying 0.280 SD rise in the price of exports due to a one percent increase in the price of imports. When the price of imports rises the price of exports also rises because in Pakistan imports are more than exports. Therefore Pakistani people used imported technology its result the cost of production increases and the price of export also increase. Equation (5) shows that, when the price of export goes up by 1 SD, exports go up by 0.82 SD. The price of export has a positive relation with exports, this is economically not true.

$$\boldsymbol{BD_t = 0.00IR_t + U_{6t}} \quad \textbf{(6)}$$

$$\boldsymbol{C_t = 0.263I_t + U_{7t}} \quad \textbf{(7)}$$

$$\boldsymbol{Peq_t = -0.238IR_t + U_{8t}} \quad \textbf{(8)}$$

$$\boldsymbol{IIP_t = 0.216IR_t + U_{9t}} \quad \textbf{(9)}$$

$$\boldsymbol{LN_t = 0.00IR_t + 0.00BD_t + U_{10t}} \quad \textbf{(10)}$$

In given Equation (6), (10) the interest rate and bank deposits coefficient are zero i.e. $\beta_{11} = \alpha_{11} = \alpha_{12} = 0$ this is because there probability value is greater than 50 percent which is highly insignificant. In equation (7), when an investment goes up by 1 SD, therefore consumption goes up by 0.263 SD. Practically when investment increase leads to rises output of the economy people have more money comes up, to spend more and more on consumption. Equation (8) shows that when interest rate increase by 1 SD, price of equity goes down by 0.238 SD. Therefore an increase interest rate the consumer and businesses spending and their earning decrease its results the price of equity also reduced. Equation (9) shows that, when the interest rate goes up by 1 standard deviation, industrial inputs prices go up by 0.216 standard deviations. The rise an interest rate will put positive pressure on industrial inputs prices its effect on the cost of production increases.

$$\boldsymbol{I_t = -0.605\, IR_t + 0.120\, LN_t + 0.00 Peq_t + U_{11t}} \qquad \textbf{(11)}$$

$$\boldsymbol{Y_t = 0.00\, EXP_t + \ 0.944\, C_t + 0.151\, I_t - 0.112 IIP_t + U_{12t}} \qquad \textbf{(12)}$$

Equation (11) shows that 1 SD change interest rate will reduce the investment by 0.605 SD. We know that if the interest rate increase the cost of borrowing and capital increase lead to reduced investment. The coefficient has positive with significant coefficient such that 0.120 SD rise investment due to increase 1 SD increase loan. The coefficient of the price of equity is zero i.e. $\alpha 23 = 0$ because they have highly insignificant their probability value more than 50 percent. Equation (12) shows that, the exports coefficient has zero i.e. $\alpha_{41} = 0$. When 1 SD change in consumption lead to rise output by 0.944 SD. According to (Piana, 2001) other thing being constant when consumption increase the same amount output have

raises. Moreover when, 1 SD change in investment leads to increase output by 0.151 SD, when investment increase the output is also increasing in economy. Finally, if industrial inputs prices 1 SD rises there lead to reduced output by 0.112 SD.

$$INF_t = 0.180\,ER_t + 0.246\,PI_t + 0.234\,PE_t + 0.00\,EXP_t + 0.00\,BD_t - 0.171\,I_t + 0.299\,C_t + 0.00\,Peq_t - 0.198LN_t + 0.235\,IIP_t - 0.308\,Y_t + U_{13t} \quad (13)$$

In the given equation (13) shows that the exchange rate has a significant effect on Inflation in Pakistan. The coefficient has a positive value is 0.180, one SD increase in the exchange rate will increase the price level by 0.180 SD. when the exchange rate increase the imported goods are more expensive. If imported goods like (production inputs, oil, etc.) more costly, then increase the domestic prices due to utilizing this imported goods in the production process its results inflation have also increased. The coefficients of the price of imports and the price of exports have positive, there for 1 unit increase the price of imports and the price of exports the inflation have come up by 0.264 and 0.234 SD respectively. If the price of imports and the price of export rise the production will be reduced therefore inflation has occurred.

The exports (EXP), bank deposits (BD) and price of equity (Peq) coefficients $\alpha_{43} = \alpha_{44} = \alpha_{47} = 0$, this is because their probability value is greater than 50 percent which is highly insignificant. The sign of the variable investment shows that there is a negative relationship between investment and inflation. If 1 SD increase an investment the inflation has reduced by 0.171 SD. The increase in investment reveals to rising

employment and output level in the economy there for reduced inflation. A positive sign of consumption indicates a positive relationship between consumption and inflation. If 1 SD increase in consumption the inflation have raised by 0.299 SD. When consumption rises, the consumer demand more than the producer's ability to produce the goods and services, therefore prices exceeds. If this carries on, it makes inflation. The coefficient of loan has a negative sign if 1 SD increase loan the inflation has reduced by 0.198 SD it is not true economically. When industrial inputs price goes up by 1 SD, inflation goes up by 0.235 SD. The industrial inputs prices rise the cost of production, therefore, output level decreases its results inflation have increased. The output has a significant coefficient, the negative sign reveals that, if 1 SD increase output level in the economy, the inflation has reduced by 0.308 SD.

5.4 Model Fit

Now for judging the overall goodness of fit of structural regression model different criteria has been used. For testing overall goodness of fit in structural equation modeling, variety of fit indices can be used. For the important signal of how good the model fits to the data, Absolute fit indices are applied. In the list of absolute fit indices Chi square test, GFI, AGFI, RMR and SRMR are included. In the list of absolute fit indices, GFI values describe the explained portion while the RMR are residual based. So GFI values close to 1, and RMR and SRMR close to 0 represent good fit.

In our model chi-square value is 128.815 with 71 degree of freedom. This chi-square over degree of freedom ratio (CMIN/d.f) is about 1.82 which is insignificant represents that the model fits the data.

CHAPTER 6

C0NCLUSION AND POLICY RECOMMENDATION:

6.1 Conclusion

This empirical study examined what determine inflation? An investigation through structural equation modeling in a case study of Pakistan by using time series data for a period of forty-three years from 1975 to 2017. We have check variables for stationarity through ADF test. The ADF test shows that Money supply (MS), interest rate (IR), Exchange rate (ER), Price of imports (PI), Price of Export (PE), exports (EXP), consumption (c), Bank Deposits (BD), loan (LN), Output (Y), Price of equity (Peq), and Industrial inputs prices (IIP), are not stationary at level such that; I (1), while Investment (I), and inflation (INF) are stationary at level i.e. I (O). Before starting the estimation to avoid spurious results and get meaningful results we have converted all the variables in difference form except inflation and investment. After that we estimated unrestricted structural equation model (USEM), the mostly coefficient of the USEM is highly insignificant i.e. the probability value is greater than 50 percent. We are given highly insignificant value, the regression weight keeps it zero on insignificant variables.

The interest rate has a positive relation with the exchange rate when interest rate increases this leads to appreciate domestic currency, therefor more interest rate appeal to foreign capital and accelerate the exchange rate. The exchange rate gives a negative impression on the price of imports that is economically not true true. The study reveals that the price of imports is found to be directly related to the price of exports in Pakistan. When the price of imports rises the price of exports also rises because in Pakistan imports are more than exports. Therefore Pakistani people used imported technology as a results the cost of production increases and the price of

export also increases. The price of export has a positive relation with total exports, this is economically not true. Investment has directly related to consumption. Practically when investment increase leads to rises output of the economy people have more money comes up, to spend more and more on consumption.

The coefficient of interest rate has a negative sign with the price of equity, therefore an increasing interest rate the consumer and businesses spending and their earning decrease its results the price of equity also reduced. The interest rate goes up by 1 standard deviation, industrial inputs prices go up by 0.216 standard deviations. The rise in interest rate will put positive pressure on industrial inputs prices its effect on the cost of production increases. When 1 SD change interest rate will reduce the investment by 0.605 SD. We know that if the interest rate increases the cost of borrowing and capital increase leads to reduction in investment. The coefficient is positive with significant coefficient such that 0.120 SD rise investment due to increase 1 SD increase loan. The consumption and investment have a positive relation with output while industrial inputs price is negatively related to output. The exchange rate has a significant effect on inflation in Pakistan when the exchange rate increases the imported goods are more expensive. If imported goods like (production inputs, oil, etc.) more costly, then increase the domestic prices due to utilizing this imported goods in the production process its results inflation have also increased. The coefficients of the price of imports and the price of exports have positive, there for 1 unit increase the price of imports and the price of exports the inflation has come up by 0.264 and 0.234 SD respectively.

The sign of the variable investment shows that there is a negative relationship between investment and inflation. If 1 SD increase an investment the

inflation has reduced by 0.171 SD. The increase in investment reveals to rising employment and output level in the economy there for reduced inflation. A positive sign of consumption indicates a positive relationship between consumption and inflation. If 1 SD increase in consumption the inflation have raised by 0.299 SD. When consumption rises, the consumer demand more than the producer's ability to produce the goods and services, therefore prices exceeds. If this carries on, it makes inflation. The coefficient of loan has a negative sign if 1 SD increase loan the inflation has reduced by 0.198 SD it is not true economically. When industrial inputs price goes up by 1 SD, inflation goes up by 0.235 SD. The industrial inputs prices rise the cost of production, therefore, output level decreases its results inflation have increased. The output has a significant coefficient, the negative sign reveals that, if 1 SD increase output level in the economy, the inflation has reduced by 0.308 SD.

6.2 Policy Recommendation

The interest rate is not a significant determinant of inflation. Therefore the exchange rate and cost channel are responsible for the transmission mechanism of interest rate to inflation in Pakistan. The finding supports the finding of the (Rehman, 2014) who also found that interest rate to control inflation is useless. On the other hands they affect investment, and growth rate negatively. To control inflation the policy of high-interest rate should be avoided.

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APPENDIX A

Summary of Literature Review:

Author	Title	Methodology	Variables	Results
Ali et al., (2012)	Impact of oil prices On food inflation in Pakistan	Simple Regression	rice, maize, wheat, chicken and cooking oil, high speed diesel	there is highly significant effect of oil prices on foods inflation
Rehman (2014)	Relationship Between Energy Prices, Monetary Policy and Inflation; A Case Study of South Asian Economies	Partial Correlation and the Granger Causality, ADF, and Pearson correlation	interest rate, M2 as a measure of money supply and CPI as a measure of prices. The rate of growth for CPI and Money supply, oil prices (dollar per barrel)	Both monetary policy and oil prices have cost side effects on inflation and monetary tightening could be counter productive if used to reduce energy pushed inflationary trend.
Hayat (2014)	An empirical assessment of Pakistan discretionary monetary policy strategy using novel discretion and inflation Bias indicator.	ARDL	Inflation, M2, interest rate, exchange rate, export, import, GDP, population, oil prices.	SBP should focus on inflation objective as against growth objectives.
Kibria (2014)	The Impact of Macroeconomic Variables on Stock Market Returns: A Case of Pakistan	Correlation Analysis, Granger Causality test and Regression Analysis	Inflation, GDP Per Capita, GDP savings, Money supply and Exchange rate at KSE 100 index	Regression Analysis show that the Inflation, Exchange rate, Money supply, GDP per capita and GDP savings has positive significant impact on KSE 100 index
Choudhry(2015)	The Relationship between Exports of Food Items and Inflation (CPI): Case Study of Pakistan	Correlations, Regression	CPI, exports of food items, GDP growth and population growth	When exports of food items were increasing, the supply of them within country was decreasing and it was increase in the demand of food items within a country, after that it could

Author	Title	Methodology	Variables	Results
				increase the prices of food items and finally inflation raised
Javed et al., (2016)	Internal Determinants of Consumer Price Index in Pakistan	Co integration and Stability Analysis	producer price index adaptive expectations, public capital stock (gross fixed capital formation) domestic credit to private sector and interest rate.	adaptive expectations increase the CPI in long and short run periods. The high producer price index is linked positively and significantly with CPI index and is the second dominant force, which increases CPI in the country
Ihsan (2013)	Impact of Money Supply (M2) on GDP of Pakistan	Regression Model.	inflation rate, interest rate and CPI, money supply, GDP	The CPI and interest rate have a significant impact on GDP and inflation rate has insignificant impact on GDP
Ellahi (2016)	Determinants of Inflation in Pakistan	ARDL	money supply, national expenditure, imports of goods and services and GDP and inflation	National expenditure has a positive impact on inflation but money supply implies negative impact on inflation. Moreover, GDP growth has negative impact on inflation and imports of goods and services have positive impact on inflation.
ASGHR et al., (2011)	AN EMPIRICAL INVESTIGATION OF DOMESTIC AND EXTERNAL DETERMINANTS OF INFLATION IN PAKISTAN	ARDL	Inflation, output gap, growth in reserve money, nominal effective exchange rate, US inflation, and financial crises dummy	the long-run money supply growth, lagged inflation, foreign inflation and dummy variable for global financial crises 2008 have positive and significant impact on inflation in Pakistan. money supply all the variables affect inflation in the short-run
CHAUDHRY et al., (2015)	MONETARY POLICY AND ITS INFLATIONARY	ARDL	inflation rate, Money supply, interest rate, GDP,	interest rate and money supply are important policy variables for controlling inflation in the long-run while it is the

Author	Title	Methodology	Variables	Results
	PRESSURE IN PAKISTAN			national output level which put downward pressure on inflation rate in the short-run.
Mahmood et al., (2015)	Stock Prices and Inflation: A Case Study of Pakistan	VAR	Sstock price is measured by KSE, inflation	inflation is influenced negatively by pressure of stock prices
Javed et al., (2010)	Cost-push shocks and inflation In economy of Pakistan	ADF, OLS	CPI, exchange rate, Money supply, GDP, wheat support price, wage in the perennial industries, value of imported raw material and Dummy variable.	The monetary variables have significant impact on CPI (consumer price index), WPI (whole price index) and GDP
AHMED et al., (2017)	LONG-RUN RELATIONSHIP OF INFLATION (CPI & WPI), AND OIL PRICES WITH KSE-100 INDEX	JOHANSEN MULTIVARIATE COINTEGRATION APPROACH	inflation indices, consumer price index (CPI), wholesale price index (WPI), crude oil prices (COP), KSE 100 index.	results of impulse response function that there is a positive and long run relationship between KSE100 returns and consumer price index (proxy of inflation) and international crude oil prices.
CHAUDHARY and AHMAD (1995)	Money Supply, Deficit, and Inflation in Pakistan	OLS method	International Reserves, Domestic financing of budget deficit including banking and nonbanking Systems and Commercial banks credit to the private sector, exports, imports	positive relationship between budget deficit and inflation during acute inflation periods, i.e., 1970s. they also found that money supply is not exogenous; rather it depends on the position of international reserves and fiscal deficit, and it has emerged as an endogenous variable.
Ansari et al., (2012)	THE DETERMINANTS OF INFLATION AND ITS	Correlations OLS	Money supply, inflation ,interest rate	long-run inflation is not only related to Interest Rate but also with supply of

Author	Title	Methodology	Variables	Results
	IMPACT ON ECONOMIC GROWTH: A CASE STUDY OF PAKISTAN			money. Hence, Interest rate has a greater impact on the inflation in Pakistan.
Mahmood et al., (2015)	impact of Interest Rate, Inflation and Money Supply on Exchange Rate Volatility in Pakistan	Johansen Co integration	Exchange rate, interest rate, money supply, CPI used proxy of inflation	Short and long run relation b/w inflation and exchange rate volatility. High money supply and increase in interest rate raises the price level (inflation) which leads to increase in exchange rate volatility.
Malik (2017)	impact of Oil Price Changes on Inflation in Pakistan	Johansson Co integration	Inflation rate, Crude oil prices, Interest rate, Fiscal deficit scaled by GDP, Real effective exchange rate, GDP growth	Our results suggest a strong oil price-inflation relationship, especially when oil prices are rising continuously over the past 1 year
REHMAN (2010)	MONEY-INFLATION RELATIONSHIP	Band spectrum regression	Money supply, GDP, inflation	money growth is positively and output growth is negatively related to inflation in low frequencies.
Hussain and Zafar (2018)	Interrelationship between Money Supply, Inflation, Public Expenditure and Economic Growth	ARDL, ECM, Granger Causality	Real GDP per Capita, Broad Money, Inflation, Total Government Expenditure Local Currency, Constant Local Currency,	long run association between Economic Growth, Government Expenditure, and Inflation.
Chaudhry et al (2011)	Foreign Exchange Reserves and Inflation in Pakistan	ARDL, co-integration, OLS, ECM	Foreign Exchange reserves, inflation	The rise in foreign exchange reserves leads to lower the rate of inflation in Pakistan during the study period.
Shaikh et al (2014)	An Investigation of Nature and Causes of Inflation in	Co integration	CPI, M2, real GDP, credit to private sector, exchange rate,	inflation in Pakistan is not only demand pull, as characterized by monetarist view

Author	Title	Methodology	Variables	Results
	Pakistan		industrial inputs prices, crude oil, imports plus exports as a proportion of GDP,	but is also cost-push and structuralist. Besides, we find evidence that inflation in Pakistan is import-induced too.
Fatima and Sahibzada (2012)	Empirical Evidence of Fisher Effect in Pakistan	Johansen co-integration, ECM, variance decomposition, Granger causility	Inflation, Money supply, interest rate.	Casual relationship between money supply and inflation indicate that inflation is not only a monetary phenomenon and fiscal imbalance and money creation in the economy also playing an important role in increasing the inflation and money supply in the economy.
Khan and Saqib (2008)	Political Instability and Inflation in Pakistan	(GMM)	Inflation, Money supply, nonmonetary Determinants, political instability.	a positive association between measures of political instability and inflation.
Malik (2009)	Crude Oil Price, Monetary Policy and Output, The Case of Pakistan	ADF, Johensan Cointegration	Real GDP, Real interest rate, Real Government spending, Real Government Revenue, Real stock price, Real Total Debt,Real effective exchange rate, Real crude oil price per barrel, Real foreign exchange reserves, Real world interest rate, Inflation rate, Expected inflation rate, target inflation rate, potential output, target real effective exchange rate	Oil prices and output are found to be strongly related relationship is bell-shaped, that is, after a certain level increase in oil price start the economy.
ZAKARIA (2010)	OPENNESS AND INFLATION:	Regression analysis, correlation	inflation rate, total trade, M2, fiscal deficit, exchange rate, terms	positive relation holds between trade openness and inflation. money supply,

Author	Title	Methodology	Variables	Results
	EVIDENCE FROM TIME SERIES DATA		of trade, democracy is proxied, per capita income.	fiscal deficit, exchange rate depreciations, foreign inflation, terms of trade, foreign debt and democracy significantly affect inflation
UMAIR And Ullah (2013)	Impact of GDP and Inflation on Unemployment Rate in Pakistan.	OLS, correlation	Inflation, GDP, unemployment	inflation has a role which influential but for GDP and unemployment with insignificant levels in the macroeconomics factors of Pakistani economy
Asad et al., (2009)	IMPACT OF REAL EFFECTIVE EXCHANGE RATE ON INFLATION IN PAKISTAN	ADF, OLS, correlation	Inflation, money supply, income velocity of circulation, real effective exchange rate, prices and money supply and real income.	Positive and strong relationship between the real effective exchange rate and inflation was found
Hussain and Malik (2011)	Inflation and Economic Growth, Evidence from Pakistan	ADF, OLS, ECM, Granger causality.	GDP, inflation,	inflation is positively related with economic growth
Bashir et al., (2011)	DETERMINANTS OF INFLATION IN PAKISTAN	JOHANSEN CO-INTEGRATION	Inflation, GDP, Imports of Goods and Services, Exports of Goods and Services, Government Expenditures, Government Revenue	long run consumer price index has found to be positively influenced by money supply, gross domestic product, imports and government expenditures on the other side government revenue is reducing overall price level in Pakistan
Saleem And Ahmad (2015)	Crude Oil Price and Inflation in Pakistan	JOHANSEN CO-INTEGRATION	GDP Deflator, Real Gross Domestic Product, M2, international Crude Oil Price,	Money Supply, Crude Oil Price, Exchange Rate, Interest rate and Indirect taxes have positive while real GDP has

Author	Title	Methodology	Variables	Results
			exchange Rate, Weighted Average Rate of Return on Deposits, Indirect Taxes.	negative impact on inflation
Arshad and Ali (2014)	Trade-off between Inflation, Interest and Unemployment Rate of Pakistan	ARDL, JOHANSEN CO-INTEGRATION, ECM	unemployment rate, population growth, external debt, exchange rate, interest rate, inflation, domestic credit to private sector, imports of goods and services, M2 and political instability dummies.	Money supply is revealed as major cause of inflation while exchange rate and imports have contributed negatively in inflation
Choudhri et al., (2015)	Monetary Policy in Pakistan, Effectiveness in Inflation Control and Stabilization	VAR, Dynamic stochastic general equilibrium modeling (DSGEM)	Approximately 30 are exogenous, and 15 are endogenous variables.	monetary policy shocks have an insignificant impact on output and inflation in Pakistan.
Abdullah and kalim (2012)	Empirical Analysis of Food Price Inflation in Pakistan	Johansen's co-integration	inflation expectations, money supply, per capita GDP, support prices, food imports and food exports	The results reveal that both demand and supply side factors are the determinants food price inflation in Pakistan. However, our study supports the structulists' point of view of inflation as money supply shows insignificant results.
Bashir et al., (2016)	Determinants of Inflation in Pakistan, Demand and Supply Side Analysis	ARDL, ADF, VAR	population, roads and government expenditure, imports, government revenue, electricity generation and external debt, inflation.	In the long run, inflation is caused by roads, government expenditure, imports, government revenue and external debt. There is decline in price level due to foreign direct investment, electricity generation and population in long run.
Shaheen (2011)	Fluctuations in Exchange	OLS, correlation	exchange rate, inflation rate,	A significant association between the

Author	Title	Methodology	Variables	Results
	Rate and its Impact on Macroeconomic Performance of Pakistan		import, export	exchange rate and inflation rate as well as annual imports is observed.
Ali et al (2012)	Impact of oil prices On food inflation in Pakistan	OLS	rice, maize, wheat, chicken and cooking oil, high speed diesel	highly significant effect of oil prices on foods inflation
Nawaz et al., (2017)	Correlation and Causality between Inflation and Selected Macroeconomic Variables in Pakistan	OLS, correlation, Granger causality	CPI, Money Supply, Government Expenditures, Government Revenue, Interest Rate. Foreign Direct Investment, GDP	money supply, government expenditure, government revenue, foreign direct investment and gross domestic product have positive impact on inflation in Pakistan, while interest rate shows negative impact
Iqbal et al., (2012)	Terms-of-Trade Volatility and Inflation in Pakistan	ADF, correlation, ARCH	Inflation, Income growth TOT, Foreign export price, Exchange rate, Money supply, Fiscal deficit, World oil price index	TOT volatility has a significant negative effect on inflation. Output growth has a negative effect on inflation while foreign export prices have a positive effect on inflation. nominal exchange rate and money supply increase the inflation rate
Memon and Ghumro (2014)	Impact of Monetary and Fiscal Policies on Pakistan	VAR	GDP, output gap, inflation, short term interest rate, and government fiscal deficit	positive effect of fiscal stimulus on inflation; but that on output gap the effect is negative. Effect of interest rate on output gap and inflation has been found to be negative.
Ahmed (2013)	Determinant of Inflation in Pakistan	Johansen Co Integration Approach	M2, GDP, price of export goods, price of import goods Output gap, Energy Crises, government current expenditure, government development	GDP, M2, energy crises, import and current government expenditure, output gap and adaptive expectation create inflation while development expenditure negatively corrected with inflation. The

Author	Title	Methodology	Variables	Results
			expenditure, and CPI	study concluded that in Pakistan demand side and supply side inflation persist.
Khanand Axel (2006)	Inflation in Pakistan: Money or Wheat?	VECM, ARDL	money supply, credit to the private sector, exchange rate, wheat support price,	monetary factors dominant role in recent inflation. Changes in the wheat support price influence inflation in the short run
Jaffri et al., (2013)	Passthrough of Global Inflation to Domestic Inflation: An Empirical Evidence for Pakistan	ADF, OLS	domestic CPI, industrial production, nominal effective exchange rate, foreign CPI, food and beverages, foreign CPI for industrial materials, foreign CPI for energy	global inflation in food, industrial inputs and energy price indices positively and significantly affect inflation in Pakistan in the long run. The empirical estimates of long run pass through of foreign food and energy inflation to domestic inflation are consistent with recent studies for developing countries
Rehman et al., (2015)	Measuring the Effects of Pakistan's Fiscal Policy over Inflation:	ADF, OLS, ARCH	growth rate of government expenditure, taxes, budget deficit, GDP, employment rate, interest rate and inflation rate.	(growth rate of government expenditure, growth rate of GDP, interest rate and employment rate) are significant, remaining variables (growth rate of taxes and budget deficit) are insignificant. So, the impact of fiscal policy is great over inflation
Khan and Gill (2010)	Determinants of Inflation in Pakistan	OLS	SPI, GDP Deflator, Budget Deficit, Exchange Rate, Wheat Support price, Interest Rate Imports in rupees, Support Prices of Sugarcane, Rice, Wheat, and Cotton in rupees, M2, CPI, WDI,	budget deficit has played no role in boosting all the four indicators of inflation in Pakistan in the long-run

Author	Title	Methodology	Variables	Results
Anwar (2013)	EFFECT OF INCREASE IN OIL PRICE ON INFLATION IN PAKISTAN	OLS	Inflation, oil prices, exchange rate	Lower real effective exchange rate and the existence of foreign exchange reserves and capital investment in Oil Exploration will help to reduce inflation in Pakistan.
Khan et al., (2007)	DETERMINANTS OF RECENT INFLATION IN PAKISTAN	OLS	Real Gross National Product, Real Demand relative to Real Supply, Private Sector Borrowing, Import Prices, Exchange Rate, Government Taxes, (YMS), Adaptive Expectations(CPI-1), and CPI	the most important determinants of inflation in 2005-06 were adaptive expectations, private sector credit and rising import prices.
Han and Gil (2007)	Impact of Supply of Money on Food and General Price Indices in Pakistan	OLS	CPI food, CPI general, WPI food, WPI general, GDP deflator and SPI as measures of inflation and M1, M2 and M3 supply of money.	CPI food, CPI general, WPI general, GDP deflator and SPI show they are negatively related with M1 and M2. CPI food, CPI general, WPI general, GDP deflator and SPI are positively related with M3
Farooq et al., (2011)	Impact of Cost-Push and Monetary Factors on GDP Deflator in Pakistan	OLS	GDP Deflator, exchange rate, wheat support price, wage in the perennial industries, value of imported raw material, Dummy variable	both cost-push and monetary factors are influenced on wholesale price index. The monetary variables have significant impact on GDP deflator.
Arshad and ali (2016)	Trade-off between In ation, Interest and Unemployment Rate of Pakistan	ARDL, VECM, johanson cointegration	unemployment rate, population growth, external debt, exchange rate, interest rate, inflation, domestic credit to private, imports	results do not provide significance trade-off between unemployment rate and inflation rate. Trade off exists in interest rate analysis over short run with inflation

Author	Title	Methodology	Variables	Results
			of goods and services, M2, political instability	rate and unemployment rate.
Shah et al (2013)	The impact of Oil Price and Oil Price Fluctuation on Growth Exports and In ation in Pakistan	ARDL, VECM	GDP, exports inflation rate, oil price.	oil price fluctuation compared to oil prices drastically and asymmetrically affect the macro-economy of Pakistan
Khan and Hanif (2013)	Role of Demand and Supply Shocks in Driving Inflation: A Case Study of Pakistan	SVAR	(IPI) industrial production index, CPI, Real Interest Rate , Real Exchange Rate,	inflation follows a sluggish time path in response to supply shock as compared to demand shock of nominal nature
Sultan and shah (2013)	Impact of Inflation on Econom ic Growth in Pakistan	Co-relation and Linear Regression	GDP, Economic growth, inflation, exchange rate, money supply, GDP per capita	tudy shows that current inflation rate is dangerous to the growth of the economy after a firm threshold point.
Ahmad et al (2014)	Inflation, Inflation Uncertainty and Economic Growth Nexus in Pakistan	GARCH, EGARCH, ARCH, Granger Causality, ADF	Growth rate, inflation, Uncertainty of inflation.	negative shocks to error term have larger impact on variance of inflation than positive shocks
Saleem et al., (2013)	DETERMINANTS OF INFLATION IN PAKISTAN	OLS	unemployment, exchange rate, GDP, interest rate and fiscal deficit and inflation	negative relationship between inflation rate with unemployment and fiscal deficit while positive relationship between inflation rate with exchange rate, GDP and interest rate.
Noor and Chaudhary (2007)	Economic Management and Roots of Inflation in Pakistan	Johansen Cointegration, ECM	Inflation Rate, Real GDP, Interest Rate, M2, Budget Deficit, Exchange Rate and, Import Prices	The results indicate a positive relationship of price level with money supply, import prices, budget deficit and expenditures on

Author	Title	Methodology	Variables	Results
				services sector.
			INTERNATIONAL	**LITERATURE**
Alexander et al., (2015)	Analysis of the Main Determinants of Inflation in Nigeria	Johansen Cointegration, ECM, VAR	Inflation rate, real GDP, lending rate, GDP of Agriculture, money supply, import, fiscal deficit and exchange rate	VAR result showed that fiscal deficits, exchange rate, import of goods and services, money supply and agricultural output have a long run influence on inflation rate in Nigeria
Mbongo et al., (2014)	The effects of money supply on inflation in Tanzania	OLS, VAR and ECM	CPI, M 2, Real exchange rate, Price of fuel, Price of maize.	OLS and ECM results show that money supply and exchange rate have significant impact on inflation in the short and long run. Further, VAR findings current inflation can be influenced by the past state inflation.
uddin et al., (2014)	Determinants of inflation in Bangladesh	ARDL	GDP, M2, Real effective exchange rate, interest rate, inflation, oil prices,remittances.	GDP, M2, and interest rate of current year of Bangladesh as well as previous year's real exchange rate and interest rate have contributed to increase inflation in Bangladesh
Amit (2016)	Determinants of Inflation: Evidence From Bangladesh	ARDL, ECM	exchange rate, money supply, interest rate and government expenditure , inflation	In long-run, exchange rate has negative effect on inflation, money supply and interest rate have no significant effect on inflation, and government expenditure has positive effect on inflation.
Ebiringa (2014)	Exchange Rate, Inflation and Interest Rates Relationships in Nigeria	ARDL, co-integration	exchange rate, interest rate and inflation	A significant short-run and long run positive relationship between inflation and exchange rate. On the other hand, interest rate exhibited a negative relationship

Author	Title	Methodology	Variables	Results
Tafti (2012)	Determinants of Inflation in Islamic Republic of Iran	Johansen, VAR, Impulse Response Functions, and Forecast Error variance Decomposition	CPI, M2, Import Price Index, GDP	the response of the (CPI) to shock in GDP is too weak and the response of CPI to shocks in import price index and liquidity is initially positive
Mahmoud(2014)	RELATIONSHIP AND CAUSALITY BETWEEN INTEREST RATE AND INFLATION RATE CASE OF JORDAN	Multiple regression, correlation, unit root tests, co-integration tests and causality tests	Inflation , interest rate, M2, economic growth, budget deficit	show that there is a positive relationship between inflation and interest rate also there is a bidirectional causality relationship between inflation and interest rate in Jordanian economy
Datta and Mukhopadhyay (2011)	Relationship between Inflation and Economic Growth in Malaysia	correlation, unit root tests, co-integration tests and causality tests, VECM	Inflation, economic growth,	exist short-run causality between the variables and direction of causality is from inflation to economic growth but in the long-run economic growth Granger Causes inflation
Musa and yousif (2018)	MODELING THE DETERMINANTS OF INFLATION IN SUDAN	GENERALIZED METHOD OF MOMENTS	GDP, Government Expenditure, Exchange Rate, CPI, Unemployment Rate, M2.	increase in money supply and CPI lead to an increasing inflation rate. The reduction of the exchange rate leads to a high rate of inflation. However the increasing in GDP, Unemployment Rate, and Government Expenditure lead to decreasing inflation rate in Sudan
Ratnasiri (2206)	The Main Determinants of Inflation in Sri Lanka	VAR	Inflation, reap output, M2, unit price of imported goods,	money supply growth and rice price increases are the main determinants of

Author	Title	Methodology	Variables	Results
			GDP, Exchange rate, interest rate, Exchange rate depreciation (USD/SLRS rate)	inflation in Sri Lanka in the long run. Short run, rice price is the most important variable as it is a totally endogenous variable
Arif and Ali (2012)	Determinants of Inflation in Bangladesh	Johansen-Juselius cointegration, ECM	Inflation, M2, GDP, Government Revenue, Government Expenditure, Exports of Goods and Services, Imports of Goods and Services	GDP, broad money, government expenditure and import have a positive effect on the inflation in long run. On the other hand, government revenue and export have a negative effect
He (2017)	A Study on the Relationship between Money Supply and Macroeconomic Variables in China	VAR	real GDP, the inflation rate & the interest rate, M2	increase in the real GDP can result in an increase in the M2,; Also, an increase in the inflation rate can lead to an increase in the M2,; Conversely, an increase in the interest rate can cause a decrease in the M2.
IENG (2017)	Determinants of Inflation In Cambodia	OLS, VECM	Inflation, food inflation, International inflation and international food inflation, (M1) Narrow money, Nominal Effective Exchange Rate, Output gap dummy, Government Expenditure and Revenue to GDP	food inflation and headline inflation of trading partners have positive impact on food inflation and headline inflation in Cambodia in the long-run. Narrow money interacting with dummy variable, government revenue to GDP, and nominal effective exchange rate also fuel inflation in the long-run based on VECM.
SAAED (2007)	INFLATION AND ECONOMIC GROWTH	co-integration, ECM, ADF, KPSS, PP	Real GDP and CPI	statistically significant long run negative relationship between inflation and

Author	Title	Methodology	Variables	Results
	IN KUWAIT			economic growth for the country as indicated by a statistically significant long-run negative relationship between CPI and real GDP
Bawa et al., (2016)	Analysis of Inflation Dynamics in Nigeria	co-integration	expected inflation, inflation, output gap, crude oil, and the role of rainfall in influencing food prices.	past inflation and average rainfall appeared to have been the main determinants of inflationary process in Nigeria. importance of money supply in the inflation process, lending credence to the dominance of the monetarist proposition on inflation dynamics in Nigeria
Yien et al (2017)	Monetary Policy Inclusive Growth: Empirical Evidence from Malaysia	Causality, structural break, VAR	growth per capita, broad money growth, inflation of consumer prices, unemployment rate, deposit rate, and foreign direct investment,	bidirectional causality between unemployment and growth per capita. VAR granger causality where foreign direct investment found to granger caused unemployment and growth
Gurgul And lach (2011)	the nexus between inflation rate and economic growth of polish provinces after eua ccession	backward stepwise regression	Real GDP, inflation, Real gross fixed capital formation in province, Total labour force in province, Human capital in province	The empirical analysis confirmed the existence of two statistically significant inflation threshold levels related to contemporaneous as well as one-year-lagged causal effects.
BIRESAW(2013)	determinant and impacts of dynamic inflation in ethiopia	Granger causality	CPI (general, food and nonfood), GDP, Official exchange rate and Gas Oil price, broad money supply	there existed a bi-directional causality between broad money supply growth and inflation and unidirectional causality between currency devaluation and inflation as well as oil price and inflation

Author	Title	Methodology	Variables	Results
Cao (2015)	Paradox of Inflation: The Study on Correlation between Money Supply and Inflation in New Era	recursive estimation method	M2 growth and CPI inflation, credit growth of the nonfinancial sectors, the ratio of dividends to investment, per capita income, GINI index,	I can conclude "in the relatively wealthy society, inflation is no longer a monetary phenomenon; it is a wealth allocation phenomenon.
Ochieng et al (2016)	Determinants of Inflation in the Kenyan Economy	OLS	Inflation, money supply, Interest rate, Real Income, Lagged Inflation, Real Exchange rate, oil prices,	the study concluded that real GDP growth, price fluctuations (changes in oil prices) and the previous period's inflation rate (lag inflation rate) are the ideal factors that affect inflation in Kenya
Vansteenkiste (2006)	what triggers prolonged inflation regimes	Probit Estimations	Food, Exchange rate regime, Trade openness, Real policy rate, Global inflation, Output gap, Investment growth, Past inflation, Debt/gdp ratio	Finally, oil prices, M2 growth and government spending were never statistically significant
Özsahin and Üçler (2017)	The Consequences of Corruption on Inflation in Developing Countries:	Panel Cointegration and Causality Tests	Inflation, corruption, GDP gap, M2	high corruption increased inflation rates, and that there was a unidirectional causal relationship from corruption to inflation for ten countries in the sample.
Ayubu et al (2013)	Monetary Policy and Inflation Dynamics: An empirical case study of Tanzanian economy	VECM	inflation, money supply, output, exchange rate and international oil price.	results suggest that inflation in Tanzania is more of an output factor than a monetary phenomenon
Eitan and Zeaud (2017)	Impact of Fluctuations in the Prices of Crude Oil on	OLS	Gold prices, oil prices, inflation	the effect after the global financial crisis began in the relationship between the

Author	Title	Methodology	Variables	Results
	Inflation: Evidence from Jordanian Economy			growth of oil prices and gold prices and inflation
Anning et al (2017)	inflation, unemployment and economic growth in iran	VAR	inflation rate, M2, interest rate, unemployment.	results indicate that there exist an equilibrium impact between unemployment and inflation in Iraq thereby supporting the validity of the Phillips Curve hypothesis