DISSERTATION

ANALYSIS OF INFLATION DETERMINANTS IN DEVELOPING OIL-EXPORT BASED ECONOMIES

Submitted by

Mohammad ALjebrin

Department of Economics

In partial fulfillment of the requirements
For the Degree of Doctor of philosophy
Colorado State University
Fort Collins, Colorado
Spring 2006

COLORADO STATE UNIVERSITY

DECEMBER 16, 2005

WE HEREBY RECOMMEND THAT THE DISSERTATION PREPARED UNDER OUR SUPERVISION BY MOHAMMAD ALJEBRIN ENTITLED ANALYSIS OF INFLATION DETERMINANTS IN DEVELOPING OIL-EXPORT BASED ECONOMIES BE ACCEPTED AS FULFILLING IN PART REQUIREMENTS FOR THE DEGREE OF DOCTOR OF PHILOSOPHY.

Committee on Graduate Work

Alexandra Bernasek

James Pritchett

Robert Kling

Adviser: Liang-Shing Fan

Department Head: Ronnie J Phillips

Acting Chair: Chuen-mei Fan

ABSTRACT OF DISSERTATION

ANALYSIS OF INFLATION DETERMINANTS IN DEVELOPING OIL-EXPORT BASED ECONOMIES

The purpose of this study is to investigate the main determinants of inflation in the developing oil-export based economies and to see if the main determinants of inflation are similar to other developing and developed economies. This study attempted to include all six Gulf Cooperation Council countries in the study. Due to the lack of data for some of these countries, the study was limited to three of them: Saudi Arabia, Kuwait and Bahrain.

We made a distinction between developed and developing economies in this study. The incentive for this distinction is that the determinants of inflation are often different in these two groups. Moreover, among the developing economies, there are the developing oil-export based economies, which may have special economic structures making them unique and diverse from other economies both developed and developing, in that they have a different economic point of view, especially relating to the determinants of inflation.

The tests performed in this study were carried out in three steps. The first was the test for stationarity, the second was the cointegration test, and the third was the error correction model (ECM).

The outcomes of the first testing model do not offer enough evidence for the determinants of inflation in the developing oil-export based economies. Taking into consideration the characteristics of the developing oil-export based economies; a new

testing model was constructed to investigate the determinants of inflation in these economies.

The results of the second model provide strong evidence concerning the determinants of inflation in developing oil-export based economies. Based on these results, the main determinants of inflation in developing oil-export based economies in the long run are growth of money, growth of non-oil GDP and growth of oil prices. Moreover, in the short run, the main determinants of inflation are money growth and non-oil GDP growth.

Mohammad ALjebrin
Department of Economics
Colorado State University
Fort Collins, CO 80523
Spring 2006

ACKNOWLEDGEMENTS

All praise and thanks are due to God who has enabled me to cope successfully with life and achieve my objectives.

I am greatly indebted to my academic advisor and committee chair, professor Liang-Shing Fan, for his guidance and precious advices. My gratitude and appreciation are also extended to the other members of my dissertation committee, Dr. Alexandra Bernasek, Dr. James Pritchett and Dr. Robert W. Kling for their valuable feedback and instructions. Many thanks also go to Dr. Stephen P. Dives for imparting his expert knowledge of empirical analysis.

I would also like to express my deep gratefulness to my wife for her endless support and understanding. I ask God to help her on the road to completing her Ph.D. Last but not least, to my children, Abdullah, Reem, Abdlaziz, and Omar for their love and perseverance that enabled them to provide me with an appropriate home environment to complete this work.

TABLE OF SUBJECTS

LIST OF TABLES ix

LIST OF FIGURES xi

CHAPTER ONE: 1

1.1. Introduction 1
1.2. Research Problem 4
1.3. Study Objective 5
1.4. Limitation and data source 6
1.5. Format of the study 7

CHAPTER TWO: LITRARTURE REVIEW 8

2.1. Review of theoretical studies 8
2.2. Review of empirical studies 23

2.2.1. Empirical studies on developed and European Transition Economies 24
2.2.2. Empirical studies on developing countries 28
2.2.3. Empirical studies on developing oil-based countries 29

CHAPTER TREE: METHODOLOGY AND MODELING 34

3.1. Methodology 34

3.1.1. Stationarity and Unit Root 35
3.1.2. Cointegration 37
3.1.3. Causality Test 38

3.2. The model 39

3.2.1. Variables used and Definitions 42

CHAPTER FOUR: ECONOMIC OVERVIEW 44

4.1. Introduction 44
4.2. Oil Market 46
4.2.1. Oil Revenues 48
4.3. Gross Domestic Product 49
4.3.1. Oil GDP 50

4.3.2. Non-Oil GDP....50

4.4. Inflation....51
4.4.1 Inflation in Saudi Arabia....51
4.4.2 Inflation in Kuwait....52
4.4.3 Inflation in Bahrain....53

CHAPTER FIVE: EMPIRICAL RESULTS....73

5.1. Data Description.... 73
5.1.1. Inflation.... 74
5.1.2. Money Supply....74
5.1.3. Gross Domestic product....74
5.1.4. The past change in price or the past inflation....74
5.1.5. Exchange rate....75
5.1.6. Foreign prices....75

5.2. Cointegration....76

5.3. Estimation problems....77
5.3.1. Multicollinearity....78
5.3.2. The impact of multicollinearity....78
5.3.3. Treatments for multicollinearity....79
5.3.4. Choosing the best treatment for our case....79

5.4. Unit Root Test....80
5.4.1. Unit Root test for Saudi Arabia....81
5.4.2. Unit root test for Kuwait....82
5.4.3. Unit root test for Bahrain....82

5.5. Johansen Cointegration Test....83
5.5.1. Saudi Arabia cointegration test results....84
5.5.2. Kuwait cointegration test results....85
5.5.3. Bahrain co-integration test results....86

5.6. Causality Test....87
5.6.1. Long run causality....89
5.6.1.1. Saudi Arabia....90
5.6.1.2. Kuwait....90
5.6.1.3. Bahrain....91

5.6.2. Short-Run Causality....92
5.6.2.1. Saudi Arabia....93
5.6.2.2. Kuwait....93
5.6.2.3. Bahrain....93

5.7. Modeling inflation in the developing oil export based economies........................105
5.7.1. The model..107
5.7.2. Data Source and Description..109
5.7.2.1 Inflation rate 109
5.7.2.2. Weighted Oil Prices growth rate 110
5.7.2.3. Weighted Oil production growth rate...........................110
5.7.2.4. Weighted Non-oil Y growth rate..................................110
5.7.2.5. Money supply growth rate... 111

5.7.3. Methodology and Empirical Findings analysis...............................112
5.7.3.1. Unit root Test..112
5.7.3.2. Johansen Cointegration Test.....................................113
5.7.3.3. Causality Test...115

CHAPTER SIX: CONCLUSION ABD POLICY RECOMMENDATIONS..........122

6.1 Conclusion...122
6.2 Policy Recommendations...128
6.2.1 Diversification and Privatization......................................129
6.2.2 Development of the private sector.....................................129
6.2.3 Completion of the Infrastructures......................................130
6.2.4 Development of more independent central bank.........................130

REFERENCES...132

LIST OF TABLES

TABLE		PAGE
4-1	Total Population and population growth rate of Saudi Arabia, Kuwait, and Bahrain.	54
4-2	GDP Per Capita and GDP Per Capita Growth Rate for Saudi Arabia, Kuwait, and Bahrain.	55
4-3	Oil price and oil productions for Saudi Arabia, Kuwait, and Bahrain.	56
4.4	Oil Reserve Life for Saudi Arabia, Kuwait, and Bahrain	59
4-5	Oil Revenue for Saudi Arabia, Kuwait, and Bahrain.	60
4-6	Total Government Revenues for Saudi Arabia, Kuwait, and Bahrain.	64
4-7	GDP growth (annual Percentage), in Saudi Arabia, Kuwait, and Bahrain.	65
4-8	Saudi Arabians Gross Domestic Product by Economic Activity	66
4-9	Kuwait's Gross Domestic Product by Economic Activity	67
4-10	Bahrain's Gross Domestic Product by Economic Activity	68
4-11	The percentage contribution of oil GDP and non-oil GDP to the total GDP in Saudi Arabia, Kuwait, and Bahrain.	69
4-12	Inflation and CPI in Saudi Arabia, Kuwait, and Bahrain.	71
5-1	ADF Unit Root Test for Saudi Arabia	95
5-2	ADF Unit Root Test for Kuwait	96
5-3	ADF Unit Root Test for Bahrain	97
5-4	Results of Cointegration test -Number of cointegrating	

	equation (Saudi Arabia)	98
5-5	Results of Cointegration test -Number of cointegrating equation (Kuwait)	99
5-6	Results of Cointegration test -Number of cointegrating equation (Bahrain)	100
5-7	Granger causality test Based on VECM for Saudi Arabia	101
5-8	Granger causality test based on VECM for Kuwait	102
5-9	Granger causality test based on VECM for Bahrain	103
5-10	Summary of causality directions for Saudi Arabia, Kuwait and Bahrain	104
5-11	ADF Unit Root Test for Saudi Arabia	118
5-12	Results of Cointegration test -Number of cointegrating equation (Saudi Arabia)	119
5-13	Granger causality test Based on VECM for Saudi Arabia	120
5-14	Summary of causality directions for Saudi Arabia	121

LIST OF FIGURES

FIGURE	PAGE
4-1 The path of oil price from 1970 to 2000.	57
4-2 Oil production path of Saudi Arabia, Kuwait, Bahrain, and the world oil production.	58
4-3 Oil Revenue path of Saudi Arabia from 1970 to 1990	61
4-4 Oil Revenue path of Kuwait from 1970 to 1990	62
4-5 Oil Revenue path of Bahrain from 1970 to 1990	63
4-6 Inflation rate path for Saudi Arabia, Kuwait, and Bahrain.	72

CHAPTER ONE

1.1. Introduction

A continued upward rise in the general price level, as measured by the consumer price index is a typical definition of inflation. However, dramatic fluctuations in the general price level which occur on a successive basis, when related to specific causes (such as demand, cost, or war, etc.) can also be a definition of inflation. This type of definition is generally associated with potentially devastating effects in terms of social and economic consequences on the economy and the long-term general welfare of the economy. Enhancing the processes of the economy by mobilizing economic resources and providing for more investment opportunities through a slow and steady rate of inflation has been cited as a benefit of moderate price level increases. Large jumps in price levels are always considered detrimental and are of major concern for any government entity.

Measuring the costs and benefits of inflation on social and economic impacts is a matter of some debate, but it is widely accepted that high rates of inflation are never good for any economy. When inflation proceeds at an expected rate, various means to avoid its cost may exist, such as adjusting interest rates to increase or decrease the spending behaviors of consumers. This is why erratic general price level changes are of great concern, due to their uncontrollable nature once an economy has started exhibiting this behavior. Even if inflation is seen as an enhancing tool for the process of economic development, there are still long-term welfare costs in the form of distribution effects, where only the rich see the investment benefits and the poor suffer under gradually rising price levels. There is also a concern that the benefits of mild inflation are outweighed by the misallocation it encourages. Controlling inflation is a primary function of the government in maintaining a healthy economy, and to have full control over this element, the causes and determinants of inflation must be identified and understood by the monetary authority. The treatment of problematic inflation becomes much easier when the causes and determinants are clearly identified.

There are various causes of inflation related to expansive monetary or fiscal policy (or both), and this type can be referred to as demand-pull in nature. Inflation can also be derived from profit inflation and/or wage inflation and is classified as either aggregate, sectoral, or cost-push inflation. Inflations resulting from temporary causes are easily identified, such as those initiated by war and natural disaster. Higher prices for goods and services imported from abroad and other external circumstances can result in transmitted effects to the domestic economy in the form of inflation as well. This is the import induced inflation.

Generally speaking, a differentiation is made between the presentation of the theories of inflation which are applied to the circumstances faced by a closed economy and those which relate to an open economy. For the open economy with a fixed exchange rate, the dominant theory is that inflation is caused by a balance of payments surplus, namely inflation imported in the form of higher commodity prices. The demand-pull, the cost-push, the expectation hypothesis, the sectoral demand-pull and the structural theories of inflation are usually associated with a closed economy. In the present days of globalization and economic dependency (primarily through some form of foreign trade and investment), the characterization of an economy as closed is not realistic. So it should be noted that such a differentiation is merely a theoretical device, whose purpose is to create definitions of causality.

A key distinction useful in this type of economic analysis is the identification of those economies which are developed, and those which are developing, because the cause and determinants of inflation are often different in these two groups, especially among oil-based economies, which may have special economic structures as compared to other developing economies.

Economic structures in developing oil-export based economies are particularly unique and different in several ways. Oil is the main source of income for the governments, which are also the owners of all the natural resources. An increase in oil revenue that occurs from governmental sale of oil potentially increases the level of governmental domestic spending, which is the way the oil revenue is transferred through the governmental expenditures to the domestic economies. In addition, these governments own most of the public services (electricity, drinking water, communication, transportation, etc.) and own the lion's share of the large production companies, primarily petro-chemical processing and manufacturing. These governments are also the dominant employers of local labor. They impose almost no taxes on either sales or income, and if they do, the rates are very low. In describing the financial structure, the monetary authority is not an independent agency, and operates essentially under a pegged exchanged rate regime. These economies are relatively small and open, importing most of their needs for consumption, investment, and production from the rest of the world.

1.2. Research problem

The utilization of oil revenues to build infrastructure through governmental control has resulted in a dramatic increase in consumption and living standards in oil-based economies through public service expansion. This is largely due to the large increase in the revenues of the oil exporting countries since the early 1970s. Rapid economic expansion and development policies and programs have taken place in all economic areas leading to phenomenal improvement in the public service sectors in most developing oil-based economies. Because of increases in the price of oil, the GDP has increased dramatically, and these increases have led to increased government expenditures, money supply, demand of goods and services, and other macro variables.

The increase in the GDP has often been accompanied, however, by an increase in inflation rates. Inflation is a worldwide problem, but it has affected developing countries more severely than developed ones, in that most of the developing countries have experienced higher rates of inflation in the last few decades as compared to wealthy developed countries. Several theories about inflation, its causes, consequences and policy measures exist. Many empirical studies have also been done concerning developing countries' inflation. However, none of the research has offered specific recommendations for more precise methods and more effective policies for controlling the inflation of oil-based economies. The proposed research will empirically test the inflations of Saudi Arabia, Kuwait and Bahrain during the period 1971 - 2002. The objective is that the research results will contribute to a better understanding of existing inflations and provide some guidelines to effective control of inflation by their governments.

1.3. Study objective

There are various theories which attempt to explain the determining factors of inflation in economies. The monetarist identifies the source of inflation as the result of money supply policy. As Friedman (1970) stated, inflation is always a monetary phenomenon. On the other hand, the structuralists blame the structure of the economy for the inflationary process, while others assign responsibility to increases in costs. The traditional classification of developed vs. developing economies utilized in established theories to explain the determinants and causes of inflation may not apply to developing, oil-based economies. Based on this premise, it is the objective of this study to examine the inflation in the developing oil-export based economies of Saudi Arabia, Kuwait, and Bahrain, for the period from 1971 to 2002 with the view of identifying the main determinants of inflation. The focal point of the study is to examine the various impacts made by the different kinds of causes of inflation, both domestic and foreign.

This study investigates both the behavior and determinants of inflation in the developing oil-export based economies of Saudi Arabia, Kuwait, and Bahrain, employing two different tests. The first test applies cointegration techniques to the inflation process, framed by a simple theoretical model. The second test applies the popular Granger-causality test by using data on both the consumer price index (CPI) and key economic variables such as GDP, money supply, exchange rate, and foreign prices.

In this study, a simple theoretical model of inflation is being constructed based on the general approach used in other inflation determinants studies on developed and developing economies e.g. Ubide (1997); Kim (2001).

Different theories in the economic literature have been developed further to explain the determinants of inflation. As mentioned above, the structuralist blame the structure of the economy e.g. Sunkel, (1960), Olivera, (1964), Maynard, (1961). Monetarists view the unconscionable increases in the money supply as the root cause of inflation e.g. Friedman, (1970), Schwartz, (1973) while others e.g. Machlup (1960), look at the increase in costs as the determining factor. In short the inflation could be the result of different sources simultaneously. In studying the determinants of inflation in the developing oil- based economies of Saudi Arabia, Kuwait, and Bahrain, a single theory is not sufficient, so a combination of theories may be a good solution.

1.4. Limitation and data source

Originally it was the intent of the author to study the determinants of inflation in the Gulf Corporation Council (GCC), comprised of Saudi Arabia, Kuwait, Bahrain, Qatar, United Arab Emirates, and Oman since these six countries have a similar economic structure and are all considered developing oil-based economies. They also have economic agreements, free trade area, customs union, and in 2002, the Supreme Council of the GCC approved the time table for the monetary union so that a single currency could be launched by January 1, 2010 at the latest. However, due to a lack of data availability, this study is limited to three of these countries, Saudi Arabia, Kuwait, and Bahrain during the period of 1971 to 2002. The data in our model are annual data including 32 observations; most of the data are collected from:

1- Saudi Arabia Monetary Agency (SAMA) annual reports

2- Bahrain's Central Bank annual reports

3- Kuwait's Central Bank annual reports

4- International Monetary Fund (IMF)

5- World Development Indicator (WDI)

1.5. Format of the study

The subsequent parts of this study are divided as follows: chapter two is a literature review of topics related to our study. We will state some of the theories and empirical research related to our study, such as different theories of the main determinants and causes of inflation. Chapter three presents the empirical methodology and model specification. Chapter four is a broad economic view of the targeted economies Saudi Arabia, Kuwait, and Bahrain, focusing on the economic evolution and inflation process during the study period to provide background information for the analysis. Chapter five will provide the empirical results including interpretation, and explanation of these results. In closing, chapter six provides a summary of the study, its conclusions, and policy implications.

CHAPTER TWO

Literature Review

2.1. Review of Theoretical Studies:

A great deal of economic literature concerns the determinants and causes of inflation. Inflation's role in the economy has been at the center of economic studies and has been debated for a long time. There are many variations in the definition of inflation. Vane and Thompson (1979), and Bronfenbrenner and Holzman (1965), define inflation as a rise in the general price level, which is therefore equivalent by definition to a continually falling value of money. Moreover, Flemming (1976), defines the rate of inflation as changes in the rate of the general level of prices in the economy. It is the proportionate change in the general price level per unit of time. Theoretical and empirical research concerning this issue is important in helping to explain the determinants and causes of the inflation process. In this chapter, the relevance of determinants and causes is examined through reviewing the different views of the inflation process. Moreover, among economists the process of inflation and its determinants has been extensively debated. Moderate inflation is seen by some economists as beneficial. On the other hand, when economists speak of inflation as an economic problem, they generally mean a continuous increase in the general price level over a period of time. The consumer price index (CPI) is the most common measure for inflation, and is determined by observing the change in price of various goods in the economy by applying econometric techniques. The increases in the price of these goods are combined to give a price index that reflects the change in price of the basket of goods, where the inflation rate is the rate of increase in this index. However, there is no single true measure of inflation, because each good in the index is assigned a different weight, and the value of inflation will be dependent on the weights given.

There are two main schools of thought which attempt to explain the main determinants of inflation. First, are the monetarists led by Milton Friedman. Friedman and Schwartz (1970), who wrote an influential book on the monetary history of the United States, argue that "inflation is always and everywhere a monetary phenomenon". Friedman attributes inflation to excess money supply generated by the central bank, and backs a central bank policy targeting equilibrium of supply and demand for money, as measured by growth in productivity and demand.

The oldest theory explaining the role of money supply on inflation is the quantity theory of money. The core idea of the quantity theory is that there is a relation between the quantity of money and prices. This theory is based on the "quantity equation" ($MV = PT$), which says that money (M) multiplied by velocity (V) equals prices (P) by the volume transaction (T). Consumers hold the money to buy goods and services, so there is a close relation between the money holding and transactions. The velocity of money (V) is the rate at which money circulates in the economy. The difficulty in measuring the number of transactions (T) is resolved by replacing the (T) by the total output (Y), then we will have, $MV = PY$, the income version of the quantity equation.

We have a useful theory explaining the effect of money on prices with the assumption that the velocity of money is constant. When the central bank changes the quantity of money (M), while the velocity (V) is constant and because the change in output (Y) is exogenus, the end result is that the change in money supply (M) will change the price level in a one to one relation. In addition, since the percentage change in the price level (P) is the rate of inflation, the quantity theory of money explains the determinant of inflation as excessive supply of money, which is caused by the central bank. If the central bank keeps the money supply stable, the price level will be stable; if the central bank raises the supply of money, the price level will rise (Mankiw 2000).

Friedman (1969), redefined the quantity money theory. He argued that the demand for money depended on a stable and predictable status in several major economic variables. Thus, if the money supply were increased, people would not simply wish to hold the extra money in idle money balances. That is if they were in equilibrium before the increase, they were already holding sufficient money balances to meet their requirements. Moreover, after the increase they would have money balances in surplus to their requirements. Hence, the aggregate demand would rise in response to the spending of the excess balances. On the other hand, if the money supply were decreased, people would reduce their spending to readjust their holdings of money. Friedman (1969) constructed this approach by equating money supply multiplied by its velocity to nominal income, which implied equilibrium in the money market. This version of the quantity theory has two new assumptions not present in the original one. The first is that the quantity theory is a theory of demand for money; the second is that the velocity of money is not constant but only stable. According to this view, when there is a full employment, if money supply increases, the price level will increase. But, the relationship between money supply and price level is not one-to-one. So, Friedman argued that the supply of money does affect the amount of spending in an economy, in contrast to the extreme Keynesian statement that 'money does not matter'.

In their empirical study of demand for money in Asian countries, Fan and Liu (1971), found that income plays an important role in the demand for money of Asian countries. They argued that Friedman's redefining of the quantity theory as a theory of demand for money is a good theory explaining the situation in Asian countries.

Basic factors such as resource availability, technological change and population growth produce changes in real output in the long run, according to Laliwala, (1984). Due to the fact that demand for money is a stable function, and taking these affecting factors into consideration, inflation can be explained by the variations in the supply of and demand for money, since money demand depends on output in a stable process. He states further that there is no case of excessive money supply which has not been followed by inflation, nor has been a case of inflation where excessive money supply is not found, regardless of the monetary system.

The quantity theory model was used by Fan (1970) in analyzing less-developed countries to test empirically the effect of monetary policy on real income and price level. He divided these countries into two categories, Asian and Latin American countries. Two different equations were regressed to perform his analysis. The first was rate of growth of real income as a function of rate of growth of money supply. The second was rate of change in price level as a function of rate of growth of money supply. Fan's findings suggest that real income can be stimulated by monetary policy in Asian countries. When this occurs, the increase in real income is accompanied by a significantly less than one-to-one ratio between rate of growth of money supply and rate of growth of price level. In contrast, he found that the effect of monetary policy on real income is negligible for Latin American countries. Moreover, the relationship between the growth rate of money supply and the inflation rate in Latin American countries is more than unity, which implies that a one percent increase in the rate of growth of money supply results in more than a one percent increase in the inflation rate. He suggested that this result is caused by hyperinflation existing in some of the Latin American countries. As a result, Fan states that the quantity theory model produces a good prediction in the case of hyperinflation. In addition, he suggested that a moderate increase in the money supply of around 16 to 17 percent is optimal for the countries studied.

Neo-Keynesians and other critics of monetarism argue that demand for money is directly linked to supply, and that demand for money cannot be predicted. Stiglitz and Greenwald (2003), have proposed that the relationship between inflation and money supply growth cannot be separated for ordinary inflation, in contrast to hyperinflation, which is mostly considered an effect of monetary policy.

Fischer (1996), questions the foundation of monetarism by investigating long periods of inflation occurring over decades. Through his work, he produced data which suggest that prior to a wave of monetary inflation there was a wave of commodity inflation, which governments responded to rather than initiated. Whether this formulation undermines the monetary data which supports the fundamentals of monetarism is still being argued.

In the second school of thought, the Keynesian economists have stated that the main determinants of inflation are aggregate demand in the economy rather than the money supply. According to Keynesians, the natural level of gross domestic product is a level of GDP where the economy is at its optimal level of production. If GDP increases beyond its natural level, inflation will accelerate as suppliers increase their prices. If GDP decreases below its natural level, inflation will deccelerate as suppliers attempt to fill excess capacity by lowering prices.

Keynes argued that money has no significant relationship with inflation, but inflation originates in the goods market. He proposed the "inflationary gap" model to explain the change in price level. According to this model, an upward shift in the expenditure function is the cause of the inflation gap. This shift is not directly caused by money supply expansion but by other factors including tax cuts, which result in an increase in consumption, or the business sector's optimistic expectations, resulting in an increase in investment. Some economists have argued that this inflationary gap cannot be maintained unless there is an increase in money supply because increases in the nominal demand for money are driven by price increases. The expenditure function will return to its original position by increases in interest rates if this increase is not matched by an increase in money supply. As a result, the inflationary gap is eliminated. (Harris, 1981)

The above conclusion is not supported by the Keynesian assumption concerning the demand for money. According to this assumption, demand for nominal money is not a stable function in prices and interest rates. Therefore, an upward shift in the function of nominal demand for money is not supported by a rise in price, so interest rates increase, and expenditure returns to its original level. This instability in the nominal demand for money is a result of the private sector's attempt to replace money with credit as a medium of exchange. Therefore the inflationary gap would be sustained, and the excess expenditure would be financed by extending credit within the sector.

Another economist, Pigou (1949), rejected the inflationary gap theory. He placed responsibility for inflation on the increase in money income. According to Pigou, inflation exists when money income increases more than the income earning capacity. He further distinguished between three types of inflation: wage-induced inflation, deficit-induced inflation, and galloping inflation. Wage-induced inflation is the increase in money stock due to an increase in wages, which requires business owners to have more money to pay employees in order to maintain the working capacity. Deficit-induced inflation occurs when government expenditures exceed its revenues from taxes and borrowing, and as a result it finances its excess expenditures by creating money. The last type, galloping inflation, is a result of the increase in money stock which can lead to distrust in currency and therefore increase the rate of change of prices. In conclusion, Pigou determined, according to his analysis, that an increase in money stock is a necessary and sufficient condition for inflation (see Zawadzki, 1986).

An important tool in Keynesian analysis is the relationship between wage rate increase and unemployment, called the Phillips curve, which was more of an empirical observation than a theory. It was intreduced by the British economist Alban W. Phillips in 1958, who investigated the relationship between wage rate increases and unemployment in the British economy. His findings indicated that there is a tradeoff between unemployment and inflation; inflation was high when unemployment was low, and vice versa (Flemming, 1976).

This kind of relationship indicates that some level of inflation coud be considered acceptable in order to decrease unemployment. Many economists believed for years following his initial 1958 publication that Phillip's results showed that there was a stable relationship between inflation and unemployment. The implications of this finding for government policy were that governments should allow a reasonable rate of inflation, as this would lead to lower unemployment.

Further investigation of this relationship has been performed by Samuelson and Solow (1960). They have redefined Phillips curve to establish a link between the rate of price change and rate of unemployment. As a result, this curve has been utilized as a policy instrument by the policymakers who have to choose a balance between unemployment and inflation rates. However, Friedman (1969) argued that unanticipated inflation creates a temporary trade off between inflation and unemployment. Because of the different expectations of the employees and employers during periods of rising inflation, unemployment decreases, but not as a result of high inflation by itself.

Gordon (1983), uses a new version of the Phillips Curve. The new version shifts, so that the "trade-off" can worsen or improve. That new version of Phillips Curve he used is called the triangle model, where the inflation rate is determined by the sum of Phillips curve inflation, supply shocks, and built-in inflation. The built-in inflation represents inflationary expectations and the price-wage spiral. The main factors in the shift of the

Phillips curve and changing the trade-off are the supply shocks and changes in built-in inflation expectation.

However many countries experienced high levels of both inflation and unemployment, or stagflation, in the 1970s. The simple and predictable relationship between inflation and unemployment was abandoned by most economists when this occurred, because theories based on the Phillips curve suggested that this could not happen.

Friedman and Schwartz (1963), argued that the Great Depression of 1930 was caused by a massive contraction of the money supply and not by the lack of investment Keynes had argued. They also maintained an over-expansion of the money supply resulted in post-war inflation. They authored the famous statement of monetarism that 'inflation is always and everywhere a monetary phenomenon'. Initially, it seems to many Keynesian-grounded economists that the Keynesian vs. monetarist debate is merely about whether if fiscal or monetary policy is the more effective tool for demand management.

On the other hand expectations play an important role in the economy because they affect economic behaviors, and a new theory has arisen to explain how inflation could occur as a result of these expectations. Lucas (1976) introduced the issue of how economic agents form expectations of the future. He stated that economic agents form market economic decisions (consumption or investment) based on the future expectations of changes in their income or profits. He also argued that traditional methods of policy evaluation do not account for the impact of policy on expectations because they are built on standard macroeconomic models.

The expectation formation has two basic versions, adaptive expectations and rational expectations. Adaptive expectation means that the economic agents form their future expectations and improve their economic decisions step by step, based on what has happened in the past. In essence, adaptive expectations mean that people base their expectations of the future on historical record.

On the other hand, the rational expectations concept do not accept step by step correction or improvement in the economic decision. Muth (1961) argued that the best predictions possible can be derived from all available information through relevant economic theory. Rational expectations coincide with the predictions of the relevant economic theories.

The inflationary expectations are used as a mechanism to explain the sudden acceleration of inflation. In the monetarist model, they play a role in the inflation acceleration theory and in the temporary nature of a monetary impulse. Moreover, in the Phillips curve model, a shift in the short run Phillips curve is caused by inflationary expectations (Frisch, 1977).

The most popular neo-classical economic critique of Keynesian economic theory is by Lucas (1976), who argues that rational expectations will defeat any monetary or fiscal policy. The new Keynesian argument is that this critique only applies if the economy has a unique equilibrium at full employment, and that rational expectations models do not produce any simple result. They claim that because of price stickiness, there are a variety of possible equilibriums in the short run.

In addition, inflation can be caused by an increase in aggregate demand or a decrease in aggregate supply. This suggests two basic sources or types of inflation: demand-pull inflation and cost-push inflation. Associated with Keynesian economists, demand-pull inflation results when economy-wide shortages are created by increases in aggregate demand. Cost-push inflation results when economy-wide shortages are created by decreases in aggregate supply, which are frequently triggered by increases in production cost.

Responsibility for inflation, according to demand-pull inflation models, is an increase in aggregate demand. This type of inflation results when the economy is incapable of producing what the four macroeconomic sectors (household, business, government, and foreign) collectively try to purchase. In terms of the simple production possibilities analysis, demand-pull inflation results when the economy tries to go beyond the production frontier, and then the end result is inflation. In other words, when buyers seek to buy more products than the economy can provide, aggregate demand increases beyond aggregate supply. The buyers drive up the price, and this extra demand "pulls" price levels up. According to a study conducted by Spinelli (1976), the finding was that excess demand has a heavy impact on prices.

On the other hand, cost-push inflation places responsibility for inflation on the decrease in aggregate supply that results from increases in production costs. When the cost of using any of the four factors of production (labor, capital, land, or entrepreneurship) increases, this type of inflation occurs. According to the production possibilities analysis, this means that when the production possibilities frontier shrinks closer to the origin causing it to be less than the aggregate demand, the end result is inflation. To summarize, the higher production cost means the economy cannot continue to supply the identical production at the original price level. If buyers want to consume the production, they must pay higher prices. The higher cost "pushes" the price level higher. According to Machlup (1960), rising money wages is the cause of inflation. Because of social pressure caused by unions, money wages increase independent of the labor market, which results in inflation because these wages increase faster than productivity. The result of inflation is a decrease in both the real value of money stock and unemployment. In addition, the government expands the money supply to try to maintain full employment. According to this analysis, the causation runs from prices to money supply and not the other way around.

Monetarists such as Milton Friedman argue against the concept of cost-push inflation because they believe that increasing the money supply by the government and its Central Bank are directly linked to inflation, and increases in the cost of goods and services would not occur otherwise. The explanation is that if the money supply is constant, increases in the cost of a good or service will decrease the money available for other goods and services, and as a result the price of some those goods will fall and offset the rise in price of those goods whose prices have increased. Based on this analysis, monetarist do not believe that the rise in the cost of oil in the 1970s was a direct cause of the resulting inflation. They argue that although the price of oil went back down in the 1980s, deflation was not present.

Keynesians responded to this fact by arguing that in a modern industrial economy, many prices are rigid, i.e., do not change easily or quickly with changes in supply and demand. Therefore, instead of prices falling in this situation, a supply shock would cause a recession, meaning a rise in unemployment accompanied by a falling in gross domestic product. The costs of such a recession would likely cause governments and Central Banks to allow a supply shock in order to stimulate inflation. They also note that there was a definite fall in the inflation rate during this period, even though there was no actual deflation in the 1980s.

In the above review we have surveyed the literature dealing with determinants of inflation in the economy as if it were separated from the effects of other international economies' inflation. In this study we are concerned with small developing open economies, and in the following sections we will review some of the theoretical models which explain how international inflation affects domestic inflation in these small open economies.

The first model dealing with inflation in small open economies is the structural approach, which has two perspectives, the Scandinavian model and the Latin American experience. The first view deals with the small open developed economies. In this model, the home country's economy is divided into two sectors: the sheltered sector, which is isolated from the world market, and the open competitive sector, which produces goods open for trade in the world market. Inflation in the competitive sector is equal to the world inflation, and considered exogenous. The inflation rate, along with an increase of labor productivity, determines the increase in wage rate within this sector. The wage rate in the competitive sector is equal to the wage rate in the sheltered sector. Because productivity is higher in the competitive sector, the inflation rate in the home country depends on the difference in productivities between the two sectors. Some economists have criticized this model on the grounds of its omission of the demand conditions (Frisch, 1974).

On the other hand, the view on less-developed countries was proposed by Campos (1967), and is referred to as the Latin American view. The economy of the home country is also divided into two sectors according to this view: the domestic sector, which produces internally consumed goods, and the open sector, which produces goods for export. Structuralists such as Campos claimed that less-developed countries' inflation is a result of transition to inward-oriented domestic market-based economies from outward-oriented export-based economies, which requires a change in the structure of the economy. The end result is that the price mechanism is unable to reflect these changes due to an imperfect market structure. Three structural constraints were identified by Kirkpatrick and Nixon (1976): the rigid supply of foodstuffs, the foreign exchange bottleneck, and the financial constraint.

The second approach dealing with the determinants of inflation in small open economies is the international transmission of inflation. According to Frisch (1977), there are several channels for international inflation to be transmitted to domestic economies. One of them is the liquidity effect. This channel is related to the monetarist who argued that the small open country inflation equals the world inflation under specific assumptions. That is because through the dynamic adjustment process, any change in domestic money stock will become part of the world money stock. Wherein, national and world inflation will rise in proportion to the increase in the world money supply (Humphrey, 1982). In this process, monetary policy is ineffective under a system of fixed exchange rates, and its only function is to determine the composition of money supply, such as shares of domestic credit and international reserves in domestic money supply.

Another channel for international inflation transmission to small open economies is called price effects. According to this channel, and assuming that such increases in the prices of the goods and services are not subsidized by the government, international inflation is transmitted to domestic economies through higher prices of imported goods and services.

To equalize the rate of inflation in the long run (a one-price law), this type of price increase tends to spread throughout the economy. The existence of two sectors within one economy, the tradable and non-tradable sectors, is attributed to the difference of the inflation rate between countries. A rise in the price of imported goods will be followed by a wage increase in that sector, and so it is assumed that price rises in tradable goods sectors are translated to the whole economy through this wage mechanism. The transfer of such an increase to the rest of the economy results from the freedom of labor mobility within each country. This hypothesis is used by the Scandinavian "structuralists" and the monetarists "balance of payments model". Therefore, the non equalization of the inflation rate throughout world economies (with fixed exchange rate), is because of the existence of non-tradable goods sectors with different rates of inflation among countries (Balassa, 1964).

The third international inflation transmission channel is called the demand effects. This channel operates under a system of fixed exchange rates and assumes full employment. The explanation of the demand effects on the transmission of inflation is by a Keynesian open economy multiple models (more than one country or economy).

Under the assumption of full employment and an increase in aggregate demand in one country through increase in the exports of the other country, the excess demand will be transferred from one country to the other, and the end result is international excess demand inflation (Frisch, 1977).

The final channel is the international inflationary expectation. According to this channel, what occurs in the rest of the world's price level can affect the formation of domestic price expectation. Therefore, when prices increase abroad, this can cause the formation of expectations, which then can be seen as a reason for price increases in another country. According to a study conducted by the Organization of Economic Cooperation and Development (OECD), there is a level of connection between the 1973 increase in the gold price and international inflationary expectation.

According to Frisch (1977), it is not easy to evaluate and understand this international inflationary expectation, as its effects are based on episodic observations rather than on systematic and extensive research.

2.2. Review of empirical studies:

In this section some empirical studies of inflation in developed and developing countries will be reviewed; there are many research results concerning the main determinants of inflation around the world. The review will be divided in three groups, developed and European Transition Economies, developing countries, and finally, developing oil-based countries.

2.2.1. Empirical studies on developed and European Transition Economies:

According to Hendry (1999), investigations of inflation in United Kingdom over the last century and a quarter examine the various theories of inflation. There is no single cause explanation imposed from the outset in this study. The study produced several results, one of which is that money was not the main determinant of inflation in the 1960s and 70s, and was far from a key influence throughout the entire period. In addition, excess demand for goods and services was an important determinant throughout this period of inflation. Also, the world inflation rate is highly significant, so some part of United Kingdom inflation may be 'imported'. The most significant determinants were excess demand for goods and services, world price inflation, Purchasing Power Parity (PPP) deviations, and United Kingdom wage inflation. The evidence here does not support single-factor explanations, and does support the basic framework that inflation is the result of the many excess demands and supplies in the economy.

Tsalinski and Kyle (2000) analyzed the determinants of Bulgarian inflation in the period from 1991 to 2000 using monthly data. Bulgarian inflation has been shown to have experienced two radically different regimes over the past decade. The dividing point between the two regimes is the spring of 1997 when the hyperinflationary trend of the prior period was ended by the institution of a currency board. They found that inflation during the previous period had been determined in a large part by monetary growth and to some extent by past inflation. Inflation after the institution of the currency board was no longer as dependent on monetary growth.

In addition, Kim (2001) used cointegration and error-correction models in his analysis on the relative impacts of the monetary, labor and foreign sectors regarding

Polish inflation from 1990 to 1999. He used a structural system approach in which co-integration relationships are used to show deviations from steady-state levels. The deviations are evaluated as excess demand pressure on inflation in a given sector and were incorporated in order to determine the short-run dynamics of Polish inflation. The results suggest that the labor and external sectors heavily influenced the determination of Polish inflation during the study period, but their effects have been the opposite since 1994. The appreciation of the domestic currency contributed to reducing inflation, while excessive wage increases prevented inflation from decreasing to a lower level. The monetary sector appears not to have influenced inflation, suggesting that monetary policy has been passive.

Golinelli and Orsi (2001), analyzed some empirical models of the inflation process in the three earliest east European transition economies; Czech Republic, Hungary and Poland. They first examined the inflation within the context of multivariate co-integration, where domestic and foreign price determinants are initially analyzed in separate blocks with each block being based on a different theory in order to identify a number of factors with long term effects. Then, they put previous information in short term simultaneous vector equilibrium correcting models for each country. As a result of using this method they found that the exchange rate is the main long term factor impacting domestic prices. In addition to market liberalization and demand-side pressure measured in terms of the output gap, the exchange rate is seen to be a significant cause of inflation.

Mitze, (2002), evaluated the relative predictive performance of different linear econometric and non-linear modeling techniques in terms of investigating the pattern of the European Monetary Union (EMU) inflation rate. He revealed many indicator variables from macroeconomic theory using co-integration analysis tools to serve as input for linear and non-linear models of inflation, and he also used growth rate data. He then estimated a set of linear and non-linear models and evaluated the in-sample accuracy. In a final step, the models were used for forecasting purposes in a simulated ex-post forecasting exercise. The main conclusions from the analysis are that the results give strong empirical support for the superiority of monetary aggregates in predicting the future pattern of inflation. These findings, in line with the recent literature, support the strategic focus of the European Central Bank (ECB) to target growth in monetary aggregates according to the first pillar of the ECB policy. Furthermore, the analysis shows the driving forces of EMU inflation and gives support to a somewhat creative approach to capturing the pattern of inflation. This analysis suggests that single cause explanations are not sufficient to completely analyze all aspects, and inflation is best modeled on the basis of multiple markets' disequilibria.

Boschen and Weise (2003), modeled the probability of a large upturn in inflation during a period of either stable or declining inflation, an occurrence that they term an inflation start in the OECD. The results indicate that three factors tend to lead up to these sustained increases in inflation. First, high rates of real GDP growth increase the probability of an inflation start, in that rapid growth reflects policy makers' attempts to exploit the short run Phillips curve, which eventually leads to higher inflation in most cases. Second, the gap between inflation in the United States and domestic inflation raises the probability of an inflation start, because inflation shocks in the world's largest economy tend to be distributed internationally. Third, the probability of an inflation start in a particular year is higher if a general election takes place. The explanation for this is that government policies aimed at influencing votes are most of the time inflationary. In contrast, oil price hikes, fixed exchange rate, fiscal policy and political initiations of the government do not have a large effect on the probability of an inflation start.

In further work, Bowdler and Nunziata (2004), extended Boschen and Weise's analysis. They claim that one determinant of the probability of an inflation start that Boschen and Weise did not examine is openness to international trade. Their empirical results show that greater trade openness decreases the probability of an inflation start, even after controlling the variables emphasized by Boschen and Weise. The contrasting of different model specifications indicate that what matters for the probability of an inflation start is changes in openness over time, rather than cross-country differences in openness.

Fic, (2003), applies an equilibrium correction model to analyze impacts of monetary, labor and external factors on German inflation using quarterly data from 1980.1 to 2001.4. Applying an eclectic approach enables empirical examination of potential inflation sources. According to the obtained results, inflation in Germany resulted from adjustment processes on the market of production factors, level of capacity utilization, external shocks contained in import prices, and monetary policy actions. Although the excess money in this study was an effect of disequilibrium on the money market it did not have empirical significance when studying inflation behavior. Fic argues that the study provides several implications for macroeconomic policy. The study indicates that wage policy is an important factor affecting price movements in the long run.

Both money supply and interest rates turned out to have a significant influence on inflation in the German economy. Such a result is a directly tied to the character of the monetary policy conducted in Germany in the last twenty years.

Vielma (2003) developed an expression that models the effect of inflation in the Solow model. Later this model was augmented with inflation and used to empirically test the effect of inflation on long run growth. Three different samples were employed in the testing: first, an extended sample of countries; second, an objectively screened sample; and third, an OECD sample. The conclusion provides strong evidence that moderate inflation does not affect long term economic growth in a negative manner.

2.2.2. Empirical studies on developing countries:

A study conducted by Ubide (1997), tries to explain the behavior of inflation in Mozambique by separating inflation into three components, a trend, a seasonal, and an irregular component. The combined analysis of the three empirical tests suggests that the rate of inflation in Mozambique is due to a group of "fundamental" trends set by economic polices, a seasonal behavior that follows closely that of agriculture, and a collection of unusual events that corresponds mainly to agro-climatic conditions. The results show that the firming of monetary policy in 1996 was the core reason for the decrease in inflation in that year. He argued that the control of monetary expansion had the multiplier effect of helping to stabilize the domestic currency, thus contributing twice to the restriction of inflation and to keeping inflation under control. The stability of the domestic currency should benefit from any improvement in the economic situation in South Africa, the largest trade partner of Mozambique, and from South African currency being more stable. This is because the money supply of Mozambique is Granger-caused by South Africa prices.

Other research relating the relationship between domestic and foreign inflation was conducted by Genberg and Pauwels (2002). They studied the transmission mechanism of foreign price and exchange rate to internal inflation in Hong Kong since establishment of the currency board arrangement in October 1983. The main finding was that there is a strong link between domestic inflation and foreign inflation.

2.2.3. Empirical studies on developing oil-export based countries:

Barry (1980), investigated the effect of increases in the government domestic expenditures, the money supply, and the rate of foreign inflation on the domestic consumer price index in Saudi Arabia for the period 1964 to 1978. These variables were not combined in one equation because of the extreme multicollinearity between them. So, two separate equations were used; one includes government domestic expenditures and foreign inflation, and the other includes the money supply and foreign inflation as independent variables. The results obtained from all models for the period 1964 to 1972 support the hypothesis that excess monetary demand is caused by a high rate of increase in both the money supply and government expenditures, in addition, foreign inflation was shown as a dominant variable in explaining the domestic rate of inflation. Government domestic expenditures and the money supply were found to be statistically significant and hence supported their importance in explaining the high rate of inflation during the period 1973 to 1978.

Darrat (1981), analyzed a monetarist model on inflation for Saudi Arabia over the 1963-1978 period by using quarterly data. The key finding was that interest rates play a statistically significant role in explaining money demand in Saudi Arabia. The Granger-causality testing results support the view that the money supply is statistically exogenous to prices. In general, the results are consistent with the monetarist view of inflation.

In investigating the domestic money market in Saudi Arabia, Aljuhani (1990), constructed two equations representing the supply of and the demand for money and specified the internal and external variables affecting them. Employing the monetarists' approach for inflation with these two equations, he analyzed the fluctuations in the Saudi price level in the period from 1970 to 1986. The findings suggest that government expenditure is the dominant variable affecting price instability in Saudi Arabia. He argues that the effect of government expenditures on price level is a result of the effect of these expenditures on domestic money supply. The Saudi government often finances its domestic deficits with international reserves accrued from oil revenues. When this occurs, the monetary base increases. Deposits in the commercial banks increase in accordance with the currency-demand deposit ratio originated from the increase in the monetary base. As a result, commercial banks' assets increase, and in response to this increase, their capability to create domestic credit also increases. Because of this, money supply increases and as a result the domestic price level increases as well, while the domestic interest rate decreases.

Salih (1993), modified and applied Hagen's analytical framework in both aggregative and disaggregative lag schemes to examine the role of the monetary stimulus and imported inflation on domestic inflation over the period 1970:1 – 1990:2 for oil exporting developing countries especially the case of Kuwait. The results of the study show that the excessive growth of monetary aggregates was more than double the rate of growth of domestic inflation. Moreover, the depreciation of Kuwait's domestic currency (Dinar) was another determinant of inflation, and its effect combined with direct imported inflation continued over ten lagged quarters. He argues that the only double digit inflation rates in the history of almost all oil exporting developing countries were in 1974 and 1980. This fact combined with their government's subsidization programs to insulate the domestic economy from imported inflation proves that monetary policy is a major cause of one form of inflation. Moreover, he suggests that, although these instruments succeeded in the past two decades to keep inflation at the world's lowest rate, it is not likely that fiscal policy alone will control inflation in the long run. He argues further that empirical evidence and the recent introduction of the debt financing instrument reflect the growing importance of monetary policy and in particular its lag effect on inflation.

Al-Saleh (1996) conducted an empirically investigation of money, income, and monetary policy in Saudi Arabia for the period 1960-1993, using a monetary framework. He estimates the effect of price level on high-powered money and the money multiplier simultaneously, showing the significant impact of these two variables on price level. He argues that this indicates inflation is strongly influenced by money supply, which emphasizes the importance of the monetary policy.

Finally, Al-Otaibi (2001), investigated the relationship among oil revenues, money supply and the price level, by concentrating on the importance of oil revenues in the money supply process. The results indicate that non-oil income is key part of the

Saudi money supply process. In addition, oil revenue is the stimulating factor in the system and has no direct effect on the price level.

From the brief review above, it is apparent there are a great number of theoretical frameworks to explain inflation. The differences among economists in explaining this economic phenomenon is clearly displayed, but in general, these theoretical frameworks can be divided into two main categories: the structuralist and the monetarist. The structuralists believe that increase in prices can be sustained without increasing money stock due to the ability of the private sectors to create credit within each sector to finance the increased price level. In contrast, the monetarists argue that the stability of the private sector's demand for money results in inflation when the money stock is increased. As a result, inflation only occurs when the money stock is increased.

These two frameworks also provide different explanations for the rate of inflation in small open economies, like those in developing oil-export based countries. The structuralist view of inflation, which is close to the Keynesian one, refers to the traded and non-traded goods markets, and their relation to domestic inflation for this kind of economy, according to the difference in productivity between the two markets, since both levels of productivity receive equal pay. On the other hand, the monetarists argue that the inflation rate in a small, open economy operating under a fixed exchange rate will equal to the world rate. The reasoning is that this type of country has no control over its money stock, and as a result, the monetary policy is ineffective. There is no reason for this kind of economy to have a different rate of price change from the rest of the world.

The economies of our case are small and open and operate under a fixed exchange rate. Regardless of the fact that their inflation rate is considerably different from the world rate, the question remains whether this is an exception to the rule for the monetary approach to global inflation transmission, or whether it can be explained by a combination of several theories using various approaches.

Most of the empirical studies concerning the oil-export based developing economies used the monetary approach. In this study, however, several approaches will be used trying to identify both the internal and external determinants of inflation.

CHAPTER THREE

Methodology and Modeling

In chapter two we reviewed several theories identifying different determinants and causes of inflation. In the Keynesian view, inflation is caused by a change in supply and demand in the goods market. On the other hand, monetarists view inflation as a monetary phenomenon that is caused by excessive increases in the money supply by the central banks. However, the structuralists place the responsibility of inflation on the structure of the economy. Others contend that the inflation from abroad can affect the domestic inflation through several channels.

Based on the literature review, the investigation and testing of the determinants and causes of inflation should consider and take into account a combination of several theories. This seems to be a good way to study the internal and external determinants and causes of inflation, especially in oil-based developing economies.

3.1. Methodology:

Most economic theories are concerned with long-run equilibrium relationships caused by behavioral rules and market forces. Moreover, most time series data especially in developing countries are non-stationary. On the other hand, in order to apply standard procedures in empirical econometric studies, the variables in the model need to be stationary, because most econometric theories rely on the assumption that the variables' data are stationary. However, in most time series data, unit root test results indicates that the means and variance are not independent of time.

Box and Jenkins (1970), support the idea of making integrated time series stationary by differencing the series before testing to obtain stationarity as a requirement for regression analysis. On the other hand, others such as Sargan (1964), Hendry and Mizon (1978), don't like the idea of differenced variables because of the difficulties in capturing the long-run equilibrium from the estimated model.

Granger (1981), argues that a vector of variables which are stationary after differencing could have linear combinations which are stationary in levels. Engle and Granger (1987), propose the idea of integrated variables sharing an equilibrium relation which could be either stationary or have a lower degree of integration than their original series. They call their idea co-integration, and it was the first time the concept of co-integration was introduced into economic literature and used to estimate economic relationships among time series variables.

In this study we will use annual time series data from 1971 to 2002 for all three countries namely, Saudi Arabia, Kuwait, and Bahrain. We will apply a unit root test to test for stationarity and non-stationarity of time series. Then we will apply the concept of co-integration. Finally, we will apply the causality test to capture the direction of the long-run relationship between the variables.

3.1.1. Stationarity and Unit Root:

There are different ways to test if a time series is stationary or non-stationary. The most popular one is the Augmented Dickey-Fuller (ADF) test (Dickey and Fuller, 1981).

It is important to test the properties of the variables under investigation for unit roots, to avoid the potential problem of estimating spurious relationships. We will employ the ADF test in order to establish the order of integration of the variables in our data set.

If a variable does not have a unit root, which means that the variable is stationary, it is said to be I (0) (i.e., integrated of order zero). The variable is said to be integrated of order one (I (1)) if it is not stationary in its level form but stationary in its first differenced form. In general, we can say, the series Xt will be integrated of order d (i.e., Xt~I (d)), if it is stationary after differencing d times, which means Xt contains d unit roots.

To determine the stationarity property of the variables in their levels as well in their first differences, the following general form of the ADF test is applied:

$$\Delta y_t = \delta\, y_{t-1} + \sum_{i=1}^{k} \Theta \Delta\, y_{t-i} + v_t \qquad (3.1)$$

$$\Delta y_t = \alpha + \delta\, y_{t-1} + \sum_{i=1}^{k} \Theta \Delta\, y_{t-i} + v_t \qquad (3.2)$$

$$\Delta y_t = \alpha + \delta\, y_{t-1} + \beta\, T + \sum_{i=1}^{k} \Theta \Delta\, y_{t-i} + v_t \quad (3.3)$$

where Δ is the difference operator, K represents the number of differenced terms used , α is a constant, T is a trend, δ and β are coefficients and v_t is the stochastic error term .

The null hypothesis for the unit root is H_0: $\delta = 1$. If the test statistics are significantly different from zero and are negative, then the null hypothesis of the unit root is rejected.

3.1.2. Cointegration:

Macroeconomists at universities, economic research institutes and other related institutions have constructed and applied time-series models for forecasting, for conducting policy analysis, and for testing economic theories. An important objective of empirical research in macroeconomics is to estimate relationships and test hypotheses derived from economic theory among such aggregate variables. The statistical theory used in constructing and testing economic models was based on the assumption that the variables in these models are stationary. The problem is that statistical inferences derived from stationary processes are no longer valid if the time series are nonstationary. Nonstationarity, a property common to many macroeconomic and financial time series, means that a variable has no clear tendency to return to a constant value or to a linear trend. In the past, nonstationary variables were differenced to make them stationary before using them in multivariate models. Later, Engle and Granger (1987), introduced the concept of cointegration for the first time. They showed that it is possible for a linear combination of integrated variables to be stationary. In this case the variables are said to be cointegrated. They show that macroeconomic models containing nonstationary stochastic variables can be constructed in such a way that the results are both economically meaningful and statistically sound. Their work provided the basis for modeling with rich dynamics among interrelated economic variables. The introduction of the concept of cointegrated variables has substantially changed the way empirical models of macroeconomic relationships are formulated today. This model has gained popularity because it can simultaneously capture the short-run dynamic properties as well as the long-run equilibrium behavior of many non-stationary time series.

Without a statistical theory for testing the concept of cointegration it would not have become useful in practice for estimating parameters of linear systems with cointegration. Engle and Granger (1987), present a rigorous proof of the Granger representation theorem. They consider the problem of testing the null hypothesis of no cointegration between a set of I(1) variables. They estimate the coefficients of a static relationship between these variables by ordinary least squares (OLS) and apply the unit root tests to the residuals, rejecting the null hypothesis of a unit root as an evidence in favor of cointegration.

3.1.3. Causality Test:

The question that usually arises in time series analysis is whether or not one economic variable can help forecast another economic variable. One way to address this question was introduced by Granger (1969) and later by Sims (1972). Testing causality, in the Granger sense, involves using F-tests to test whether lagged information on a variable Y provides any statistically significant information about a variable X in the presence of lagged X. If not, then "Y does not Granger-cause X." Causality involves time; the first thing happens, and then later the second thing happens as a result. It is important to know that Granger-causality tests are very sensitive to the choice of lag length and to the methods employed in dealing with any non-stationarity of the time series.

By employing the Granger causality test procedure, we will determine the direction of causality. In our analysis we will investigate the causality between the dependant variable and independent variables using annual data for the countries under study for the period from 1971 to 2002.

For example, the causality between the consumer price index (CPI) and GDP would be as follows:

$$CPI = \sum \alpha_i \, GDP_{t-i} + \sum \beta_j \, CPI_{t-j} + u_{1t} \quad (3.4)$$

$$GDP = \sum \lambda_i \, CPI_{t-i} + \sum \delta_j \, GDP_{t-j} + u_{2t} \quad (3.5)$$

Assuming u_{1t} and u_{2t} are uncorrelated.

Consequently, we will have four possibilities:

1- GDP $\rightarrow$ CPI: $\sum \alpha_i \neq 0$ and $\sum \lambda_i = 0$ $\rightarrow$ unidirectional causality.

2- CPI $\rightarrow$ GDP: $\sum \alpha_i = 0$ and $\sum \lambda_i \neq 0$ $\rightarrow$ unidirectional causality.

3- CPI $\leftrightarrow$ GDP: $\sum \alpha_i \neq 0$ and $\sum \lambda_i \neq 0$ $\rightarrow$ all sets of coefficients are significant (feedback/ bilateral causality).

4- No causality, all sets of coefficients are not significant (independent from each other).

3.2. The model:

This section derives a simple theoretical model of inflation determination in order to analyze the impact of the different variables on inflation. In this study, a simple theoretical model of inflation is constructed from the basis of the general approach used in other inflation determinants studies on developed and developing economies following e.g.,Ubide, (1997); Kim, (2001).

The starting point is the general price level which according to economic theory can be expressed as a weighted average of the price of tradable goods (**P^T**) and non-tradable goods (**P^{NT}**):

$$\mathbf{LogP_t = \Theta\,(Log\,P_t^{T}) + (1\text{-}\Theta)(Log\,P_t^{NT})} \tag{3.6}$$

Where $\mathbf{\Theta}$ is the share of tradable goods in the consumption basket and $\mathbf{0 < \Theta < 1}$

The price of tradable goods assuming a small open economy and purchasing power parity (PPP) is determined in the world market and depends on foreign price $\mathbf{(P^f)}$ and on the exchange rate **(e)**. In domestic currency terms, $\mathbf{P^T}$ can be described by the following expression:

$$\mathbf{Log\,P^T = Log\,e_t + Log\,p_t^f} \tag{3.7}$$

Hence depreciation (appreciation) of the exchange rate or an increase (decrease) in foreign prices will increase (decrease) domestic prices.

On the other hand, the price of non-tradable goods is determined in the domestic money market, where demand for non-tradable goods is assumed, for simplicity, to move in line with demand in the economy overall. As a result, the price of non-tradable goods is determined by the money market equilibrium condition, where real money supply $\mathbf{(M^s/p = m^s)}$ equals real money demand $\mathbf{(m^d)}$:

$$\mathbf{LogP_t^{NT} = \beta(Log\,m^s{}_t - Log\,m^d{}_t)} \tag{3.8}$$

Where $\boldsymbol{\beta}$ is a scale factor illustrating the relationship between economic-wide demand and demand for non-tradable goods. Moreover we assume that the demand for real money balances depends on real income and inflationary expectations. Also the money demand function should include interest rates in addition to inflationary expectations as an opportunity cost variable. However, because of the lack of data during the study period, we assume that the relevant substitution is between goods and money, and not among different financial assets. Accordingly, the opportunity cost of substitution between goods and money is the expected inflation rate $E(\pi_t)$.

$$\mathbf{m_t^d = h(y_t, E(\pi_t))} \quad , \qquad f_1 > 0 \, , \, f_2 < 0 \qquad (3.9)$$

An increase in real income will lead to an increase in money demand and an increase in expected inflation will lead to a decrease in money demand.

Another reason for including expected inflation in the model is the Lucas critique. As Lucas (1976) argued, rational agents will change their behavior with changes in the policy stance, and hence any inference that does not explicitly consider expectations is bound to make systematic predictive errors. There are different ways to model expected inflation ($E(\pi_t)$). A general modeling could be the following:

$$\mathbf{E(\pi_t) = d(L(\pi_t)) + (1\text{-}d)\ \Delta Log P_{t-1}} \qquad (3.10)$$

Where $L(\pi_t)$ indicates a learning process for the agents of the economy. If all the weights in $L(\pi_t)$ are equal, then we have adaptive expectations. If the weights decrease with time, we have a learning process. Therefore, people will form expectations on the basis of previous inflation and past experience in forecasting inflation. To simplify the procedure, we will assume that d=0

Then we will have $$\mathbf{E(\pi_t) = \Delta\ Log\ P_{t-1}} \qquad (3.11)$$

Substituting (3.7) and (3.8) into (3.6)

$$\mathbf{Log\ P_t = \Theta\ (Log\ e_t + Log\ p_t^f) + (1\text{-}\Theta)\ \beta(Log\ m^s_t - Log\ m^d_t)} \qquad (3.12)$$

Substituting (3.11) into (3.9)

$$\mathbf{Log\ m_t^d = h(Log\ y_t, \Delta\ Log\ P_{t-1}))} \qquad (3.13)$$

Substituting (3.13) into (3.12)

$$\mathbf{Log\ P_t = H\ (Log\ e_t\ , Log\ p_t^f,\ Log\ m^s_t, Log\ y_t, \Delta\ Log\ P_{t-1})} \qquad (3.14)$$

For estimating our model we will use the following equation,

$$\log Pt = \alpha_1 \log m_t + \alpha_2 \log y_t + \alpha_3 \Delta \log P_{t-1} + \alpha_4 \log e_t + \alpha_5 \log P^f_t \qquad (3.15)$$

3.2.1. Variables used and Definitions:

Our model includes domestic prices (P), as the dependent variable, and money supply (m), real income (y), change in domestic prices (ΔP_{t-1}), exchange rate (e), and foreign prices (P^f) as independent variables. The variables' descriptions are as follows:

1- Domestic Prices (P): The best definition for domestic prices is the Consumer Price Index (CPI). It is the most commonly used measure of the overall level of prices, and it shows the cost of a fixed basket of consumer goods relative to the cost of the same basket in a base year.

2- Money Supply (m): This is (M_2), defined as currency in circulation plus demand deposits.

3- Real Income (y): or Gross Domestic Product (GDP) in real terms. This is the value of goods and services measured using a constant set of prices.

4- Change in past Prices (ΔP_{t-1}): This variable is measured by the change in CPI_{t-1} compared to the previous year's CPI, which is $\Delta CPI_{t-1} = CPI_{t-1} - CPI_{t-2}$.

5- Exchange rate (e): This is the rate at which a country exchanges its currency in the world market. The exchange rate we will use in this study is the U.S. dollar exchange rate against each currency for the economies under investigation (Saudi Riyal, Kuwaiti Dinar, and Bahraini Dinar). The reason for using the U.S. dollar is that the United States is the major exporter to the economies under investigation.

6- Foreign Prices (P^f): Because the United States has the lion's share of the total imports in the economies under investigation and the oil price is set in terms of the U.S. dollar, the United States' consumer price index (USP) data will be used in our model as foreign prices.

Therefore our final estimation equation is as follows:

$$\mathbf{Log\ P_t = \alpha 1\ Log\ m_t + \alpha_2\ Log\ GDP_t + \alpha_3\ \Delta\ Log\ P_{t-1} + \alpha_4\ Log\ e_t + \alpha_5\ Log\ USP_t} \quad (4.12)$$

In this chapter we presented the methodology and testing model to be used to investigate the determinants and causes of inflation in developing oil-export based economies. In the next chapter, a review of the economic conditions of the three countries will be provided.

CHAPTER FOUR

Economic overview

4.1 Introduction:

As a result of a sharp rise in petroleum revenues in 1974, developing oil-export based economies were among the fastest-growing economies in the world. They have enjoyed a substantial surplus in its overall trade with other countries; imports increased rapidly; and plenty of government revenues were available for development. Among those countries are Saudi Arabia, Kuwait, and Bahrain.

Saudi Arabia, Kuwait, and Bahrain are located in the Arabian Peninsula in the East Asian continent. With the exception of Saudi Arabia, Kuwait and Bahrain are fairly small. Saudi Arabia occupies most of the Arabian Peninsula with a total land area of 2,149,690 sq km, as can be seen from Table 4-1. Kuwait is located in the northeast Arabian Peninsula at the head of the Persian Gulf, with land area of 16,000 sq km. Conversely, Bahrain is the smallest gulf country comprising of an archipelago of low sandy islands in the Persian Gulf east of the Saudi Arabian coast with a land area of 689 sq km (GCC, 2002). All three countries have a similar harsh dry desert climate with great temperature extremes. The total population of Saudi Arabia, Kuwait, and Bahrain in the year 2000 was 22,009.5, 2228.4, and 690.8 thousand respectfully. The average annual population growth in the period from 1990 to 2000 was 3.4 percent for Saudi Arabia, 1 percent for Kuwait, and 3.2 percent for Bahrain (Table 4-1). It is praiseworthy to mention that a significantly high percentage of the present population in these countries consist of foreign nationals.

In terms of Gross Domestic Product per capita, the increase in oil revenues has allowed the populations of these countries to benefit from the high GDP per capita during the oil boom period. In 1970, the GDP per capita was $624, $3,884, and $545 for Saudi Arabia, Kuwait, and Bahrain respectfully. By 1980, the GDP per capita had risen to $12,380 in Saudi Arabia, $20,803 in Kuwait, and $9,035 in Bahrain. The average annual per capita growth from 1970 to 1980 was 11.1 percent in Saudi Arabia, -3.6 percent in Kuwait, and 8.9 percent in Bahrain. From 1980 to 1992, the average annual per capita growth was -3.6 percent in Saudi Arabia, 3.6 percent in Kuwait, and -2.2 percent in Bahrain (Table 4-2).

Saudi Arabia, Kuwait, and Bahrain share many economic characteristics. Oil contributes about one-third of the total GDP and three-fourths of the annual government revenues and exports. Also, they share a common history, religion, language and socioeconomic structure.

Over the past three decades, Saudi's, Kuwait's, and Bahrain's economies have witnessed considerable economic and social revolutions. Oil revenue has been used to modernize infrastructure, generate employment, and advance social indicators, while the importance of the non-oil sector has developed gradually, reflecting these countries' efforts at economic diversification. This development has been accomplished with an open exchange and trade system, which includes a significant amount of foreign labor, as well as free capital flows. With monetary policy directed at maintaining a stable exchange rate and controlling inflation, fiscal policy has been the primary instrument to achieve other economic objectives, including growth and employment. Nevertheless, fiscal policy has been constrained by the heavy dependence of government revenues on unstable oil export receipts. The fall in oil prices in the mid 1980's affected the economies of Saudi Arabia, Kuwait and Bahrain greatly because these countries are heavily dependent on oil exports. This affect was caused by a failure to employ an increase in oil revenues from 1973 to 1982 which would diversify their economies. This diversification would have softened any blow that would have hit the economic sector such as the oil sector; thus, allowing them to continue to depend on the oil revenue.

In order to study the inflation of these three countries, one must take into account there economic structure. Hence, in this chapter, an economic overview of these countries will be conducted, but first it will be useful to start by looking at the oil market.

4.2 Oil Market:

Since we are going to view the economic structure of Saudi Arabia, Kuwait, and Bahrain and because they are oil-export based economies it is beneficial to have an understanding of the oil market and its patterns. Due to global recession, demands for oil have decreased. Specifically, the world's oil production fell to 53256 thousand barrels per day in 1983 as compared to 59600 thousand barrels per day in 1980. As for Saudi Arabia, Kuwait, and Bahrain, reduction in the worlds demand for oil caused oil production of these countries to drop to 5086, 1064, and 42 thousand barrels per day in 1983 respectively as compared to 9900, 1656, and 48 thousand barrels per day in 1980 respectively (Table 4-3).

In 1983 the oil price dropped to 28.77 USD/B, compared to 34.23 USD/B in 1981. During 1983-1986, most of the oil producers around the world needed to compensate for the decrease in the oil revenues because of the drop in the oil prices. These countries increased their production of oil so they could continue their development projects. As a result, the oil prices dropped for a second time to 13.73 USD/B in 1986 and continued to fluctuate until 1998 when it reached its lowest level at 12.20 USD/B.

According to the Gulf Cooperation Council economic report (2002), the improvement of the economic growth in the developed and developing countries led to an increase in the demand of crude oil in 2000. This demand led to an increase in oil prices to reach 26.81USD/B, in 2000 and the beginning of 2001. After the incident of 9-11-2001, the prices of crude oil started to decline. As a result, the Organization of the Petroleum Exporting Countries (OPEC) decreased its production to stop the declining of prices and to maintain price stability at 20 USD/B. Figure 4-1 demonstrate the oil price path from 1970 to 2000.

In 2003 the oil productions of Saudi Arabia, Kuwait, and Bahrain accounted for 14, 5.4, and .12 percent of world's production respectively. The volume of oil production of these three countries in 2003 was 8848.232, 2240.918, and 38 thousand barrels per day respectively. Furthermore, the patterns of oil production fluctuations have some indicators. Figure 4-2 illustrate that the trends of these fluctuations on the production of Saudi Arabia is almost identical to the trends of the fluctuations of the total world production. Saudi Arabia is the largest producer of oil in the world and is a member and act as swinging producer of OPEC in the eighties. The fluctuating trends of Kuwaiti oil productions also have some similarities with the world's production fluctuation patterns.

The reason for this is because Kuwait is a member of OPEC, which results in Kuwait having to follow OPEC's production quotas. Finally, Bahrain's production fluctuation patterns do not match the world's production fluctuations. This is due to the fact that Bahrain is not a member of OPEC and its production is very small and its capability of production is decreasing with time.

Due to new discoveries in 1999, the oil reserve of Saudi Arabia has increased from 261.5 billion barrels at the end of 1998 to 263.5 billion barrels at the end of 1999. In addition, the Saudi oil reserve increased to 32 percent of OPEC total oil reserve and 25.5 percent of the world oil reserve. Kuwait's oil reserve, on the other hand was 96.5 B/B at year end of 1999. Moreover, Bahrain has the smallest amount of oil reserve in the group which is 0.15 B/B at the end of 1999 (GCC 2002). In 1973, the life of the oil reserve was estimated to be 52.6 years in Saudi Arabia, 65.8 years in Kuwait, 15 years in Bahrain.

The 1990 estimations for the life of the oil reserve indicate an increase for two of the three countries. Saudi Arabia increased to 109.3 years, and Kuwait increased to 213.6 years. Alternatively, the life of the oil reserve for Bahrain has decreased to 7.3 years (Table 4-4).

4.2.1 Oil Revenues:

The governments in Saudi Arabia, Kuwait, and Bahrain own the natural resources, particularly the oil. The oil revenue is used by the government to finance its expenditure to build the infrastructure and to improve the quality of life for its citizens. In 1970, the oil revenue was 2.55, 1.41, and 0.05 billion U.S. dollars for Saudi Arabia, Kuwait, and Bahrain respectively. In 1980, the oil revenue peaked at 100.6, 19.06, and 1.2 billion U.S.

dollars respectively. Due to the decline in exports and in oil prices in the mid and late eighties: Saudi Arabia, Kuwait, and Bahrain witnessed a significant decline in their oil revenues. In 1986, oil revenues fell to 18, 6.3, .69 billion U.S.D. in Saudi Arabia, Kuwait, and Bahrain respectively (Table 4-5). The oil Revenue path of Saudi Arabia, Kuwait, and Bahrain from 1970 to 1990 is illustrated in figures 4-3, 4-4, and 4-5 respectfully.

In these countries, oil revenues contribute a high percentage to the government revenue. In 2002 the contribution of the oil revenue to the government revenue was 78 percent, 77 percent, and 67 percent in Saudi Arabia, Kuwait, and Bahrain respectively (Table 4-6).

4.3 Gross Domestic Product (GDP):

The previous section illustrated the importance of Saudi Arabia, Kuwait, and Bahrain to the world oil market. This section will demonstrate the importance of oil production and oil revenue to their economies. As mentioned earlier, these countries depend heavily on oil export revenue and their gross domestic product (GDP) which is affected by the fluctuation in the oil market. Data from Table 4-7 demonstrates that in 1981 the GDP recorded a growth rate of 4.7 percent in Saudi Arabia, -19 percent in Kuwait and -5.3 percent in Bahrain. In 2002, the GDP recorded a growth rate of 4.8 percent in Saudi Arabia, 3.8 percent in Kuwait, and 5.3 percent in Bahrain. Figure 4-2 illustrates the pattern of the GDP growth in Saudi Arabia, Kuwait, and Bahrain. Moreover, the GDP in developing oil-export based economies such as Saudi Arabia, Kuwait, and Bahrain, is different from the GDP in the developed economies. In an oil-export based economy, the source of income is based mainly on oil revenue. The increase and decrease of the GDP is not a necessary stand for the economic activities within the economy. The change in the GDP could be the result of a rise or decline in the price of oil, determined by the world market. Accordingly, it would be reasonable to disaggregate the GDP into two parts, oil-GDP and non-oil GDP.

4.3.1 Oil GDP:

Tables 4-8, 4-9, and 4-10, illustrates the components of the GDP for Saudi Arabia, Kuwait, and Bahrain based on the economic activities. The largest component of the GDP is the mining sector which consists primarily of oil production. In 1974, the oil GDP contributed 79.8, 79.2 and 46.8 percent of the total GDP in Saudi Arabia, Kuwait and Bahrain respectively.

After twenty years of persistent effort to diversify the economy and encourage other sectors, these figures have declined in Saudi Arabia, Kuwait, Bahrain to reach 37 percent, 43.4 percent, and 13 percent respectfully (Table 4-11).

4.3.2 Non-Oil GDP (Non-Mining Sector):

In view of the fact that oil is non-renewable and the demand for oil is not secure and it can be disrupted, diversification of the economies is of extreme importance. Influenced by the enormous fluctuations in oil prices and oil revenues that happened in the 1980s, the governments of Saudi Arabia, Kuwait, and Bahrain have paid more consciousness to the non-mining sector. Interest free loans, subsidies, and other economic policies were applied to encourage private investments and large scale production in the non-mining sector. Accordingly, the non-oil GDP of these countries is progressively becoming more important and adding more to the total GDP. According to the data represented in Tables 4-8, 4-9, and 4-10, the importance of the non-oil GDP is growing at different levels in these countries. In 1980, the non-oil GDP adds to the total GDP in Saudi Arabia ($36 billion), in Kuwait ($8 billion), and in Bahrain ($2 billion). In terms of the percentage of the total GDP, these countries were at 31 percent, 27 percent, and 58 percent respectively. In 2001, the case was different for the contributions of the non-oil GDP sector to the total GDP. In Saudi Arabia, it was $120 billion and its contributions to the total GDP was 64 percent. In Kuwait, it was $19 billion and its contributions to the total GDP was 58 percent. Finally, in Bahrain, it was $6 billion and its contributions to the total GDP was 84 percent.

Bahrain has the highest percentage of the total gross domestic product being created in the non-oil GDP sector. According to ALmofarrej (1991), the explanation of this high percentage of the non-oil GDP is the limitation of the oil sector and the diversification policies that were applied in Bahrain at an earlier time.

4.4 Inflation:

4.4.1 Inflation in Saudi Arabia:

In Saudi Arabia, the rapid economic growth during the 1970s and early 80s was associated with high inflation. According to Al-Aboudi, (1997), in the early 1970's, the underdeveloped financial market and the structural rigidities, such as bottlenecks in the form of skilled labor shortage, limited industrial capacity and limited agricultural resources, prevent equivalent increase in production which were responsible for inflationary pressure. On the other hand, in the late 1970's and 1980's, factors such as import prices, money supply, and growth of government expenditure, were most to blame for inflationary pressure (Al-Aboudi, 1997). Because most of the goods for production and consumptions were imported and the industrial countries had experienced an increase in inflation in the same period: the government, and many economists in Saudi Arabia, blamed the world market for the rapid increase in inflation and that external factors were most responsible for inflation in Saudi Arabia (Al-Aboudi, 1997).

According to the data presented in table 4-12, the Consumer Price Index for Saudi Arabia reveals the highest jump in 1975 and the associated inflation rate was 35. Due to the efforts to fight inflation, Saudi Arabia has gradually recorded decreasing inflation rates through the eighties, nineties, and currently where they have succeeded to maintain a low inflation rate and in some cases a negative inflation (deflation).

Figure 4-2 illustrates the pattern of inflation in Saudi Arabia. Inflation starts to increase in 1973 and reaches its highest rate in 1975 before it dropped dramatically.

4.4.2 Inflation in Kuwait

Several studies were conducted to investigate the causes of inflation in Kuwait. The results of these studies have given different explanations and causes of inflation in Kuwait such as import prices, money supply expansion, government expenditure, world inflation, and the openness of the economy. Unlike Saudi Arabia, the bottleneck effect is less effective in the Kuwaiti economy because Kuwait is small in size relative to the Saudi economy (Al-Aboudi, 1997).

According to the data presented in Table 4-12, in the 1970s, the average annual inflation rate in Kuwait was 8.6 percent and in the 1980s and 1990s was 5.6 percent and

3.5 percent respectively. Inflation in Kuwait has gradually increased since 1973, where it reached its highest level in 1974 (figure 4-2).

4.4.3 Inflation in Bahrain

According to Table 4-12, the inflation in Bahrain before 1973 was modest; the rate showed a huge jump in 1974 to reach a level that was 24% higher than the previous year. After 1974, the rate fluctuated, but with a trend that was decreasing (Figure 4-2). In the 1970s, the average annual rate of inflation in Bahrain was 12.5 percent. In the 80s and the 90s, the average annual rate of inflation dropped down to 2.1 percent and 1.0 percent respectively. At the turn of the century, Bahrain achieved a low rate of inflation.

Inflation in Bahrain compares to that of developed countries. The relation is closely correlated particularly before 1973 and after 1980. The money supply and government expenditures of Bahrain, as a percentage of GDP, has a significant increase after 1973 and reached a peak in 1976 which was 45 percent greater than that previous year. On the other hand, government expenditures as a percentage of GDP showed the same pattern of increase after 1973 (Al-Aboudi, 1997). The inflation rate for all three countries for the period 1970-2003 is displayed graphically in figure 4-6.

Table 4-1 Total Population and population growth rate of Saudi Arabia, Kuwait, and Bahrain.

Year	Saudi Arabia		Kuwait		Bahrain	
	Population (Thousand)	Population Growth %	Population (Thousand)	Population Growth %	Population (Thousand)	Population Growth %
1990	15712		2125		503	
1991	16185	3.0	1363	- 3.6	516	2.6
1992	16734	3.3	1181	- 1.3	520	.8
1993	17514	4.7	1460	2.4	538	3.4
1994	18232	4.1	1520	4.1	568	5.6
1995	18802	3.1	1576	3.6	578	1.8
1996	19345	2.9	1894	2	599	3.6
1997	20001	3.4	2209	1.7	620	3.5
1998	20665	3.3	2271	2.8	643	3.7
1999	21334	3.2	2273.7	.1	666.4	3.6
2000	22009.5	3.1	2228.4	- 2	690.8	3.7

Source: GCC Statistical Bulletin, 2000, 2004.

Note: The population growth rate by author's own calculation.

Table 4-2: GDP Per Capita and GDP Per Capita Growth Rate for Saudi Arabia, Kuwait, and Bahrain.

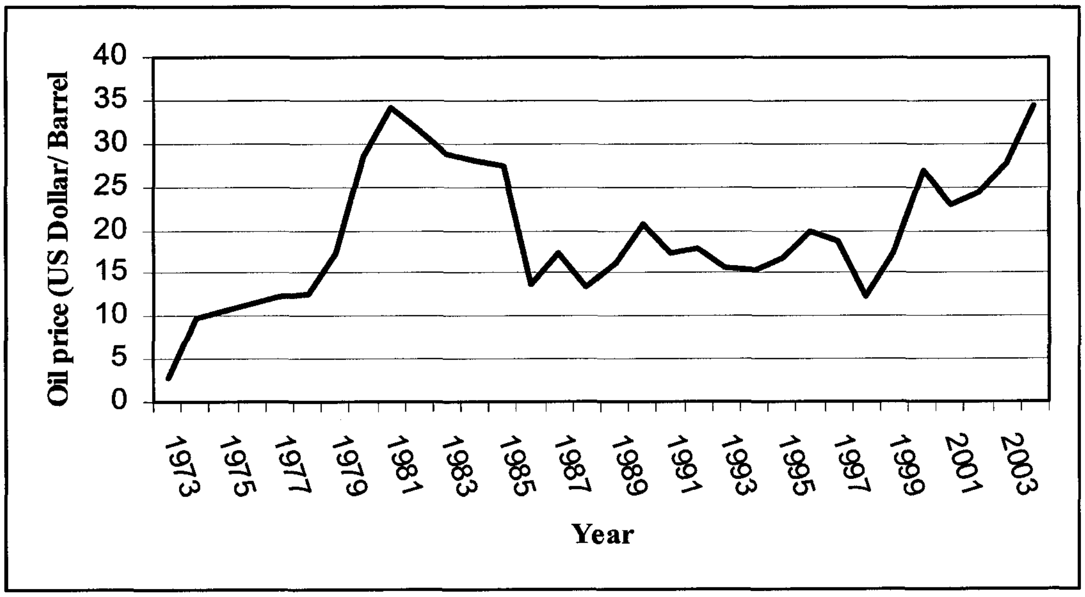
Year	Saudi Arabia		Kuwait		Bahrain	
	GDP Per Capita $	GDP Per Capita Growth Rate	GDP Per Capita	GDP Per Capita Growth Rate	GDP Per Capita $	GDP Per Capita Growth Rate
1970	624		3884		545	
1971	818	20.6	4914	1.4	633	16
1972	1038	34.3	5297	7.5	652	-12.8
1973	1618	25.1	6069	1.5	1665	60.2
1974	4014	1.5	13844	-10.3	2975	-5.5
1975	5473	5.4	11905	-17.5	3983	-0.6
1976	6117	9.2	12289	-0.1	5353	19.3
1977	7217	0.3	12340	-6.8	6481	7.1
1978	7808	5	12815	5.2	7310	3.5
1979	8314	5.9	19211	6.5	8077	-2.6
1980	12380	3.9	20803	-23.4	9035	4.8
1981	15687	-4.5	17510	-24.8	9908	-9.1
1982	13037	-5.5	14380	-18.5	9853	-12.5
1983	9787	-18.8	13315	2	9826	5.6
1984	8458	-9.2	13233	-0.9	10011	2.2
1985	7001	-11.1	12458	-10.2	9035	-6.8
1986	5666	-1.1	9933	7.3	7587	-0.8
1987	5404	-7.4	11884	-4.2	7204	-5.7
1988	5431	4.4	10431	-0.7	7464	5
1989	5752	-2.7	11885	-2.7	7626	-1.9
1990	6761	7.5	8412	-41.4	7965	-2.9
1991	7059	6.1	5358	-46.2	7971	0.6
1992	6994	-0.5	15419	183.6	7672	-0.1
1993	7378		20140		7778	

Source: Askari, (1997).

Table 4-3: Oil price and oil productions for Saudi Arabia, Kuwait, and Bahrain

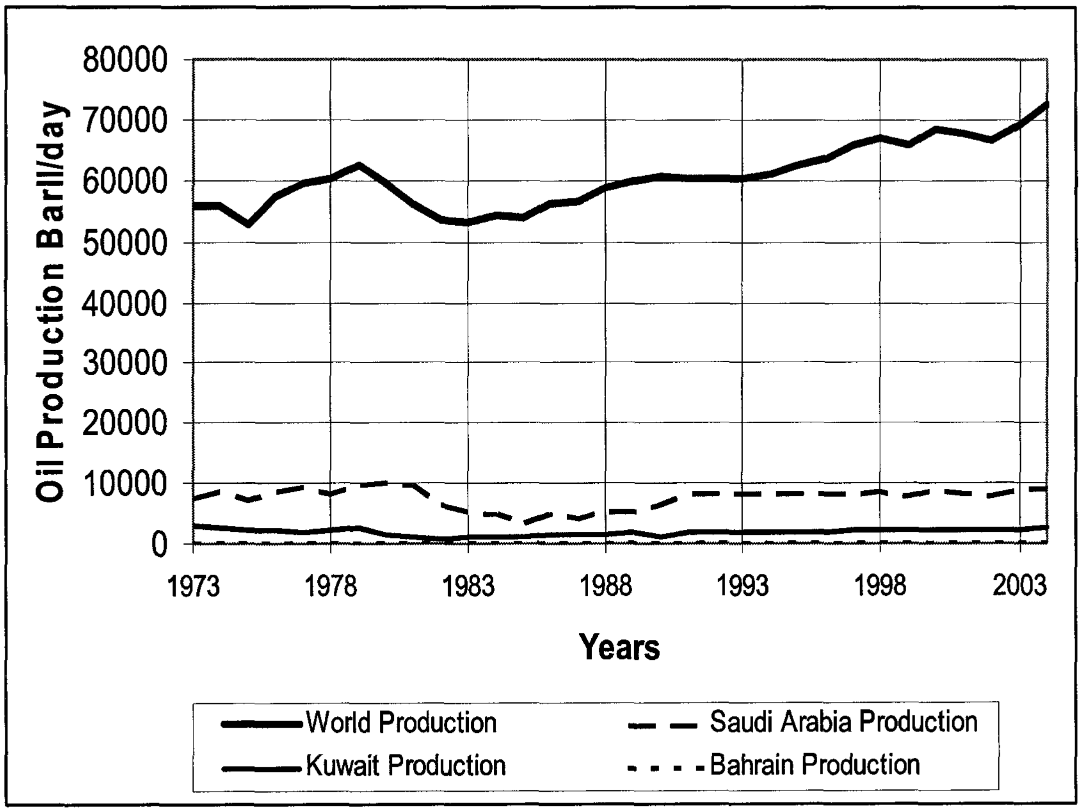
Year	Oil Price (USD)	World Production of Oil (Thousand Barrels per Day)	Oil Productions (Thousand Barrels per Day		
			Saudi Arabia	Kuwait	Bahrain
1973	2.70	55678.9	7596	3020	68
1974	9.76	55716.49	8480	2546	67
1975	10.72	52828.41	7075	2084	61
1976	11.51	57344.4	8577	2145	58
1977	12.40	59706.92	9245	1969	58
1978	12.70	60157.95	8301	2131	55
1979	17.26	62674.15	9532	2500	51
1980	28.67	59599.75	9900	1656	48
1981	34.23	56076	9815	1125	46
1982	31.74	53481	6483	823	44
1983	28.77	53255.64	5086	1064	42
1984	28.06	54488.64	4663	1157	42
1985	27.54	53981.59	3388	1023	42
1986	13.73	56227	4870	1419	42
1987	17.23	56666	4265	1585	42
1988	13.40	58737	5086	1492	43
1989	16.21	59863	5064	1783	43
1990	20.82	60566	6410	1175	42
1991	17.43	60207.05	8115	1891.8	42
1992	17.94	60212.72	8332	1943	41
1993	15.68	60236.43	8197.81	1960	41
1994	15.39	60990.78	8120	1930.9	40
1995	16.73	62334.66	8231.233	1992.753	40
1996	19.91	63711.03	8218.075	2000.532	39
1997	18.71	65689.919	8362.033	2132.452	39
1998	12.20	66921.488	8388.904	2153.458	38
1999	17.45	65847.503	7833.39	2129.86	37
2000	26.81	68343.938	8403.799	2165	38
2001	23.06	67874.684	8031.096	2256.156	37
2002	24.32	66784.165	7634.396	2117.863	38
2003	27.69	69153.956	8848.232	2240.918	38
2004	34.53	72469.509	9100.82	2508.962	NA

Sources: Bahrain government page, Energy Information Administration, SAMA,



Source: Energy Information Administration (2005).

Figure 4-1: The path of oil price from 1970 to 2004.



Sources: Bahrain government page, Energy Information Administration, SAMA,

Figure 4-2 oil production path of Saudi Arabia, Kuwait, Bahrain, and the world oil production.

Table 4.4: Oil Reserve Life for Saudi Arabia, Kuwait, and Bahrain (Years).

Year	Saudi Arabia	Kuwait	Bahrain
1973	52.6	65.8	15
1974	45.4	77.7	14.6
1975	67.1	106.9	15
1976	48.8	93	14.7
1977	46	102.1	14.2
1978	51	95	13.9
1979	49.3	81.1	13.7
1980	46.7	118.6	15.6
1981	46.8	165.3	13.9
1982	70.5	226.6	13
1983	89.8	169.9	13.1
1984	98.9	157.8	12.3
1985	136	244.5	11.1
1986	93.9	179.6	10.1
1987	109.9	197	9
1988	91.1	173.8	9
1989	91.1	144.7	8.1
1990	109.3	213.6	7.3

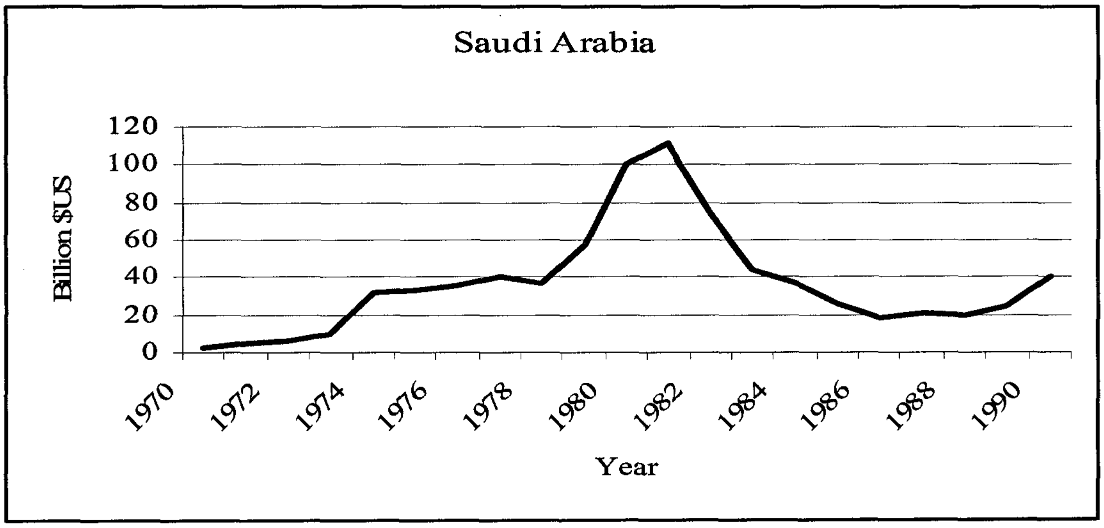
Sources: Askari (1997).

Table 4-5: Oil Revenue for Saudi Arabia, Kuwait, and Bahrain.

Billion US Dollar.

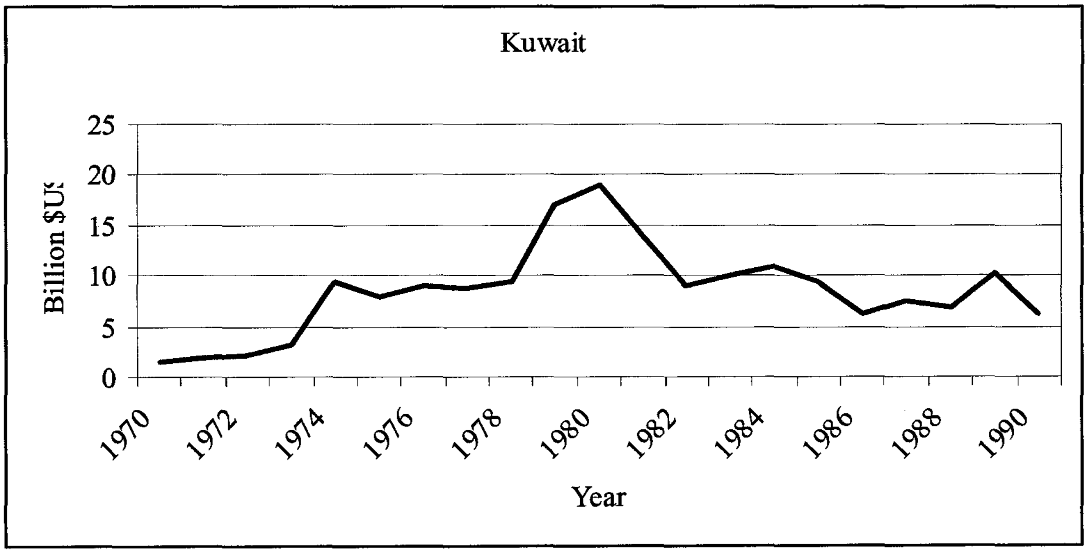
Year	Saudi Arabia	Kuwait	Bahrain
1970	2.55	1.41	0.05
1971	4.68	1.89	0.06
1972	5.82	2.16	0.08
1973	10.29	3.26	0.12
1974	31.89	9.35	0.35
1975	33.22	7.84	0.37
1976	35.42	8.89	0.44
1977	40.16	8.74	0.55
1978	36.86	9.40	0.57
1979	57.88	17.03	0.76
1980	100.60	19.06	1.20
1981	111.00	13.95	1.46
1982	72.90	8.90	1.18
1983	44.60	9.94	0.97
1984	36.20	10.90	1.06
1985	25.84	9.35	0.96
1986	18.00	6.30	0.69
1987	20.37	7.40	0.76
1988	20.14	6.80	0.69
1989	24.02	10.30	0.80
1990	39.96	6.22	2.94

Source: World Bank, World Development Indicators (2004).



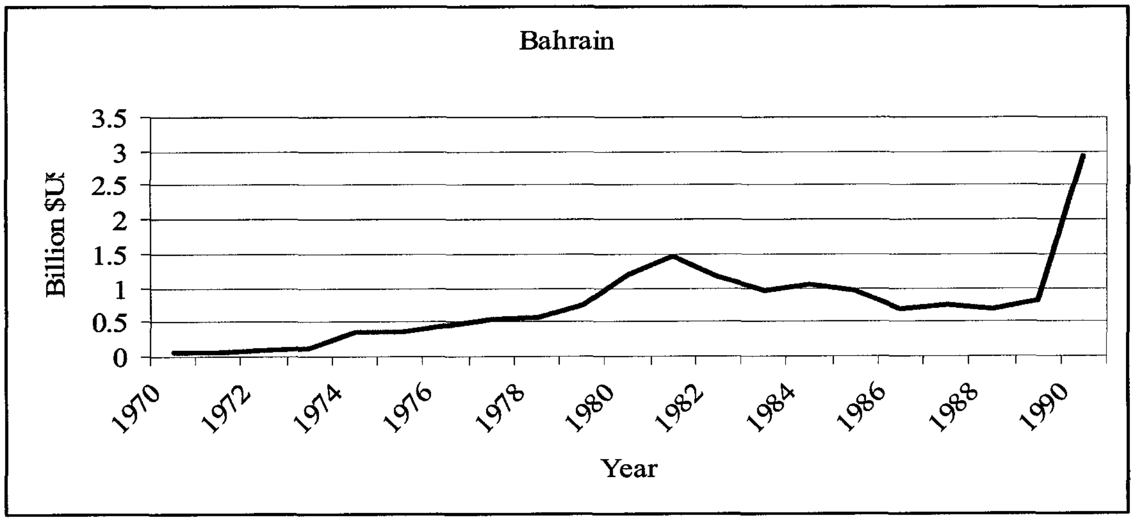
Source: World Bank, World Development Indicators (2004).

Figure 4-3: Oil Revenue path of Saudi Arabia from 1970 to 1990.



Source: World Bank, World Development Indicators (2004).

Figure 4-4: Oil Revenue path of Kuwait from 1970 to 1990.



Source: World Bank, World Development Indicators (2004).

Figure 4-5: Oil Revenue path of Bahrain from 1970 to 1990.

Table 4-6: Total Government Revenues for Saudi Arabia, Kuwait, and Bahrain.
Million Dollars

Country	Revenues	2000	2001	2002
Saudi Arabia	Oil Revenue	57179.7	49044	44293.3
	Non-Oil Revenue	11637.6	11798.4	12506.7
	Total Revenue	68817.3	60842.4	56800
	% Oil Revenue of Total Revenue	83	80	78
Kuwait	Oil Revenue	17662.0	16001.4	17292.5
	Non-Oil Revenue	6312.7	5682.4	5058.1
	Total Revenue	23974.7	21683.6	22350.6
	% Oil Revenue of Total Revenue	73	72	77
Bahrain	Oil Revenue	2033.5	1787.5	1838.8
	Non-Oil Revenue	751.9	821.3	892.3
	Total Revenue	2785.4	2608.8	2731.1
	% Oil Revenue of Total Revenue	73	68	67

Source: GCC Statistical Bulletin, 2004.

Table 4-7: GDP growth (annual Percentage), in Saudi Arabia, Kuwait, and Bahrain.

Year	Saudi Arabia	Kuwait	Bahrain
1980	6.519219	-20.61553	..
1981	4.690928	-19.0297	-5.316696
1982	-11.09816	-12.31484	-7.556224
1983	-8.216561	10.41419	6.376385
1984	-3.088329	5.239906	5.003642
1985	-4.324168	-4.257717	-4.758272
1986	5.090299	8.565232	1.183
1987	-3.983788	8.142554	10.399
1988	8.224005	-10.04967	7
1989	6.25E-02	25.89518	0.364
1990	8.328504	..	4.438
1991	9.103791	..	11.23
1992	4.628553	..	6.69
1993	2.61E-02	33.99046	12.87
1994	0.6655583	8.436165	-0.25
1995	0.2009172	4.8583	3.93
1996	3.383815	-2.702703	4.11
1997	2.592669	1.190476	3.093
1998	2.834566	3.158453	4.79
1999	-0.7485106	-1.602795	4.3
2000	4.864568	3.852981	5.3
2001	0.5474358	-1.025538	0
2002	0.1280609	-0.4	5.1
2003	7.179343	9.9	..

Source: World Bank, World Development Indicators (2004).

Table 4-9: Saudi Arabians Gross Domestic Product by Economic Activity at current prices.

Million Dollars

Year	Mining	Agricu.	Manufac.	Electri., Gas and Water	Construc.	Wholesale, Retail, Hotels& Restaurants	Transport, Commun.& Storage	Finance &Insurance Services	Real Estate Services	Gov. Services	Other Services	G.D.P at Cost Prices	G.D.P. at Market Prices
1979	39678.5	805.2	3359.5	73.7	11246.7	4139.5	4179.2	3595.1		5184	1238.6	73498	83915
1980	73059.2	1397.2	5032.6	81.5	12862.7	5272.7	4512.2	2360.6	3295.1	70.2	1694.3	116579	116166
1981	82076.1	15995.7	5747.6	93	14689.8	6021.7	5153.3	1570.4	3763.3	8027.5	1806	130545	131360
1982	94921.6	1966.7	6531.6	125.1	16977.2	7313.6	5798.3	2723	3665.5	10610.1	1988	152671	126835
1983	56393.7	2525.8	6939.8	246	15894.4	8131.4	7221	3620.7	3853.8	13486.3	2434.1	119707	119983
1984	34667.7	3297.4	7781.2	166.3	12759.4	8622.6	6766.5	4932.7	3722.2	14776.4	2753.7	98588	99715
1985	24875.2	3807	6763.9	83.1	10597.1	8344	6548.6	4585.4	2939.8	15177	3046.1	85596.6	86876
1986	17018.6	4283.3	5326	141.2	9178.8	7850.9	6152.6	3922.2	2142.6	14620	2858.2	72332.2	73206.5
1987	17387	4890	6369	182	8879	7422	6898	3990	1743	14168	1703	72630	73552
1988	16947	5526	6606.6	193	8436	7117	6064	4357	1584	14622	1837	73290	75292
1989													
1990													
1991	42411.2	7686.3	9558.9	216.6	9742.6	7944.2	7197.1	4894.8	1786.9	23223.0	3253.7	116164.8	118033.9
1992	47230.4	8070.5	10481.4	187.2	10424.3	8341.5	7592.0	5066.2	1864.6	19884.1	3363.2	120773.8	123203.7
1993	39977.6	8312.7	10089.7	194.1	10997.6	8633.4	7895.6	6218.2	1929.8	21036.9	3464.1	116038.7	118515.9
1994	39809.9	8437.8	10539.9	201.3	11409.9	8805.9	8132.4	5364.2	2006.9	21388.5	3568.0	117953.5	120166.9
1995	44296.7	8588.0	11433.6	209.9	11615.2	9191.2	8254.5	5310.6	2027.0	23028.8	3621.4	125808.3	127811.0
1996	54070.2	8918.6	15478.0	681.4	10371.4	9632	6693.7	7282.5	11070.0	27795.2	5263.8	155373.3	157743.1
1997	54274.0	9052.3	16648.9	718.8	10421.1	10321.5	6972.5	7681.7	11326.3	31412.6	5545.5	162564.0	164993.9
1998	35210.9	9197.1	15512.4	744.2	10764.8	11310.8	7693.2	7854.5	10883.0	30952.7	5571.2	143293.7	145967.4
1999	46880.1	9338.6	16769.0	774.1	10530.6	12280.9	7448.1	8438.7	11274.0	31185.3	5708.1	158599.5	161172.0
2000	70066.5	9534.8	18235.0	805.1	11141.3	12772.2	7771.2	8831.2	11496.9	31808.5	5921.5	186116.7	188693.5
2001	64390.4	7686.3	18717.2	841.7	11486.8	13219.2	8144.2	9202.1	11704.9	33044.9	6176.2	7184332.7	186489.5

Sources: AL-mofarrej (1991), GCC Statistical Bulletin, 2002.

Table 4-10: Kuwait's Gross Domestic Product by Economic Activity at current prices.

Million Dollars

Year	Mining	Agricu.	Manufac.	Electri., Gas and Water	Construc.	Wholesale, Retail, Hotels& Restaurants	Transport, Commun.& Storage	Finance &Insurance Services	Real Estate Services	Gov. Services	Other Services	G.D.P at Cost Prices	G.D.P. at Market Prices
1979	16030	52.1	1326.1	90.1	651.7	1268.9	3743	538		1967.6		23298.8	23299
1980	19078.3	64.7	1626.4	100.3	684.4	1389.2	441.7	736.6		3158.4		27280	30241
1981	14742.9	66.7	1615.6	107.3	764	1687.7	486.8	836.6		3050.4		23352.9	23353
1982	9610.6	107.6	1297	104.5	983	1889.6	596.7	831.5	972.6	2713.3	322.3	19607.6	19958
1983	10615.2	116.6	1375.7	116.9	991.5	1825.2	655.6	1000.4	1049.8	2895.3	340.6	21077	21336
1984	11293.7	116	1020.1	-592	900.2	1866.1	896.2	996.5	851.9	2995.9	652.2	20996.8	21210.3
1985	10271.6	135.3	1312.8	-517.7	892.2	1646.6	929.7	829.5	773.4	3349	680.2	20303.2	20067.8
1986	6608.7	186.1	1991	-252.1	650.1	1483.9	934.5	682.4	741.2	3672.2	704.8	17402.8	17271.3
1987	8003.9	178.9	2881	-106.8	527.8	1901	925.1	576.2	1760.1	3882.4	616.3	21146	20999.3
1988	7177	215.8	2642.9	-151.9	548.9	1877.4	945.1	583	1830	3816.4	625	20110	19976.3
1989													
1990													
1991	1159.4	30.1	535.3	-212.3	662.2	1815.4	319.9	509.7	1637.3	4703.1		10815.0	10826.1
1992	9218.3	75.6	3159.0	-323.7	431.5	1656.6	433.9	604.4	1373.9	4820.3		21869.0	21583.0
1993	9825.8	70.3	2107.0	-192.8	721.7	1820.0	1071.2	750.2	2033.0	5802.2		24201.4	23992.1
1994	9509.3	71.9	2574.3	-72.3	822.1	1601.8	970.3	909.4	2069.2	6084.0		24540.1	24243.8
1995	10510.6	114.1	2976.9	-106.1	815.8	2073.2	1213.6	3017.9		6258.6		26874.6	26550.5
1996	13787.6	124.0	3683.7	-23.0	821.3	2113.6	1305.3	3196.4		6505.0		31514.0	31134.6
1997	12087.9	126.3	4032.2	32.2	808.7	2136.8	1395.0	3470.5		6045.9		30134.2	30223.2
1998	7779.1	115.8	3005.7	-77.1	778.9	2106.4	1515.8	3897.1		7179.4			25322.7
1999	11032.6	117.4	3618.1	-42.8	754.4	2126.4	1663.7	4204.8		7490.8			29705.3
2000	18198.8	127.8	3994.3	-291.7	759.8	2176.7	1776.1	2086.8		7807.9		39038.1	37779.3
2001	14961.0	126.9	2174.4	-346.4	800.0	2268.7	1655.8	2248.8	2200.0	8049.0		31233.8	32800.6

Sources: AL-mofarrej (1991), GCC Statistical Bulletin, 2002.

Table 4-11: Bahrain's Gross Domestic Product by Economic Activity at current prices.

Million Dollars

Year	Mining	Agricu.	Manufac.	Electri., Gas and Water	Construc.	Wholesale, Retail, Hotels& Restaurants	Transport, Commun.& Storage	Finance &Insurance Services	Real Estate Services	Gov. Services	Other Services	G.D.P at Cost Prices	G.D.P. at Market Prices
1979	807.6	33.6	295.7	13.1	221	380.6	137.4				449.3	2338	2338
1980	914.8	68.2	465.6	22.6	429.5	283.1	221.3	296.4	279.9	273.8		3225	4031
1981	1068.4	79.8	543.6	26.6	501.9	330.9	358.5	346	326.9	319.6		3803	3801
1982	1081.6	50.2	499.4	50.2	360.9	523.1	437.7	769.6	274.7	313.3	266.7	4627	4968
1983	1044.4	52.9	546.5	55.3	381.3	547.3	481.1	898.4	296.2	335.1	281.3	4918	4920
1984	931.9	51.6	471.8	65.2	445.7	382.7	486.7	737.5	300.3	614.6	123.7	4475.3	4611.6
1985	10387.7	52.9	374.2	68.6	355.6	317	444.4	605.8	216.8	647	142	4153.5	4262.9
1986	602.1	54.8	545.3	60.9	276.7	275	400	550.5	200.3	667	136.7	3644.7	3678.2
1987	598.4	42.6	508	58.2	230.9	313.3	372.1	390.7	178.5	721.5	169.7	3583.9	3169.7
1988	521.3	41	625.8	61.7	239.6	360.4	391.8	449.5	185.1	766	184.8	3827	3358.8
1989													
1990													
1991	779.2	37.3	517.1	73.5	244.0	551.5	388.2	798.1	423.9	910.6	324.6	4486.6	4616.1
1992	774.0	42.1	516.1	79.6	268.9	651.6	390.7	874.0	431.4	948.1	363.1	4596.9	4750.7
1993	815.1	47.2	639.7	81.5	278.4	669.4	413.1	1049.1	502.8	977.6	356.4	5067.6	5200.5
1994	796.3	46.6	807.6	80.2	292.3	802.0	447.7	1132.6	521.1	978.5	373.9	5431.9	5567.3
1995	899.8	50.6	1026.3	90.9	283.5	773.1	432.9	1042.0	553.4	1023.4	378.6	5723.0	5849.5
1996	1105.4	57.1	985.8	94.8	262.8	770.6	441.8	1206.5	575.0	1052.5	385.5	5982.6	6101.9
1997	1186.6	54.6	932.6	104.8	249.1	717.7	448.5	1341.8	612.2	1085.9	431.4	6201.9	6349.2
1998	841.1	55.8	787.5	116.5	251.2	768.3	512.6	1417.2	635.3	1153.4	479.1	6015.5	6184.1
1999	1206.3	56.9	815.6	119.4	280.9	702.8	521.8	1428.6	714.8	827.4	625.8	6468.9	6620.7
2000	2236.3	58.8	911.7	113.9	284.6	798.8	561.1	1702.2	726.0	837.5	642.6	7822.2	7970.7
2001	1967.8	57.6	952.3	113.8	317.6	1021.4	596.2	1483.9	757.5	854.5	545.8	7781.6	7934.8

Sources: AL-mofarrej (1991), GCC Statistical Bulletin, 2002.

Table 4-12: The percentage contribution of oil GDP and non-oil GDP to the total GDP in Saudi Arabia, Kuwait, and Bahrain.

Country		1974	1975	1976	1977	1978	1979	1980	1981	1982	1983
Saudi Arabia	Oil GDP%	79.8	71.1	66.8	63.1	56.7	54	61.6	65.5	61.5	46.9
	Non-Oil GDO%	20.2	28.9	33.2	36.9	43.3	46	38.4	34.5	38.5	53.1
Kuwait	Oil GDP%	79.2	70.5	65.7	61.3	60.1	65.6	67.9	63	49	50.4
	Non-Oil GDO%	20.8	29.5	34.3	38.7	39.9	34.4	32.1	37	51	49.6
Bahrain	Oil GDP%	46.8	25.6	27	24.3	23.6	24.2	31.8	32.9	29.2	24.7
	Non-Oil GDO%	53.2	74.4	73	75.7	76.4	75.8	68.2	67.1	70.8	75.3

Table 4-12(Continued)

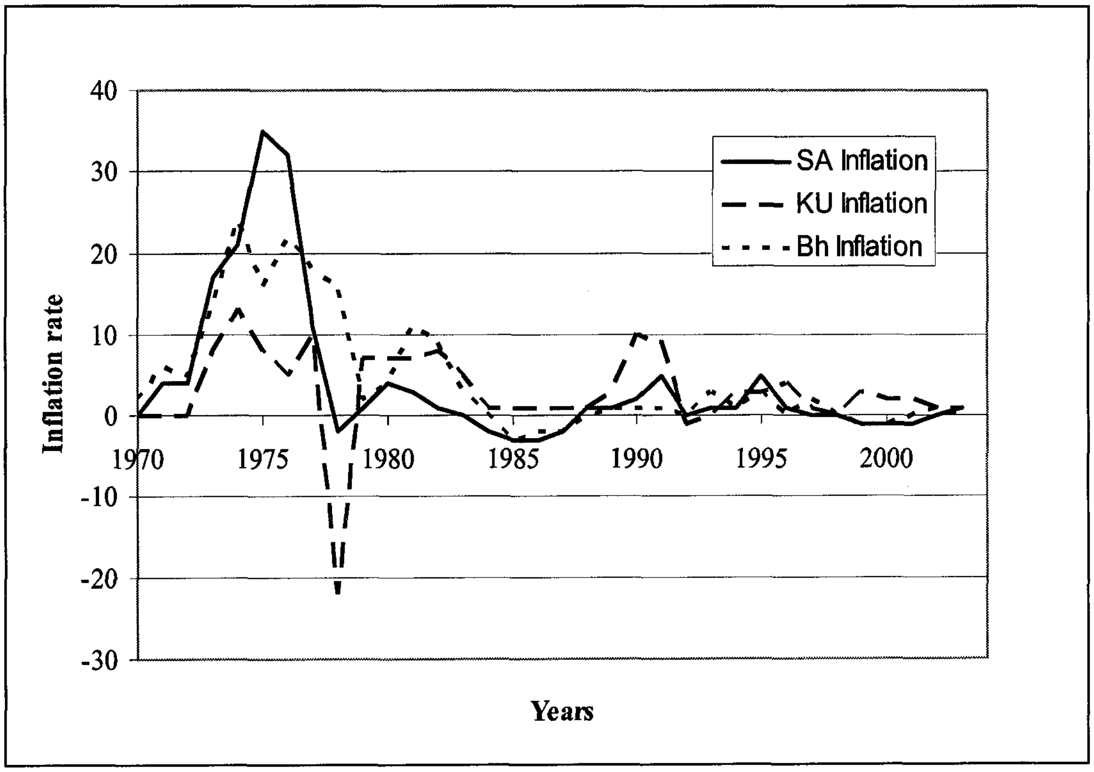
Country		1984	1985	1986	1987	1988	1989	1990	1991	1992	1993
Saudi Arabia	Oil GDP%	38.5	33.5	28.3	29.7	25	29.8	37.6	38	37.1	37
	Non-Oil GDO%	61.5	66.5	71.7	70.3	75	70.2	62.4	62	62.9	63
Kuwait	Oil GDP%	51.4	50.2	38.3	37.7	35.9	40.9	38	14.4	43.1	43.4
	Non-Oil GDO%	48.6	49.8	61.7	62.3	64.1	59.1	62	85.6	56.9	56.6
Bahrain	Oil GDP%	24	24.4	25.6	25.3	20.2	23.1	22	27.3		13
	Non-Oil GDO%	76	75.6	74.4	74.7	79.8	76.9	78	72.7		87

Source: Askari (1997).

Table 4-12: Inflation and CPI in Saudi Arabia, Kuwait, and Bahrain.

Year	Saudi Arabia		Kuwait		Bahrain	
	Inflation	CPI	Inflation	CPI	Inflation	CPI
1970	0	29	..	..	2	24
1971	4	31	..	..	6	25
1972	4	32	..	40	5	27
1973	17	37	8	43	14	31
1974	21	45	13	49	24	38
1975	35	61	8	53	16	44
1976	32	80	5	56	22	54
1977	11	89	10	61	18	64
1978	-2	88	-22	48	16	74
1979	1	89	7	51	2	75
1980	4	92	7	55	4	78
1981	3	95	7	59	11	87
1982	1	96	8	63	9	95
1983	0	96	5	66	3	98
1984	-2	95	1	67	0	98
1985	-3	92	1	68	-3	95
1986	-3	89	1	69	-2	93
1987	-2	87	1	69	-2	92
1988	1	88	1	70	0	92
1989	1	89	3	73	1	93
1990	2	91	10	80	1	94
1991	5	95	9	87	1	95
1992	0	95	-1	86	0	95
1993	1	96	0	87	3	97
1994	1	97	3	89	1	98
1995	5	102	3	91	3	100
1996	1	103	4	95	0	100
1997	0	103	1	95	2	102
1998	0	103	0	95	0	102
1999	-1	101	3	98	-1	101
2000	-1	100	2	100	-1	100
2001	-1	99	2	102	0	100
2002	0	99	1	103	1	101
2003	1	100	1	104	..	..

Source: World Bank, World Development Indicators (2004).



Source: World Bank, World Development Indicators (2004).

Figure 4-6: inflation rate path for Saudi Arabia, Kuwait, and Bahrain.

CHAPTER FIVE

Empirical Results

In chapter two, economic theories were illustrated to identify various determinants and causes of inflation. In chapter three, a testable model of inflation was derived for forecasting the determinants of inflation in developing oil-export based economies such as Saudi Arabia, Kuwait and Bahrain. Also in chapter three, the methodology to be used in this study was presented.

This chapter presents the empirical results obtained by applying the previously developed model and using the methodologies specified earlier, the cointegration test and the causality test.

5.1. Data Description:

In our study we will use annual data from 1968 to 2002. The reason for using annual data is that some of the key economic variables, such as GDP, are reported only annually. The testing model includes six variables domestic prices (P) as dependent variable and the explanatory variables are the gross domestic product (GDP), money supply (m), exchange rate (e), the past change in domestic price (ΔPt_{-1}), and foreign prices (P^f).

5.1.1. Inflation:

Domestic prices (P): the best representation of domestic prices is the consumer price index (CPI) data (1995=100). It is also the best data to represent inflation in the economy. Domestic prices (P) are the dependent variable in the testing model.

5.1.2. Money Supply (m):

The proxy used is (M2), (constant 95 prices), which is defined as currency in circulation plus demand deposits. In the literature, the relationship between the money supply and price is found to be positive according to the monetarists and the quantity equation (MV = PY), which means that when the money supply increases, prices will increase and vice versa.

5.1.3. Gross Domestic product (GDP):

GDP is the value of goods and services produced within the economy in one year measured using a constant set of prices. According to economic theories, the relationship between the real GDP and prices is negative, i.e. when prices increase, real income (Y/p) decreases and vice versa.

5.1.4. The past change in price or the past inflation (ΔP_{t-1}):

This variable represents the expectation of inflation in time (t-1). According to adaptive expectation, economic agents form their future expectations and inform their economic decisions based on what has happened in the past, which means that the relationship between the past change in price and current price is positive, because when inflation has been high in the past, economic agents will expect that prices will increase in the future.

5.1.5. Exchange rate (e):

In this study the U.S dollar exchange rate will be used. According to the small open economy model with fixed exchange rate, like in our cases the relationship between exchange rate and the domestic prices is positive. This means that when the exchange rate of the dollar appreciates, domestic prices will increase, and if the exchange rate of the dollar depreciates, domestic prices decrease. Especially for economies like those in the study sample (Saudi Arabia, Kuwait and Bahrain), which import most of their needs for consumption and investments from the rest of the world.

5.1.6. Foreign prices (P^f):

The United States consumer price index (USP) data will be used in this study to represent the foreign prices (P^f). Again, the study sample imports most of their needs from the rest of the world and the United States is the largest exporter to those economies under study. Also United States is the largest economy in the world. According to the price effect channel, which is one of the international inflation transmission channels to domestic economies, the international inflation will be transmitted to domestic economies through the higher prices of imported goods and services, which means that the relationship between foreign prices and domestic inflation is positive; when foreign prices increase domestic prices will increase.

In our model, the dependent variable and explanatory variables will be transformed to logarithm form (Log Log). Logarithm functions are among the most useful in economics. The regression coefficient on a logarithmic variable can be interpreted as an elasticity, that is, as the rate of the percentage change in the dependent variable for each one percent change in the independent variable. In more detail, if the estimated coefficient on log (GDP) is 0.8, a ten percent increase in a country's GDP increases the dependent variable (P) by 8 percent.

In general, the log models are invariant to the scale of the variables since they measure percent changes and give a direct estimate of elasticity, and more narrowly limit the effect of outliers. Moreover, the log transformation is applicable only when all the observations in the data set are positive (Gujarati, 1995, p. 387). The types of variables often used in log form are dollar amounts, which must be positive, and very large variables such as population. Consequently our final estimation equation is as follows (L represent the Log):

$$\mathbf{LP}_t = \alpha_1\, \mathbf{Lm}_t - \alpha_2\, \mathbf{LGDP}_t + \alpha_3\, \Delta\, \mathbf{LP}_{t-1} + \alpha_4\, \mathbf{Le}_t + \alpha_5\, \mathbf{LUSP}_t \qquad (5.1)$$

Therefore the model predicts that an increase in money supply, expected inflation, the exchange rate and foreign prices will lead to an increase in prices i.e. $\alpha_1, \alpha_3, \alpha_4, \alpha_5 > 0$.while an increase in real income will lead to a fall in the inflation rate i.e. $\alpha_2 < 0$.

5.2. Cointegration:

The purpose of the cointegration test is to determine whether a group of nonstationary series is cointegrated or not. The problem is that statistical inferences derived from stationary processes are no longer valid if the time series are nonstationary. Nonstationarity, a property common to many macroeconomic and financial time series, means that a variable has no clear tendency to return to a constant value or to a linear trend. In the past, nonstationary variables were differenced to make them stationary before using them in multivariate models. Engle and Granger (1987) introduced the concept of cointegration. They showed that it is possible for a linear combination of integrated variables to be stationary. In this case the variables are said to be co integrated. They show that macroeconomic models containing nonstationary stochastic variables can be constructed in such a way that the results are both economically meaningful and statistically sound.

On the other hand, in order to apply standard procedures in empirical econometric studies, the variables in the model need to be stationary because most econometric theories rely on the assumption that the variables' data are stationary. It is important to test the properties of the variables under investigation for unit roots to avoid the potential problem of estimating spurious relationships.

5.3. Estimation problems:

When cointegration and casualty test are run in E-views to try to estimate relationships among variables, the error message "Near singular matrix" always appears. According to the E-views user's guide this message indicates that the regressors are very highly collinear and E-views may experience difficulty in computing the regression estimates, making it more difficult to interpret the results.

There are several assumptions which must be met in order for estimation to be the best possible. One of those classical assumptions is that no explanatory variable is perfect linear function of other explanatory variable(s) or no multicollinearity exists (Studenmund, 2000 p 85).

5.3.1. Multicollinearity:

Perfect multicollinearity implies that the variation in one independent variable can be completely explained by movements in another independent variable. Another case of perfect multicollinearity occurs when an independent variable that is definitionally related to the dependent variable is included in a regression equation. Such an independent variable is so highly correlated with the dependent variable that it completely overcomes the effects of all other explanatory variables in the estimation (Studenmund, 2000). Moreover when we have a perfect multicollinearity, then the regression coefficients of the variables are indeterminate and their standard errors are infinite (Gujarati, 1995, p322).

In our case, after running a number of tests, the dependent variable which caused the multicollinearity problem was the change in last year's prices (ΔP_{t-1}) which in our model is the proxy of inflation expectations.

5.3.2. The impact of multicollinearity:

According to Studenmund, (2000), there are several impacts of multicollinearity:

1- Estimates will remain unbiased.
2- Standard errors and the variance of the estimates will increase: it becomes difficult to specifically identify the separate effect of the multicollinear variables when two or more of the independent variables are highly related.
3- Falling of the computed t-score; the multicollinearity causes a decrease in the t-scores of the estimated coefficients because of the increase in the standard error.
4- When perfect multicollinearity exists, the estimates will be highly sensitive to change in specification, which means that any deletion or addition of an

independent variable or deletion or addition of a few observations will cause a major difference in the estimates.

5.3.3. Treatments for multicollinearity:

Ramanathan, (1989), suggests several treatments or solutions for multicollinearity. The first is to do nothing and ignore the multicollinearity. This solution is undertaken when the existence of the multicollinearity does not cause a significant problem.

The second treatment is transforming the multicollinear variables, like forming a combination of the multicollinear variables or transforming the equation into first difference.

The third treatment is increasing the size of the sample since the larger sample size often reduces the variance of the estimated coefficients, thus reducing the impact of the multicollinearity. The last suggested treatment is dropping one of the multicollinear variables. The result of including too many variables in the regressions in order to make sure that all variables important for the estimation are included in the estimation equations may be a sequence that has two or more variables that are measuring the same thing. In this case the multicollinear variables are not rrelevant because any one of them is probably theoretically and statistically good enough.

5.3.4. Choosing the best treatment for our case:

After reviewing the multicollinearity suggested solutions and treatments, it is time to choose one of them which is the most appropriate to solve our problem in the best way.

The first solution, doing nothing, will not solve our problem because then it will not be possible to continue to run the tests. Transforming the multicollinear variables, the second suggested treatment, also doesn't solve the problem as the multicollinearity still exists. The third suggested treatment, increasing the size of the sample, also does not help to solve the multicollinearity problem. The sample was increased from 32 observations to 36 observations due to data availability (1968 – 2003). Finally, it seems that the best treatment for the multicollinearity in our case is to drop the multicollinear variable and carry out our estimations with five variables instead of six. As a result, the variable causing the multicollinearity which is the change in last year prices (ΔP_{t-1}) (proxy of the inflation expectations), will be dropped. Therefore our final estimation equation is as follows:

$$\mathbf{LP_t = \alpha_1\, LM_t + \alpha_2\, LGDP_t + \alpha_3\, Le_t + \alpha_4\, LUSP_t} \qquad \mathbf{(5.2)}$$

5.4. Unit Root Test:

There are different ways to test if a time series is stationary or non-stationary. The most popular one is the Augmented Dickey-Fuller (ADF) test (Dickey and Fuller, 1981). We will employ the ADF test in order to establish the order of integration of the variables in our data set. According to the test, the null hypothesis is that the variable contains a unit root, which means that the variable is non-stationary. The alternative hypothesis is that the variable does not contain a unit root or the variable is stationary. If the null hypothesis is not rejected for the variable in its level and rejected for the variable in its first difference, then we can say that the variable is integrated of order one; I(1). If the variable has to be differenced twice (i.e. take first difference of the first difference) to become stationary the variable is integrated of order 2 or I (2).

Generally speaking, if a variable has to be differenced d times, it is integrated of order d or I (d), which means we have a non-stationary variable any time we have an integrated time series of order one or greater (Gujarati, (1995), p 719). If the null hypothesis is rejected for the variable in its level, then it can be said the variable is stationary; I (0).

In this section, the ADF unit root test is employed for all variables, dependent and independent, for each country under investigation using an E-views application. The test was applied to both the level series in logarithms form and the first difference of the series.

5.4.1. Unit Root test for Saudi Arabia data:

Unit root tests are performed for Saudi Arabia using the Augmented Dickey-Fuller (ADF) test using a five lag length (Saudi Arabia has five years development plan), and annual data from 1968 to 2003. As illustrated in Table (5-1), LP, Le, LGDP, Lm, and LUSP are non-stationary in their level at ten percent, five percent and one percent confidence levels. The results show that ADF t-values for all the five variables are greater than critical values; therefore, the series are nonstationary.

The null hypothesis of a unit root in first difference is rejected for LP, Le, and LGDP at all confidence levels. The null hypothesis of a unit root in first difference is rejected for Lm at ten percent confidence level, (the series is stationary in the first difference). Moreover, the null hypothesis of a unit root in second difference is rejected for LUSP at all confidence levels, (the series is stationary in the second difference). The unit root results for Saudi Arabia demonstrate that, LP, Le, LGDP and Lm are integrated of order one, i.e. I(1), and LUSP is integrated of order two, i.e. I(2).

5.4.2. Unit root test for Kuwait data:

The test for unit root is performed by using the Augmented Dickey-Fuller (ADF) test for Kuwait using one lag length and data from 1968 to 2003. The results of the ADF tests are summarized in Table (5-2). LP, Le, LGDP, Lm, and LUSP are nonstationary in level at ten percent, five percent and one percent confidence levels. As shown in table (5-2), ADF t-values for all the five variables are greater than critical values; therefore, the series is nonstationary.

The null hypothesis of a unit root in first difference is rejected for LP, Le, and LGDP at all confidence levels. The null hypothesis of a unit root in first difference is rejected for Lm at ten percent confidence level; (the series is stationary in the first difference). Moreover, the null hypothesis of a unit root in second difference is rejected for LUSP at all confidence levels; (the series are stationary in the second difference). The unit root results for Kuwait show that, LP, Le, LGDP and Lm are integrated of order one, i.e. I(1), and LUSP is integrated of order two, i.e. I(2).

5.4.3. Unit root test for Bahrain data:

The Augmented Dickey-Fuller (ADF) test was carried out to test for unit root using a two lag length and annual data from 1971 to 2003.

According to Table (5-3), all the five variables are nonstationary, which mains they contain a unit root in their level. Therefore, the null hypothesis that they contain a unit root cannot be rejected at one percent, five percent or ten percent levels of significance. The unit root test for all five variables in their first difference demonstrates that all five variables are stationary. LP and Le are stationary in their first difference at one percent level of significance, LGDP is stationary in its first difference at five percent level of significance, and in addition Lm and LUSP are stationary in their first difference at ten percent level of significance. Therefore, all of Bahrain's variables are integrated of order one, i.e. I (1).

5.5. Johansen Cointegration Test:

After determining the order of integration by using the ADF test, we will continue by testing for cointegration to determine the long run relationship between the variables in our model, to establish whether they are cointegrated or not. The Johansen cointegration test was applied, and a cointegration rank (r), was determined based on values of Max – Eigen statistic. The cointegration rank is examined by comparing the Max- Eigen statistic to the critical values at five percent. If Max - Eigen is less than critical values, then cointegration does not exist. If the Max Eigen-value is greater than critical values, then cointegration exists. The null hypothesis in the Johansen cointegration test is that $r = 0$, which means there is no co-integration, and the alternative hypothesis is that there exists a cointegration when $r = 1$. Rejection of the null hypothesis indicates that there is at least one co-integrated equation. The interpretations of the Johansen cointegration tests results for Saudi Arabia, Kuwait and Bahrain follow.

5.5.1. Saudi Arabia cointegration test results:

The outcome of the cointegration test for Saudi Arabia is illustrated in Table (5-4). The test was performed for all variables in level except for LUSP in first difference since it is integrated of order two (I (2)) i.e. DLUSP.

The cointegration test results based on the Max-Eigen statistic suggest the rejection of the null hypothesis of "no cointegration" at the five percent level of significance. The Max-Eigen statistic is 41.36, and the matching critical values at five percent significance level is 33.87. The Max- Eigen statistic is greater than the critical values, which means the rejection of the hypothesis at the 0.05 level. The hypothesis of at most one cointegration equation is not rejected at 0.05 level of significance. The Max-Eigen statistic is 24.77, and the matching critical value is 27.58. Accordingly, there exists one cointegrating vector among the variables of the equation.

The coefficient for Le is (- 4.36) with a t-stat of (-1.4), which is not significant according to the t-test at 5% level of significance, and the sign is what was expected. The Lm coefficient is (0.922) with a t-stat of (2.8) and is significant, but the sign is not what was expected and is not consistent with the theory. For DLUSP the coefficient is (-1.26) with a t-stat of (-0.21). Although the sign is consistent with the theory, it is not significant. Finally, the coefficient for LGDP is (-3.06) with a t-stat of (-3.0), which is significant; however, the sign is different than what was expected. My assumption was based on the real GDP (GDP/P), that when price increases, GDP decreases. Moreover, the sign of LGDP coefficients can be explained and considered based on the fact that when GDP increases, the aggregate demand increases, and consequently, prices increase.

The testing for the long-run relationship between LP and Le, LM, DLUDP and LGDP for Saudi Arabia produced the following cointegration equation (t-statistics in parentheses):

$$LP- 4.4LE + 0.9Lm - 1.3DLUSP - 3.1LGDP = ECT_{t-1} \qquad (5.3)$$

$$(-1.42) \quad (2.83) \quad (-0.21) \quad (-3.02)$$

The result in the above equation indicates that there is a long-run relationship between LP and Le, Lm, DLUSP, and LGDP.

5.5.2. Kuwait cointegration test results:

Table (5-5) illustrates the results of the Johansen's cointegration test for Kuwait using LP as the dependent variable and LE, Lm, LUSP and LGDP as independent variables. LUSP is used in first difference since it is integrated of order 2, i.e. (I (2)) i.e. DLUSP.

The cointegration test results based on the Max-Eigen-statistic, suggest the rejection of the null hypothesis of "no cointegration" at the five percent level of significance; the Max-Eigen-statistic is 38.6 and the matching critical values at five percent significance level is 33.87. The Max-Eigen statistic is greater than the critical values, which means the rejection of the hypothesis at the 0.05 level. The hypothesis of at most one cointegration equation is not rejected at five percent level of significance. The Max-Eigen statistic is 26.33 and the matching critical value is 27.58. Accordingly, there exists one cointegrating vector among the variables of the equation.

The coefficient for Le is (- 3.9) with a t-stat of (-1.5), which is not significant according to the t-test at 5% level of significance, but the sign is what was expected. The Lm coefficient is (-0.28) with a t-stat of (-1.5) and is not significant, but the sign is what was expected (consistent with the theory). For DLUSP the coefficient is (29.9) with a t-stat of (5.4). Although the sign is not consistent with the theory, it is significant. Finally, the coefficient for LGDP is (1.8) with a t-stat of (3.3), which is significant; however, the sign is consistent with the theory. My assumption was based on the real GDP (GDP/P), that when prices increase, GDP decreases.

The testing for a long-run relationship between LP and Le, Lm, DLUSP and LGDP for Kuwait produced the following cointegration equation (t-statistics in parentheses):

$$LP - 3.9\ LE - 0.3\ Lm\ + 30\ DLUSP + 1.7\ LGDP = ECT_{t-1} \qquad (5.4)$$

$$(-1.49) \quad (-1.50) \quad (5.49) \quad (3.39)$$

The result in the cointegration equation shows that there is a long-run relationship between LP and Le, Lm, DLUSP, and LGDP.

5.5.3. Bahrain cointegration test results:

Table (5-6) show the results of the Johansen cointegration test for Bahrain using LP as the dependent variable and Le, Lm, LUSP and LGDP as independent variables. The cointegration test results based on the Max-Eigen statistic suggest the rejection of the null hypothesis of "no cointegration" at the five percent level of significance. The Max-Eigen statistic is 131.5 and the corresponding critical value at five percent significance level is 33.87. The Max- Eigen statistic is greater than the critical values, which means the rejection of the hypothesis at the 0.05 level. The hypothesis of at most one cointegration equation is rejected at 0.05 level of significance. The Max-Eigen statistic is 36.9 and the corresponding critical value is 27.58. The hypothesis of at most two cointegration equations is not rejected at 0.05 level of significance. The Max-Eigen statistic is 20 and the corresponding critical value is 21. Accordingly, there exist two cointegration vectors among the variables of the equation.

From the one cointegration equation, the coefficient for Le is (1.04) with a t-stat of (2.48). According to the t-test at five percent level of significance it is significant but the sign is not what was expected. For Lm, the coefficient is (-0.165) with a t-stat of (-3.46). The sign is what was expected and it is significant. In addition, for LUSP, the coefficient is (0.37) with a t-stat of (4.45). it is significant but the sign is not what was expected. Finally, the coefficient for LGDP is (-0.0916) with a t-stat of (-1.19), which is not significant, and the sign is not what was expected.

The testing for a long-run relationship between LP and Le, Lm, LUSP and LGDP for Bahrain generated the following cointegration equations (t-statistics in parentheses):

$$LP + 1.04Le - 0.165Lm + 0.37LUSP - 0.0916LGDP = ECT_{t-1} \qquad (5.5)$$

$$(2.48) \qquad (-3.46) \qquad (4.45) \qquad (-1.19)$$

The outcome of the cointegration equations shows that there is a long-run relationship between LP and Le, Lm, LUSP, and LGDP.

5.6. Causality Test:

The cointegration test indicates the existence of a long-run relationship amongst the five variables; however cointegration testing des not indicate the directions of the relationships amongst the variables. According to Engle and Grainger (1987), causality should exist in at least one direction in the I (1) variables in the case of cointegrated variables with the Error Correction base causality. Therefore, a causality test will be applied to identify the direction of the long-run and the short-run relationship among the variables. In our case, the standard causality test will not be used because the variables are nonstationary. In order to get consistent and efficient estimation, another technique will be used which involves taking the first difference and estimating the equation by adding the Error Correction Term (ECT). This technique is called Error Correction Model (ECM). Applying the following Error Correction Equations:

$$\Delta Y = \beta_1 + \sum^{p}_{i=1}[\alpha_1 \Delta Y_{t-i} + \gamma_1 \Delta X_{t-i}] + \lambda_1 \, ECT_{t-1} + \varepsilon_{t1} \qquad (5\text{-}7)$$

$$\Delta X = \beta_2 + \sum^{p}_{i=1}[\alpha_2 \Delta Y_{t-i} + \gamma_2 \Delta X_{t-i}] + \lambda_2 \, ECT_{t-1} + \varepsilon_{t2} \qquad (5\text{-}8)$$

Where X_t and Yt have been identified as first-differenced stationary, cointegration time series, ECT_{t-1} is the error correction term lagged one period and represents the disequilibrium residuals of a cointegrating equation. As discussed previously, the Granger causality approach seeks to determine how much of a current variable, Y, can be explained by past values of Y and lagged values of another variable X. There are four likely patterns of the causality test. First, no causality exists between x and y. Second, there is unidirectional causality from X to Y. Third, there is unidirectional causality from Y to X. Fourth, there is bidirectional causality or two-way causality. One of the causation sources can be recognized by testing for significance of the coefficients on the dependent variables in equations (5.7 and 5.8). In other words testing Ho: $\gamma_i = 0$ for all i in equation (5.7), or Ho: $\alpha_i = 0$ for all i in equation (5.8), indicate a Granger causality. Other causation sources are the Error Correction Term (ECT_{t-1}), in both equations (5.7 and 5.8). The ECT_{t-1} coefficients symbolize how fast the departure from the long run equilibrium is eliminated following change in each variable, by testing a simple t-test, if

β_1 is zero, then Y does not respond to a departure from the long-run equilibrium in the past period.

The two sources of causality significant must be analyzed together to check for causality. The analysis of causality in the ECM is applied in three stages according to Anwer et al. (1996). Combined hypothesis Ho: $\beta_1 = 0$ and Ho: $\gamma_i = 0$ is tested for all i in the equation (5.7) or Ho: $\beta_1 = 0$ and Ho: $\alpha_i = 0$ for all i in the equation (5.8). If the null hypothesis is not rejected, that means the variables don't have causality and no further testing will be performed. On the other hand, in case of the rejection of the null hypothesis, then causality does exist and an evaluation of the source of causality is required. It is important to find out if the causality is related to the terms of the error correction or to short term stationary variation. The second step of the analysis of causality in the ECM is to test the significance of the γ_i and α_i to verify the possibility of a short run causality. The third step is to analyze the direction of the β's to check if there exists a long run equilibrium relationship.

5.6.1. Long run causality (Adjustment coefficients):

To find out the long run causality, the direction of the coefficients on $ECTt_{-1}$ will be investigated to find which variables adjust in response to any disequilibrium to return to the long run equilibrium relationship. Assuming that there is disequilibrium, i.e. a positive value of ECT_{t-1}, then one of the variables LP, Le, Lm, LUSP, LGDP or all of them must adjust to return to the long run equilibrium. In the circumstances of positive value of $ECTt_{-1}$, the coefficient of the λ for LP must be negative. That means LP must decrease, and the coefficients of λ for Le, Lm, LUSP, LGDP, must be positive (increase).

In this study we will focus on the causality between price (P) and exchange rate (e), money supply (m), foreign price (USP), and GDP in Saudi Arabia, Kuwait, and Bahrain.

5.6.1.1. Saudi Arabia:

According to the results of the error correction model for Saudi Arabia illustrated in Table (5-7), a comparison of the sign of error correction term with the sign of cointegration equations and the t-statistic for LP shows that the sign of the error correction term is different from the sign of the cointegration equation. This means that LP adjusts to the shock in the long run but the t-statistic is not significant. Le and Lm signs of ECT are also different from the sign of cointegration equation and the t-statistic is significant. LUSP and LGDP signs of the error correction term are not different than the sign of the cointegration equation, which means they do not adjust to the shocks.

The results of the error correction model for Saudi Arabia indicate that there exists a long run unidirectional causality from price (LP) to the exchange rate (Le) and money supply (Lm), which means that price Granger causes exchange rate and money supply. In the other hand price is not Granger caused by any one of the independent variables, which is not consistent with the theory.

5.6.1.2. Kuwait:

The results of the error correction model for Kuwait are illustrated in Table (5-8). A comparison of the sign of the error correction term with the sign of cointegration equations and the t-statistic for LP the results shows that the sign of error correction term is not different from the sign of cointegration equation. This means that LP does not adjust to the shock in the long run. Le and Lm signs of error correction term are different than the sign of cointegration equation, and the t-statistic for Le is not significant, moreover the t-statistic for Lm is significant. LUSP sign of error correction term is different than the sign of cointegration equation, but the t-statistic is not significant. That means it does not adjust to the shocks. Finally, the sign of error correction term for LGDP is different than the sign of cointegration equation, and the t-statistic is significant, which means that LGDP adjusts to the shocks in the long run.

The results of the error correction model for Kuwait demonstrate that there exists a long run unidirectional causality run from price (LP) to money supply (Lm) and GDP (LGDP), which means that price Granger causes money supply and GDP, and the price is not Granger caused by any one of the independent variables, which is not consistent with the theory.

5.6.1.3. Bahrain:

The results of the error correction model for Bahrain are illustrated in Table (5-9). The results of a comparison of the sign of error correction term with the sign of cointegration equations and the t-statistic show that the signs of error correction term for LP and Lm are not different than the signs of cointegration equation. This means that LP and Lm do not adjust to the shock in the long run. The Le sign of the error correction term is different than the sign of the cointegration equation, and the t-statistic is significant (it does adjust to the shock in the long run). Finally, the signs of error correction term for LUSP, and LGDP are different than the signs of cointegration equation but the t-statistic is not significant.

The results of the error correction model for Bahrain illustrate that there exists a long run unidirectional causality from price (LP) to the exchange rate (Le), which determines that price Granger causes exchange rate, and the price is not Granger caused by any one of the independent variables, which is not consistent with the inflation theory.

The investigation of the long run causality between the dependent variable (price) and the explanatory variables (exchange rate, money supply, foreign price and GDP) for Saudi Arabia, Kuwait and Bahrain do not exemplify any long run causality explaining the causes of movements in the domestic prices. The end conclusion is that the error correction model results are not consistent with the inflation determinant theories and do not specify the causes and determinants of inflation in the long run for developing oil export based economies. The next step is to analyze the results for short run causations.

5.6.2. Short-Run Causality:

The next step in the causality investigation is to find out whether or not there is short-run causality between domestic prices and the explanatory variables. To do that, we will assess the α_i and γ_i coefficients in the error correction equation by performing the Wald test to check the probability values which indicate the existence of short run causality.

5.6.2.1. Saudi Arabia:

Table (5-7) illustrates the results of the chi-statistics and associated P-value for the short-run causality between domestic prices and the explanatory variables (Le, Lm, DLUSP and LGDP) for Saudi Arabia.

The analyses show that there is a unidirectional short-run causality (one way casualty) from Le to LP, in levels one, five and ten of significance. That indicates that there exists a short run unidirectional causality from exchange rate to price. In other words, the exchange rate causes prices in the short run in Saudi Arabia. On the other hand, the results don't show any short run causality between prices and money supply, foreign prices and GDP at any level of significance.

5.6.2.2. Kuwait:

The results of chi-statistics and its associated P-value for Kuwait are listed in Table (5-8). The analysis of the results does not provide support for the existence of short run causality between prices and foreign prices. Moreover, the results show that there exists of unidirectional causality from LP to Le, Lm and LGDP.

This means that prices cause exchange rate, money supply, and GDP in the short run in Kuwait. Unfortunately, the results of short – run causality in Kuwait do not indicate what causes the prices in the short run.

5.6.2.3. Bahrain:

For Bahrain, the results of chi – statistics and their associated P- values for the short run causality are included in Table (5-9). The analyses show that there is a bidirectional short-run causality (two way casualty) between Le to LP, in levels one, five and ten of significance. That indicates that there exists short run bidirectional causality between exchange rate and price in Bahrain. However, the results don't show any short run causality between prices and money supply, foreign prices and GDP at any level of significance.

The analysis of causality between domestic prices and the explanatory variables (exchange rate, money supply, foreign prices and GDP) in Saudi Arabia, Kuwait, and Bahrain in the long and short run, do not give convincing arguments about what are the main determinants of inflation in the developing oil-export based economies. In Table (5-10), a summary of causality direction in the long-run and short-run is demonstrated.

While these results are not consistent with the existing inflation determinant theories, they support the hypothesis of this study, which is that the existing inflation determinant theories were developed to explain the inflation determinants in developed economies and do not consider some of the characteristics of developing economies, especially the developing oil-export based economies such as the sample of this study. It may be that the model which explains the inflation determinants in developed and some developing economies is not powerful enough to explain the main inflation determinants in developing oil-export based economies because it does not include some important explanatory variables which distinguish these economies. Therefore in the next section, I will derive a simple theoretical model of inflation determination for developing oil export based economies in order to analyze the impact of the different variables on inflation taking in account its exceptional situation. This model should provide more explanatory power to the determinants of inflation in the developing oil-export based economies.

Table 5-1: ADF Unit Root Test for Saudi Arabia

Variables	Level	First difference	Second difference
LP	0.518668 *	-1.903242 ***	
Le	1.463050 *	-2.996732 *	
LGDP	0.736720 *	-3.730491 *	
Lm	0.640778 *	-1.728769 ***	
LUSP	0.336706 *	-1.515638	-2.378426**

Notes:

- Lag Length : Five
- Critical value for the level of the variable:

  a. At 1% -2.644302
  b. At 5% -1.952473
  c. At 10% -1.610211

- Critical value for the first difference of the variable:

  a. At 1% -2.647120
  b. At 5% -1.952910
  c. At 10% -1.610011

- Critical value for the second difference of the variable:
  a. At 1% -2.650145
  b. At 5% -1.953381
  c. At 10% -1.609798

- * Significant at 1%.
  ** Significant at 5%.
  *** Significant at 10%.

Table 5-2: ADF Unit Root Test for Kuwait

Variables	Level	First difference	Second difference
LP	2.629323 *	-2.742073 *	
Le	0.570476 *	-4.059286 *	
LGDP	0.431881 *	-6.016158 *	
Lm	1.735941 *	-1.631500 ***	
LUSP	1.110936 *	-1.375963	-6.409974 *

Notes:

- Lag Length : One
- Critical value for the level of the variable:

  a. At 1% -2.630762
  b. At 5% -1.950394
  c. At 10% -1.611202

- Critical value for the first difference of the variable:

  a. At 1% -2.632688
  b. At 5% -1.950687
  c. At 10% -1.611059

- Critical value for the second difference of the variable:
  a. At 1% -2.634731
  b. At 5% -1.951000
  c. At 10% -1.610907

- * Significant at 1%.
  ** Significant at 5%.
  *** Significant at 10%.

Table 5-3: ADF Unit Root Test for Bahrain

Variables	Level	First difference	Second difference
LP	0.349474 *	-2.763255 *	
Le	1.597458 *	-2.690976 *	
LGDP	2.702518 *	-2.092577 **	
Lm	2.324195 *	-1.711147 ***	
LUSP	1.455823 *	-1.612079 ***	

Notes:

- Lag Length : Two
- Critical value for the level of the variable:

  a. At 1%) -2.647120
  b. At 5% -1.952910
  c. At 10% -1.610011

- Critical value for the first difference of the variable:

  a. At 1% -2.650145
  b. At 5% -1.953381
  c. At 10% -1.609798

- * Significant at 1%.
  ** Significant at 5%.
  *** Significant at 10%.

Table 5-4: Results of Cointegration test -Number of cointegrating equation (Saudi Arabia)

Unrestricted Cointegration Rank Test (Maximum Eigenvalue)

Hypothesized No. of CE(s)	Eigenvalue	Max-Eigen Statistic	0.05 Critical Value	Prob.**
None *	0.714461	41.36142	33.87687	0.0053
At most 1	0.527990	24.77491	27.58434	0.1099
At most 2	0.464818	20.62990	21.13162	0.0586
At most 3	0.213518	7.926129	14.26460	0.3862
At most 4	0.034718	1.166039	3.841466	0.2802

Max-eigenvalue test indicates 1 cointegrating eqn(s) at the 0.05 level
* denotes rejection of the hypothesis at the 0.05 level
**MacKinnon-Haug-Michelis (1999) P-values

Table 5-5: Results of Cointegration test -Number of cointegrating equation (Kuwait)

Unrestricted Cointegration Rank Test (Maximum Eigenvalue)

Hypothesized No. of CE(s)	Eigenvalue	Max-Eigen Statistic	0.05 Critical Value	Prob.**
None *	0.678516	38.58347	33.87687	0.0127
At most 1	0.539139	26.33842	27.58434	0.0715
At most 2	0.359256	15.13425	21.13162	0.2796
At most 3	0.319409	13.08297	14.26460	0.0762
At most 4	0.059895	2.099962	3.841466	0.1473

Max-eigenvalue test indicates 1 cointegrating eqn(s) at the 0.05 level
* denotes rejection of the hypothesis at the 0.05 level
**MacKinnon-Haug-Michelis (1999) P-values

Table 5-6: Results of Cointegration test -Number of cointegrating equation (Bahrain)

Unrestricted Cointegration Rank Test (Maximum Eigenvalue)

Hypothesized No. of CE(s)	Eigenvalue	Max-Eigen Statistic	0.05 Critical Value	Prob.**
None *	0.987537	131.5492	33.87687	0.0000
At most 1 *	0.707877	36.91744	27.58434	0.0024
At most 2	0.488148	20.09158	21.13162	0.0694
At most 3	0.289852	10.26846	14.26460	0.1949
At most 4	0.083889	2.628526	3.841466	0.1050

Max-eigenvalue test indicates 2 cointegrating eqn(s) at the 0.05 level
* denotes rejection of the hypothesis at the 0.05 level
**MacKinnon-Haug-Michelis (1999) P-values

Table5-7 Granger causality test based on VECM for Saudi Arabia

		ΔLP	ΔLe	ΔLm	ΔDLUSP	ΔLGDP
Long - Run	ECT_{t-1}	-0.01620	0.02669	-0.07081	-0.00475	-0.07659
	t-stat	[-1.2692]	[5.2924]	[-3.3083]	[-0.8644]	[-3.9628]
Short - Run	P-Value & Chi-sq	ΔLP	ΔLE	ΔLm	ΔDLUSP	ΔLGDP
	ΔLP ↓	←	0.0001*** (15.25422)	0.7101 (0.13821)	0.5585 (0.34224)	0.1329 (2.25827)
	ΔLe	0.2199 (1.5051)				
	ΔLm	0.2350 (1.41043)				
	ΔDLUSP	0.1198 (2.4198)				
	ΔLGDP	0.1739 (1.8487)				

*, **, *** indicates that a test statistic is significant at the 10%, 5%, 1% level of significance, respectively. (Chi-sq in parenthesis).

Table5-8 Granger causality test based on VECM for Kuwait

		ΔLP	ΔLe	ΔLm	ΔDLUSP	ΔLGDP
Long - Run	ECT_{t-1}	0.042204	0.015581	0.085595	-0.005275	-0.136167
	t-stat	[1.5469]	[1.4582]	[3.9705]	[-1.0292]	[-2.3188]
Short - Run	P-Value & Chi-sq	ΔLP	ΔLe	ΔLM	ΔDLUSP	ΔLGDP
	ΔLP ↓	←	0.4263 (0.63295)	0.2188 (1.51243)	0.3091 (1.03450)	0.6562 (0.19819)
	ΔLe	0.0212** (5.3130)				
	ΔLm	0.0426** (4.1101)				
	ΔDLUSP	0.1110 (2.5392)				
	ΔLGDP	0.0783* (3.1005)				

*, **, *** indicates that a test statistic is significant at the 10%, 5%, 1% level of significance, respectively. (Chi-sq in parenthesis).

Table5-9 Granger causality test based on VECM for Bahrain

		ΔLP	ΔLe	ΔLm	ΔDLUSP	ΔLGDP
Long - Run	ECT_{t-1}	0.014192	-0.059774	-0.002458	-0.005637	0.103542
	t-stat	[0.4298]	[-26.418]	[-0.01487	[-0.4384]	[1.5553]
Short - Run	P-Value & Chi-sq	ΔLP	ΔLe	ΔLm	ΔLUSP	ΔLGDP
	ΔLP ↓	←	0.0047*** (7.98457)	0.4388 (0.59944)	0.2032 (1.6190)	0.9220 (0.0095)
	ΔLe	0.0000*** (38.7518)				
	ΔLm	0.1215 (2.39758)				
	ΔLUSP	0.8401 (0.0407)				
	ΔLGDP	0.2971 (1.08715)				

*, **, *** indicates that a test statistic is significant at the 10%, 5%, 1% level of significance, respectively. (Chi-sq in parenthesis).

Table 5-10: Summary of causality directions for Saudi Arabia, Kuwait and Bahrain

Country	In the Long-Run			In the Short-Run		
Saudi Arabia	LP	→	Le	LP	←	Le
	LP	→	Lm	LP	No	Lm
	LP	No	DLUSP	LP	No	DLUSP
	LP	No	LGDP	LP	No	LGDP
Kuwait	LP	No	Le	LP	→	Le
	LP	→	Lm	LP	→	Lm
	LP	No	DLUSP	LP	No	DLUSP
	LP	→	LGDP	LP	→	LGDP
Bahrain	LP	→	Le	LP	↔	Le
	LP	No	Lm	LP	No	Lm
	LP	No	LUSP	LP	No	LUSP
	LP	No	LGDP	LP	No	LGDP

5.7. Modeling inflation in the developing oil-export based economies:

The developing oil-export based economies are the economies which rely heavily on exporting oil, and the government depends on the oil revenue to finance its expenditures. When oil prices or oil demand increases or decreases the entire economy will be affected. That is because the government owns all of the country's natural resources and it uses the oil revenue to finance its expenditures, so the government expenditures depend on oil revenues and the economy depends on the government expenditures. In these economies, the government is the main employer for local labor, the government owns all the services, and the central bank is not independent.

Although the description above does not make these economies special or different from other economies in the rest of the world, what make them different is that their main export, oil, is very important to the rest of the world, developed, developing, non-developing, rich or poor.

Another fact is that developing oil-export based economies such as Saudi Arabia have a strong effect on the world oil market in respect to prices and supply. On the other hand, these economies do not have much effect on the rest of the world with respect to prices of goods and services since they are small open economies importing most if not all of their needs for consumption and production from the rest of the world. The conclusion is that the developing oil-export based economies influence the world economies through oil prices, and the rest of the world affects their economy through the imports of goods and services.

A starting point to understand the inflation rate determinants of these economies is the cost push inflation model. According to the cost push inflation model, when the cost of using any of the four factors of production (labor, capital, land, or entrepreneurship) increases, this type of inflation occurs. Higher production cost means the economy cannot continue to supply identical production at the original price level. If buyers want to consume the production, they must pay higher prices. The higher cost "pushes" the price level higher. According to Mankiw (2000), the cost push inflation is the actions that push up the cost of production. An example of this is the rise in world oil prices in the 1970's (p 367). When oil prices increase, oil revenue increases (assuming the world demand for oil does not decrease), and because the economy depends on the oil revenue, the GDP of the developing oil-export based economies increases as well. The production cost of goods and services in the rest of the world will increase also, which leads to an increase in all prices in the rest of the world. According to the international transmission of inflation model, which deals with the determinants of inflation in small open economies, Frisch (1977) argues that there are several channels for international inflation to be transmitted to domestic economies. One of these is called price effects channel. According to this channel, and assuming that such increases in the prices of the goods and services are not subsidized by the government, international inflation is transmitted to domestic economies through higher prices of imported goods and services. Consequently, because the developing oil-export based economies are small open economies importing most of their needs for consumption and production from the rest of the world, the increase in world prices of goods and services will cause the domestic prices in the developing oil-export based economies to increase.

Hence, when assembling a model to investigate the determinants of inflation in the developing oil-export based economies, the nature of these economies as explained above must be considered.

5.7.1. The model:

In this section, I will derive a simple theoretical model of inflation determination in order to analyze the impact of the different variables on inflation in an attempt to give more explanatory power to the developing oil-export based economies and their unique situation.

As mentioned earlier in chapter two, there are two main schools of thought which attempt to explain the main determinants of inflation. The first school of thought is the monetarists led by Milton Friedman. Friedman and Schwartz (1970) argue that "inflation is always and everywhere a monetary phenomenon." Friedman attributes inflation to excess money supply generated by the central bank. The second school of thought, the Keynesian economists, has stated that the main determinants of inflation are aggregate demand in the economy. According to Keynesians, the natural level of gross domestic product is a level of GDP where the economy is at its optimal level of production. If GDP increases beyond its natural level, inflation will accelerate as suppliers increase their prices. If GDP decreases below its natural level, inflation will deccelerate as suppliers attempt to fill excess capacity by lowering prices.

Base on these two schools of thought we can say that inflation (π) is a function of money supply growth ($\dot{M}$) and total output growth ($\dot{Y}$).

$$\pi_t = f(\dot{M}_t, \dot{Y}_t) \tag{5-9}$$

Total output growth rate ($\dot{Y}$) is a function of oil output growth rate ($\dot{OY}$) and non-oil output growth rate ($\dot{NOY}$).

$$\dot{Y}_t = h(\dot{OY}_t, \dot{NOY}_t) \tag{5-10}$$

Furthermore, to insure that the explanatory variables are reasonably represented in the model, oil GDP and non-oil GDP will be weighted by their contributions to total GDP, so:

$$\dot{Y}_t = h(\beta \dot{OY}_t, (1-\beta)\ \dot{NOY}_t) \tag{5-11}$$

where β represents the contribution of oil GDP to total GDP and (1-β) represents the contribution of non-oil GDP to total GDP.

Oil GDP growth rate ($\dot{OY}$) is a function of the oil price growth rate ($\dot{OP}$) and the oil production growth rate ($\dot{OPRO}$). Specifically:

$$\dot{OY} = \dot{OP}_t + \dot{OPRO}_t \tag{5-12}$$

Substituting (5-12) into (5-11):

$$\dot{Y}_t = h(\beta\ \dot{OP}_t, \beta\ \dot{OPRO}_t, (1-\beta)\ \dot{NOY}_t) \tag{5-13}$$

Substituting (5-13) into (5-9):

$$\pi_t = f((\beta\ \dot{OP}_t, \beta\ \dot{OPRO}_t, (1-\beta)\ \dot{NOY}_t, \dot{M}_t) \tag{5-14}$$

For estimating our model we will use the following equation:

$$\pi_t = \alpha_1 \beta \dot{OP}_t + \alpha_2 \beta \dot{OPRO}_t + \alpha_3 (1-\beta) \dot{NOY}_t + \alpha_4 \dot{M}_t \qquad \textbf{(5-15)}$$

5.7.2. Data Source and Description:

In this study, annual data from 1971 to 2003 will be utilized, including 33 observations. The data has been collected from different sources such as the Energy Information Administration (EIA), the Saudi Arabian Monetary Agency (SAMA) and the International Monetary Fund (IMF).

The testing model is comprised of five variables. The domestic inflation rate (π_t) is the dependent variable, and the explanatory variables are non-oil income growth rate (NOY), oil price growth rate (OP), oil production growth rate (OPRO), and money supply growth rate (M).

5.7.2.1 Inflation rate (π):

The Inflation rate is the rate of change in the price of goods and services over a given period of time. The most generally used measure of inflation is the Consumer Price Index. We can say that the inflation rate is the annual percentage change in consumer prices compared with the previous year's consumer prices.

In this study, the annual inflation rate will be used for the period from 1971 to 2003. The inflation rate is the dependent variable in this study.

5.7.2.2. Weighted Oil Prices growth rate (WOPG):

The proxy used for oil prices is the price of light Arabian oil; the growth rate of oil prices is the annual percentage change in oil prices compared with the previous year's oil prices. The oil price will be weighted by the percentage contribution of oil GDP to the total GDP. In this study the annual growth rate of oil prices will be used for the period from 1971 to 2003. According to the cost push inflation model, the relationship between oil price growth and the inflation rate is found to be positive, which means that when oil prices increase the inflation rate will increase and vice versa.

5.7.2.3. Weighted Oil Production Growth Rate (WOPROG):

Oil production is measured by barrels, and the growth rate of oil production is the annual percentage change in oil production compared with the previous year's oil production. The oil production will be weighted by the percentage contribution of oil GDP to the total GDP. In this study, the annual growth rate of oil production will be used for the period from 1971 to 2003. In the economics literature, the relationship between growth rate of oil production and the inflation rate is found to be positive. According to Keynesians, when price increases, the suppliers increase their supplies. This means that when the growth rate of oil price increases, the oil production growth rate increases; therefore, the inflation rate will increase and vice versa.

5.7.2.4. Weighted Non-oil Y Growth Rate (WNOYG):

The proxy of non oil Y is the data of non oil GDP growth (NOGDPG). Non oil GDP is measured at producers' values excluding import duties and oil GDP. The growth rate of non oil GDP is the annual percentage change in non oil GDP compared with the previous year's non oil GDP. The non-oil GDP will be weighted by the percentage contribution of non-oil GDP to the total GDP (WNOGDPG). In this study, annual growth rate of non oil GDP will be used for the period from 1971 to 2003. The relationship between growth of non-oil GDP and inflation is ambiguous. According to the aggregate demand and aggregate supply model, the relation could be negative or positive. On the demand side, when prices decrease, the aggregate demand increases which lead to increase in the total output (negative relationship between non-oil GDP and inflation). On the other hand, on the supply side, when prices increase, the aggregate supply increases which lead to increase the total output (positive relationship between non-oil GDP and inflation).

5.7.2.5. Money supply growth rate (MG):

Money supply is defined as currency in circulation plus demand deposits. Money growth is the annual percentage change in money supply compared with the previous year's money supply. In this study, annual money supply growth will be used for the period from 1971 to 2003. In the literature, the relationship between money growth and inflation rate is found to be positive according to the monetarists, which means that when money growth increases, the inflation rate will increase and vice versa.

Therefore our final estimation equation is as follows:

$$\pi_t = \alpha_1\,\mathrm{WOPG}_t + \alpha_2\,\mathrm{WOPROG}_t \pm \alpha_3\,\mathrm{WNOGDPG}_t + \alpha_4\,\mathrm{MG}_t \qquad (5\text{-}16)$$

Consequently, the model predicts that an increase in oil price, oil production, and money supply will lead to an increase in inflation rate i.e. α_1, α_2, $\alpha_4 > 0$. Furthermore, the sign of non-oil GDP is not clear i.e. $\alpha_3 > 0$ or <0.

5.7.3. Methodology and Empirical Findings analysis:

In this section, cointegration and the Error correction Model (ECM) will be implemented in order to investigate the determinants of inflation in developing oil export based economies. The testing model contains five variables, inflation rate (π), as the dependent variable and money supply growth rate (M), oil prices growth (OPG), oil production growth (OPROG) and non oil GDP growth (NOGDPG) as explanatory variables. The data used is annual time series data.

The testing procedure is divided into three parts. First is the test for stationarity. Second, is the cointegration test, and finally, the Error Correction Model and Granger causality test. In this section, Bahrain will not be considered because of lack of data.

5.7.3.1. Unit root Test:

Since the data are time series, we need to test for the properties of the series to avoid the problem of spurious regressions. Unit root tests are performed for Saudi Arabia using the Augmented Dickey-Fuller (ADF) test using two lag length, and annual data from 1971 to 2003. As illustrated in Table (5-11), π, MG, WOPG, WOPROG and WNOGDPG are non-stationary in their level at ten percent, five percent and one percent confidence levels. As shown in Table (5-11), ADF t-values for all the five variables are greater than critical values; therefore, the series are nonstationary.

The null hypothesis of a unit root in first difference is rejected for π, WOPG, and WOPROG at all confidence levels. The null hypothesis of a unit root in first difference is rejected for MG and WNOGDPG at five percent confidence level, (the series are stationary in the first difference). The unit root results for Saudi Arabia demonstrate that, π, MG, WNOGDPG, WOPG and WOPROG are integrated of order one i.e. I (1).

Also the unit root tests for Kuwait are executed using four, three, two, one and zero lags. Moreover, the unit root test results for Kuwait data show that some variables are nonstationary in level and the other are stationary in level. This data problem will prevent executing the remainder of the tests with Kuwait.

Therefore, because of the lack of data for Bahrain and because of data problems for Kuwait, we will carry out our study in this section with Saudi Arabia only. The Saudi Arabian economy is the best to represent the developing oil-export based economies and a good sample for investigating inflation determinants in developing oil export based economies. Also Saudi Arabia is the most important economy among the sample in this study.

5.7.3.2. Johansen Cointegration Test:

After determining the order of integration by the Augmented Dickey Fuller test, we will continue by testing for cointegration to determine the long run relationship between the variables in our model, in other words to see if they are cointegrated or not. The Johansen cointegration test was applied, and cointegration rank (r), was determined based on values of Max–Eigen statistic. The cointegration rank is examined by comparing the Max- Eigen statistic to the critical values at five percent.

The outcomes of the cointegration test for Saudi Arabia are illustrated in Table (5-12). The test was performed for all variables in level. The cointegration test results based on the Max-Eigen statistic suggest the rejection of the null hypothesis of "no cointegration" at the five percent level of significance. The Max-Eigen statistic is 42.7 and the matching critical values at five percent significance level is 30.4. The Max- Eigen statistic is greater than the critical values, which means the rejection of the hypothesis at the 0.05 level. The hypothesis of at most one cointegration equation is also rejected at 0.05 level of significance. The Max-Eigen statistic is 36.2 and the matching critical value is 24.2. The Max- Eigen statistic is greater than the critical values, which means the rejection of the hypothesis at the 0.05 level of significance. The hypothesis of at most two cointegration equations is not rejected at 0.05 level of significance. The Max-Eigen statistic is 10.9 and the matching critical value is 17.8. The Max- Eigen statistic is less than the critical values, which means that the hypothesis at the 0.05 level of significance is not rejected. Accordingly, there exists two cointegrating vector among the variables of the equation.

Since we are interested in the long run relationship between the dependent variable and the independent variables in our model, then we will use the one cointegrating equation in our analysis of the long run relationship between the variables in our model.

The coefficient for MG is (- 0.55) with a t-stat of (-1.64), which is not significant according to t-test at 5% level of significance and the sign is what was expected. The WNOGDPG coefficient is (2.05) with a t-stat of (1.91), which is nearly significant, and the sign is negative and it was expected based on the demand side analysis. For WOPG, the coefficient is (-1.67) with a t-stat of (-7.75). The sign is what was expected, and it is significant. Finally, the coefficient for WOPROG is (-0.34) with a t-stat of (-1.056) which is not significant and the sign is what was expected.

The test for a long-run relationship between inflation rate and money growth, non-oil GDP growth, oil price growth and oil production growth for Saudi Arabia produced the following cointegration equation (t-statistics in parentheses):

$$\underset{(-1.64)}{\pi - 0.55MG} + \underset{(1.91)}{2.05WNOGDPG} \underset{(-7.75)}{- 1.67WOPG} \underset{(-1.05)}{- 0.35WOPROG} = ECT_{t-1} \quad (5\text{-}17)$$

The result of the above equation indicates that there is a long-run relationship between inflation rate and money growth, non-oil GDP growth, oil price growth and oil production growth.

5.7.3.3. Causality Test:

Although the cointegration test indicates the existence of a long-run relationship amongst the five variables, the cointegration testing does not indicate the directions of the relationships amongst the variables. Therefore, a causality test will be applied to identify the direction of the long-run and the short-run relationship among the variables. To apply the causality test, the Error Correction Model (ECM) will be used, applying the Error Correction Equations (5-5 and 5-6).

To find out the long run causality (adjustment coefficients) the direction of the coefficients on $ECTt_{-1}$ will be investigated to find which variables adjust in response to any disequilibrium to return to the long run equilibrium relationship. Assuming that there is disequilibrium i.e. a positive value of ECT_{t-1}, then one or some of the variables π, MG, WNOGDPG, WOPG, WOPROG or all of them must adjust to return to the long run equilibrium. In the circumstances of positive value of ECT_{t-1}, the coefficient of the λ for π must be negative which means π must decrease and the coefficients of λ for MG, WNOGDPG, WOPG, WOPROG, must be positive (increase).

In this study we will focus on the causality between inflation rate (π) and money growth (MG), non-oil GDP growth (WNOGDPG), oil price growth (WOPG), and oil production growth (WOPROG) in Saudi Arabia.

According to the results of the error correction model for Saudi Arabia illustrated in Table (5-13), a comparison of the sign of the error correction term with the sign of the cointegration equations and the t-statistic for π shows that the sign of the error correction term is different from the sign of cointegration equation and the t-statistic is significant, which means that π adjusts to the shock in the long run. The sign of error correction term for MG is same as the signs of the cointegration equation, which indicates that MG does not adjust to the shock in the long run. For WNOGDPG and WOPG, the outcome shows that the sign of the error correction term is different from the sign of the cointegration equation and the t-statistic is significant, which signifies that WNOGDPG and WOPG adjusts to the shock in the long run. Finally, for WOPROG the sign of the error correction term is different from the sign of the cointegration equation but the t-statistic is not significant.

The results of the error correction model for Saudi Arabia indicate that there exists a long run unidirectional causality (one way causality), from money growth (MG) and oil production growth (WOPROG) to the inflation rate (π), and bidirectional causality or two-way causality between non-oil GDP growth (WNOGDPG) and inflation rate (π). Also, the results indicate that there exists bidirectional causality (two-way) between oil price growth (WOPG) and inflation rate.

In other words, the results of the error correction model for Saudi Arabia show that the inflation rate in Saudi Arabia is Granger caused by the money growth, non-oil GDP growth, oil prices growth and oil production growth. Moreover, the results show that the inflation rate Granger caused non-oil GDP growth and oil price growth.

The next step in the causality investigation is to find out whether or not there is short-run casualty between the inflation rate and the explanatory variables. To do that, we will assess the α_i and γ_i coefficients in the error correction equation by performing Wald test and checking the probability values which indicate the existence of short run causality.

Table (5-13) illustrates the results of the chi-statistics and their associated P-value for short-run causality between the inflation rate (π) and the explanatory variables (MG, WNOGDPG, WOPG and WOPROG) for Saudi Arabia.

The analyses show that there is a bidirectional short-run causality (two-way casualty) between oil price growth (WOPG) and inflation rate (π), at five percent level of significance. Moreover, the analyses do not indicate the existence of short run causality between inflation rate (π) and money growth (MG), non oil GDP growth (WNOGDPG) or oil production growth (OPROG). The direction of the causality in the long-run and short-run is summarized in Table (5-14).

Table: 5-11: ADF Unit Root Test for Saudi Arabia

Variables	Level	First difference
π	-2.380304	-4.332449*
MG	-1.656588	-3.425156**
WNOGDPG	-1.775488	-2.974701**
WOPG	-2.447316	-6.187824*
WOPROG	-2.618624	-4.212245*

Notes:

- Lag Length : 2
- Critical value for the level of the variable:
  a. At 1% -3.670170
  b. At 5% -2.963972
  c. At 10% -2.621007
- Critical value for the first difference of the variable:

  a. At 1% -3.679322
  b. At 5% -2.967767
  c. At 10% -2.622989
- * Significant at 1%.
  ** Significant at 5%.
  *** Significant at 10%.

Table 5-12: Results of Cointegration test -Number of cointegrating equation (Saudi Arabia)

Unrestricted Cointegration Rank Test (Maximum Eigenvalue)

Hypothesized No. of CE(s)	Eigenvalue	Max-Eigen Statistic	0.05 Critical Value	Prob.**
None *	0.759043	42.69412	30.43961	0.0009
At most 1 *	0.700473	36.16654	24.15921	0.0008
At most 2	0.305082	10.91885	17.79730	0.3932
At most 3	0.212209	7.155665	11.22480	0.2363
At most 4	0.066227	2.055645	4.129906	0.1788

Max-eigenvalue test indicates 2 cointegrating eqn(s) at the 0.05 level
* denotes rejection of the hypothesis at the 0.05 level
**MacKinnon-Haug-Michelis (1999) p-values

Table5-13: Granger causality test Based on VECM for Saudi Arabia

		$\Delta\pi$	ΔMG	ΔWNOGDPG	ΔWOPG	ΔWOPROG
Long - Run	ECT_{t-1}	-0.171885	-0.370307	-0.141972	0.368165	0.162752
	t-stat	[-4.19935]	[-4.55643]	[-4.89164]	[2.76988]	[1.74798]
Short - Run	P-Value & Chi-sq	**$\Delta\pi$**	**ΔMG**	**ΔWNOGDPG**	**ΔWOPG**	**ΔWOPROG**
	$\Delta\pi$ ↓	←	0.7395 (0.110567)	0.4208 (0.648007)	0.0288** (4.776598)	0.6214 (0.243897)
	ΔMG	0.7869 (0.07305)				
	ΔWNOGDPG	0.4717 (0.51804)				
	ΔWOPG	0.0258** (4.97046)				
	ΔWOPROG	0.2570 (1.28492)				

*, **, *** indicates that a test statistic is significant at the 10%, 5%, 1% level of significance, respectively. Chi-sq in parenthesis.

Table 5-14: Summary of causality directions for Saudi Arabia

In the Long-Run			In the Short-Run		
π	$\leftarrow$	MG	π	No	MG
π	$\leftrightarrow$	WNOGDPG	π	No	WNOGDPG
π	$\leftrightarrow$	WOPG	π	$\leftrightarrow$	WOPG
π	$\leftarrow$	WOPROG	π	No	WOPROG

CHAPTER SIX

Conclusion and policy Recommendations

6.1 Conclusion:

The purpose of this study is to investigate the main determinants and causes of inflation in the developing oil-export based economies. The Gulf Cooperation Council (GCC) countries, Bahrain, Kuwait, Oman, Qatar, Saudi Arabia, the United Arab Emirates, are all developing oil-export based economies, and they have similar economies, cultures and political structures as well as similar inflation rates. Furthermore, during the GCC summit in December 2001 in Oman, the GCC countries agreed to a joint customs tariff of five percent by the year 2003 and voted to create a single currency by the year 2010. As an intermediate stage toward establishing a single currency, they also agreed to use the U.S. dollar as a common peg for their currencies by the end of the year 2002.

In this aspiration to achieve monetary integration and a common currency, the GCC countries hold the common belief that complete integration requires the elimination of the uncertainties associated with the existence of separate currencies. One of the most important factors to get under control is the inflation rate. From this perspective, it was the attempt of this study to include all six GCC countries in the study. Nevertheless, because of lack of data for some of these countries, the study was limited to three of them, Saudi Arabia, Kuwait and Bahrain.

In the seventies, the developing oil-export based economies, especially Saudi Arabia, Kuwait and Bahrain witnessed an increase in oil revenue because of the increase in oil prices. On the other hand, in the mid eighties, because of the world recession the oil prices dropped.

This fluctuation in oil prices has a tremendous affection in the developing oil-export economies, affecting all economic factors and activities, including the inflation rate. The inflation rate in the mid seventies for Saudi Arabia, Kuwait, and Bahrain was 34 percent, 13 percent, and 24 percent, respectively. On the other hand, in the mid eighties, the inflation rate was -3 percent, 1.5 percent, and -2.6 percent respectively.

In this study we make a distinction between developed and developing economies. The incentive for this distinction is that the causes and determinants of inflation are often different in these two groups. Moreover, among the developing economies, there are the developing oil-export based economies, which may have special economic structures making them unique and different from other economies both developed and developing, in that they have a different economic point of view, especially relating to the causes and determinants of inflation.

The attempt of this study is to investigate the determinants and causes of inflation in the developing oil–export based economies of Saudi Arabia, Kuwait and Bahrain to find out if the main determinants and causes of inflation are similar to other developing and developed economies. The study also explore whether the same inflation determinant theories which explain inflation in developed and other developing economies will explain the inflation causes and determinants in these developing oil-export based economies.

For the purpose of this study, a simple theoretical model of inflation based on the general approach used in other inflation determinant studies e.g. Ubide (1997) has been constructed. In this model several key economic variables have been included, such as domestic prices, GDP, money supply, foreign prices and exchange rate.

The test performed in this study was carried out in three steps. The first was the test for stationarity, the second, the cointegration test, and the third, an error correction model (ECM). The unit root test was performed in order to avoid the problem of estimating spurious regressions and to determine the properties of time series under investigation. The cointegration test was used to examine the existence of long-run equilibrium relations between the domestic price as the dependent variable and money supply, GDP, foreign prices, and exchange rate as independent variables. Finally, Granger causality and an error correction model were applied to identify how the variables in the model adjusted to reach their long-run equilibrium.

The outcome of the empirical tests of the first model illustrated the existence of one cointegrating equation between the five variables (domestic prices, exchange rate, money supply, foreign prices, and GDP) for Saudi Arabia and Kuwait. For Bahrain, the empirical test outcomes of the first model concluded the existence of two cointegrating equations. The findings for Saudi Arabia are a positive relation between domestic prices and exchange rate, foreign prices, and GDP, and a negative relation between domestic prices and money supply. For Kuwait, the findings are a positive relation between domestic prices and exchange rate, and between domestic prices and money supply; and a negative relation between domestic prices and foreign prices, and between domestic prices and GDP. Finally, the findings of Bahrain are a positive relation between domestic prices and money supply, and between domestic prices and foreign prices; and a negative relation between domestic prices and GDP. Consequently, an Error Correction Model (ECM) was performed in order to examine the dynamics of the variables in the testing model. The empirical outcomes of the error correction model for Saudi Arabia, Kuwait, and Bahrain indicate that the change in the explanatory variables (exchange rate, money supply, foreign prices, and GDP) do not determine the change in the domestic price in the long run or in the short run. Except for Saudi Arabia, the outcomes show that change in the exchange rate causes change in the domestic prices in the short run.

The outcomes of this testing model do not offer enough evidence for the determinants of inflation in the developing oil-export based economies. That may be because of several reasons. The most important, in my opinion is the ignoring of economic aspects which differentiate the developing oil-export based economies from other types of economies.

As a result of the large oil revenues in the developing oil-export based economies during the late 70's and early 80's, most of the basic infrastructures were developed or improved and most of the economic factors changed. Government expenditure increased, wages increased, and the quality of services improved (health, education, etc.). Moreover, to investigate the inflation determinants in these economies, we have to understand their economic characteristics. The developing oil-export based economies are characterized by the following:

1. The structures of their economies are dominated by the oil sector.
2. The government owns all the natural resources, including oil.
3. Oil is the main source of income for the governments.

4. There are no taxes imposed on either sales or income.
5. The government uses the oil revenue to finance its domestic expenditures to build the economy.
6. The governments own most of the public services (electricity, drinking water, communication, transportation etc.).
7. The governments own most of the large production companies such as petro-chemical processing and manufacturing.
8. The governments are the dominant employer of local labor.
9. The monetary authority is not an independent agency; it is under the Ministry of Finance.
10. The exchange rate is fixed.
11. These economies import most of their needs for consumption and production from abroad.

Taking into consideration the characteristics of the developing oil-export based economies demonstrated above; a testing model was constructed to investigate the causes and determinants of inflation in these economies. The main inspiration is disaggregating the total GDP to oil-GDP and non-oil GDP, bearing in mind that oil is a wealth not a GDP, whose revenue is used to modernize the infrastructure of the country and improve the social lives of the citizens through government expenditures. Also, bearing in mind that non-oil GDP is tied to the oil GDP and it changes as a result of the oil GDP changes. In other words, the non-oil GDP is a result of the circulation of the petrodollars in the economy. So to investigate inflation determinants in developing oil-export based economies, each sector (oil and non-oil) should be included separately (disaggregate

GDP) as explanatory variables in the testing model. That is because each sector is hypothesized to have its own dynamic effect on inflation.

The second testing model in this study is comprised of five key economic variables: the inflation rate as an independent variable with oil price growth rate, oil production growth rate, money supply growth rate, and non-oil GDP growth rate as explanatory variables. Because of the lack of data for Bahrain and data problems for Kuwait, the investigation was performed on Saudi Arabia only. The tests carried out with the second model were same as those on the first model: the test for stationarity, the cointegration test, and finally an error correction model (ECM).

The outcome of the empirical tests of the second model demonstrates the existence of two cointegrating equations between the five variables (inflation rate, money growth, non-oil GDP growth, oil prices growth, and oil production growth) for Saudi Arabia. The findings are a positive relation between inflation rate and money growth, oil price growth, and oil production growth, and a negative relation between inflation rate and non-oil GDP growth.

Consequently, an Error Correction Model (ECM) was performed in order to examine the dynamics of the variables in the testing model. The empirical outcome of the error correction model for Saudi Arabia indicates that the change in the explanatory variables (growth of money, growth of non-oil GDP, growth of oil prices, and growth of oil production) does determine changes in the inflation rate in the long run. The results indicate the existence of unidirectional causality from money growth and oil production growth to inflation rate, and bidirectional causality between inflation and growth of non-oil GDP. Also bidirectional causality between inflation and oil price growth existed.

Moreover, in the short run, the results indicate the existence of bidirectional causality between the oil price growth and the inflation rate, and no evidence of causality in the short run was found between inflation rate and growth of money, non oil GDP growth or growth of oil production.

The results of the second model provide strong evidence regarding the determinants of inflation in developing oil-export based economies. Based on the significances of these results, we can say that the main determinants of inflation in developing oil-export based economies in the long run are growth of money, growth of non-oil GDP, and growth of oil prices. Furthermore, in the short run, the main determinant of inflation is oil price growth.

6.2 Policy Recommendations:

The results indicate that growth of the non-oil sector has been anti inflationary and have strengthened the economy. Although the growth of the non-oil sector is not inflationary in the period of the study, it could be potential problem in the future. Also, the results indicate that the inflation in the developing oil-export based economies is caused by the growth of oil price that because these economies rely heavily on the oil revenue. Over the past three decades, most developing oil-export based economies witnessed an extraordinary economic and social transformation. Oil contributes about one-third of the total GDP and three-fourths of the annual government's revenues and exports.

Therefore, rapid development of the non-oil sector will strengthen the economy and reduce the important of oil price as a source of inflation. Based on these facts and on the findings of this study, the following policies are recommended:

6.2.1 Diversification and Privatization:

The developing oil-export based economies should implement economic plans to diversify the economy from the oil sector, giving the results, which show the strength between oil price and inflation.

Although initiatives for diversification are included in the development plans, after three decades, the level of diversification is not enough. The governments are taking most of the responsibility for diversification, leaving little for the private sector. To speed up the diversification in these economies, the private sectors should take its opportunity and the governments should encourage the private sector through privatization. The public sector and the private sector should complement the function of each other rather than substituting for the others. In other words, the public sector should concentrate on the crowd-in projects not the crowd-out projects.

6.2.2 Development of the private sector:

The development of the private sector needs to be accomplished through legal and institutional restructuring along with privatization. This would involve the following: reduction in controls and restrictions on private sector investment, equal treatment of all investors local and foreign, a comprehensive framework for the privatization, an improvement of market confidence, the development of an efficient investment database, more long term financing, and liberalization of restrictions on foreign capital inflows so that the required capital and related technologies would be accessible to support privatization and private sector development.

6.2.3 Completion of the Infrastructures:

Oil revenue in the developing export-based economies was used for building the basic infrastructures in the last three decades, which improved the economics and social indicators of these countries. Yet, the infrastructures are not yet complete and there remains a lot to be done. The governments should concentrate on the completion of main infrastructure projects such as, roads, schools, universities, hospitals, airports, and railways, etc.

The completion and maintenance of infrastructure projects is an important factor for economic development which will increase the efficiencies of the private sector and attract investors, both local and foreign. Furthermore, the large public sector means that private sector investment remained relatively low as a percent of the GDP. So the completion of major infrastructures projects will reduce the role of government spending in non-oil sector growth.

6.2.4 Development of more independent central bank:

The results show that the growth of money is a source of inflation in the long run in the developing oil-export based economies. With a nondependent central bank and fixed exchange rate, the monetary policy is directed at maintaining a stable exchange rate and to suit the government's desires. As a result, the central bank does not have control over the money supply. Hence, a more independent central bank is recommended to achieve other economic objectives such as controlling inflation.

REFERENCES

Al-Aboudi, A. (1997). *The Transmission of international inflation in small open economies: A case studi on Gulf Cooperation Council Countries.* Ph.D. Dissertation, Colorado State University, Fort Collins.

Aljuhani, E. A. (1990). *Money market, price fluctuations and the role of the monetary authority in Saudi Arabia.* Doctoral dissertation, Colorado State University, Fort Collins.

AL-Otaibi, N. O. (2001). *An investigation of the relationship among oil revenues, money supply, and the price level in Saudi Arabia.* Doctoral dissertation, American University, Washington D.C.

AL-Saleh, K. A. (1996). *Money, income, and monetary policy in the economy of Saudi Arabia: An empirical study using a monetary framework.* Doctoral dissertation, Southern Illinois University, Carbondale.

Anwer, M., S. Davies and R. sampath. (1996). Causality Between Government Expenditures and Economic Growth: an Examination Using Cointegration Techniques. *Public Finance, 51*(2), 166-184.

Askari, H., V. Nowshirvani, and M. Jaber. (1997). *Economic Development in the GCC: The Blessing and the Curse of Oil.* London: Jai Press Inc.

Bahrain Government Page, Economic Statistic. Retrieved October 10, 2005, from, http://www.bahrain.gov.bh/arabic/RunIndex.asp?count=20

Ball, L. (1993). *What causes inflation?* Philadelphia: Federal Reserve Bank of Philadelphia.

Balassa, B. (1964). The purchasing power parity doctrine: A reappraisal. *Journal of Political Economics, 72*(6), pp. 584-596.

Barry, Z. A. (1980). *Inflation in Saudi Arabia: 1964 to 1978.* Doctoral dissertation, University of Colorado, Boulder.

Boschen, J. and Weise, C. (2003). What start inflation: Evidence from the OECD countries. *Journal of Money, Credit and Banking, 35*, pp. 324-349.

Bowdler, C. and Nunziata, L. (2004). *A note on the determinants of inflation starts in OECD*: Economics Group, Nuffield College, University of Oxford.

Box, G. E. P. and Jenkins, G. M. (1970). *Time series analysis: Forecasting and control.* San Francisco.: Holden Day.

Bronfenbrenner, M. and Holzman, F. D. (1965). A survey of inflation theory. In *Surveys of Economic Theory* (Vol. I). New York: St Martin's Press.

Campos, R. O. (1967). *Reflections of Latin American development.* Austin, Texas: University of Texas Press.

Darrat, A. F. (1981). *A monetarist approach to inflation for Saudi Arabia.* Doctoral dissertation, Indiana University, Bloomington.

Dickey, D. A. and Fuller, W. A. (1981). Likelihood ratio statistic for autoregressive time series with a unit root. *Econometrica, 49*, 1057-1072.

Energy Information Administration (EIA). (2005). Retrieved September 20, 2005 from http://www.eia.doe.gov/emeu/mer/inter.html

Engle, R. F. and Granger, C. W. J. (1987). Co-integration and error-correction: Representation, estimation, and testing. *Econometrica, 55*, 251-276.

Fan, L. S. (1970). Monetary performances in developing economies: A quantity theory Approach." *Quarterly Review of Economics and Business, 10.*

Fan, L. S. and Liu, Z. (1971). Demand for money in Asian countries: Empirical evidence. *Indian Economic Journal, 18*, 473-481.

Fic, T. (2003). *Identifying determinants of German inflation An eclectic approach.* Berlin: German Institute of Economic Research.

Fischer, D. H. (1996). *The great wave: Price movements in modern history.* Oxford: Oxford University Press.

Flemming, J. S. (1976). *Inflation.* Oxford: Oxford University press.

Friedman, M. and Schwartz, A. J. (1963). *Monetary history of the United States, 1867 – 1960.* Princeton, N.J.: Princeton University Press.

Friedman, M. (1969). The quantity theory of money: A restatement. In *The Optimum Quantity of Money and Other Essays.* Chicago: Aldine Publishing Company.

Friedman, M. (1970). A theoretical framework for monetary analysis. *Journal of Political Economy, 78*(2).

Friedman, M. and Schwartz, A. J. (1970). *Monetary statistics in the U.S. estimates, sources, method.* New York: National Bureau of Economic Research (NBER).

Frisch, H. (1974). *Inflation in small countries.* Paper presented at the Proceeding of an international conference held at, Institute for Advanced Studies, Vienna.

Frisch, H. (1977). Inflation Theory 1963-1975: A 'Second Generation Survey'. *Journal of Economic Literature, 15*(4).

Genberg, H. and Pauwels, L. (2002). *Inflation in Hong Kong, SAR - in search of a transmission mechanism.* Graduate Institute of International Study, Geneva, Working paper no.09/2002.

Gordon, R. J. (1983). *Credibility vs. mainstream: Two views of the inflation process.* In *Inflation: Prospects and Remedies, Alternatives for the 1980.*: Center for National Policy.

Golinelli, R. and Orsi, R. (2001). *Modelling inflation in EU accession countries: The case of the Czech Republic, Hungary and Poland.* Poland: Macroeconomic and Financial data Centre of the University of Gdansk.

Granger, C. W. J. (1969). Investigating causal relation by econometric model and cross-spectral methods. *Econometrica., 37*(3), 424-438.

Granger, C. W. J. (1981). Some properties of time series data and their use in econometric model specification. *Journal of Econometrics, 23*, 121-130.

Gujarati, D. (1995). *Basic Econometrics.* New York: Mc Graw-Hill, Inc.

Gulf Cooperation Council (2002). *Economic Bulletin Volume XVII.* Retrieved August 28, 2005, from http://www.gcc-sg.org/economic_bulletin_17/index.html

Gulf Cooperation Council, (2002), *Statistical Bulletin.* Retrieved August 25, 2005, from, http://library.gcc-sg.org/Arabic/Books/ArabicPublish-30.htm 2002

Gulf Cooperation Council, (2004), *Statistical Bulletin.* Retrieved October 14, 2005, from, http://library.gcc-sg.org/Arabic/Books/ArabicPublish-30.htm 2004

Harris, L. (1981). *Monetary theory.* New York: McGraw-Hill Book Company.

Hendry, D. F., and Mizon, G. E. (1978). Serial correlation as a convenient simplification not a nuisance: A comment on a study of demand for money by the Bank of England. *Economic Journal, 88*, 549-563.

Hendry, D. F. (1999). *Does money determine UK inflation over the long run?* Oxford, U.K.: Nuffield College.

Humphrey, T. M. (1982). A global monetarist model of world inflation and the balance of payments. In *the monetary approach to the balance of payments, exchange rates, and world inflation.* New York: Praeger Publishers.

International Monetary Fund (2004) . *International Financial Statistics* (IFS) CD-ROM.

Kim, B.Y. (2001). *Determinants of inflation in poland: A structural cointegration approach.* (No.16). Helsinki, Finland: Bank of Finland Institute for Economies in Transition. Discussion papers 2001.No.16.

Kirkpatrick, C. H. and Nixon, F. I. (1976). The origins of inflation in less developed countries: A selective review. In *Inflation in Open Economies* (pp. 126 -174). Manchester: Manchester University Press.

Ladslous, M. (1998). *Determinants of inflation in Zambia.* Doctoral dissertation, Goteborg University, Goteborg, Sweden.

Laliwala, J. I. (1984). *The theory of inflation.* New Delhi: Vikas Publishing House, Ltd.

Lucas, R. (1976). *Macroeconomic policy evaluation: A critique, in the Phillips curve and labor markets.* Paper presented at the Carnegie-Rochester Conference Series on Public Policy, Amsterdam: North Holland.

Machlup, F. (1960). Another view of Cost-Push and Demand-Pull Inflation. *Review of Economic Studies., 42.*

Mankiw, N. G. (2000). *Macroeconomics* (fourth ed.). New York: Worth publishers.

Maynard, G. (1961). Inflation and growth: Some lessons to be drawn from Latin American experience. *Oxford Economic Papers, 13*(2).

Mitze, T. (2002). *Forecasting the EMU inflation rate: A fuzzy rule-based approach with Genefer compared to mainstream econometrics.* Muenster.: Muenster Institute for Computational Economics (MICE), University of Muenster.

Muth, J. F. (July 1961). Rational expectation and the theory of price movements. *Econometrica, 3*, 315-335.

OECD. (July, 1973). The international transmation of inflation. *OECD. Economic Outlook*, 81-96.

Olivera, J. H. G. (1964). On structural inflation and Latin American structuralism. *Oxford Economic Papers, 16.*

Pigou, A. C. (1949). *The veil of money.* London: Macmillan.

Ramanathan, R. (1989). *Introductory Econometrics.* Orlando,FL.: Harcourt Brace Jovanovich.

Salih, S. (1993). Determinant of inflation in oil-exporting developing countries: An empirical investigation 1970-1990. *Applied Economics, 25*, 439-445.

Samuelson, P. A.and Solow, R. M. (1960). Analytical aspects of anti-inflation policy. *American Economic Review, 50.*

Sargan, J. D. (1964). *Wages and prices in the United Kingdom: A study in econometric methodology.* Oxford: Blackwell.

Saudi Arabian Monetary Agency (SAMA), Retrieved September 18, 2005 from http://www.sama.gov.sa/newreports/ar/annual/section10/index.htm

Saudi Arabian Monetary Agency (SAMA), Retrieved September 23, 2005 from http://www.sama.gov.sa/newreports/en/annual/section9/indexe.htm

Saudi Arabia Monetary Agency, (Various issues). *Annual Report.* Riyadh: SAMA.

Schwartz, A. J. (1973). Secular price change in historical perspective. *Journal of Money, Credit and Banking, 5*(1).

Sims, C. A. (1972). Money, income, and causality. *American Economic Review., 62*(4), 540-552.

Spinelli, F. (1976). The determinants of price and wage inflation: the case of Italy. In *Inflation in open economies* (pp. 201-236). Manchester: Manchester University Press.

Stiglitz, J. and Greenwald, B. (2003). *Towards a new Paradigm in monetary economics*: Cambridge University Press.

Studenmund, A. H. (2000). *Using Econometrics.* New York: Addison Welsley Longman, Inc.

Sturm, J. E. and Haan, J. (2001). *Inflation in developing countries: Does central bank independence matter? New evidence based on a new data set.* Groningen, The Netherlands.: University of Groningen.

Sunkel, O. (1960). Inflation in Chile: Unorthodox approach. *International Economic Papers, 10.*

Tsalinski, T. and Kyle, S. (2000). *Determinants of inflation in The Bulgarian economy.* Cambridge: Harvard Institute for International Development.

Ubide, A. (1997). *Determinants of inflation in Mozambique.*: International Monetary Fund, African Department, working papers No. 97/145.

Vane, H. R., & Thompson, J. L. (1979). *Monetarism theory, evidence and policy.* New York: John Wiley and Sons.

Vielma, H. M. (2003). *Inflation and long run growth: Further empirical evidence.* Chicago, University of Illinois.

World Bank, (2004). *World Development Indicators.* Washington, DC.

Zawadzki, K. K. F. (1986). *The economies of inflation process.* New York: Praeger.