Dissertation

Economic Interdependence of Saudi Arabia and Pakistan through Oil and Labor

Submitted by

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WE HEREBY RECOMMEND THAT THE DISSERTATION PREPARED UNDER OUR SUPERVISION BY KHALID ABDULLAH ALKHATHLAN ENTITLED "ECONOMIC INTERDEPENDENCE OF SAUDI ARABIA AND PAKISTAN THROUGH OIL AND LABOR" BE ACCEPTED AS FULLFILING IN PART REQUIREMENTS FOR THE DEGREE OF DOCTOR OF PHILOSOPHY.

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Abstract of Dissertation

Economic Interdependence of Labor Importing and Exporting Countries: Saudi Arabia and Pakistan

The purpose of this study is to investigate the impact of oil price fluctuations and oil revenues on the main macroeconomic variables in oil based labor importing economies and labor exporting economies, represented by Saudi Arabia and Pakistan respectively. Numerous academic studies have addressed the issue of workers' remittances and oil price fluctuations. However, those studies have not used oil price fluctuations as a measure that affect investment and development plans in oil exporting countries and thus affect demand on laborers and jobs opportunity for foreign laborers which in turn will affect investment and income growth in labor exporting countries. By employing oil price fluctuations in this study, a much clearer understanding of the effects of oil prices fluctuations on macroeconomic variables in an oil based economy will be shown and how this effect will be transmitted to labor exporting countries through workers' remittances.

While we expect the effect on an oil based economy to be direct, since Saudi Arabia is the largest oil producer in the world, the effects of oil price fluctuations on a labor exporting economy take place by directly affecting its macroeconomic variables and/or indirectly by affecting workers' remittances to Pakistan. Use of cointegration methodology and Error Correction Model in this study allows us to determine and analyze the causality, measure the impact and the magnitude of such impact. This can be done through identification of how oil price fluctuations affect variables such as investment, government expenditure, and income growth in both Saudi Arabia and

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Pakistan. The results indicate that oil price fluctuations have impacts on macroeconomic variables in both oil based economy and labor exporting economy. The Johansen Cointegration tests show that long term relationships exist among macroeconomic variables in our models. The Granger Causality tests indicate that oil price fluctuations and oil revenue cause both investment and income growth in Saudi Arabia. On the other hand, income growth in Saudi Arabia affects workers' remittances to Pakistan which in turn affect both investment and income growth in Pakistan. This means that oil price fluctuations indirectly affect macroeconomic variables in Pakistan. Moreover, oil price fluctuations also directly Granger causes investment in Pakistan.

These results support the hypothesis that oil revenues in Saudi Arabia and oil price fluctuations not only affect oil producing countries but also labor exporting countries as well.

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Chapter One

Introduction

1.1 Problem Statement:

The substantial increase in oil prices from 1973-74 generated a large increase in oil revenue for oil sector dependent countries. Oil based economies in the Gulf Region include Saudi Arabia, Kuwait, United Arab Emirates, Qatar, Oman and Iran. The effects of the oil boom in 1973 were quite significant. Notably, the increase in oil revenue has led to foreign exchange and budget surpluses in those countries during the 1970's. The budget surpluses enabled those countries to start ambitious economic development plans in an attempt to diversify and create new sources of income.

As a result, these development plans targeted such areas as infrastructure, trade, the health care system, the education system, and other social investments. These development plans also were made in an effort to attract even more investments into those countries in the nonoil sectors in an attempt to decrease the dependence on oil as the main source of income for Gulf region countries. However, the architects of these ambitious plans were faced with the considerable problem of a lack of human capital. A severe shortage of skilled labor forced these countries to depend on foreign labor in order to implement the plans for development. Moreover, in the case of Saudi Arabia, high oil prices caused economic prosperity in Saudi Arabia which led to high per capita income that allowed Saudi citizens to be dependant on low wage foreign labor (mostly unskilled labor) for minor works such as home services. As a result, Saudi Arabia started to import a significant amount of skilled and unskilled foreign labor because of the severe shortage

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of skilled and unskilled local labor. Hence, the oil boom in the early 1970's has had two main results: one is that it increased the revenues for oil based countries and the second is that it increased wage rate, and reliance on foreign workers.

Consequently, the oil boom led to an increase in the demand for low wage labor from South and South East Asian countries such as Pakistan, Bangladesh, the Philippines, and India, all of which can be identified as labor exporting countries. These countries have been quite willing to supply a labor force in return for economic aid, as well as foreign exchange earnings from the remittances of workers, which in turn directly affect macroeconomic variables, such as saving, consumption, and investment, of labor exporting countries. On the other hand, laborers from those countries have been willing to work in oil based countries to improve their living standards. In effect, the workers' remittances have become a key contributor to the national income of many South and South East Asian countries. Thus, the oil boom generated a significant relationship between oil based economies and many labor exporting economies.

For the purposes of this study, the oil based economy will be represented by Saudi Arabia and the labor exporting economy will be represented by Pakistan. The instability of oil prices over the last thirty-five years has posed a significant problem to Saudi Arabia in its efforts to development. Over time, and especially in the 1980's, oil prices experienced huge fluctuations which affected government expenditures and other economic activities in Saudi Arabia in response to the overall budget deficits. As a result of oil price fluctuations, development plans and the demand for jobs and for foreign labor were adversely affected, which in turn influenced the workers' remittances flowing to Pakistan (see Table 4). This resulted in altering the balance of payment, capital flow and

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other macroeconomic variables, such as consumption and investment, in Pakistan. In essence, oil price fluctuations affect both the oil based economy and the labor exporting economy, but quite differently.

It has been shown that commodity price fluctuations have destabilizing effects on export revenues and foreign exchange earnings in developing countries (Labys and Maizels, 1993) and adversely affect government current expenditure, and government development expenditure (Eltony, 1999). Moreover, oil price fluctuations affect welfare (Al-Mutawa and Cuddington, 1994) and impact total demand, income received, and employment in the manufacturing sector (Perryman, 1987). Also, since oil price fluctuations might affect total exports in oil based economies (since they depend heavily on oil), some economists have argued that export instability has a negative effect on domestic saving and investment (Nash, 1990) and lowers the inflow of capital goods and savings, which are crucial for economic development in developing countries (Maizels, 1968), and leads to a reduction in investment (Kenen and Voivodas 1972).

Exports boost savings which is vital for development [Maizels (1968) and Sinha (1996)]. Aggregate fluctuations in petroleum exporting countries exhibit intense volatility in their terms of trade due to the important fraction of traded oil in these economies extending from oil exports and the associated oil price changes (Baxter and Kouparitsas, 2000). On the other hand, some economists have disagreed with these findings. Sinha (1999) found that by taking into account stationary and cointegration issues, a negative relationship exists between export instability and economic growth for some countries while a positive relationship between the export instability and economic growth prevails in others. A mixed result was found in some countries, although in most

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cases, economic growth is positively associated with domestic investment. Glezakos (1973), Voivodas (1974), Ozler and Harrigan (1988), and Gyimah-Brempong (1991) have all shown a negative correlation between export instability and economic growth. Knudsen and Parnes (1975) and Yotopoulos and Nugent (1976) have suggested that uncertainty in export earnings leads to an increase in saving and investment. Others like Moran (1983) and MacBean (1966) have argued that no general conclusion can be reached about the relationship between export fluctuations and economic growth. Moreover, the effect of workers' remittances on labor exporting countries has been the interest of some specialists. Lipton (1980) found that workers' remittances go mainly to consumption while Chandavarkar (1980) argued that remittances are used for consumption, saving and investment. Some economists have argued that workers' remittances affect income distribution (Adams, 1996), are more stable than private capital flows (Solimano, 2003), and decrease poverty (Adams and Page, 2003). Furthermore, some economists also argued that workers' remittances increase national income, increase the foreign exchange inflow, and decrease the unemployment rate for labor exporting countries (Neyapti, 2004).

1.2 The Purpose of the Study:

Because most studies focus on how fluctuations in oil prices affect only oil exporting countries while neglecting the effects on labor exporting countries, this study is an effort to contribute to the understanding of how oil price fluctuations not only affect oil exporting economies, especially after thirty years of the first oil boom, but also affect labor exporting economies. In each case there are considerable repercussions on

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development for both types of economies. The most recent official population census in Saudi Arabia showed 22,673,538 people (Alwatan Newspaper, 2004), with the number of Saudi citizens reported as 16,529,236, or 72.9 percent of the total population; the remaining percentage are guest workers. This indicates that a huge amount of money flows out of Saudi Arabia in the form of remittances, which in turn is a substantial inflow of foreign exchange for many labor exporting countries.

The goal of this study is to test the hypothesis that oil price fluctuations and oil revenue have an effect not only on oil based economies such as Saudi Arabia but also on labor exporting countries such as Pakistan as well as to investigate the size of that effect. The Pakistani economy is affected by the transfer of remittances flowing from Saudi Arabia. The relationship between the Saudi economy and the Pakistani economy arises through the remittance of Pakistani workers into the country from Saudi Arabia, which thereby affects the Pakistani government's development plans and economic activities. Moreover, oil price fluctuations affect the Pakistani economy since the government of Pakistan is still in the process of shifting the economy from a traditional economy to an industrial one.

Labor exporting economies are faced with problems such as fluctuations in the price of agricultural products and transferring primary agricultural products to manufactured goods where the main imports for these countries are capital and intermediate goods. Recently, labor exporting economies have experienced a shift from primarily agricultural products to manufactured goods in an attempt to equalize their balance of payments. Also, foreign debt and slower than anticipated economic growth are additional problems faced by those countries which have made them even more

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dependent on workers' remittances from oil sector based economies. Furthermore, due to the contractionary economic policies of oil based economies, fluctuations in oil revenues harm the labor exporting economies in that they decrease the demand for jobs and/or labor from these countries, giving rise to smaller and smaller remittance flows that produce negative effects on the balance of payments and economic growth of labor exporting countries.

Thus, this study examines the effects of oil price fluctuations and oil revenue on the main macroeconomic variables in oil based economies and labor exporting economies, represented by Saudi Arabia and Pakistan respectively, determine the causality, and measure the size of such effects. This can be done by using econometric tools such as the Error Correction Model, Impulse Response Function, and Variance Decomposition through identification of how oil prices fluctuations, oil revenue, and workers' remittances affect the key macroeconomic variables and the dynamic response of these economic variables including policy variables such as government spending. In addition, this study will test for the causality among different macroeconomic variables within each model to give us a clear picture about the relationships among macroeconomic variables in both economies and the effects that they have on each other.

1.3 The Importance of the Study:

Most studies of oil shocks focus on the effects on oil producing countries or industrial countries, ignoring the effect of oil price fluctuations on poor developing countries through many factors. The most important factor is the workers' remittances that are related to the need of oil producing countries for foreign skilled and unskilled

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workers to implement their ambitious development plans. Besides providing a needed analysis of the relationship between oil producing economies and labor exporting economies through fluctuations in oil prices, this study is one of the few that investigate the importance and the effect of oil shocks on developing labor exporting countries, by using cointegration methodology. This study will help policymakers in both labor exporting and oil producing economies understand how the oil price shocks are affecting both economies. Explicitly, it aims to comprehend how oil based economies are affected and how these effects are transmitted to labor exporting economies, and thus enables policymakers to use the best strategies to deal with such effects based on the available tools and policies.

1.4 The Objectives of the Study:

A) This study is an attempt to explain the macroeconomic models for interrelated oil based and labor exporting economies and to test how fluctuations in oil prices translates into variations in macroeconomic variables of both Saudi Arabia and Pakistan. In addition, this study investigates the causality among those macroeconomic variables in Saudi Arabia and Pakistan, and measures the magnitude of this causality.

B) This study will also provide a theoretical structure of oil based and labor exporting economies for policymakers when making or analyzing decisions which deal with fluctuations in the flow of foreign exchange and budget deficits, all as a result of swings in oil prices.

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1.5 The Scope of the Study:

In order to study this economic problem, the models to be used will focus on the mechanism and structure of both the Saudi Arabian economy and the Pakistani economy and their macroeconomic variables. The models will be adjusted to suit the purpose of the present study. The empirical analysis will be based on time series data for a sample of two countries: one is an oil based economy, Saudi Arabia, and the other is a labor exporting economy, Pakistan.

1.6 Data & Methodology of the Study:

Data were obtained from three sources:

1) World Development Indicator 2003 (WDI), World Bank
2) World Development Indicator 2004 (WDI), World Bank
3) State Bank of Pakistan
4) Saudi Arabian Monetary Agency (SAMA)

These data sources were used to derive both independent and dependent variables. All data are expressed in real values of dollars, which means both the official exchange rate and consumer price index (base year is 2000) were taken into account when collecting the data. The quantitative analysis will be provided. By using economic theory and statistical analysis tools, the method of this study is considered to be a quantitative study of the economies of both Saudi Arabia and Pakistan. Also, the theoretical working hypothesis and analytical framework of the models were established using Cointegration and Error Correction Model analysis and will be used to provide an empirical analysis of the period of 1970-2003 for this study. However, the data for workers' remittances from

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Saudi Arabia to Pakistan will be for the period of 1972-2003 since data is not available for the years 1970 and 1971. Moreover, for government expenditure data for the years 1990 and 1991, this study uses the average of both years because, as stated by the Saudi monetary website, the budget allocation for the fiscal year 1991 was merged with the budget for 1990 when 13 months annual salaries were paid. This merge of data is due to the Coalition War against Iraq.

1.7 The Organization of the Study:

The organization of this study is as follows: Chapter One includes the introduction, statement of the problem, the purpose, the importance, the objectives, scope, and the organization of the study. Chapter Two reviews the structure and characteristics of the oil based and labor exporting economies and the effects of foreign exchange flows (oil revenue and remittance) on both economies. Chapter Three will focus on the theoretical aspects of the role of oil prices and exports on economic growth in developing countries with particular focus on export instability and the role of remittances in labor exporting economies. In Chapter Four two models will be presented: one of the oil based economy and the other addressing the labor exporting economy. Chapter Five will provide the methodology that will be used for this study. Chapter Six will provide the model estimation and results. Chapter Seven is devoted to a summary, conclusions, and policy implications drawn from the study for Saudi Arabia and Pakistan specifically. Some suggestions for further research will also be discussed.

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Chapter Two

Overview of Two Economies

To enhance understanding of the structures of both oil producing and labor exporting economies and how they are affected by different factors, this chapter will provide a brief analysis of both oil based and labor exporting economies and try to explain the main factors affecting those economies. We are going to take a brief look at the benefits and the costs of foreign labor for an oil based economy and how oil revenues affect the macroeconomic variables for oil based economies. In addition, we will see how workers' remittances are considered to be a crucial factor for labor exporting economies.

2.1 The Oil based Economy (Case of Saudi Arabia):

There are many characteristics of this economy. First, and most importantly, this economy is totally dependant on oil exporting revenues. Any fluctuation in the oil commodity, which is non-renewable resource, will affect the development plans, foreign exchange earnings and as a result the balance of payment of the country, since large amount of output comes from oil sector exports.

Any fluctuations in oil price would be accounted for aggregate fluctuations in economies. Certainly, an important fraction of trade in these economies comes from oil exports and associated oil price changes (Saes and Puch, 2002). This will directly affect the level of foreign investment into the country.

The oil sector refers to the production activity pertaining to the extraction and supply of crude oil. Oil sector GDP is thereby formed by primary petroleum extraction

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and production, without processing and conversion into petroleum-related products. As a world leader of oil exporting countries, any change in the oil market will not just affect the Saudi Arabian economy but also the global economy since most of the international economies are dependent on oil commodity. Table 1 shows the dependency of the Saudi economy on the oil sector and the share of oil sector to the GDP of the country.

Second, Saudi Arabia as a leader of the world's oil exporters faces a problem with its absorptive capacity, which includes both the capacity of fixed capital formation and the capacity to consume commodities and services. The sharp increase in oil prices in the 1970s and early 1980s reduced the constant financial constraints that had troubled the Saudi state since its inauguration. Huge oil revenues, combined with delays in using the funds and the Saudi economy's limited absorptive capacity, created large financial surpluses in both the private and government sectors of the economy. The vast majority of these assets were invested in international financial institutions and in Western government securities (basically securities that are denominated in dollars). Absorptive capacity is defined as the real local investment in both physical and human capital. The Saudi economy has a problem with absorptive capacity since it has a low population, high per capita income (high per capita oil revenue), small local market, few resources, and shortage of manpower, (Al-Abbasi, 1991).

Third, the Saudi economy is influenced by both world inflation as a result of fixed exchange rates and Saudi oil policy. Since the Saudi economy is dependent on a single oil export commodity, it has difficulties in conducting independent monetary policy where monetary policy may be endogenous to export generating revenues.

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Table 1: The Importance of the Oil Sector to the Economy of Saudi Arabia, 1969 – 2003

Year	$\frac{OS}{GDP}$	$OS\%$
1969	0.45	3.65
1970	0.47	16.94
1971	0.57	63.92
1972	0.59	31.82
1973	0.63	47.96
1974	0.79	280.29
1975	0.64	-16.98
1976	0.61	31.58
1977	0.57	6.35
1978	0.48	-11.04
1979	0.55	55.97
1980	0.63	67.78
1981	0.61	11.46
1982	0.49	-33.10
1983	0.37	-35.97
1984	0.34	-13.76
1985	0.28	-25.75
1986	0.23	-30.43
1987	0.25	8.41
1988	0.24	-2.59
1989	0.28	28.56
1990	0.37	60.86
1991	0.37	13.16
1992	0.40	11.30
1993	0.35	-14.93
1994	0.34	-0.34
1995	0.36	10.79
1996	0.39	20.65
1997	0.37	0.78
1998	0.28	-33.04
1999	0.34	30.20
2000	0.41	45.32
2001	0.38	-11.64
2002	0.38	3.13
2003	0.42	28.11

Source: Central Department of Statistics, Ministry of Economy and Planning of Saudi Arabia. $\frac{OS}{GDP}$ = ratio of oil revenue to GDP; OS% = percentage change in oil revenue.

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Figure (1): The Importance of the Oil Sector to the Economy of Saudi Arabia, 1969 – 2003

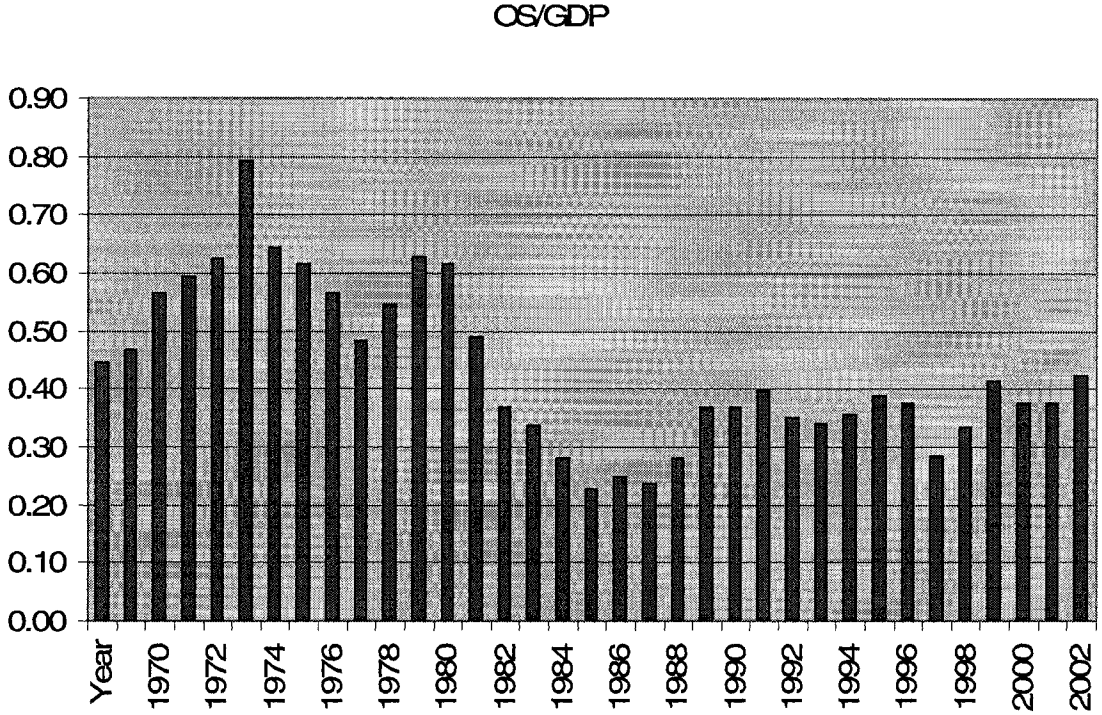

Table 1 shows the significance and contribution of the oil sector to the Saudi economy. It shows that the oil sector plays a significant role in the GDP of Saudi Arabia. However, the importance of the oil sector to the GDP became even more significant after the oil boom of 1973, as a result of oil price increases due to a Saudi oil embargo against the United States because of the Arab-Israeli conflict in the Middle East. Table 1 shows that as exporting of oil increases, the significance of the oil sector to GDP increases. After being low in real terms in the 1960's, oil prices increased drastically in 1973-1974 (the oil crisis) causing a huge increase in the share of oil revenue in Saudi GDP, which went up to 79 percent in 1974. In the same year, the change in the oil sector earnings was up to 280 percent. Afterward, the oil earnings decreased and so did the oil share of GDP as a result of a slight decline of oil prices between 1975-1978 from where it used to be in

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1973-1974. Oil prices went up sharply again in 1979-1980 rising to US $35 a barrel[1] because of the first major fighting in the Iran-Iraq War (The first Gulf War in the Middle East) which caused a big increase in oil earnings and consequently a larger share of oil sector in GDP for Saudi Arabia.

This increase in oil prices caused huge inflows of foreign exchange earnings into Saudi Arabia which led to an emphasis on implementing new development plans and more reliance on foreign workers to achieve those development plans. The growth rate of oil sector earnings fell throughout most of the 1980's. Oil prices dropped sharply in 1982 to $6-8 a barrel leading to a sharp decrease in oil earnings for Saudi Arabia. Furthermore, the oil sector contribution to the GDP decreased sharply to below 30 percent in the period between 1984 and 1989. The fallen price of oil during most of the 1980's was a result of new producers entering the market like the North Sea oil, the increase of the oil output of nonmembers of The Organization of Petroleum Exporting Countries (OPEC) such as Mexico, and increased energy sales from the former Soviet Union to Europe.

In the 1990's, oil price were low on average. The Iraqi invasion of Kuwait did not affect the market significantly since Saudi Arabia stepped in and increased its production to overcome the Kuwaiti production shortage; however, the most noticeable economic event in the 90's was the Asian crisis.

[1]For more information about world oil market and oil price between 1970-03, see the Energy Information Administration (EIA), chronology of Department of Energy's Office of the Strategic Petroleum Reserve, Analysis Division, USA, March 2004.

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With the beginning of the Asian crisis in 1997, and slow economic activities in Japan and Europe, the world consumption of oil fell significantly short of production and the price of oil fell from about $20 a barrel in early 1997 to below $11 in early 1999[2]. These events decreased Saudi Arabia's oil sector earnings significantly in 1998 leading to a reduction of the share of the oil sector to GDP to 28 percent.

The Organization of Petroleum Exporting Countries (OPEC) met several times in 1998 to discuss a reduction in oil production along with non members of OPEC such as Mexico and Norway. A reduction in oil production enabled oil prices to rise causing an increase in the share of the oil sector to GDP for Saudi Arabia. In 2000, Saudi Arabia along with other OPEC nations decided again to reduce oil production to raise oil prices. In 2001, OPEC reduced oil production three more times which led to an increase in its oil share to GDP.

Oil price increases in early 1970's were a crucial factor in forming the oil market throughout the world. It gave an advantage to the oil exporters (especially Saudi Arabia) over industrial countries regarding balance of payment and in terms of trade in general. It also assured the power of the Organization of Petroleum Exporting countries (OPEC) in the oil market and its influence on oil price as a monopoly power. Moreover, the increase in oil prices in 1970's led to an increase in the inflow of foreign exchange and revenues for oil exporting countries, causing an increase in per capita income and a transfer of wealth and technology to those countries from oil consuming countries.

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[2]Prepared by a staff team consisting of David Robinson, Tamim Bayoumi, Manmohan S. Kumar, Peter Isard, Maitland MacFarlan, Hali Edison, Blair Rourke, Benjamin Hunt, and Ximena Cheetham " The Impact of Higher Oil prices on the Global Economy", International Monetary Fund(IMF), December 8, 2000.

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This led to an enhancement of the economies of the oil producing countries. The inflow of foreign exchange to oil producing countries was the main source of financing the government expenditures which were necessary for financing the development plans for those countries, especially Saudi Arabia. Those development plans targeted infrastructure depending on oil exports since it is the main source of revenue for the country. On the other hand, as a result of this high per capita income in Saudi Arabia and the high demand for foreign workers to accomplish development plans, foreign workers (especially from both the Middle East and South and South East Asia) were recruited to work in the country to provide themselves and their families with higher living standards. As a result, they provided their poor countries with needed foreign exchange earnings. This led to a massive inflow of foreign workers to Saudi Arabia taking advantage of employment opportunities. In 1981 foreign workers accounted for about 70 percent of Saudi Arabia's 2.5 million labor force (Hallwood, 1987). In 1989, the number of foreign workers had risen to close to 5.8 million (Ministry of planning, various Issues). The data of 2004 shows that the number of non- Saudi citizens in the country is 6,144,236, which represents about 27.1 percent of a total population of 22,673,538 (Alwatan, 2004).

In sum, fluctuations in oil prices over time led to a great deal of instability of oil revenue for Saudi Arabia as a leader of oil exporting countries. The growth of the oil sector as a contributor to national income tended to reduce the role of nonoil sectors and led to a rapid increase in foreign labor (Eltony, 1999).

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2.1.1 Oil Income and Macroeconomic Variables:

The effects of the oil boom after 1973 on the economies of the oil exporting countries have been significant. Oil has created sufficient revenues to stimulate economic development especially through contracting with foreign companies to build the country's infrastructure. Also, there has been an increase in oil exports which caused an increase in oil revenue and thus an increase in per capita income. However, ongoing fluctuations in oil prices lead to fluctuations in output for oil producing countries (Al-Mutairi, 1993). Al-Mutairi pointed out that shocks in oil prices will account for 50 percent of the variance of GDP. Also he found that shocks of real government expenditures have a significant role in GDP fluctuations. For nonoil GDP, shocks in oil prices would explain a small fraction of its variation. Al-Mutawa and Cuddington (1994) found that foreign oil companies and foreign workers play an important role in the economy of a small Gulf state such as the United Arab Emirates. They have shown that if the boom results in an improvement in the budget surplus implying that national welfare must increase, an increase in quota level of OPEC is shown to be more preferable to an oil price increase.

On the oil revenue side, earnings from oil exports have been the main source of government revenue. For example, in 2000, oil revenues formed more than 75 percent of budget revenues for Saudi Arabia. Other government revenues such as investment income and fees for services are also indirectly related to oil since capital available for investment and consumption is obtained from oil in general (U.S. Department of State, 2002). Furthermore, increase in imported labor resulting from high oil revenue has a huge influence on many aspects of economic activities in oil based economies. The increase in

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the foreign labor, given the necessary capital increases the availability of goods and services due to more resources that would be available for production. Also, domestic consumption increases since the expatriate workers and their families are consumers too (Tawi, 1989). On the other hand, the increase in the production capacity of the economy as a result of importing labor causes an increase in the export of goods and services. However, expatriate workers cause an increase in consumption and that leads to an increase in imports of some goods and services. Also, the balance of payment will be influenced by the remittance of expatriates to their home countries.

On the expenditure side, the increase in oil prices in the 1970's caused the oil revenue to be the main source of financing government expenditures. So, there was no need for nonoil revenue to finance government expenditures and thus any fluctuation in oil prices leads to fluctuations in government expenditures in oil exporting countries. In Saudi Arabia for instance, whenever oil revenue increases, an increase in government expenditures follows quickly, almost automatically, and the gap between revenues and expenditures has been closed whenever the Saudi government has time to adjust to new level of income (Kanovsky, 1994). Also, exports enhance savings which is crucial for economic development (Sinha, 1996). The oil boom after 1973 and the second oil shock in 1979-1980 caused just high levels of income in Saudi Arabia and also caused an increase in price inflation, wage rates, and reliance on foreign workers. Ambitious development plans have forced the Saudi government to continue high spending even when there was a decrease in oil prices. When this situation occurs, high spending, accompanied by less revenue as a result of lower oil price, leads to problems in balance of payments and a budget deficit for the country. Besides the high local spending, the

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government of Saudi Arabia adopted investment abroad as a solution to the problem of absorptive capacity. Investment abroad takes many forms such as loans to labor exporting or poor countries and loans to international organizations, such as the IMF and World Bank, to invest assets in countries or regions with huge economies like the U.S.A. and Europe. Also, the Saudi government invests directly in those countries (FDI).

One can argue that investment abroad might not be the best solution since this investment might be more beneficial to other countries' economies than to oil exporting economies like Saudi Arabia. Another factor that kept high government spending out of oil revenue in Saudi Arabia even when oil prices are fallen is the need for military spending. The Middle East is a high conflict area which forces the Saudi government to modernize its military over time for its own security. There are two aspects of this kind of government spending. First, the relationship of foreign aid to security as is shown when Saudi Arabia supported Iraq in its war with Iran from 1980-1988 which cost Saudi Arabia a total of $25.7 billion. The International Coalition War against Iraq in 1991 was disastrous for Saudi government finances. Higher oil revenues were insufficient to cover the estimated $60 billion that the war cost the Saudi government. The authorities had to use the last of the financial reserves remaining from the oil boom days of the early 1980's. Second, Saudi Arabia has allocated billions of dollars to defense and some of this revenue was allocated to stockpile weapons and the rest was spent on infrastructure and training.

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Table 2: The Significance of Government Expenditure in Saudi Arabia 1969 – 2003

Year	$\frac{GE}{GDP}$	*GE%*
1969	0.301	-
1970	0.288	6.984
1971	0.275	29.370
1972	0.268	22.220
1973	0.350	83.238
1974	0.201	72.293
1975	0.501	155.271
1976	0.571	56.843
1977	0.531	7.6204
1978	0.547	7.188
1979	0.504	27.297
1980	0.434	25.592
1981	0.459	20.323
1982	0.470	-13.960
1983	0.521	-6.013
1984	0.519	-6.004
1985	0.494	-14.955
1986	0.431	-25.315
1987	0.546	26.272
1988	0.418	-22.288
1989	0.426	10.863
1990	0.531	53.002
1991	0.471	206.004
1992	0.421	-7.606
1993	0.386	-11.095
1994	0.331	-12.834
1995	0.330	6.207
1996	0.340	13.897
1997	0.363	11.687
1998	0.354	-14.105
1999	0.309	-3.272
2000	0.337	28.003
2001	0.375	8.421
2002	0.333	-8.481
2003	0.322	10.064

Source: Central Department of Statistics, Ministry of Economy and Planning of Saudi Arabia. $\frac{GE}{GDP}$ = ratio of government spending to *GDP*; *GE%* = percentage change in government expenditure.

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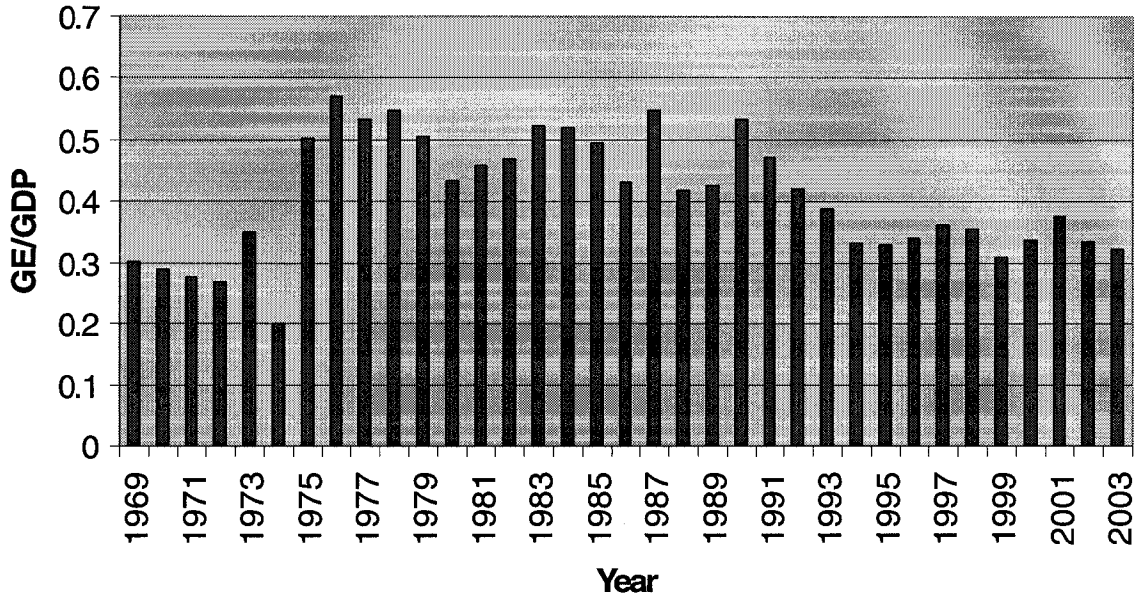
Figure (2): The Significance of Government Expenditure in Saudi Arabia 1969 – 2003



2.1.2 Benefits of Expatriate Labor to Saudi Arabia:

Since this study focuses on labor remittance, it is important to examine aspects of both benefits and costs of expatriate labor. According to (Tawi, 1989), the Saudi Arabian economy has benefited from importing labor from labor exporting countries. Benefits can be summarized as follows:

I. Rapid increase in economic growth and improved services and living standards that can not be achieved by relying only on unskilled domestic labor. The growth of the Saudi economy depends strongly on foreign labor. For example, the third development plan (1980-1985) witnessed about 8.9 percent growth rates in nonoil GDP with an associated increase in total labor need of about 6 percent per year (Sherbiny, 1984). The gap between growth rate of domestic workers (3 percent) and the resulting expansion of total employment (6 percent) was filled by expatriate labor.

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II. Expatriate labor lowers the cost of labor services by increasing the supply of cheap labor in the Saudi economy.

III. Foreign labor provides trained human capital which in turn leads to reduce the cost of training and thus provides the economy with skilled labor. Indeed, most of the labor exporting countries experiences "brain drain" of highly educated laborers. Many of highly educated laborers seek to move to oil exporting countries. For instance, 50 percent of the medical school graduates in Pakistan work abroad especially in high per capita income countries like oil exporting countries where there is a large demand for their profession (Hallwood, 1987). Saudi Arabia like any other oil exporting country enjoys the benefit of skilled labor without suffering the cost of training them while the labor exporting countries suffer those costs.

IV. Saudi Arabia increases its exports to labor exporting countries as a result of the effect of expatriate workers' remittances to their home countries. Some workers' remittances are transferred in the form of goods and services. Workers' remittances are important for the economies of labor exporting countries as a main source of foreign exchange inflow. In addition, workers' remittances are very important source of financing imports for their home countries.

2.1.3 Costs of Foreign Labor Force to Saudi Arabia:

Despite the fact that there are various benefits, there are also some costs from importing labor to Saudi Arabia which can be summarized as follows:

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I. Imported labor needs some social and infrastructure services which are very costly. Providing foreign laborers and their families with education, medical services, clean water, transportation and other physical and social services is very costly to the economy (Serageldin, et al. 1984). These costs are heavily subsidized in Saudi Arabia and the foreign workers in the country are exempt from income taxes.

II. Expatriate workers increase the demand for goods, services, and social capital. This leads to more demand on workers which will be met with more demand for foreign workers since there is a shortage of domestic workers, which means more dependency on expatriate workers (Al-Thomaley, 1986). Thus, the foreign labor inflow becomes a self-feeding process. Since an increase in expatriate workers could lead usually to an increase of their dependents, the problem becomes even worse. Thus, in the long run there could be doubt about the net benefit from importing labor as the dependency on foreign workers continues. As a result, the problem that foreign workers are brought to solve - diversifying and expanding the economy - may not be solved.

III. If foreign workers are numerous this could then cause a problem regarding balance of payments since workers' remittances to their home countries could drain the foreign exchange from the host country.

2.2 The Labor Exporting Economies (Case of Pakistan):

There are many characteristics of labor exporting economies and most of these characteristics are common to nonoil developing countries. First, Pakistan, like

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other labor exporting countries, is suffering from a large population, limited economic resources, low per capita income, small fragmented land holdings, a large market, and above all, a surplus of manpower. Second, these economies mostly have persistently high fiscal deficits, largely as a result of inability to raise enough revenues. Pakistan, like other nonoil developing countries, suffers from these problems. In many labor exporting countries, including Pakistan, the "twin deficit" (national budget and balance of payment) has been the main reason for low economic growth. Whenever the deficit is large, the growth rate of the economy staggers, inflation becomes higher, and most importantly the economy faces a huge current account deficit causing a crisis for the balance of payments of the country. In the 1990's, fiscal problems in Pakistan became severe with a budget deficit of about 6 percent of GDP. This was accompanied by a slowing down of economic growth to, on average, 4 percent each year, as compared to an average annual growth rate of 6 percent in the 1980's (Khan and Khan, 1998). Inflation also increased to 12 percent a year. At the same time, the current account balance and foreign exchange reserve decreased sharply so that it was enough to finance only two weeks of imports by the end of 1996.

However, Pakistan made considerable progress in many areas during 1999-2002 when it adopted a more liberal trade policy and achieved a tax collection target .The data of 2003 shows that exports increased to about US $ 11.1 billion and the current account surplus reached an all time high of US $ 4 billion (5.9 percent of GDP). Remittances increased to a new high of US $ 4.2 billion (which is the highest one-year accumulation in the history of Pakistan), foreign exchange reserves reached a record US $ 10 billion, and inflation dropped from 3.5 percent in 2002 to 3.1 percent in 2003.

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All of these factors along with disciplined spending pushed the fiscal deficit to a 27 year low while the fiscal deficit decreased to 4.4 percent of GDP compared to 5.2 percent in 2002[3]. Both capital and current account (including workers' remittances) gains were the main reasons for a balance of payment surplus of US $ 4.6 billions. These data show the importance of workers' remittances to the economy of Pakistan and how much influence it has on it.

Third, agriculture is a dominant sector of the Pakistani economy, which employs about 50 percent of the labor force and provides, directly or indirectly, more than half the export revenues. However, agriculture generates limited revenues from direct taxes on agriculture producers. Thus, a significant share of GDP and employment are coming from the agriculture sector in Pakistan. In 2003, the share of agriculture sector to GDP was 24.2 percent compared to a 1.4 percent in an industrial country such as the United States and 4.6 percent for an oil based economy such as Saudi Arabia[4].

2.2.1 *Effect of Remittances on Labor Exporting Economies:*

One of the most important factors that generates foreign exchange inflow and contributes to economic growth in labor exporting countries is the huge amount of workers' remittances coming to labor exporting countries from rich countries, including oil based economies. The reason is that workers' remittances have a positive side influence on the global economy and are easily seen as a source of external funding for many low income countries.

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[3]For more data and information about the Pakistani economy, see http://www.ecosecretariat.org/ECOTradeNet/TradeCountries/Pakistan/Pakistan2002.htm.
[4]World Bank, World Tables, 2004, Washington, D.C.

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Workers' remittances are considered the second largest source of external funding for low income countries after FDI. According to the World Bank (2003), workers' remittances that go back to the developing countries reached $67 billion in 1999 and then increased to $72.3 billion in 2001 and to 82 billion in 2002. An estimated $18 billion of remittances came to developing countries was from the United States. Saudi Arabia, followed by Germany, Belgium, and Switzerland are other top sources of remittances. Saudi Arabia was the biggest source of remittances until mid 1990's when its economic boom was finished. However, it is still the largest source of a per capita basis.

Another study shows that official remittances which went back to developing countries exceeded $ 93 billion in 2003 (Ratha, 2004). This amount doesn't include the unrecorded remittances that went through informal channels. If both official and unofficial transfers were included, then the actual size of remittances would be even bigger. Workers' remittances are now larger than twice the size of net official development assistance flows (under $30 billion) and they are second to foreign direct investment, which is around $133 billion, as a source of external finance for developing countries. In addition, remittances are individual to individual flows, directly targeting the needs of recipients who are mostly poor, as poor people tend to emigrate.

In fact, remittances are considered to be more effective than foreign aid because remittances help solving the world poverty problem by allocating resources efficiently through directly supporting poor families in labor exporting economies. In 2001, workers' remittances to low income countries as a share of GDP and imports were higher than remittances to middle income countries. Workers' remittances to low income countries were 1.9 percent of GDP and 6.2 percent of imports. Workers' remittances to

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lower middle income countries were 1.4 percent of GDP and 5.1 percent of imports, while workers' remittances to upper middle income countries were 0.8 percent of GDP and 2.7 percent of imports. Remittances are more stable than volatile capital flows such as portfolio investments, international bank credit and official foreign aid. In oil based countries, after the oil boom in 1973, workers transferred a high portion of their wages to their home countries with the amount of remittances being a positive function of the economic activities of the oil based countries. However, it is apparent that the actual size of remittances is underreported. Informal remittances are either hand carried on home visits or transferred through unofficial channels such as friends and family members. Moreover, labor exporting countries don't keep accurate records of the number of the international migrants, and thus data on remittances are believed to be incomplete and inaccurate. It is widely known that official remittances are less than actual remittances. The official statistics captures only the remittances transmitted through official channels, but many studies would suggest that large proportion of remittances are transmitted by money orders or less formal channels. Some remittances also may take the form of goods, like cars or furniture shipped home (Puri and Ritzema, 1999).

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Table 3: The Ratio of Workers' Remittances to GDP and its Growth in Pakistan, 1969-2003

Year	$\frac{WR}{GDP}$	WR%
1969	-	-
1970	0.008	1.18
1971	0.006	-18.37
1972	0.013	85.57
1973	0.023	11.90
1974	0.017	3.43
1975	0.019	45.95
1976	0.024	48.88
1977	0.038	76.04
1978	0.064	100.31
1979	0.070	20.94
1980	0.073	25.04
1981	0.074	20.01
1982	0.072	6.16
1983	0.100	29.70
1984	0.087	-5.18
1985	0.078	-10.30
1986	0.081	5.72
1987	0.068	-12.20
1988	0.052	-11.71
1989	0.047	-5.76
1990	0.048	2.37
1991	0.040	-4.84
1992	0.030	-20.56
1993	0.030	6.40
1994	0.027	-7.42
1995	0.030	29.04
1996	0.023	-21.70
1997	0.022	-3.55
1998	0.023	5.74
1999	0.018	-28.85
2000	0.016	-7.26
2001	0.018	10.47
2002	0.057	-65.34
2003	0.085	54.31

Source: World Development Indicators 2004, World Bank

$\frac{WR}{GDP}$ = ratio of workers remittances to *GDP*; *WR%* = percentage change in workers remittances.

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From the data presented in Table 3, the impact of workers' remittances on the Pakistani economy can be categorized as follows. First, in general, workers' remittances have been growing in 1970's and early 1980's, and then mostly decreasing in the late 1980's. This can be connected to the increase in oil prices in the 1970's and early 1980's and the decline of the oil prices in the mid and late 1980's. In the 1990's workers' remittances mostly were declining because of the war against Iraq and generally low oil prices. Note that the effect of changes in oil price on remittances takes some time to appear. Second, workers' remittances are significant as a source for foreign exchange inflow; their importance to the economy has been increasing after the oil boom in the oil exporting countries. When there was an increase in oil prices, the ratio of remittances to GDP increases. For example, between 1978 and 1982, there was a sharp increase in oil prices which caused a significant increase in the share of remittances to GDP in Pakistan. In general, there was an increase in the share of workers' remittances to GDP of Pakistan from the early 1970's to the mid 1980's, followed by a general decrease in late 1980's through the 1990's. Also, two points should be considered. First, the data lacks accuracy because some workers' remittances go to Pakistan through unofficial channels, as explained earlier. Second, the sharp decrease of remittances to Pakistan in 2002 could be attributed to a reluctance of workers to transfer money to their home country through official channels, which was a result of more monitoring of money transferred from and to countries like Saudi Arabia and Pakistan. The increased monitoring of transferred money stemmed from the World Trade Center tragedy in 2001, to prevent transferring money to support terrorism.

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Table 4: Workers' Remittances (WR) from Saudi Arabia, United Kingdom, and the United States to Pakistan, 1970-2003 (Unit: 1000 US Dollars)

Year	WRSA	WRU.K.	WRU.S.A.	TWRT	TWR	TWRT/ TWR	WRSA/ TWR
1970	-	-	-	-	86,000	-	-
1971	-	-	-	-	70,209	-	-
1972	7,870	72,130	9,980	89,980	130,290	0.690	0.060
1973	10,520	55,380	14,410	80,310	145,800	0.550	0.072
1974	17,260	74,110	19,180	110,550	150,800	0.733	0.114
1975	46,360	54,380	25,770	126,510	220,100	0.574	0.210
1976	158,820	49,290	29,320	237,430	412,000	0.576	0.385
1977	464,100	76,690	51,530	592,320	872,000	0.679	0.532
1978	594,380	119,120	53,640	767,140	1,309,000	0.586	0.454
1979	795,460	149,720	61,470	1,006,650	1,502,000	0.670	0.529
1980	984,270	184,920	70,970	1,240,160	2,048,000	0.605	0.480
1981	1,129,450	121,310	72,110	1,322,870	2,067,000	0.639	0.546
1982	1,441,960	161,720	133,500	1,737,180	2,588,000	0.671	0.557
1983	1,441,080	141,790	105,820	1,688,690	2,940,000	0.574	0.490
1984	1,245,230	135,980	105,350	1,486,560	2,581,000	0.575	0.482
1985	1,162,870	223,270	194,460	1,580,600	2,537,000	0.623	0.458
1986	945,520	204,930	191,940	1,342,390	2,446,000	0.548	0.386
1987	821,750	215,880	177,510	1,215,140	2,181,000	0.557	0.376
1988	691,640	171,060	174,780	1,037,480	1,872,000	0.554	0.369
1989	626,390	178,160	209,240	1,013,790	2,017,000	0.502	0.310
1990	681,970	180,050	190,230	1,052,250	2,006,000	0.524	0.339
1991	516,160	137,020	150,340	803,520	1,549,000	0.518	0.333
1992	525,940	114,020	157,800	797,760	1,574,000	0.506	0.334
1993	493,650	101,190	122,490	717,330	1,446,000	0.496	0.341
1994	554,080	109,960	141,090	805,130	1,749,000	0.460	0.316
1995	503,220	109,740	141,920	754,880	1,712,000	0.440	0.293
1996	418,440	97,940	146,250	662,630	1,284,000	0.516	0.325
1997	474,860	98,830	166,290	739,980	1,707,000	0.433	0.278
1998	318,490	73,590	81,950	474,030	1,172,000	0.404	0.271
1999	309,850	73,270	79,960	463,080	996,000	0.464	0.311
2000	304,430	81,390	134,810	520,630	1,075,000	0.484	0.283
2001	376,340	151,930	778,980	1,307,250	1,461,000	0.894	0.257
2002	580,760	273,830	1,237,520	2,092,110	3,554,000	0.588	0.163
2003	565,290	333,940	1,225,090	2,124,320	3,964,000	0.535	0.142

Source: World Development Indicators 2004, World Bank and State Bank of Pakistan.
WRSA: workers' remittances from Saudi Arabia, WRU.K.: workers' remittances from United Kingdom, WRU.S.A.: workers' remittances from the United States. TWRT: total WR from all three countries to Pakistan. TWRT/TWR: ratio of workers' remittances from the three countries to total remittances. WRSA/TWR is the ratio of workers' remittances from Saudi Arabia to total remittances.

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Table 4 shows workers' remittances from the three largest sources to Pakistan. Those source countries are Saudi Arabia, the United Kingdom and the United States. Table 4 shows that workers' remittances increase over time to Pakistan from those countries. Overall, it shows that Saudi Arabia has contributed most of the workers' remittances to Pakistan. In the beginning of the 1970's, the United Kingdom contributed most workers' remittances to Pakistan (before the oil boom). Then, starting in 1976 and throughout the 1980's and the 1990's, Saudi Arabia took the lead as the largest source of worker's remittances to Pakistan. Table 4 reveals the importance and strength of the relationship between the Saudi and Pakistani economies through workers' remittances. While column 6 shows the total workers' remittances to Pakistan from all over the world, column 7 shows the ratio of workers' remittances from Saudi Arabia, the United Kingdom, and the United States to total remittances. It shows the significance of the contribution of workers' remittances coming from those countries to Pakistan. On average, about 58 percent of workers' remittances are coming to Pakistan from Saudi Arabia, the United Kingdom, and the USA for the period between 1972 to 2003, which is a very significant percentage considering the fact that it is only from three countries.

Column 8 shows the influence of the Saudi economy to Pakistan through workers' remittances. After being low in early the 1970's (0.06 percent), it started to increase as a result of the oil boom in 1973 until it reached 55 percent of total remittances to Pakistan in 1982 when oil prices reached a peak at about $ 36 a barrel. Oil prices went down starting in 1983 and kept decreasing over time especially in the mid and late 1980's and so did workers' remittances reaching only 14% in 2003. Thus, we can see the strong connection between oil prices and workers' remittances sent from Saudi Arabia to

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Pakistan. This connection between oil prices and workers' remittances from Saudi Arabia to Pakistan can be recognized by comparing the percentage of workers' remittances in the mid 1970's (after development plans took place) and the early 1980's when oil prices were higher compared to the percentage of workers' remittances after that. The percentage of workers' remittances from Saudi Arabia to Pakistan was between 38% to 55% from the mid 1970's through the early 1980's (increasing over time as a result of overall high oil prices), and it was between 49% to 14% from1983 through 2003 (decreasing over time as a result of overall low oil prices). Overall, the average of worker's remittances from Saudi Arabia alone to Pakistan for the whole period between 1972 to 2003 is about 34 percent, which is considered to be a huge source of foreign exchange coming out from only one country. This high percentage of workers' remittances from Saudi Arabia to Pakistan is considered to be one of the major reasons for decreasing the severe consequences of the budget deficit in Pakistan.

2.2.2 *Economic Benefits from Remittances to Labor Exporting Economies:*

As mentioned earlier, workers' remittances are important for generating foreign exchange inflow essential to the balance of payment for a country. Workers' remittances are a key source of external development finance. They have been growing relative to other sources of external finance and in absolute volume. As one of a variety of sources of external finance, they are the most stable source of external resources and they work as a social insurance in many countries that have political and economic crises (Kapur, 2003). Workers' remittances are also important for labor exporting countries on the level of both macro and micro economics because they increase both income of recipients and

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foreign exchange reserves of labor exporting countries. Unlike the government-to-government foreign aid, the strength of remittances is in that money goes directly to individuals which is a good way to avoid bureaucracies that may be corrupt or inefficient in developing countries. Workers usually invest their remittances in their home countries especially in those countries which have improved economic policies. In the 1990's, there was a global improvement in policies of foreign exchange controls which encouraged the investment of remittances (Ratha, 2003). It should be noted that investing the remittances contributes to output growth. Remittances are a complement for national savings and they are used to provide a source of finance for capital formation, especially for small scale projects, by bringing foreign exchange (Solimano, 2003). Thus, remittances support economic growth in labor exporting countries.

Remittances are also a positive development tool for the labor exporting countries. They affect development through encouraging saving, investment, growth, consumption, reduction in poverty and more equitable income distribution. The impact of remittances on growth is achieved through savings and investment and in the short run they also affect aggregate demand and output through consumption. The saving effects of remittances come from an increase in domestic saving and an increase in the total pool of resources available to investment. Usually the effects of remittances on investment are in the form of small community projects. In addition, a large part of remittances is used for consumption and in this case they generate positive effects for the economy. Moreover, large parts of remittances are used to finance consumption and thus private savings increase proportionally but is quite lesser compared to increase in income from external remittances (Solimano, 2003). Most studies show that about 80 percent of remittances are

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used for consumption and 5-10 percent are used to invest in human capital such as education, better nutrition, and health. Also, part of the remittances goes to investments in housing, land, and livestock. Small portions of remittances are used for socio-cultural events, loan repayment, and savings. In general, only a small fraction is invested in employment and income generating activities other than agriculture and livestock [Sander (2003) and Suro (2003)]. So the joint effects of remittances on both investment and consumption can increase output and growth. Remittances reduce poverty and redistribute income as well. The recipients of remittances are usually low income households who are faced with limited economic opportunities in their home countries. Remittances improve their income and thus help eliminate the poverty of families of immigrants. In sum, remittances create substantial benefits to the world economy (Ratha 2003).

2.3 **Transaction Costs**:

Despite the welfare benefits from remittances for labor exporting countries, some weaknesses in the financial sector and government administration impose transaction costs which hinder the generation of more remittances to these countries through official channels. Removing or reducing obstacles such as remittances fees would generate more shares of remittance payments through formal channels of the financial system which would significantly increase annual remittances flows to developing countries. Inefficiencies in the banking system, delays in check clearance, exchange losses, all delay inflow of remittances (Ratha, 2003). For example, the average cost of transferring remittances from the U.S. to Central and South America is about 13 percent and often exceeds 20 percent (Orozco, 2002). These charges, which are huge

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compared to cost of banks transfers in industrial countries, are due to the fixed cost of wire transfers, and are exacerbated by the fact that remittance transactions on average are small, usually less than $200. Decreasing transaction costs to less than 10 percent would imply an annual savings of $3.5 billion to overseas workers. This substantial amount of savings would be remitted and would increase foreign capital inflow to labor exporting countries. Improving technology in the banking sector would reduce transaction costs by overcoming the problems of exchange losses and delays in transfers to recipients. One of the best solutions is to establish a partnership between government post offices and leading banks in poor countries that do not have banks branches in rural areas.

A lot of workers in the Middle East try to use informal channels such as the Hawala[5] to avoid high transaction costs since the cost of transfer is less than formal channels (El-Qorchi, 2002). However, efforts to reduce or eliminate money laundering and financing terrorism did affect the flow of remittances through informal networks and more workers are using formal channels to transfer funds now. Also, a large number of foreign workers do not have bank accounts, especially those who are not documented or who are poor. To solve this problem, it would be efficient to improve those workers' access to the banking system in host countries which will lead to reduce transactions costs of remittances.

[5]Hawala is an alternative remittance system where it operates outside traditional banking or financial channels. For more details, see Jost and Sandhu (2000).

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2.4 Remittances and the Balance of Payment Problem in Labor Exporting Countries:

The current accounts for most of the labor exporting countries have been in deficit since the 1970's. This result is expected since those countries are poor developing countries. Developing countries lack an inflow of foreign exchange and also have a problem finding the resources to overcome it. The situation with the balance of payments in those countries is a natural result of domestic and external shocks in the 1970's, 1980's, and 1990's accompanied by structural shifts which make managing the economies in labor exporting countries even harder and keep them under stress. Political instability was also a huge domestic factor for lack of foreign capital inflow to those economies. According to Al-Abbasi (1991), there are three main external reasons putting labor exporting countries under this pressure. First, there has been a high increase in the international price of oil and prices of other major imports. Second, there were fluctuations of the price of primary goods in the world market. Third, there was a slowdown of economic growth and economic activities in both developed countries and oil based countries. In addition to these external factors, the political shocks that happened in the Middle East, including many wars and conflicts in the Gulf region such as the Iraqi-Iranian war in 1979 and the first Gulf War in 1991, cost billions of dollars and reduced the region's wealth. These political tensions created pressure on the resources of a region where a lot of foreign workers from labor exporting countries work and settle down. Workers' remittances provided labor exporting countries with foreign exchange flow that contributed to lessen the severe consequences of the balance of payment deficit in those countries. Thus, the remittances improved the balance of payments for those countries.

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Another endogenous reason that negatively affected the balance of payment is the increase of imports. There were three main reasons for this increase of imports in the labor exporting economies. First, although agriculture is still the main sector in labor exporting economies, there was decrease in agricultural production leading to an increase in imports of food and related products. Second, imports increased as government spending for human resource development grew along with the need for new materials to be used for infrastructure in those economies. Third, many labor exporting countries were engaged in military conflicts (for example, the Pakistani-Indian conflict) which lead to an increase in weapons imports by those countries.

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Table 5: Current Account for Pakistan, 1969-2003
(In millions of US dollars)

Year	current account
1969	..
1970	-667
1971	-482.43
1972	-240.71
1973	-82.3
1974	-492.3
1975	-1,069.1
1976	-783.082
1977	-736.905
1978	-721.681
1979	-1,117.990
1980	-924.657
1981	-917.452
1982	-804.834
1983	26.895
1984	-1,200.430
1985	-1,083.050
1986	-647.636
1987	-563.029
1988	-1,429.810
1989	-1,340.320
1990	-1,661.500
1991	-1,402.880
1992	-1,876.770
1993	-2,900.570
1994	-1,812.130
1995	-3,348.750
1996	-4,436.050
1997	-1,711.630
1998	-2,248.000
1999	-920.000
2000	-85.000
2001	1,878.000
2002	3,854.000
2003	3,573.000

Source: 1) World Development Indicators 2003, World Bank.
2) International Financial Statistics 2004, IMF

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Pakistan is not an exceptional case here. Table 3 and Table 5 show the importance of remittances for the current account. An increase in the share of remittances to Pakistani GDP helps to reduce the severe current account deficit. However, Table 5 does not demonstrate the real importance of the increase of workers' remittances in helping to reduce the balance of payment deficit in Pakistan for two reasons. First, during those years with high remittances accompanied by high deficits, there was an increase in imports and a decrease in agriculture exports (The State Bank of Pakistan, various issues). Second, there are inaccuracies in the official data on workers' remittances and official recorded remittances fall short to actual remittances. According to Puri and Ritzema (1999) there are many reasons for the leakage of remittances. First, there is a shortage of efficient banking facilities especially in the rural areas of many labor exporting countries, including Pakistan. Second, it is common that there are price differences between sending and receiving remittances to and from countries which are taking remittances in the form of goods for personal use or for trade in informal market. In Pakistan remittances in the form of goods are estimated to comprise 16 percent of money transfers for urban areas and 11 percent for rural areas. Third, there is the existence of informal exchange rate markets (or black market for exchange rate).

In those markets, appreciation of currencies of labor exporting countries work as taxes on money transfers from workers who transfer remittances through official channels.

This will lead workers to use informal channels instead of formal channels. There are many informal exchange rate markets in South and South East Asia.

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One famous example of informal exchange rate channels is the "Hundi"[6] system used by Pakistani, Indian, and Bangladeshi foreign workers.

It is estimated that, on average, Pakistani foreign workers transfer 16 percent of total remittances through the Hundi system. This reliance on the Hundi system can be as high as 48 percent in rural areas in Pakistan where banking facilities are not efficient or not available. (Another example of an informal exchange rate market is the "Money Courier Industry" in the Philippines.) From another perspective, according to the State Bank of Pakistan, the reason for the recent current account surplus of Pakistan is the significant increase of workers' remittances accompanied by increasing exports in the agriculture sector, especially textiles, and increases in the price of agriculture products in general.

[6]for more details on Hundi system, look at Saith, A. (1992) "Absorbing External Shocks: The Gulf Crises, International Migration Linkages and the Indian Economy, 1990 (with special reference to the impact on Kerala), Development and Change, 23, pp. 101-45.

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Chapter Three

Literature review

In the last two decades there has been more attention paid to the importance of remittances as a huge source of foreign exchange inflow for labor exporting countries. While the oil boom has had a huge positive effect on oil producing countries where it led to large economic growth, the effect of such boom on remittances through demand on foreign labor was also large. Households in some labor exporting countries used these remittances to produce positive effects on their economies by using remittances to generate more savings and investment and thus more economic growth. On the other hand, households in other labor exporting countries used remittances to increase consumption. This chapter provides a theoretical review of the effects of oil price fluctuations, discusses the importance of exports in the economies of developing countries, and explains how export instability will affect the growth rate of those economies. Also, we will review some empirical studies that attempt to investigate the uses and effects of those remittances in labor exporting countries. Moreover, the determinants and economic effect of the flow of foreign exchange represented by remittances on the economic development in labor exporting economies is discussed and explained.

3.1 **Studies on the Effects of Oil Price Fluctuations**:

Since oil is an important commodity for the world economy, its price fluctuations profoundly affect both economies of oil based and industrial countries. Oil prices swing widely in a time of shortage or oversupply. Furthermore, oil price effects may extend

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over many years responding to changes in consumers' demand as well as supply by both OPEC and non-OPEC sources.

Perryman (1987) has argued that oil price fluctuations affect production costs such as equipment rental rates and labor costs. Moreover, he argued that oil price fluctuations directly impact income received, employment in the manufacturing sector, nonelectrical machinery sector, petroleum refining and petrochemical sectors, and the transportation sector. The governmental sector will also be affected by oil price fluctuations through sales and taxes, which means that government revenue in oil producing economies is indirectly affected by fluctuations in oil prices. For example, low oil prices lead to an increase in disposable income (from declining prices) but will be met by a fall in incomes generated by layoffs and shutdowns. Furthermore, while declining oil prices may stimulate consumption by lowering fuel costs and electric utilities, they could also reduce industrial activities by depressing demand. Perryman concluded that oil price fluctuations affect aggregate income and sales for oil producing economies.

Al-Mutawa (1991) has studied the issues of oil price shocks on the oil producing country, the United Arab Emirates (UAE). He developed a theoretical model that accounts for four important features of the UAE's economy. These features, which are common among other Gulf States Countries, are: OPEC's oil production quotas, the importance of government expenditures in the economy, the division of oil profits, and the large presence of foreign workers. Al-Mutawa showed that a higher economic welfare is generated by an oil quantity boom rather than an oil price boom. Furthermore, the results showed that an oil price drop or a quantity bust leads to less economic growth and has a welfare loss.

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Al-Mutawa and Cuddington (1994) have extended Al-Mutawa's (1991) work to include the role of foreign oil companies and foreign workers in a prototypical small Gulf state. Their conclusion was that times of boom result in an increased budget surplus which means an increase in a state's welfare, and that an increase in the quota level is better than an increase in oil prices where it leads to more welfare.

Eltony (1999) used Vector Autoregression Model, Vector Error Correction Model, and Structure VAR Model to estimate the effect of fluctuations in the world's oil prices on macroeconomic variables such as oil revenues, the consumer price index, and the value of imports in Kuwait. In addition, he included three more policy variables, money supply, current government expenditures, and government development expenditures. Eltony used quarterly data for the period of 1984:1 to 1998:4 to conduct his study. His findings showed a high degree of interrelation among the main macroeconomic variables. Moreover, the results showed that there was a causality running from oil prices and oil revenue to other variables. Specifically, he found that shocks to oil prices are significant in explaining most of the forecast errors variance for both current and development government expenditures; however, developmental government expenditures were more responsive to oil price shocks. This implies that fluctuations in oil prices affect development process in oil producing countries. While Eltony's results pointed out that oil price shocks produce a small effect on money demand, the results indicated that oil price shocks significantly explain the value of imports.

On the other hand, the effects of oil prices are extended to reach stock markets (Swanson, 2005). Increasing oil prices have a negative effect on the stock market by

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dropping stocks while decreasing oil prices affect the stock market positively. Thus, oil price fluctuations create good or bad opportunities for stock market investments depending on the kind of investment that one may be involved in.

In another study, Haling (1992) tested for the effect of oil price fluctuations on the productivity of the agriculture sector. He found that the productivity of agricultural production decreased for small–scale agricultural producers during the oil boom. This decline in productivity is a result of a decrease in the scale of productivity and a reduction in technology used in the production process, which is dependent on investment in fertilizers, insecticides, and improved seeds. Thus, since oil price fluctuations are affecting economic activities in oil producing countries, this in turn will affect workers' remittances by influencing the demand on labor in oil producing countries.

Another issue that is related to fluctuations in oil prices is instability in oil exports that affects oil revenues. Sometimes fluctuations in oil prices have an effect on exports in oil producing countries (primarily oil as the main export for those countries) and thus macroeconomic variables such as economic growth in those countries. Fluctuations in oil prices affect investment in the oil sector of oil producing countries and thus affect export of oil in the long run. Studies that investigate the consequences of export instability on macroeconomic variables in oil producing countries are reviewed in the following section.

3.2 **Instability in Oil Export and its Effect on the Economic Growth**:

There are many studies which investigated the effect of instability of exports and its effect on economic growth. According to Savvides (1984), at present there

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is no satisfactory theoretical model that explains how instability of exports would affect economic growth. In the absence of a theoretical foundation, the results of statistical regressions may be interpreted differently. We will see different results of the effect of instability of exports on economic growth depending on which theoretical framework we are using. The effects of export instability on economic growth and development have been investigated theoretically and empirically. Countries vary in size, resources endowments, and differ in national policies. Consequently countries respond in a variety of ways to their economic development interdependencies. Thus, the impact of instability of exports differs from country to country.

The uncertainty associated with instability of exports lowers the effectiveness of investment and thus has an influence on the growth of developing countries. Love (1989) has traced this impact, noting that through the influence on producers' income and government expenditures, instability of exports leads to instability in aggregate demand and stimulates more inflation pressures. By increasing business miscalculation, inflationary pressures and demand fluctuations will induce risk-averse behavior. Furthermore, inflationary pressures discourage private investment in two ways. First, inflationary pressures lead to reductions in the real return and thus reduce domestic savings. Second, inflationary pressures will lead to an increase in investors' doubts about exchange rate depreciation.

Glezakos (1973), in his study of a sample of countries for the period of 1953-66, argued that because Less Developing Countries (LDC's) depend on primary products or few items as exports, they would have higher export instability than Developed Countries (DC's), which will harm their economic growth. His conclusion was that instability in

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exports has a significant negative effect on the real per capita income growth of the 36 LDC's included in his study. Furthermore, by using separate instability indexes (the export price instability index and export volume instability index), he found that export price instability is a greater restraint to exports and economic growth than export volume instability.

In contrast, Savvides (1984) obtained different results from Glezakos using the Glezakos (1973) methodology to investigate the hypothesis that instability of exports is a factor detrimental to the growth of LDC's. He used the cross-section regressions (the same that Glezakos used for his study) for a sample of countries studied for an extended period of time (1967-1977). Savvides found that LDC's experience higher export instability than DC's which confirms Glezakos's results. However, he also found that instability in exports has a significant positive effect on the real GDP per capita growth of LDC's and that the growth rate of exports is a more significant factor as a determinant of growth of income for LDC's than for DC's. His conclusion was that instability in exports does not have a significant negative effect on the economic growth of LDC's as Glezakos claimed. One reason for these contradictory conclusions between Glezakos's (1973) and Savvides's (1984) studies could be that they cover different data (periods) for their samples. While Glezakos's study covered the period 1953-1966, Savvides's covered the period 1967-1977.

In an attempt to study the relationship between instability in export and economic growth, Lim (1991) tested the degree and the causes of instability of exports in primary goods producing developing countries. He argued that instability in export is an obstacle to economic growth and his empirical results showed that it is export earnings that need

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to be stabilized rather than the price of export. His conclusion was that instability in export earnings will harm the economic growth. Love (1992) used another methodology where he applied a Granger (1969) and Sims (1972) reduced form method of causality tests on a sample of 20 trade-dependent countries to investigate the impact of export instability on the domestic economies of developing countries. Specifically, he investigated whether export instability generates short run macroeconomic instability in income. His findings were that there was a casualty operating from export instability to short run income instability which means that export instability encourages short run macroeconomic instability.

Ghirmay, Sharma and Grabowski (1999) in their study about the causal relationships between instability in exports, income terms of trade instability, and investment and economic growth using cointegration analysis and multivariate error correction model. They used a sample of fourteen developing countries to test the hypothesis that instability in exports and income terms of trade would affect development process in two different ways. One is through a direct effect on output and investment, and the other way is indirectly, through investment and output to influence the income terms of trade. They found that the relationship between instability of the income terms of trade and output to be negative and the relationship between instability of exports and output to be mixed. They also concluded that export instability has a negative effect on GDP in all countries of their sample. However, we need to be cautious when it comes to concluding that instability of exports has a negative effect on GDP by region in general. Sinha (1999) used a time series analysis to investigate the relationship between export instability, investment, and economic growth in nine Asian countries. In her study she

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found that the variables are not stationary and not co-integrated. She found that for countries like the Philippines, Japan, Malaysia, and Sri Lanka, the relationship between export instability and economic growth was negative. For countries like Pakistan, South Korea, Myanmar, and Thailand, the relationship between the export instability and economic growth was positive. For India, she obtained mixed results.

Chaudhary and Qaisrani (2002) developed an econometric model and used the Ordinary Least Squares (OLS) method in their study to test for the role of trade and export instability in the economic growth for Pakistan. Their argument was that instability in export earnings are harmful to investment, which will lead to inflation which is destructive to economic growth in the developing countries. They also investigated the role of foreign exchange reserves in economic growth in a developing country. They found that uncertainty associated with exports does not affect economic growth and investment in Pakistan. In addition, they found that huge amounts of foreign exchange reserves enhance investment and will lead to increased output. Moreover, they observed that instability in exports does not affect imports of capital goods and domestic investment. Their findings confirm the importance of foreign exchange to increase economic activities and then sustain growth.

3.3 **More Studies on the Connection between Exports and Economic Growth:**

Since the Saudi Arabian economy depends largely on oil as a main export, it is necessary to study the relationship between exports and economic growth. In an attempt to explain the importance of the exports on economic growth, many studies have included exports in the production function as an input, just like labor and capital. For

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example, Feder (1983), Ram (1987) and Sheehey (1990) included exports in a general production function. The specification of general production function is as follows:

$$Y = f(K, L, X)$$

where Y is real aggregate output, K is capital stock, L is labor force, and X is export levels. These studies used different approaches and techniques to test the relationship between exports and economic growth.

Tyler (1981) has examined the relationship between exports and economic growth. In his study, he used a production function model for a sample of 55 middle income developing countries for the period from 1960 to 1977. His finding was that the exports growth rate has a statistically significant effect on GDP growth when the influences of capital formation and labor were taken into account. He found that an increase in export growth rate by 1 percent will lead to an increase in economic growth by .06 percent. Also, compared to other variables like growth rate of direct foreign private investment and manufacturing output, he found that export growth has a stronger positive effect on GDP growth rate.

Ram (1985) conducted a study to test whether export growth has an effect on economic growth. He used a production function that includes exports as an input and used data for the period of 1960 to 1970 and the period of 1970 to 1977 for 73 less developed countries. Ram's study included both low income and middle income less developed countries. He sorted his data into these two periods to see whether exports had a bigger effect on economic growth in the 1970s when oil prices were high and led to an increase in the cost of imports. Ram assumed that high oil prices might lead to an increase in the importance of exports to economic growth. In his study he tested the

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homoscedasticity of the disturbances term through a white test. His finding was that export growth has positive significant relationship with economic growth for both low income less developed countries and middle income less developed countries. He pointed out that export growth became even more significant to economic growth in the 1970s; however, in the 1960s, export growth was less significant to economic growth for low income less developed countries comparing to middle income countries.

Ekanayake (1999) used the cointegration and error correction models to test for the casual relationship between export growth and economic growth in 8 Asian less developed countries: Pakistan, India, Malaysia, Thailand, the Philippines, South Korea, Indonesia, and Sri Lanka. He found a strong bidirectional causal relationship between export growth and economic growth in all of the countries in his study, with stronger evidence for export-led growth in Malaysia. Also, he found (with the exception of Sri Lanka) that there was a short term Granger causality between economic growth (leading) and export growth (following), with no evidence on reverse direction.

Alkhuzaim (2005) conducted another study that examined the relationship between export and economic growth. He used the cointegration methodology to investigate the long term relationship between aggregate export and economic growth in the following countries: Bahrain, Kuwait, Oman, Saudi Arabia, and the United Arab Emirates. His results show a long run relationship between economic growth and both disaggregate and aggregate exports in all of his sample countries except Saudi Arabia. However, in Oman the results showed that there was no long run relationship between economic growth and oil exports, implying that economic growth and oil exports were not cointegrated. Also for Oman, Alkhuzaim's findings support the hypothesis that

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aggregate exports Granger cause real GDP. But, for other countries like Saudi Arabia, Kuwait, and the United Arab Emirates, there was no evidence that aggregate exports Granger cause real GDP. For Bahrain, there was no causal long run relationship between the two variables. Regarding disaggregate exports, his findings show that unidirectional causality runs from real GDP growth to oil exports in the following countries: Kuwait, Saudi Arabia, and the United Arab Emirates. In the case of Oman, he found that there was unidirectional causality from oil exports to real GDP growth. Also, he found that there was causality from GDP growth to non oil exports in the United Arab Emirates, while he found the opposite results for Oman. In the case of Saudi Arabia and Kuwait he found bidirectional causality between GDP growth and non oil exports. For Bahrain, he found that there was no causal relationship between economic growth and non oil exports.

3.4 **Sources of Export Earnings Fluctuations:**

One of the biggest problems that most LDC's encounter is that they export only one or a few primary products. This concentration in production might be the main reason for the fluctuation in export earnings that lead to large changes in export revenues. If the commodities are more diversified or less concentrated then a fall in some goods' prices might be met or balanced by an increase in other goods' prices, leading to more stable total export revenues. According to Lim (1991), export earnings instability refers to the positive and negative variations in earnings from the short term trend over a given period. Devkota (2004) defines export instability as a year to year variation in exports. It is important here to distinguish between stability in prices and stability in earnings of

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exports under all circumstances. Kanbur (1986) mentioned that fluctuations in export prices, export quantities, or both can cause fluctuations in export earnings. If prices are assumed to be fixed by, for example, an international commodity agreement, then changes in the quantity of exports will make unstable export earnings more stable. But this is the case only if supply is price inelastic and the price elasticity of demand is less than a half. But, if the supply is price inelastic and the price elasticity of demand is less than unity, then earnings instability will be reduced by partial price stabilization (Nguyen, 1980). In general, it is agreed that price stabilization will stabilize export earnings if prices fluctuations are brought about completely by shifts in demand.

It has been commonly thought that fluctuations in export earnings in LDC's would create welfare loss leading to domestic instability which will affect the development process. Now, even though there are many studies that investigate the link between causes of instability of export earnings with primary or agriculture commodities of LDC's, all of those studies do not agree on one final conclusion. Most of the LDC's try to adopt policies to encourage diversification from dependence on primary commodity export earnings. The usual argument is that LDC's largely depend on production of primary goods for their exports, which are the main contributors to LDC's' earnings fluctuations. Based on this argument, there are many studies that agree on two major sources as explanatory variables, which are commodity concentration and geographical concentration in the export sector. However, those studies differ in including other explanatory variables that cause export instability in the LDC's. According to Tegegne (1991), in addition to commodity concentration, the determinants of export earnings instability include world demand conditions, internal supply

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conditions, and relative effectiveness of commodity agreements. The empirical evidence on the relationship between export instability and commodity concentration appears to be inconclusive. However, in spite of the empirical evidence, policymakers still think that commodity concentration is the main reason for export earnings instability and thus encourage increase in the effort of export diversification. For example, Massel (1970) and Knudsen and Parnes (1975) have found a positive relationship between export instability and commodity concentration, while others like Coppock (1962), Michaely (1962) and Soutar (1977) have found a negative relationship between the two variables.

One of the first studies that tries to explain the causes of instability in export earnings was conducted by Massell (1970). His study included 55 countries (36 LDC's and 19 DC's) for the period of 1955 to 1966. He included nine structural variables in his regression. In addition to commodity concentration ratio and geographical concentration ratios, he also analyzed other variables which he thinks help illustrate the economic structure of a country, such as food ratio (the proportion of export earnings gained from food, beverages and tobacco), raw materials ratio (the proportion of export earnings gained from crude materials, petroleum, fuels and some fats), domestic consumption ratio, export market share, per capita income, and the value of merchandize exports. His results were that the value of merchandise exports, commodity concentration ratio, and food ratio did have a high statistical significance with expected positive signs, which indicate that the relationship between these variables and export instability are positive. His recommendation was that if a policymaker in a less developing country wants to decrease the instability of exports, he or she must realize that the results in this study don't include all related information for his/her particular country. Economic variables

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that affect instability of exports differ from one country to another which means that these results do not apply to a specific country.

In another study, Tegegne (1991) investigated the relationship between export earnings fluctuations and commodity concentration in 29 African countries for the period of 1960-82. To inspect the influence of the main export commodity to total export earnings instability, the total export in each country of those 29 countries was decomposed in receipts from the main commodity and from all other minor commodities (total export receipts minus receipts from the main export). Tegegne's finding was that there is a positive relationship between instability of export earnings and commodity concentration for those countries where the main export contributes largely to total export earnings instability. He found that there are two factors that determine how large the contribution of main exports is to export earnings instability. One is the relative instability of the main commodity and the other is the association between fluctuations from year to year in the main exports and other export items, forming total exports.

On the other hand, Asheghian and Saidi (1999) investigated the relationship between commodity concentration and export instability for an oil producing country, Venezuela. In their time series regression model, they included an explanatory variable to account for petroleum export earnings instability. They collected quarterly time series data for the period from January 1975 to January 1996, providing them with 86 observations which were employed in the regression analysis to estimate the impact of commodity concentration and price variability in Venezuela. Their findings supported the argument of a positive correlation between commodity concentration and export instability and further confirmed the argument that time series model is more fitting for

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examining export instability (time series model would support the argument that commodity concentration has a big influence on export instability) rather than cross-section data. In addition, they showed that variability of price has a major impact on the export earnings of Venezuela. The more diversified commodities would lead to more stability in total export revenue.

3.5 Effects of Guest Workers on the Saudi Arabian Economy:

One of the main goals of importing workers to Saudi Arabia is to help achieve development plans and achieve diversification of income. This section will review some studies that investigated the effects of guest workers on the Saudi economy.

Assaf (1982) studied the effect of guest foreign workers on economic growth in Saudi Arabia. He used a Cobb-Douglas type of production function to study the effect of two independent variables: labor and capital on output or economic growth in Saudi Arabia. He decomposed labor into two groups of laborers, local and foreign laborers. His conclusion was that foreign workers have a negative effect on income distribution, inflation, and domestic labor supply. Also, he found that in order to keep a growth rate of output constant at 13.2 percent annually, 2.28 million additional foreign workers had to be imported by 1990. In addition, Assaf found that in order to sustain the level of output growth without increasing the number of foreign workers, capital has to increase by 30 percent. Another study by Aljiffry (1983) investigated manpower planning using an input-output model. The purpose of his study was to project Saudi Arabia's future manpower requirements. The main finding of his study was that Saudi Arabia will

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continue to suffer from the problem of manpower shortage. Therefore, Saudi Arabia will keep depending on foreign workers in the future to achieve its development goals. Moreover, Al-Khouli (1985) used a time series technique for the period between 1982 to 1990 to forecast requirements for different manpower skills in different sectors in Saudi Arabia and the total Saudi manpower requirement to achieve the fourth development plan's target. His findings supported the findings of Aljiffry (1983), which is that Saudi Arabia will be in need of foreign workers in the future.

Also, Al-Thomaley (1986) studied the effect of foreign workers on domestic wages with a focus on private non-agricultural sector. He used partial equilibrium analysis for the period of 1978 to 1982. His main finding was that foreign workers reduced domestic wages growth in three sectors: manufacturing, trade, and community social and personal services. Also, he found that foreign workers reduced the employment level for domestic workers.

3.6 **Effects of Workers' Remittances on Labor Exporting Economies**:

The effects of workers' remittances have been the focus of many specialists due to their importance as a main source of exchange flow and their effect on macroeconomic variables in labor exporting countries. For example, Adams (1996) used data from 727 households to inspect the direct effect of two types of remittances, internal and external, on asset accumulation and income distribution in rural Pakistan. His conclusion was that internal remittances have a positive relationship with income distribution and external remittances have negative relationship with income distribution. He found that the external remittances, which are mainly earned by higher -income people, cause higher

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income inequality (12 percent) compared to internal remittances (only 3 percent). The reason is the increasing "entry costs" to external migration in Pakistan. His study shows that remittance income plays a role in rural asset accumulation in Pakistan, but this role is less important than the role of other variables such as initial assets, the number of educated household males, and total household income without remittances. Solimano (2003) also studied the effect of remittances, as a second large source of development finance after foreign direct investment, on many developmental and financial issues. He concluded by contrast that remittances are more stable than private capital flows such as bank credit and portfolio investments. He identified many reasons why remittances have become a major source of development finance for developing countries. Those reasons are: they are a main source for foreign exchange, they positively affect consumption level for low and middle income households, and they are a direct source to finance small investment projects in poor communities tied to migrants abroad. He also argued that remittances have a positive effect on reducing poverty since most families that receive remittances are low income families. According to Solimano, if remittances are used correctly then they will increase investment in basic infrastructure including roads, low income housing, water, school buildings, and investment in human capital (education). In addition, they will help to fund microcredit programs and small scale-firms. To countries from where remittances come, the development process for poor and middle income countries is benefited since remittances help decrease the dependence of poor countries on official development aids. However, at present, the positive effect of remittances on the development process are weakened by factors such as high cost of transferring money and a poor competitive global market for remittances.

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Adams and Page (2003) conducted a study of 74 low and middle-income developing countries. This study included data on remittances, international migration, and poverty. They tried to study the impact of migration and remittances on poverty in developing countries. Their study was unique because, unlike other studies which concentrated on a specific country or region, they included countries from different developing regions in the world, such as North Africa, Middle East, Latin America and Caribbean, Europe and Central Asia, East Asia, South Asia, and Sub-Saharan Africa. While their study found no evidence that developing countries with higher rates of poverty produce more migrants because of the high cost of migration, it found that remittances have a significant statistical impact on decreasing poverty. They found that on average, a 10 percent increase in the share of remittances in a country's GDP will lead to a 1.6 percent decrease in the number of people living in poverty. They found that remittances have a big influence on the living standards of people in developing countries in Asia, Africa, Latin America, and the Middle East. The study of Adams and Page shows that remittances have a significant negative effect on poverty. Notably, higher sensitivity measures of poverty (the poverty gap and squared poverty gap) leads to a larger impact of remittances on poverty reduction. Furthermore, a 10 percent increase in remittances would lead to about 2.0 percent decline in deepness or severity of poverty in developing countries. According to Neyapti (2004), during the 1990's, in developing countries like Samoa, Yemen, Cape Verde, Jordan, Tonga, Albania, and El Salvador, the net workers' remittances receipts exceeded 10 percent of the GDP. For other countries like Hungary, Egypt, Morocco, and Sri Lanka, they exceeded 5 percent of the GDP. For countries like Nicaragua, Portugal, Tunisia, Georgia, Croatia, Nigeria, and Turkey they

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exceeded 2 percent of the GDP. However, most of the early studies of international migration were focusing on the effects of migration on labor importing countries rather than labor exporting countries. The reason for this focus was the assumption that such effects will be positive on the labor exporting countries in the sense that migration would have positive effects such as a decrease in the unemployment rate and increase in the foreign exchange inflow, leading to a positive effect on balance of payment in those countries. Also, there was some attention paid to related difficulties facing those countries, such as the "Brain Drain" problem, and some attention paid to supplying labor and economic growth and development in labor exporting countries.

3.7 **Use of Remittances**:

In the economic development literature regarding remittances the main question is, how are remittances being used? The effect of workers' remittances on labor exporting economies and thus development in those countries depends on answering such question. If remittances are used to increase savings and thus investment then the positive consequences should be an increase in employment, output, and productive capacity in the economy. On the other hand, if remittances are used to purchase new consumer goods then due to limited domestic supply the result should lead to an increase in price levels and an increase in imports.

Many economists believe that most workers' remittances are spent on personal consumption. For example, Lipton (1980) argued that in a village, daily needs would take about 90 percent or more of the remittances and that the investment comes as the fourth and last main concern for recipients of remittances. Also, Chandavarkar (1980) studied

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the use of remittances in some labor exporting countries like Pakistan, Yemen, and Turkey. In Yemen, he found that most of the remittance flows went to urban real estate, retail marketing, road transport, and commercial agencies. Also, since Yemen produces a large number of emigrants among developing countries, remittances account for a bigger share of foreign exchange earnings and a larger share of national economy than in other labor exporting countries. In Pakistan, he found that emigrants spent about 40 percent of their income overseas on consumption, and save some of it or send remittances home. He found that the cash remittances were used for personal saving, price escalating trade, real estate, and social ceremonies. For Turkey, Lipton found that unlike other labor exporting countries, remittances were used or directed into productive investment like housing, small shops and factories. He recommended that labor exporting countries establish new policies that ensure an optimal use of cash remittances. According to Lipton, people have the choice to use remittances for consumption, saving, or investment. Usually, remittances have added little to the long run development process for most labor exporting countries. This reflects the lack of a rational policy to mobilize savings from remittances into productive investment. So, there should be a logical policy to turn savings from remittances into productive investment.

Chandavarkar suggested that the first priority is to establish special financial institutions or special departments within banks to deal with remittances. The need for these specifically designed institutions arises because of the lack of migrants' managerial and financial skills dealing with remittances. On the other hand, recipients of remittances should be taught how to make saving decisions by providing them with contractual saving plans and connecting savings to credit facilities. This can be achieved through

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establishing branches of banks and technology in rural areas of labor exporting countries. Since poor people in rural areas are denied credit because of lack of collateral and of moral hazard issues, banks in rural areas should adjust policies to lend to practicable projects rather than accessibility of credit.

One key empirical study that investigated the use of remittances was conducted by Gilani, Khan and Iqbal (1981). They found that Pakistani workers use remittances they get abroad to increase their consumption; one-third of the migrant households increased their consumption of essential goods. They found out that 62 percent of remittances went to consumption, 22 percent went to real estate, 13 percent to direct investment, and 3 percent to financial investment.

Adams (1991) has conducted a study in 1986-87 using data from two household surveys, for both migrant and nonmigrant households in three villages in the Minya province in Egypt. He was trying to investigate the economic uses and impact of remittances in Egypt and compared 74 migrant household with 74 nonmigrant households with regard to expenditures on three variables: consumption, investment, and durable consumer goods (such as televisions and washing machines). His findings (which contrast with Lipton's (1980)) were that migrants' households do not waste their remittances on consumption expenditures. Rather he found that for migrant households, the budget share for consumption is less than 90 percent, which is opposite to Lipton's findings. Actually, he found that migrant households dedicate only 12 percent of their expenditure to consumptions (food, school, clothing, medical, pilgrimage, and marriage). He found that most of the households' expenditures go to housing. Migrant households tend to recognize their earnings from remittances as a "transitory income", and thus do

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not spend it on new consumption. Also, consistent with other studies findings, he found that a large part of remittances (53.9 percent) goes into construction or repairing houses since migrant households have a higher propensity to use money on housing than nonmigrant households. One of the main concerns for migrant households is the old, traditional houses they live in, so they try to enjoy temporary income (remittances) from abroad by switching from crowded, traditional houses to new, modern houses. Also, Adams found that migrant households have a higher propensity to invest than nonmigrant households, in opposition to Lipton's finding that investment comes last as a concern for migrants. Adams found that budget shares to investment are higher for migrant households than nonmigrant households, while most of the investments of migrant households go to purchasing land. He found that for migrant households, about 73 percent of per capita expenditures on investment are used to purchase agricultural or building land since migrant households recognize land as good and the best investment available.

3.8 **Determinants of Remittances:**

The increase in the amount of workers' remittances transferred to poor developing countries has made the subject of its determinants noteworthy. Most of the studies on workers' remittances have found different determinants of remittances flow.

Swamy (1981) argued that the remittances flow is influenced by two things. First, Swamy emphasized, the growth rate in the labor importing (host) country where changes in economic activities affect the demand for foreign labor from labor exporting countries. Second, Swamy identified the influence of the inflation rate in the host country. Inflation

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rates affect the nominal value of remittances since changes in the inflation rate would affect the value of wages. His finding was that about 70-90 percent of the variations in remittances flow to labor exporting countries were explained by fluctuations in economic activities in the host country. This implies that fluctuations in an oil exporting country's economy would negatively affect workers' remittances to labor exporting countries.

Lucas and Stark (1985) studied the determinants of workers' remittances in Botswana. They found that there are three self-interest reasons for remitting. First, workers remit because they expect to inherit from the household's fortune. Second, they remit because they invest in assets in their home region and they expect the household to take care of them. Third, they remit because they plan to return home in the future and thus benefit from the household gratitude from having sent remittances.

On the other hand, Straubhaar (1986) tried to study the remittances flow from West Germany to Turkey for the period from 1963 - 1982. He found that wage level, which is an indicator of host countries' economic condition, and total active labor are significant in determining workers' remittances. He found no evidence that exchange rates or interest rates affect workers' remittances. Also, he concluded that the actual flow of remittances is affected by political stability more than economic benefits. Puri and Ritzema (1999) named some factors that influence workers' remittances. Those factors include: number of workers, wage rates in host countries, economic activities in host countries, exchange rate, political risk in host countries, relative interest rates between host and receiving countries, and marital status and level of education of workers.

In a recent study Aydas, Neyapti and Metin-Ozcan (retrieved in 2005), investigated the effect of macroeconomic variables such as inflation, black market

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premium, interest differentials, and per capita income in both domestic and host countries, in addition to economic variables that are related to political risk, on workers' remittances flows to Turkey. They used a time series analysis with data for the period from1964 to 1993. Their findings were that inflation, black market premium, military regime period (political instability) and domestic country income have a negative effect on workers' remittances. Other variables like growth, interest rate differential, and host country income have a positive significant effect on workers remittances to Turkey. This implies that by using suitable macroeconomic policies, labor exporting countries can affect the inflow of workers' remittances.

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Chapter Four

Model Specifications

In order to investigate the effect of oil price fluctuations on oil exporting economies, numerous methodologies and models have been used in the past. The effect of remittances on labor exporting economies has also been investigated with various models. The model to be used in this paper was originally presented by Al-Abbasi (1991). Many modifications to this model will be made to fit with this study. The models of oil based economy are theoretically applied to developing countries which are largely dependent on one main good or service as a leading export sector. Any fluctuations in the price of this commodity will lead to instability in export earnings and thus instability in the economy of these countries. This will then also affect the development of the country and reduce the economic growth prospects of the country. The models of labor exporting economy are theoretically applied to developing countries which are dependant on other economies as a source for foreign exchange. In this type of economy, workers' remittances and foreign aid play an important role in the economic growth and development process. Also, the agricultural sector plays an important role in output in this economy.

In this chapter, two models will be developed; one focuses on an oil based exporting economy and the other represents a labor exporting economy. Because oil based economies and labor exporting economies have different characteristics and structures, it may be assumed that they have dissimilar determinants of investment and GDP growth as well. For example, the economic development in an oil based economy

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is heavily influenced by oil revenues and government expenditures. In contrast, economic development in labor exporting economies is primarily influenced by agriculture sector, workers' remittances and foreign aid and loans.

4.1 Oil Based Economy:

For this type of economy, a macroeconomic model will be developed in order to examine the effect of fluctuations in oil prices and thus volatility in oil revenue on economic activities in a country such as Saudi Arabia. The oil based economy can be divided broadly into a modern oil sector and a traditional nonoil sector. Since the nonoil sector participation in oil production is insignificant, the oil sector is mostly independent from the rest of the economy. In addition, in the oil based economy oil revenue is the primary source of foreign exchange. In the case of an oil based economy, the oil revenues generated flow directly to the government; therefore, the government has control over the distribution of oil revenues. Thus, the development of oil exporting countries depends basically on the commitment of the government to spend on infrastructure, health, education, and other social services.

4.1.1 Components of the Level of Investment:

Based on neoclassical theory, two components are driving the investment function: net investment and depreciation. Changes in the desired stock of capital translate into changes in net investment, while changes in depreciation are assumed to be a fraction (δ) of the capital stock at the beginning of the period. Coen (1971) presented an investment function:

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$$I_t = b[K_t^* - (1-\delta)K_{t-1}] \qquad (1.1)$$

where I_t is the level of investment at time t, K_t^* is the desired capital stock, K is actual capital stock, b is speed of adjustment of the gap between the actual capital stock and planned (desired) capital stock where $0<b<1$, δ is depreciation rate.

Because developing countries have difficulty in providing sustainable infrastructure, lags in the delivery of capital goods, and other constraints such as time needed to import skilled or to train labor force, the actual investment for developing countries, I_t, might differ from planned investment, i.e. $b \prec 1$. There are two possibilities that could occur given the speed of adjustment, b, of actual investment to planned investment: 1) when b is zero or close to zero, then adjustment of actual investment to planned investment is not going to occur. This situation happens in developing countries that lack foreign exchange inflow; 2) when b is one or close to one, then the adjustment of actual investment to planned investment is almost immediate (within one year). This could be applied to oil based economies where the constraint of foreign exchange is not binding most of the time. In this case, the economy can achieve its target growth rate for output in less time by increasing the speed of adjustment of capital accumulation. However, since the main source of foreign exchange flow in this type of economy is oil export income which is related to oil price fluctuations, the speed of adjustment in an oil exporting economy is affected by fluctuations in oil earnings. For instance, when there is a fall in oil prices (leading to lower revenues), the oil based economy will be faced with a foreign exchange constraint which leads to a delay or cancellation of some investment projects, thereby resulting in a decrease in the speed of adjustment of capital formation.

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Coen (1971) postulated that the speed of adjustment, b, is a function of cash flow (FE_t). In the case of an oil based economy the cash flow basically is the foreign exchange flow from oil revenue which is affected by oil price fluctuations. Moreover, in oil based economies, oil revenue is the main source for foreign exchange and thus capital stock accumulation. Generally, the role of foreign exchange resources would appear to be the most important factor in determining the speed at which differences between the actual and planned investment are eliminated. This implies that in a developing economy, the speed of adjustment of capital formation is a function of the availability of foreign exchange resources rather than a constant.

The speed of adjustment can be written as:

$$b = \left[b_0 + b_1 \frac{FE_{t-1}}{K_t^* - (1-\delta)K_{t-1}} \right] \qquad (1\text{-}2)$$

where b_0 is an autonomous component and b_1 is the coefficient of the speed of adjustment, which depends upon the ratio of the foreign exchange flow of the previous period and the necessary investment to attain the optimal capital stock.

Coen (1971) derived the following investment:

$$I_t = b_o[K_t^* - (1-\delta)K_{t-1}^*] + (1-b_1)(1-\delta)I_{t-1} + b_1[FE_{t-1} - (1-\delta)FE_{t-2}] \qquad (1.3)$$

Thus, for an oil based economy, besides lagged investment and capital stock, foreign exchange flow is a determinant for investment. However, all these factors are subject to oil revenue change which is subject to oil price fluctuations.

Thus, one of the variables that affects investment in an oil based economy is the oil price fluctuations. There are many channels that allow oil price fluctuations to affect investment in oil based economy. One mentioned earlier is through affecting foreign

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exchange and capital stock which are necessary for investment. Another one is that investors would know the risk of investing in the market by measuring the percentage change in oil prices over time. By estimating the percentage change in oil prices over years, investors would be able to approximate the risk level of their investment in the oil based economies and thus decide the magnitude of their investment based on the estimated risk. For example, if the estimated oil price fluctuation over time is $5 a barrel, then investors in the oil sector would estimate it to be less risky than price fluctuation of $15. Also, according to Love (1989), fluctuation in oil earnings will negatively affect the balance of payments for an oil based economy which will lead to even greater risk for investors since they will expect more depreciation in the exchange rate leading to further decreases in private investment. Another way that oil price fluctuations affect investment is that changes in oil prices affect government expenditures and decisions (since the government controls oil revenue) to invest in the future since most of the oil based economies plan their investments based on expectations of future oil price by taking past information on the oil market into account. In oil based economy where the government controls the oil sector, any fluctuations in oil prices are expected to negatively affect foreign exchange inflow by affecting oil revenue. Therefore, the lower the oil prices are, the greater the negative effect on investment in Saudi Arabia (mainly investment in the oil sector).

Another factor that affects investment is output, as shown by Hall and Jorgenson (1971), where the desired level of capital (K^*) is a function of the real rental of capital input (c/p) and output (Y):

$$K_t^* = k\left(Y, \frac{c}{p}\right) \tag{1.4}$$

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For the oil based economy, there is no tax on capital, and the prices of most traded and non-traded commodities are subsidized by the government. The interest rate is constant over time and is determined by the Central Bank. Consequently, the real rental user cost of capital (c/p) is relatively constant over time. Therefore, the desired capital stock can be expressed as the following linear function:

$$K_t^* = \alpha_0 + \alpha_1 Y_t \qquad (1.5)$$

This equation shows that in the long run, planned investment is a function of output which means that in the long-run with no trend in c/p, the growth of output is determined by planned investment.

Moreover, in the oil based economy, the government controls oil revenues and decides how to spend them based on its needs and interests. Therefore, it is reasonable to assume that the investment level is subject to the government's economic and political decisions. Thus, government expenditures, which are subject to changes/fluctuations in oil prices, play an important role in determining the level of investment. Therefore, government expenditures can be added to be a determinant for investment.

Thus, based on the above discussion, it is reasonable to write the estimated equation of investment as follows:

$$INVS_t = e_0 + e_1 YS_t + e_2 IP_t + e_3 GS_t \qquad (1\text{-}6)$$

where $INVS_t$ is total investment, YS_t is total income, IP_t represents the instability of oil price, and GS is government expenditure in Saudi Arabia.

Another factor that we expect to affect investment in oil producing countries is the labor force. As mentioned earlier, the huge increase in oil prices in 1973 forced both public and private sectors to be dependant on foreign labor to achieve their investment

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targets due to a shortage of local labor. In oil based economies, such as the Gulf region, foreign labor, which dominates manpower, receives low wages compared to local labor, and was a significant attraction for investors to invest in oil based economies. According to Al-Thomaley (1986), foreign laborers decrease domestic wage rates. The low-wage foreign labor force led the private sector to depend more on foreign workers, which enabled them (the private sector) to make huge profits, attracting more foreign and local investors to invest into the oil based economy. Low wage labor is a big factor attracting investment. Also, since most of the oil based countries, including Saudi Arabia, adopted a policy of training and sending students and workers abroad to obtain additional training and education in industrial countries, local workers become efficient and more productive to oil based economies over time. Consequently, the availability of the labor force, either local or foreign, is expected to attract more investment into an oil based economy. Therefore, the economy would be able to achieve the goals and targets that are necessary to reach the level of planned growth in the economy without delay.

The labor supply in the oil based economies of the Middle East is elastic and wages are constant. The reason for this is that these countries are surrounded by labor surplus countries and there is considerable flexibility and opportunity to import labor from South and South Asian countries as well. However, training or importing laborers has to be accomplished through some governmental procedures and thus needs time to be achieved.

Therefore, taking this point into consideration, the estimated investment equation now takes on the following form:

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$$INVS_t = e_0 + e_1 YS_t + e_2 IP_t + e_3 GS_t + e_4 LS_{t-1} \quad (1\text{-}7)$$

where LS_{t-1} is the total labor force lagged one period due to the time need to train labor and/or import labor from other labor exporting countries.

4.1.2 Components of Government Expenditure:

In an oil exporting economy, it is not surprising that government expenditures are highly correlated with oil revenues (ORS_t). As mentioned earlier, in oil based economies governments control oil revenues and their decisions to invest are based on both oil revenues and expected oil prices in the future. In oil based economies, oil revenue and government expenditures have a positive relationship. The more the oil revenue (ORS_t), the greater the amount of government expenditures expected, meaning they are positively correlated. In a time of high oil revenues, governments of oil based economies tend to increase their investment especially in social investments and vice versa. The reason for this high correlation between the two variables is simple: oil is the main source of income in oil based economies and thus used to be the main source to finance their government spending.

On the other hand, according to Eltony (1999), oil price fluctuations affect both current government expenditures, and government development expenditures. Shocks to oil prices are significant in explaining most of the forecast errors variance for both current and development government expenditures; however, development government expenditures are more responsive to oil price shocks. It is expected that government expenditures (GS_t) are negatively correlated with instability of oil prices (IP_t). Therefore,

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the greater the instability of oil prices, the smaller is the expected government expenditures.

Another variable that is expected to affect government expenditures in oil based economies is investment. In oil based economies, the government spending decisions are made by government officials who use oil revenue to invest in social capital investments such as building roads, health, and education, which form a huge part of total investments in the oil based economies. In Saudi Arabia, the main target to diversify income is by investing more in nonoil sectors. Building infrastructure in the oil based economies is very important to attract even more investment to diversify income. Moreover, by investing more in non oil sectors and thus diversifying income, government income increases and becomes less dependent on oil. We expect investment to have positive relationship with government expenditures.

Taking this into consideration we can write the equation of government expenditure as follows:

$$GS_t = b_0 + b_1 ORS_t + b_2 IP_t + b_3 INVS_t \qquad (1\text{-}8)$$

4.1.3 Income Growth Determinants:

In oil based economies, oil revenue is the main contributor to GDP and the main source for income. Therefore, income growth in Saudi Arabia is highly correlated with oil revenue. There is an assumed positive relationship between the level of growth of income and growth of oil revenue.

On the other hand, any fluctuations in oil prices are expected to affect income growth in Saudi Arabia through two main channels. First, it is expected that instability of oil prices

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will affect investment as explained before. Second, income growth affects total exports (where oil is the main export) thus affecting total income by affecting oil revenue. Moreover, since oil is the main source of income, any fluctuations in oil prices and oil revenues will affect government expenditures and economic activities in an oil based economy.

In addition, as a result of a huge increase in oil revenues, most of the oil based economies adopted diversification policies to be less dependent on the oil sector. The increase in oil revenue thus led to budget surpluses in those countries during the 1970's which enabled their governments to start economic development plans to develop nonoil sectors. These development plans were also initiated in an effort to attract even more investment into the country in the nonoil sectors in an attempt to decrease dependence on oil as the main source of income for oil based countries. Thus, an increase in the proportion or the share of nonoil sectors of the total income is a key factor for income growth in oil based economies. It is expected that growth in nonoil sectors will lead to positive effect on income growth in those economies.

From above discussion it is reasonable to assume that the following variables affect income growth in an oil based economy:

$$YS_t = c_0 + c_1 ORS_t + c_2 IP_t + c_3 NOS_t \qquad (1.9)$$

Where NOS_t is nonoil sector income in Saudi Arabia.

4.1.4 The Oil price Instability Index (IP_t):

The oil price instability index can be obtained by examining the deviation of the value of oil prices from its trend. The trend can be obtained by taking the linear

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functional form. Thus, by running the regression of annual oil prices over time the deviation can be obtained from annual oil prices. Therefore, the instability index can be constructed by equalizing it with the deviations from the time trend. Using the absolute value of the deviation of oil prices from its trend, the instability of the oil price index is computed. Also, both the absolute value of the deviation of oil prices and expected values of oil prices according to trend can be used to obtain the instability index by using the following form:

$$P_t' = \frac{[P_t - P_{t-1}]}{P_t} * 100$$

where P_t is the oil price at time t and P_{t-1} is the oil price at time t-1 which can be calculated by regressing the oil prices over time for the whole period of data. This study will use the oil prices average of the Arabian Light and North Sea (Brent).

4.1.5 The Complete Model for an Oil Based Economy:

From the previous discussion, the estimated models for an oil based economy are as follows:

a. Investment Equation:

$$INVS_t = e_0 + e_1 YS_t + e_2 IP_t + e_3 GS_t + e_4 LS_{t-1}$$

b. Government Expenditure Equation:

$$GS_t = b_0 + b_1 ORS_t + b_2 IP_t + b_3 INVS_t$$

c. Income Growth Equation:

$$YS_t = c_0 + c_1 ORS_t + c_2 IP_t + c_3 NOS_t$$

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The mechanism of the model can be explained by the following. The government of an oil based economy strongly relies on oil revenue since oil is the main export and the main source of foreign exchange flows for the economy and thus finances its spending. However, oil prices fluctuate due to the policies of OPEC and/or the demand-supply conditions in the world market. As a result, the price of oil will as a rule fluctuate more than any other good and thus will affect oil revenue. A reduction in oil revenue will have a negative effect on the balance of payments in the oil based economy. To alleviate this problem, the government will either place a restraint on imports coming into the country or take funds out of the international reserve. Instability in oil revenues will lead to volatility of government revenues and, therefore, volatility in the amount of expenditures by the government and, thus, variability in the amount of investment for the country. It follows that the precariousness of government expenditures will have an adverse effect on the economic growth prospects of an oil based economy. In addition, the amount of investment by the private sector is heavily influenced by decisions of the government regarding capital investment because the private sector actually carries out a large proportion of this investment.

4.2 Labor Exporting Economy:

In a labor exporting economy, workers' remittances have a substantial effect on the balance of payments as they are a considerable portion of the foreign exchange inflow. Thus, workers' remittances have a sizable effect on local economic activities. Since workers abroad transfer large portions of their income to households in their home

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country, this leads to an extensive influence placed on private consumption, saving, and investment in their home country.

A labor exporting economy has the following characteristics:

- The labor sector of the economy is a large portion of the total economy
- The economy itself is small as compared with the rest of the world
- Workers' remittances represent a substantial portion of the foreign exchange inflow
- Foreign aid and foreign loans are very important aspects of development for the economy
- There is a great deal of mobility of the labor force internationally

Economic growth in a labor exporting economy is very different from that of an oil exporting economy. In a labor exporting economy, the workers' remittances and foreign aid are quite significant in determining the level of investment of the economy and, therefore, are very important to the growth of the economy.

For the purposes of this paper, workers' remittances and how they influence the economic growth of the labor exporting economy are the primary focus.

4.2.1 Remittances and Investment in the Labor Exporting Economy:

The role of workers' remittances in economic growth will be investigated through the effect of inflows of foreign exchange and how they then affect local investment. While a substantial portion of the Economics literature examine the role of inflows of foreign exchange as foreign aid, foreign investment, or even export earnings, few empirical applications have focused on the impact of workers' remittances and their

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significance in the economic growth of the labor exporting countries through the effect of remittances on private consumption and local investment.

For the purpose of this study and to investigate the role of remittances in a labor exporting economy, we will focus on two primary groups of people in this type of economy: workers who migrate abroad to work and those who remain residents and are recipients of the workers' remittances. Typically, migration for the workers is temporary rather than permanent. Adults in a family in this type of economy migrate abroad, work, and then send a large portion of their income to their dependent families at home. The duration of their stay and work depends on economic activities in the oil based economies. Usually recipients are assumed to be "uncertain" as to receiving remittances. The reason for this uncertainty is that remittances are subject to changes in the level of oil revenues in the oil based economies. Thus, the inflow of remittances is influenced primarily by the changes in income growth through its effect on the demand for labor. These changes in oil revenues directly affect workers' remittances leading to a direct effect on the level of consumption and the level of investment in a labor exporting economy. A measure of the uncertainty that faces recipients in the labor exporting economy can be obtained by examining the growth of and the cyclical fluctuations in economic activities of an oil based economy which are crucial factors in determining remittance payments. Thus,

$$WR_t = f(YS_t); \qquad f' > 0 \qquad (2.1)$$

Here, WR_t represents the flow of remittances and YS_t the income growth in the oil based economy which is Saudi Arabia in our study. The greater the level of instability in oil

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prices and oil revenues, the lesser the chance for employment for immigrants and thus, the smaller the amount of money to be sent to the recipients in the home country.

Remittances begin in the first period because it is assumed that the workers migrated in the past and commence remitting in period one. If we assume that current income (Y_t) is predetermined, then Y_t depends only on activities that have happened in the past. For recipients, remittances are considered to be extra gains and treated as exogenous. Thus,

$$Y_t + WR_t(YS_t) = C_t + I_t \tag{2.2}$$

where Y_t is current income, C_t represents consumption, and I_t is the amount of investment.

From equation (2.2), total investment is;

$$I_t = Y_t + WR_t(YS_t) - C_t \tag{2.3}$$

Since current income is predetermined, the impact of remittances on total investment is:

$$\frac{dI}{dWR} = 1 - \frac{dC}{dWR} \tag{2.4}$$

In general, $0 < \frac{dC}{dWR} < 1$, this means the marginal propensity to consume out of remittances is positive, but less than one.

From our previous discussion, it is reasonable to assume that the domestic investment in the labor exporting country can be expressed as follows:

$$INVP_t = \gamma_0 + \gamma_1 YP_t + \gamma_2 WR_t \tag{2-5}$$

where I_t is the total domestic investment, YP_t represents total income, and WR_t is assumed to represent the workers' remittances. It is expected then that dI/dWR and dI/dYP will be positive; that is, an increase in income or workers' remittances should bring about an increase in investment.

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In the case of labor exporting countries, an additional factor plays an important role in determining the level of investment and must be taken into account. Foreign aid is a substantial dynamic factor that affects the level of investment and the accumulation of capital stock in these countries. Foreign aid plays an important role in determining the level of investment since it is primarily directed to investing in productive public investment projects which are a crucial determinant for economic growth. Moreover, foreign aid as a source of foreign exchange can be used to buy imported capital goods. According to Ahmad and Qazi (2005), foreign capital (loans, FDI, grant and portfolio) work as a substitute for domestic saving.

Another variable that is expected to affect investment in Pakistan is oil price fluctuations. The oil price fluctuations are expected to affect investment in Pakistan in three different ways. First, fluctuations affect oil producing countries where a lot of Pakistani workers are employed; oil price fluctuations affect workers' remittances which are a very important source for foreign exchange. Second, Pakistan as a country is an oil importer, especially with new economic reforms intended to change the country from a traditional economy to an industrial one. Third, the location of the country, which is close to oil producing countries, makes it a target for oil investment. Pakistan's location attracts oil companies to either invest in searching for oil or to transfer oil from neighboring oil producing countries such as the former Soviet Union. According to Bashar (2002), the energy sector is the only vibrant sector where foreign investment is noticeably arriving.

Therefore, adding foreign aid (FAP) and oil price fluctuations to the equation, investment can be expressed as:

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$$INVP_t = \gamma_0 + \gamma_1 YP_t + \gamma_2 WR_t + \gamma_3 FAP_t + \gamma_4 IP_t \quad (2\text{-}6)$$

Where YP_t is income in Pakistan, WR_t is workers remittances, and FAP_t is foreign aid to Pakistan.

4.2.2 Determinants of Remittances:

Assuming that differences in interest rates between host and receiving countries has no effect on workers' remittances, many other factors determine and affect remittances to labor exporting countries. The most important factor is the magnitude of the number of workers in foreign countries and the wage rate paid in those foreign countries. However, data on these two variables are unavailable or difficult to obtain from Saudi Arabia. For this reason, the growth rate in the oil based economy will be used as an indicator affecting the demand for workers in the oil based economy, and thus, affects the remittance flow to the labor exporting economy.

Swamy (1981) argued that remittances flow is influenced by two variables. The first is the growth rate in the labor importing (host) country (in this study, Saudi Arabia) where changes in economic activities affect the demand for foreign labor from labor exporting countries. The assumption is that supply of migrant labor to the host country is infinitely elastic which means that increases or decreases in economic activities determine the aggregate amount of guest workers in the economy. Second, the inflation rate in the host country is a key factor influencing remittances. An increasing inflation rate will lead to reduced currency value. In the case of inflation, we expect more money will be spent on goods and services inside the host country by migrants and thus less remittance goes back to labor exporting home countries. In times of high oil revenues in a country such as

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Saudi Arabia, we expect inflation rates to increase over time because of a high per capita income allowing people to consume more. In addition, the inflation rate is expected to affect real wages, which correspond to price changes, and thus affect workers' remittances. Since most foreign workers transfer money to their home countries based on set time schedule (three or four times a year), it is expected that the effect of inflation on workers' remittances will take some time to appear.

From the above discussion, we can write the workers' remittances function as following:

$$WR_t = \lambda_0 + \lambda_1 YS_t + \lambda_2 IFS_{t-1} \qquad (2\text{-}6)$$

where IFS_{t-1} is inflation rate. It is lagged one period because we expect the effect of inflation on workers' remittances to take some time to manifest.

Another variable expected to affect workers' remittances in the oil based economies is oil price fluctuations. Oil price fluctuations may change the incentive of workers to immigrate to work in oil based economies and thus affect workers' remittances by affecting the number of workers. Oil price fluctuations may cause uncertainty about job opportunities for foreign workers in oil based economy and affect workers' decisions to work abroad in the oil based economies since oil based economies are dependant only on oil. This uncertainty resulting from oil price fluctuations is expected to affect the numbers of workers that want to work abroad which would lead to an effect on workers' remittances. Also, most of the workers take into account the cost of living (which is cheap in their home labor exporting countries) compared to their income in oil based economies, which is related to oil prices. This comparison affects workers' decisions to work abroad. In addition, in a time of oil price fluctuations, oil based countries tend to reassess their spending on development projects and social investments.

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This assessment is expected to affect government decisions on the number of foreign laborers needed in the future (demand on labor). On the other hand, since labor exporting countries are oil importers, fluctuations in oil prices might affect the decisions of foreign workers to save or to send more or less money back home. In the case of high oil prices, we might expect workers to send more money back home to help their families to overcome problems such as high cost of fuel that is needed to run a farm or high costs of transportation.

Taking this variable into account, we can rewrite the workers' remittances equation as following:

$$WR_t = \lambda_0 + \lambda_1 YS_t + \lambda_2 IFS_{t-1} + \lambda_3 IP_t \qquad (2\text{-}7)$$

4.2.3 Determinants of Income Growth:

From the above discussion and also based on the literature review in Chapter Three, we expect that an increase in remittances will lead to increased income which in turn will lead to an increase in consumption and investment. Consequently, there will be an increase in economic activities leading to economic growth in labor exporting countries. This is elucidated by Ratha (2003). Thus, remittances are an important factor for economic growth in labor exporting countries.

In addition, we expect foreign aid to be one of main determinants fueling income growth in labor exporting economies. Due to a lack of sources of income, foreign aid is one of the main channels for foreign exchange, which is necessary for economic growth in labor exporting countries.

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Pakistan is like other developing countries which suffer from a large population with limited economic resources. Rapid population growth appears to have negative effects on poor developing countries, especially those developing countries that have traditional economies. Specifically, the growth of the GDP can be constrained by fast population growth in poor developing countries. According to Cincotta and Engelman (1997), population growth dampened the growth of per capita gross domestic product which is the main measuring unit of economic growth. On the other hand, Cincotta and Engelman indicated that one of the main reasons for economic growth in the East Asian region including South Korea, Taiwan, Singapore, Hong Kong, Thailand, Indonesia, and Malaysia, is the declining birth rate throughout the 1970's and 1980's. Low population growth caused by a decline in the birth rate stimulates domestic savings generated essentially by households. Consequently, we expect that the large population in Pakistan would have negative effect on income growth in Pakistan.

Moreover, labor exporting economies are mostly still traditional economies where the agriculture sector plays a primary role. Some studies indicate that a portion of workers' remittances are invested in this sector as discussed in both Chapters Two and Three. Thus, the agricultural sector is a very important determinant for income growth in those countries.

Thus, taking all these factors into account, the model for income growth in labor exporting economies can be expressed as:

$$YP_t = \eta_0 + \eta_1 WR_t + \eta_2 FAP_t + \eta_3 POP_{t-1} + \eta_4 AGP_t \qquad (2\text{-}8)$$

where AGP_t is agriculture sector net output. POP_{t-1} is total population lagged one period.

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4.2.4 The Complete Model for the Labor Exporting Economy:

From the previous discussion, the estimated models for the labor exporting economy are as follows:

a. Investment determinants

$$INVP_t = \gamma_0 + \gamma_1 YP_t + \gamma_2 WR_t + \gamma_3 FAP_t + \gamma_4 IP_t$$

b. Remittance determinants

$$WR_t = \lambda_0 + \lambda_1 YS_t + \lambda_2 IFS_{t-1} + \lambda_3 IP_t$$

c. Income determinants

$$YP_t = \eta_0 + \eta_1 WR_t + \eta_2 FAP_t + \eta_3 POP_{t-1} + \eta_4 AGP_t$$

The mechanism of the model can be explained as follows.

In the discussion of the oil based economy model, it was argued that instability of oil prices and oil revenues would have an effect on the economic growth prospects of the labor exporting economy. Now, consider the case of stable oil prices and thus oil revenue. This would translate into more economic growth for the oil based economy, and as a result would lead to a positive effect on economic activities in the labor exporting economy in two distinct ways. First, the increase of economic growth in the oil exporting economy would lead to an increase in the inflows of foreign exchange in the labor exporting economy through a rise in workers' remittances. This increase in the workers' remittances to the labor exporting economy would lead to an increase in private investment expenditures and consumption, thus affecting economic growth rate in the labor exporting economy. Second, there would be some influence by the level of aid and loans received by labor exporting countries as discussed earlier. Workers' remittances

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and foreign aid are the two major variables that affect the level of investment, and therefore, economic growth in a labor exporting economy.

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Chapter Five

The Methodology

One of the objectives of analyzing economic data is to investigate the relationship between one variable and another variable or one variable and many other variables. These relationships are investigated either in short or long run terms. One of the methods that is used to achieve this goal is the time series approach which relates current values of a variable to its past values, past values of other variables, and the values of current and past random error terms. Models that use past values of a number of economic variables to give details on changes in current values of all those variables together are called multivariate time series models. An example of these models is the VAR (Vector Autoregressive Model).

According to Hill, Griffiths and Judge (1997), for time series data, in order to use models such as Autoregressive Model (AR), Moving-Average Process (MA), Autoregressive Moving Average Processes, and the VAR model, the mean, variance, and autocorrelation function of the data have to be fixed (do not change) over time. This kind of data is called stationary data. However, usually, time series data tend to trend downwards or upwards over time which means that the mean, variance and autoregressive function change over time. These data is called nonstationary data. Our focus here will be nonstationary data since we are using time series data.

In the case of having variables that are nonstationary time series, the ordinary least square method is not appropriate. The reason is that running one nonstationary variable on another will violate one of the assumptions for classical linear regression

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models, i.e., the error terms for the economic variables are supposed to be uncorrelated. That is, Y_t can't be correlated with the stochastic error term of e_{xt} and X_t can't be correlated with the stochastic error term of e_{yt}. When running nonstationary variables on each other, least squares is not a suitable estimation technique because it would generate misleading results. In this case, the least square estimator (β) is not consistent and would lead misleading t-statistic results.

5.1 An Introduction to the VAR Model:

A vector autoregressive model (VAR) can be defined as a model that considers two or more time series variables to be explained. It is an extension of the AR model that forecasts only one time series variable at a time. According to Eltony (1999), the VAR approach is very appropriate and popular lately for two main reasons: first, it is capable of illustrating the dynamic structure of the model. Second, it is capable of avoiding too many identifying restrictions related to economic theories. Sims (1980) suggested that the VAR model is better to be used to forecast macrocosmic time series variables[7]. VAR is connected to simultaneous equations models in the sense that the variables are assumed to be jointly determined and endogenous. However, the difference between simultaneous equations and the VAR model is that the VAR model uses only past regularities data as a foundation to forecast values of economic variables. By assuming that the variables are endogenous in the VAR model, the VAR model treats the variables equally since there is a lack of assurance that the variables are endogenous or exogenous.

[7]for more discussion about this point see Sims (1980).

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We can recognize the VAR model as a system of reduced form equations where each one of the endogenous variables is explained by its own lagged values and other variables' lagged values in the same system. Let's assume that we have the following VAR model including two economic variables, X and Y, which we are trying to forecast:

$$Y_t = \alpha_0 + \alpha_1 Y_{t-1} + ... + \alpha_j Y_{t-j} + \beta_1 X_{t-1} + \beta_2 X_{t-2} + ... + \beta_j X_{t-j} + e_t$$

$$X_t = \gamma_0 + \gamma_1 Y_{t-1} + ... + \gamma_j Y_{t-j} + \lambda_1 X_{t-1} + \lambda_2 X_{t-2} + ... + \lambda_j X_{t-j} + u_t$$

In this model we notice that the current value of the variable Y_t is explained by lagged values of itself and lagged values of the variable X_t and error term e_t.

The current value of the variable X_t is explained by the lagged values of itself and lagged values of the variable Y_t and error term u_t. Also, note that the present value of Y_t is not explained directly by the present value of X_t and that makes this VAR model different from a simultaneous equations model. This kind of VAR model is called a two-dimensional vector autoregressive model of order *j*. It is called by this name because it includes two variables and two equations and it has lags up to order of *j* (Hill, Griffiths and Judge, 1997). Both e_t and u_t in this model are random errors which are serially uncorrelated with zero mean and constant variance. Since these residuals or error terms are uncorrelated, we can use ordinary least squares method to estimate this model. However, before we estimate the coefficients of the model meaningfully we have to limit the length of the lags in the polynomials[8].

[8]for more discussion on this subject see Eltony (1999).

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A significant feature of the VAR model is the use of estimated residuals (called VAR innovations) in dynamic analysis. These innovations are treated as an essential part of the system. In the VAR model, the error terms capture unexpected contemporaneous events, while the expected effect of a variable is captured in the parameters of lagged polynomials. Therefore, the current innovations in the VAR technique are unexpected, but they turn out to be a part of the information set in the next period. Usually, there are two methods to study the oil shocks using the VAR model. The first method is using the Impulse Response Function (IRF) and the second is using Forecast Error Variance Decomposition (FEVD). In addition, there are many uses for the VAR model besides impulse response analysis and variance decomposition such as causality tests, theories tests and hypothesis seeking (Enders, 1995). We are going to discuss some of these uses in the upcoming sections. But first the idea of nonstationary time series and cointegration is explained since it is the core of the empirical results for this study.

5.2 Nonstationary Series and Cointegration:

In economics most of the variables that we encounter are nonstationary time series variables, and thus, as mentioned earlier, the ordinary least square method is not appropriate. Fortunately, most of the time series variables can be changed into stationary variables by lagging them one time or more. That is to difference them one or more times. This process is called *integrated nonstationary process* and the *order of the integrated process* is the number of times that a variable has to be lagged (or differenced) to be stationary (Hill, Griffiths and Judge, 1997). According to Anwar, Davies and Sampath (1996), the time series variable Y_t is integrated of order d if the variable

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becomes stationary after differencing it *d* times, that is Xt~I(*d*). Then, X_t includes *d* unit roots. For example, if time series data are differenced once to be stationary then this data is I(1). In that case if the variables are stationary at that level (no trend), then no differencing is needed and this data is I(0). Let us take the example given by Hill, Griffiths and Judge (1997) to illustrate the process of nonstationary series and cointgration.

Let us assume that we are trying to investigate the relationship between total income and total consumption and thus our regression equation is as follows:

$$C_t = \alpha + \beta Y_t + e_t$$

where C_t is the total consumption, Y_t is total income and e_t is error terms. Suppose that C_t and Y_t are nonstationary time series variables. Also, suppose that they are I(1) series. That is, by differencing them one time they are becoming stationary variables. In this case, we expect the error term:

$$e_t = C_t - \alpha - \beta Y_t$$

to be also I(1). The reason is that if e_t is I(1) then the variance of error terms will not be constant over time and will be serially autocorrelated. In this case, we express the error term as:

$$e_t = \delta e_{t-1} + \rho_t$$

where ρ_t is stationary random error (not necessarily uncorrelated). Assuming that we have $\delta = 1$ (unit root, it is called unit root because it is the root of a polynomial), the above equation shows that least square might create misleading results, specifically a significant connection between total consumption and total income even if the coefficient

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β is zero, and that is why least square is not appropriate method here. This is called spurious regression (Granger and Newbold, 1974).

By differencing or lagging total consumption and total income (I(1)) it does not mean that the error term is I(1) necessarily; it might be the case that the error term is stationary at levels where an error term represents a short run variation from the equilibrium level . If this happens, where our variables total consumption and total income are I(1) and the error terms are I(0), then we say that both variables are cointegrated. Granger (1981) introduced the idea of cointegration to investigate a long term relationship between economic time series variables and the concept was further developed by Engle and Granger (1987). If we have variables that are cointegrated then least squares estimation will lead to consistent estimation of the coefficients. Cointegration means that our variables can eventually reach equilibrium, or have a long run equilibrium relationship. According to Dickey, Jansen and Thornton (1991), Cointegration means that one or more linear combinations of time series variables are stationary even though individually they are not. That is, these time series variables are not able to move "too far" away from each other. That is, these variables have common trends (Stock and Watson, 1988). Thus, absence of cointegration among variables suggests that these variables have no long run link. Therefore, in sum, cointegration assures that if two variables are nonstationary and they have the same order of integration (I(d)) then a linear combination of the two variables $e_t = C_t - \alpha - \beta Y_t$ is stationary. Thus, the two variables can achieve a long run relationship. So, in general, if we have a set of linear combination time series variables where their integrated series I(*d*) is stationary, then those variables are cointegrated.

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It is necessary to use the unit root test to determine whether the time series variables are nonstationary and integrated of a specific order. If a time series variable has a unit root then it means that the variable is a nonstationary variable. Usually macroeconomic variables have a trend and thus they have a unit root. If they have a unit root then the variance and the mean change with time. As a result, in order to assess the effect of a shock on a variable, we have to convert the series to a stationary by lagging it (or differencing it).

There are many unit root tests; however, the most famous unit root tests are the Dickey-Fuller (DF) test and the Augmented Dickey-Fuller (ADF) test [Dickey and Fuller(1979) and Dickey and Fuller (1981)].

The procedure of an ADF test is as follows:

$$\Delta Y_t = \alpha + \beta Y_{t-1} + \sum_{i=1}^{n} \beta_{1+i} \Delta Y_{t-i} + e_t$$

where ΔY_t is the first difference operator for the variable of interest which is Y, β is the coefficient of the interest. The null hypothesis for this test is that:

$$H_0 : \beta = 0$$

And the alternative hypothesis is

$$H_1 : \beta \neq 0$$

The null hypothesis means that there is a unit root in the variable or the variable is nonstationary. If H_0 is not rejected then the variable of interest is nonstationary in its level and thus it could be integrated of order one (I(1)). If H_0 is rejected then the variable is stationary; that is, the variable does not have unit roots or it is said that the variable of interest is integrated of order zero, i.e. I(0). According to Enders (1995), if the variable is

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stationary then Ordinary Least Square (OLS) is suitable to be used and there is no need for cointegration.

5.3 The Granger Causality Test:

Granger (1969) defined causality as a one time series variable predicting another time series variable. Granger (1980) assures that X_t "Granger causes" Y_t if X_t helps in prediction of Y_t. By taking lagged (past) values of both X_t and Y_t , a time series variable X_t Granger causes another time series variable Y_t, if lagged values of X_t and Y_t helps to a better prediction of Y_t rather than using past values of Y alone. Also, we say that a time series variable Y_t Granger causes another time series variable X_t if lagged values of Y_t and X_t helps for better prediction of Y_t rather than using past values of X alone.

According to Gujarati (1995) Granger causality test assumes that the time series of both variables, X_t and Y_t, contains all information that help to predict X_t and Y_t .

Let's assume that we are interested in estimating the following:

$$X_t = \sum_{i=1}^{n} \alpha_i Y_{t-i} + \sum_{r=1}^{n} \beta_r X_{t-r} + u_{1t} \qquad (5\text{-}1)$$

$$Y_t = \sum_{i=1}^{h} \delta_i Y_{t-i} + \sum_{j=1}^{h} \gamma_j X_{t-j} + u_{2t} \qquad (5\text{-}2)$$

Again, here u_{1t} and u_{2t} are random errors which are assumed to be uncorrelated with zero mean and constant variance. Note that the current values of the variable X_t is explained by lagged values of itself and lagged values of the variable Y_t. Also, the current values of the variable Y_t is explained by lagged values of itself and lagged values of the variable X_t. Thus, these two regressions focus on historical data of each variable and its relationship with the other. Here, we have four different cases:

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1) We will have unidirectional causality from Y to X if $\sum \alpha_i \neq 0$ and $\sum \gamma_j = 0$. That is, if estimated parameters of the lagged values of the variable Y in equation (5-1) are statistically different from zero and the estimated parameters of the lagged values of the variable X in equation (5-2) equal zero.

2) There will be unidirectional causality from X to Y if $\sum \alpha_i = 0$ and $\sum \gamma_j \neq 0$. That is, if estimated parameters of the lagged values of the variable Y in equation (5-1) are statistically equal to zero and the estimated parameters of the lagged values of the variable X in equation (5-2) are different from zero.

3) Bi-directional or feedback. This happens when X Granger causes Y and Y Granger causes X. in this case, the coefficients in equation (5-1) and (5-2) are different from zero. That is, $\sum \alpha_i \neq 0$ and $\sum \gamma_j \neq 0$.

4) There is no causality. X does not Granger cause Y and Y does not Granger cause X. That is, if estimated parameters of the lagged values of the variables Y and X in equations (5-1) and (5-2) are statistically equal to zero. That is, $\sum \alpha_i = 0$ and $\sum \gamma_j = 0$.

As mentioned earlier, if we regress one nonostationary time series variable on another the least square method can generate misleading results. Thus, Granger causality requires time series variables to be stationary. Therefore, conintegration method and Granger causality require that nonstationary time series be integrated into a stationary series.

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5.4 Error Correction Model (ECM):

Having cointegration allows for the use of ECM model. Earlier we discussed how differencing (lagging) one time (I(1)) nonstationary time series variables to make them stationary allow for the use of different methodologies including VAR modeling. In the case of existing cointegration, the more appropriate methodology to be used is ECM methodology rather than the usual Granger causality tests.

According to Granger (1988), ECM examines the short term dynamics of time series variables of interests which is affected by long term equilibrium's error terms. This happens in the cointegration structure through a variable correcting itself to the error term from the cointegrated vector. Thus the Error Correction Model can be explained as follows: if the economy is imbalanced or is not in equilibrium, then at least one of the variables has to correct this disequilibrium by adjusting according to the size of disequilibrium to get the economy back to equilibrium (Sweidan, 2004). As a result, ECM measures the speed of adjustment of a variable responding to error terms to return back to long run equilibrium (Mabrouk, 2004). If the speed of adjustment of a variable is equal to zero then this variable is "Granger-no causal" in determining the short term dynamics of other variables in the vector.

According to Johansen (1991) and Johansen and Juselius (1992), in addition to keeping information about the variables at levels, the benefit of using causality inferences derived from ECM over the casualty inferences derived from conventional Granger test is that by lagging the variables the stationarity properties of the variables in the cointegration vector are taken into account in the ECM.

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To illustrate this subject more let us go back to previous example of total income and total consumption where we had:

$$e_t = C_t - \alpha - \beta Y_t$$

Since C and Y are cointegrated, there is a long run equilibrium between the two variables; thus we can apply the error term (e_t) to attach the short term behavior of C to its long term path.

A representation of error correction model can be described as follows:

$$C_t - C_{t-1} = \Delta C_t = \alpha + \gamma_1 (C_{t-1} - \beta_1 - \beta_2 Y_{t-1}) + e_t \qquad (5\text{-}3)$$

$$Y_t - Y_{t-1} = \Delta Y_t = \lambda + \gamma_2 (C_{t-1} - \beta_1 - \beta_2 Y_{t-1}) + \upsilon_t \qquad (5\text{-}4)$$

These equations explain that changes in C and I from the lagged period (t-1) to the present period (t) depend on the deviations from long run equilibrium which is defined by the cointegrating relationship. That is to say corrections to (or changes in) both variables depend on:

$$\varepsilon_{t-1} = C_{t-1} - \beta_1 - \beta_2 Y_{t-1}$$

which represents error term in the period (t-1) from the long run equilibrium ($C = \beta_1 + \beta_2 Y$). In other words, ε_{t-1} captures the adjustment in the direction of long term equilibrium. So, corrections to total income and total consumption depend on the size of the deviation of the system from its long term equilibrium in the past period. The error terms e_t and υ_t represent short run deviations from long run cointegrating equilibrium and in that case there would be a movement back (correcting back) towards equilibrium. Therefore, for each single variable we have to test for how the error correction term is

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different from zero in our conintegration vector. The reason for this test is to determine accurately the direction of Granger causality.

In both equations (5-3) and (5-4) ΔC_t and ΔY_t are stationary I(0) because C_t and Y_t are I(1). For $C_{t-1} - \beta_1 - \beta_2 Y_{t-1}$, it is also I(0) because both C and Y are cointegrated. According to Engle and Granger (1987), in cointegration, there is a causality running in at least one direction (at least one variable causing another variable). Now, to explain more of the error correction model let us look at the following bivariate error-correction model:

$$\Delta X_t = \alpha_1 + \beta_1 h_{t-1} + \sum_{i=1}^{n} \gamma_{1i} \Delta X_{t-i} + \sum_{i=1}^{n} \lambda_{1i} \Delta Y_{t-i} + e_{1t} \qquad (5\text{-}5)$$

$$\Delta Y_t = \alpha_2 + \beta_2 h_{t-1} + \sum_{i=1}^{n} \gamma_{2i} \Delta Y_{t-i} + \sum_{i=1}^{n} \lambda_{2i} \Delta X_{t-i} + e_{2t} \qquad (5\text{-}6)$$

where h_{t-1} is the error correction term lagged one period and represents disequilibrium residuals of a cointegration vector. It is I(0) since both Y and X are cointegrated. According to Anwar, Davies and Sampath (1996), the test of Granger causality in the ECM involves three different steps: first, we do tests on the null hypotheses: $H_0 : \beta_1 = \lambda_{1i} = 0$ in equation (5-5) and $H_0 : \beta_2 = \lambda_{2i} = 0$ in equation (5-6). If we reject the null hypotheses then causality does exist and we need to evaluate the source of causality to determine whether causality is connected to short run stationary variation or to error correction term, h_{t-1}. On the other hand, if we fail to reject the null hypotheses, then causality doesn't exist and no additional tests are needed.

Second, if we reject the null hypotheses, then we need to investigate for the existence of short term causality by testing whether λ_{1i} and λ_{2i} are significant or not.

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Third, we have to evaluate the direction of β's to observe if they conclude a long term relationship. There is an advantage of using ECM to test for causality because it concentrates on the coefficients of the speed of adjustment, β's. We need to contrast the sign of speed of adjustment coefficient in the cointegrating equation and the corresponding β to decide whether a long term change in a variable is consistent with a real economic relationship.

5.5 Impulse Response Function (IRF):

When we have more than one cointegrating relations, it is difficult to interpret the coefficients in the error correction model. Sims (1980) introduced the method of impulse response function to examine the direction and the dynamic interrelationship among variables in a VAR model. Impulse response function is one of the approaches, besides variance decomposition, used to study and interpret the impact of shocks on macroeconomics variables in the VAR model. Impulse response function primarily investigates or follows the effect of one time shock or error on the system, or investigates how other variables respond to a shock in one variable within the same system. In other words, impulse response function simulates the effects of a one time shock to a one time series variable in a system on the conditional forecast of another variable (Elder, 2003). According to E-views (2004), since a shock in a variable affects that variable and will also be transmitted to other endogenous variables through lags structure of VAR, the main objective of impulse response function is to outline the consequences of a one time shock to one of the error terms on present and future values of the endogenous variables in the VAR model. Thus, the IRF would give or provide the means to investigate the

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dynamic behavior of the target variables because of unexpected shocks in the variables. The IRF can be obtained from a moving average representation of the VAR model. IRF can be represented as the following matrix form:

$$\begin{bmatrix} Y_t \\ X_t \end{bmatrix} = \begin{bmatrix} \mu_{yt} \\ \mu_{xt} \end{bmatrix} + \sum_{i=0}^{\infty} \begin{bmatrix} \phi_{11}(i) & \phi_{12}(i) \\ \phi_{21}(i) & \phi_{22}(i) \end{bmatrix} \begin{bmatrix} u_{yt-1} \\ u_{xt-1} \end{bmatrix}$$

The representation above is a helpful means for evaluating the Y_t and X_t series. It includes the residuals of the structural VAR model. According to Enders (1995), the coefficients ϕ_i are helpful to give the effects of u_{yt} and u_{xt}. The elements of the matrix $\phi_{jk}(0)$ are called "impact multipliers" and they are the coefficients matrix of the moving average representation. The coefficients of the matrix $\phi_i(\phi_{11}(i), \phi_{12}(i), \phi_{21}(i), \phi_{22}(i))$ are the impulse response functions because they show the consequences or the impact of shocks in residuals (innovations) u_{yt} and u_{xt} on the time series variables Y_t and X_t. For example, the coefficient $\phi_{11}(i)$ shows the overtime effect of one unit change in u_{yt-1} on period response of Y_t. Also, the coefficient $\phi_{12}(i)$ shows the over time effect of one unit change in u_{xt-1} on one period response of Yt.

We would not be able to estimate the IRF if residuals of the VAR model are correlated (VAR model is under identified). One way to see the response of the time series variables X_t and Y_t to shocks is to plot IRF (plotting $\phi_{jk}(i)$ versus i). The shape of IRF would give an indicator as to whether the outcome is reliable or not (whether it is consistent with the theory). According to Sweidan (2004), the shape of IRF is supposed to be constant. That is, it is supposed to be a straight line after some time following the shock, which means that the shock had some temporary effect. The IRF has to converge

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to zero, and in this case, the shock definitely has a temporary effect. If the IRF converges to a new level that means the shock has a lasting or permanent effect.

5.6 Forecast Error Variance Decomposition (FEVD):

As I mentioned earlier, the FEVD is one of the two tools used to study and interpret the impact of shocks on macroeconomics variables in the VAR model. The FEVD estimates the contribution of distinct shocks to variances because it represents the decomposition of forecast error variances. It provides us with information about how significant each shock (innovation) is to the variables in the VAR model. According to Enders (1995), it provides us with information about how a shock in the variable X_t would affect X_t itself compared to shocks to other variables. If e_{xt} can not explain any of the forecast error variance of Y_t sequence then we say that Y_t sequence is exogenous. Thus, the Y_t sequence would be independent from the u_{xt} shocks and X_t sequence. On the other side, Y_t will be endogenous if the shocks in e_{xt} can explain all of the forecast error variance of Y_t. Usually, in applied econometrics, a variable explains a big part of its error variance in short distances (horizon) and lesser part in long distances. Both impulse response function and forecast error variance decomposition are good tools to inspect relationships among economic variables. Like IRF, a problem with forecast error variance decomposition is that it is not usable if the VAR model is under identified[9].

[9]for more discussion on this subject see Enders (1995).

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Chapter Six

Empirical Estimation and Results

6.1 Introduction:

This chapter will report the empirical results of the study and analyze the outcome based on the cointegration method and the error correction model. If cointegration does exist, then there would be long run equilibrium among variables and these variables are affected by deviation from long run path. To reset the long run equilibrium, at least one of the variables has to move in the correct direction in response to the size of disequilibrium. The Error Correction Model will be used to capture movements among these variables and to study the interrelated relationships among variables for both oil based and labor exporting economies in both the short run and long run. Studying and interpreting the empirical results will help us to understand how fluctuations in oil price and oil revenue will affect macroeconomic variables in both oil based and labor exporting countries in areas such as investment, government expenditures and economic growth. Also, empirical results will help us to clarify how this effect on an oil based economy is expected to be transferred to a labor exporting economy through workers' remittances. This study is specific to examining the effect of oil price fluctuations on the macroeconomic variables in both oil based and labor exporting economies. We will look at these relationships using yearly aggregate data for all variables for the period 1970-2003, except for the variable of workers' remittances where data is for the period 1972-2003 because of data unavailability for the years 1970 and 1971.

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Since we are using the cointegration and error correction models, there are many steps to be taken to make sure that we are using the better technique for investigating the data in this study. First, test whether our data is stationary or nonstationary for each time series variable included in this study. The test that we are going to use to decide whether our data is stationary or nonstationary is the Augmented Dickey Fuller (ADF) unit root test. In order to use the cointegration method, the nonstationary data have to be stationary to the same degree on the first difference. The data must be stationary to make sure that the effects of past errors get smaller or have less effect over time. Another related reason is that when we test for long run relationships using impulse response function, errors' effect will vanish over time and thus the figure of the impulse response function will take a straight line in the long run, which means that the series converges to the long term level. If the nonstationary time series data is found to be integrated of the same order (as explained in the previous chapter), then we go to the next step. Second, we must verify whether the nonstationary time series data is cointegrated. So, we perform the Johansen Cointegration Test to examine if there is long run equilibrium among variables. The Johansen Test shows how many cointegrating vectors that we have in our model.

Based on our findings we can use different approaches. If there were no cointegrating vectors to be found, then we would be able to apply unrestricted VAR model to the first difference of the data. If we find that the time series variables are cointegrated (i.e. if cointegration does exist), then we have to use the error correction model to examine which variable is moving to reset long run equilibrium. In the case that we find only one cointegrating vector then we have to add one error correction term to every equation in the VAR model. Also, for each additional cointegrating vector found,

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we have to put in an additional error correction term to every equation in the model. Cointegration implies that there is an influence from deviations in the long run equilibrium on the behavior of the cointegrated variables over time. If the system is out of equilibrium, Error Correction Model (ECM) would clarify how to get back to the equilibrium again. ECM would tell us how the movement of at least one of the time series variables must be in response to the size of disequilibrium to bring the system back to long term equilibrium. Third, we test for causality in the ECM which will help us to investigate the direction of causality between the variables in the system in both the short and long run. In this study two additional tests are run that concern the relationships among variables included in our study. This will give us more reliable results. These tests are Impulse Response Function and Forecast Error Variance Decomposition, which were explained in the previous chapter. I will be using these tests mainly to investigate the long run relationships among variables. To perform my investigations and tests, I will be using E-views 5 (Econometric Views 5) software package.

To sum up, there are two main reasons for using cointegration tests and error correction model in this study. The reason is to test whether there is long run equilibrium among the variables in our models (cointegration). Second, these methods are used to determine which variable is adjusting in the long run to bring the system back to equilibrium and to determine which variable is affecting others in the short and long runs.

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6.2 Variables in the study:

The variables included in this study for an oil based economy (Saudi Arabia) are as follows:

INVS: investment level in Saudi Arabia

GS: Government Expenditure in Saudi Arabia

IP: Oil Price Fluctuations

DLS: Total Labor in Saudi Arabia Lagged One Period

NOS: Nonoil Income in Saudi Arabia

ORS: Oil Revenue in Saudi Arabia

YS: Income in Saudi Arabia

The variables included in this study for labor exporting economy (Pakistan) are as follows:

INVP: Investment Level in Pakistan

YP: Income in Pakistan

WR: Workers' Remittances from Saudi Arabia to Pakistan

IP: Oil Price Fluctuations

FAP: Foreign Aid to Pakistan

YS: Income in Saudi Arabia

DIFS: Inflation Rate in Saudi Arabia Lagged one period

AGP: Agriculture net output in Pakistan

DPOP: Total Population Lagged One Period

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6.3 Unit Root Tests:

Most of the macroeconomic time series variables have a time trend and thus we expect them to have nonstationary data. To forecast such time series variables and to assess shocks on those variables we have to transform those data to stationary data. Therefore, we start with a unit root test to test the integration properties of the time series. I will be using the Augmented Dickey-Fuller test (ADF). The Augmented Dickey-Fuller test statistics value must be less than those of the test's critical values to reject the null hypothesis of nonstationarity (a variable has a unit root). Dickey and Fuller (1979) have shown that the unit root test does not follow the standard t- student's distribution where they obtained asymptotic outcomes and simulated critical values for various test and sample sizes. Also, Mackinnon(1991) and Mackinnon(1996) used response surface regressions based on simulation experiments to compute distribution functions for some unit root and cointegration test statistics, allowing for the computation of Dickey-Fuller critical values for arbitrary sample sizes. The software package E-Views 5 uses Mackinnon (1996) critical value computations in building unit root test output. The Augmented Dickey-Fuller test's results are shown in Tables 6-1 and 6-2. They show the results on both levels and first differences for the time series variables included in this study for both Saudi Arabia and Pakistan, respectively. Comparing the test statistics that are shown in the table with critical values of ADF test indicates that all time series variables are nonstationary at levels and stationary at first differences. That is, the null hypothesis of nonstationarity is not rejected at levels but it is rejected at first differences. This implies that these series are integrated of order one I(1). The lag length was computed automatically using Schwarz Info Test (SIC) which is explained in details in E-

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views 5 (2004). Also, note that when using ADF tests for unit root tests, a constant (intercept) is included.

Both tables show that all time series variables are nonstationary at levels and stationary at first differences. Thus, they are integrated of the same order I(1). Since these variables can be cointegrated, our next step is to test whether a long run relationship exist among variables or not. This can be determined by conducting Johansen's Cointegration Test.

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Table 6-1: Augmented Dickey-Fuller Unit Root Results for Saudi Arabia

Time Series	ADF Test Statistics		Critical values for ADF Test		
	Levels	1st Difference	1%	5%	10%
YS	-2.490	-4.695	-3.65	-2.95	-2.61
INVS	-2.042	-8.667	-3.65	-2.95	-2.61
GS	-1.319	-4.603	-3.65	-2.95	-2.61
ORS	-2.993*	-4.116	-3.65	-2.95	-2.61
NOS	-1.184	-4.058	-3.65	-2.95	-2.61
IP	-2.472	-5.851	-3.65	-2.95	-2.61
DLS	-1.703	-5.244	-3.65	-2.95	-2.61

*shows statistical significance at 1%

Table 6-2: Augmented Dickey-Fuller Unit Root Results for Pakistan

Time Series	ADF Test Statistics		Critical values for ADF Test		
	Levels	1st Difference	1%	5%	10%
AGP	1.147	-6.645	-3.65	-2.95	-2.61
INVP	-0.142	-6.404	-3.65	-2.95	-2.61
YP	-2.417	-4.817	-3.65	-2.95	-2.61
YS	-2.490	-4.695	-3.65	-2.95	-2.61
FAP	-2.359	-7.231	-3.65	-2.95	-2.61
IP	-2.472	-5.851	-3.65	-2.95	-2.61
DIFS	-2.123	-4.193	-3.65	-2.95	-2.61
WR	-1.299	-3.264**	-3.72	-2.98	-2.63
DPOP	1.487	-3.687	-3.65	-2.95	-2.61

**shows statistical significance at both 5% and 10%

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6.4 Johansen Cointegration Test:

As mentioned, the Johansen Cointegration Test is intended to verify whether integrated time series of the same order, *d(1)* in this study, can be cointegrated. The results of Johansen cointegration test includes the Eigenvalues (E_i), also called characteristics roots. Based on the Eigenvalues, Johansen's test computes two other statistics values which are Trace Statistics (λ_{trace}) and Max-Eigen Statistics (λ_{max}). Basically, Trace Statistics (λ_{trace}) is as follows:

$$\lambda_{trace}(r) = -T\sum_{i=r+1}^{n}\ln(1-E_i)$$

The Max-Eigen Statistics (λ_{max}) is as follows:

$$\lambda_{max}(r, r+1) = -T\ln(1-E_{r+1})$$

where E_i is the estimated values of the characteristics roots, T is the number of usable observations, r is all hypothesized numbers of cointegrating equations.

The Trace Statistics (λ_{trace}) test's null hypothesis is that the number of cointegrating equations is less than or equal to r against general alternative hypothesis. For example, if the null hypothesis is r=0 (no cointegrating vector), then the alternative hypothesis is r=1, 2, 3, ... number of variables minus one. If the null hypothesis is r=1, then the alternative hypothesis is r=2, 3, ... number of variables minus one. On the other hand, for Max-Eigen Statistics (λ_{max}), it tests for null hypothesis of the number of cointegrating equations equal r against a specific alternative hypothesis r+1. If the null hypothesis is r=0, then the alternative hypothesis is r=1(one cointegrating vector). If the null hypothesis is r=1, then alternative hypothesis is r=2, and so on. The Johansen cointegration test uses 1% and 5% critical values to decide whether to reject or not the

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null hypothesis. Therefore, to decide whether to reject the null hypothesis or not we compare the calculated values with critical values. If calculated values are greater than critical values then we reject the null hypothesis and vice versa. If we reject the first null hypothesis then we test the next hypothesis and so on until we fail to reject the null hypothesis. These procedures are demonstrated in the tables of Johansen Cointegration Tests provided in this study. For example, in Table 6-3A, to test for r=0 versus r=1, 2, 3or 4 we compare the calculated value of λ_{trace} which is *107.27* to the critical values of λ_{trace} at significance level of 5% and 1% which are *68.52* and *76.07* respectively. Since the calculated value of λ_{trace} is greater than critical values at both significance levels, then we reject the null hypothesis of r=0 which means that the Trace test suggests that we have at least one cointegrating equation in our model. By using the same process to test the null hypothesis that r is less than or equal two ($r \leq 2$), we fail to reject the null hypothesis since the calculated value of λ_{trace} which is *29.36* is less than the critical values which are *29.68* and *35.65* at 5% and 1% respectively. Since we found that λ_{trace} is less than critical values at both 5% and 1% we stop testing. Thus, for the investment model in Saudi Arabia, the Trace test suggests that we have two integrating equations at both significance levels 5% and 1%. Following the same steps to test for cointegrating relations, the Max-Eigen Statistics show that we also have one cointegrating equation at levels 5% and 1%. Note that in λ_{max} we are testing for a precise alternative hypothesis. For example, if we test for the null hypothesis r=0 versus r=1, we found that λ_{max} = 32.001 is greater than 27.07and less than 32.24 at 5% and 1% respectively. Thus we reject the null hypothesis at 5% significance level and we fail to reject it at the 1%

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significance level. When we test for r=1 versus r=2 we fail to reject the null hypothesis since λ_{max} =20.69 is less than 25.52 at the 5% significance level. Thus, we conclude that Max-Eigen Statistics suggests that we have one cointegrating equation for the investment model in Saudi Arabia at the 1% level of significance and two cointegrating equations at the 5% significance level.

Sometimes Trace Statistics and Max-Eigen Statistics produce conflicting results. Since Max-Eigen Statistics has a more specific alternative hypothesis, many economists, such as Enders (1995), rely on Max-Eigen Statistics more than Trace Statistics. On the other hand, economists such as Ghirmay, Sharma and Grabowski (2001) argue that Trace Statistics produce more powerful results than Max-Eigen Statistics since it includes all alternative hypotheses. So, in the case that Trace Statistics and Max-Eigen Statistics give conflicting results, the choice of which one of them to rely more on is inconclusive. In other words, using or relying on any one of these tests is justified. This study focuses on the results of one cointegration which measures the relationship among variables in each model. To answer of the question of whether it is better to have more or less cointegrating vectors, It is important to note that according to Dickey, Jansen and Thornton (1991), the greater the number of cointegration vectors in the system the more stable the system is because cointegrating vectors are considered to be constraints that an economic system enforces on the variables movements in the system during the long run. When nonstationary variables are cointegrated, there will be a direction where a meaningful long run relationship exists among them. Thus, it is better for an economic system to be stationary in as many directions as possible due to its implication as being convergent to steady-state long run equilibrium.

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The results of the Johansen Cointegration Test for Saudi Arabia are reported in Tables 6-3A, 6-3B, and 6-3C. The results of Johansen Cointegration Test for Pakistan are reported in Tables 6-4A, 6-4B, and 6-4C.

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Table 6-3A: Johansen Cointegration Test for Investment in SA

Trend assumption: Linear deterministic trend Series: INVS YS IP GS DLS Lags interval (in first differences): 1 to 2				
Hypothesized No. of CE(s)	Eigenvalue	Trace Statistic	5 Percent Critical Value	1 Percent Critical Value
None **	0.783523	107.2739	68.52	76.07
At most 1 **	0.655863	61.36584	47.21	54.46
At most 2	0.498403	29.36438	29.68	35.65
At most 3	0.245911	8.665611	15.41	20.04
At most 4	0.006587	0.198267	3.76	6.65
Trace test indicates 2 cointegrating equation(s) at both 5% and 1% levels *(**) denotes rejection of the hypothesis at the 5%(1%) level				
Hypothesized No. of CE(s)	Eigenvalue	Max-Eigen Statistic	5 Percent Critical Value	1 Percent Critical Value
None **	0.783523	45.90809	33.46	38.77
At most 1 *	0.655863	32.00146	27.07	32.24
At most 2	0.498403	20.69877	20.97	25.52
At most 3	0.245911	8.467344	14.07	18.63
At most 4	0.006587	0.198267	3.76	6.65
Max-eigenvalue test indicates 2 cointegrating equation(s) at the 5% level Max-eigenvalue test indicates 1 cointegrating equation(s) at the 1% level *(**) denotes rejection of the hypothesis at the 5%(1%) level				

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Table 6-3B: Johansen Cointegration Test for Government Expenditures in SA

Trend assumption: Linear deterministic trend
Series: GS ORS INVS IP
Lags interval (in first differences): 1 to 2

Hypothesized No. of CE(s)	Eigenvalue	Trace Statistic	5 Percent Critical Value	1 Percent Critical Value
None **	0.599544	56.44733	47.21	54.46
At most 1	0.455435	28.07762	29.68	35.65
At most 2	0.237359	9.236794	15.41	20.04
At most 3	0.026633	0.836805	3.76	6.65

Trace test indicates 1 cointegrating equation(s) at both the 5% and 1% levels
*(**) denotes rejection of the hypothesis at the 5%(1%) level

Hypothesized No. of CE(s)	Eigenvalue	Max-Eigen Statistic	5 Percent Critical Value	1 Percent Critical Value
None *	0.599544	28.36970	27.07	32.24
At most 1	0.455435	18.84083	20.97	25.52
At most 2	0.237359	8.399989	14.07	18.63
At most 3	0.026633	0.836805	3.76	6.65

Max-eigenvalue test indicates 1 cointegrating equation(s) at the 5% level
Max-eigenvalue test indicates no cointegration at the 1% level
*(**) denotes rejection of the hypothesis at the 5%(1%) level

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Table 6-3C: Johansen Cointegration Test for Income Growth in SA

Trend assumption: Linear deterministic trend
Series: YS ORS NOS IP
Lags interval (in first differences): 1 to 2

Hypothesized No. of CE(s)	Eigenvalue	Trace Statistic	5 Percent Critical Value	1 Percent Critical Value
None **	0.617868	62.67901	47.21	54.46
At most 1 *	0.464820	32.85733	29.68	35.65
At most 2	0.337152	13.47760	15.41	20.04
At most 3	0.023276	0.730099	3.76	6.65

Trace test indicates 2 cointegrating equation(s) at the 5% level
Trace test indicates 1 cointegrating equation(s) at the 1% level
*(**) denotes rejection of the hypothesis at the 5%(1%) level

Hypothesized No. of CE(s)	Eigenvalue	Max-Eigen Statistic	5 Percent Critical Value	1 Percent Critical Value
None *	0.617868	29.82168	27.07	32.24
At most 1	0.464820	19.37972	20.97	25.52
At most 2	0.337152	12.74751	14.07	18.63
At most 3	0.023276	0.730099	3.76	6.65

Max-eigenvalue test indicates 1 cointegrating equation(s) at the 5% level
Max-eigenvalue test indicates no cointegration at the 1% level
*(**) denotes rejection of the hypothesis at the 5%(1%) level

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Table 6-4A: Johansen Cointegration Test for Investment in Pakistan

Trend assumption: Linear deterministic trend
Series: INVP YP WR FAP IP
Lags interval (in first differences): 1 to 2

Hypothesized No. of CE(s)	Eigenvalue	Trace Statistic	5 Percent Critical Value	1 Percent Critical Value
None **	0.807439	101.7612	68.52	76.07
At most 1 *	0.547834	53.98828	47.21	54.46
At most 2 *	0.451408	30.97083	29.68	35.65
At most 3	0.337243	13.55925	15.41	20.04
At most 4	0.054662	1.630170	3.76	6.65

Trace test indicates 3 cointegrating equation(s) at the 5% level
Trace test indicates 1 cointegrating equation(s) at the 1% level
*(**) denotes rejection of the hypothesis at the 5%(1%) level

Hypothesized No. of CE(s)	Eigenvalue	Max-Eigen Statistic	5 Percent Critical Value	1 Percent Critical Value
None **	0.807439	47.77293	33.46	38.77
At most 1	0.547834	23.01745	27.07	32.24
At most 2	0.451408	17.41158	20.97	25.52
At most 3	0.337243	11.92908	14.07	18.63
At most 4	0.054662	1.630170	3.76	6.65

Max-eigenvalue test indicates 1 cointegrating equation(s) at both 5% and 1% levels
*(**) denotes rejection of the hypothesis at the 5%(1%) level

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Table 6-4B: Johansen Cointegration Test for Workers' Remittances in Pakistan

Trend assumption: Linear deterministic trend
Series: WR YS DIFS IP
Lags interval (in first differences): 1 to 2

Hypothesized No. of CE(s)	Eigenvalue	Trace Statistic	5 Percent Critical Value	1 Percent Critical Value
None **	0.680058	69.03194	47.21	54.46
At most 1 **	0.573761	35.98313	29.68	35.65
At most 2	0.310877	11.25324	15.41	20.04
At most 3	0.015584	0.455507	3.76	6.65

Trace test indicates 2 cointegrating equation(s) at both the 5% and 1% levels
*(**) denotes rejection of the hypothesis at the 5%(1%) level

Hypothesized No. of CE(s)	Eigenvalue	Max-Eigen Statistic	5 Percent Critical Value	1 Percent Critical Value
None **	0.680058	33.04881	27.07	32.24
At most 1 *	0.573761	24.72990	20.97	25.52
At most 2	0.310877	10.79773	14.07	18.63
At most 3	0.015584	0.455507	3.76	6.65

Max-eigenvalue test indicates 2 cointegrating equation(s) at the 5% level
Max-eigenvalue test indicates 1 cointegrating equation(s) at the 1% level
*(**) denotes rejection of the hypothesis at the 5%(1%) level

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Table 6-4C: Johansen Cointegration Test for Income Growth in Pakistan

Trend assumption: Linear deterministic trend
Series: YP WR FAP DPOP AGP
Lags interval (in first differences): 1 to 2

Hypothesized No. of CE(s)	Eigenvalue	Trace Statistic	5 Percent Critical Value	1 Percent Critical Value
None **	0.737495	93.86478	68.52	76.07
At most 1 **	0.593220	55.07773	47.21	54.46
At most 2	0.406490	28.99270	29.68	35.65
At most 3	0.251644	13.86335	15.41	20.04
At most 4 *	0.171527	5.456946	3.76	6.65

Trace test indicates 2 cointegrating equation(s) at both the 5% and 1% levels
*(**) denotes rejection of the hypothesis at the 5%(1%) level

Hypothesized No. of CE(s)	Eigenvalue	Max-Eigen Statistic	5 Percent Critical Value	1 Percent Critical Value
None **	0.737495	38.78704	33.46	38.77
At most 1	0.593220	26.08503	27.07	32.24
At most 2	0.406490	15.12934	20.97	25.52
At most 3	0.251644	8.406408	14.07	18.63
At most 4 *	0.171527	5.456946	3.76	6.65

Max-eigenvalue test indicates 1 cointegrating equation(s) at both the 5% and 1% levels
*(**) denotes rejection of the hypothesis at the 5%(1%) level

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The cointegration tests show that there is at least one cointegrating equation for each model in our study suggesting the existence of long run relationship among variables. That is, all variables in each model are moving together towards steady long equilibrium.

6.5 Error Correction Model (ECM):

The cointegration vectors' tables showed the existence of long run equilibrium among the variables in our models; however, they do not tell which variables are adjusting to reset long run equilibrium, the causality among variables or the direction of this relationship. Besides long run causality, the Error Correction Model (ECM) addresses the short run relationship among the models' variables. Consequently, in the case of cointegration among variables, the more appropriate methodology to be used is ECM methodology. Since existence of cointegration in the model suggests that deviation (error) from the long term equilibrium affects time paths behavior of the variables in the model, we have to use error correction model to investigate how every variable responds to a shock (error) in the cointegrating vector. It is called error correction because deviation from long term equilibrium is corrected slowly through a sequential partial short run adjustment. To bring the system back to equilibrium, at least one of the variables has to respond to the magnitude of disequilibrium and therefore ECM suggests that there will be causality running among variables. As a result, ECM measures the speed of adjustment of a variable responding to error terms to return to long run equilibrium. Before we test for long run and short run Granger causality in the ECM, let us discuss the cointegrating vectors for our models.

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Tables 6-5A and 6-5B report the results of the cointegration equations for Saudi Arabia and Pakistan respectively, one for each model. Each equation is normalized on the dependent variable. According to Enders (1995), by fixing the coefficient as one (unity), we are using a variable to normalize the cointegrating equation. The error terms ε_{t-1} in the normalized cointgrating vectors in Tables 6-5A and 6-5B is lagged one period and represent the deviations from long run equilibrium of the cointegrating equations. The coefficient signs of the normalized cointegrating vectors are reversed because they appear on the left hand side of the equations.

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Table 6-5A: Normalized Cointegrating Vectors for Saudi Arabia*

Investment	INVS + 2.761YS + 1.666 IP - 0.307 GS – 2.542 DLS = ε_{t-1} (0.33)[£] (0.14)[£] (0.10)[£] (0.89)[£]
Government Expenditure	GS - 1.441 ORS + 2.293 INVS + 3.635 IP = ε_{t-1} (0.214)[£] (0.279)[£] (0.124)[£]
Income Growth	YS - 0.216 ORS + 0.109 NOS +0 .013 IP = ε_{t-1} (0. 080)[£] (0.029)[£] (0.470)

*standard error in ( ), [£]significant at all significance levels

Table 6-5B: Normalized Cointegrating Vectors for Pakistan*

Investment	INVP+ 1.008 YP - 0.146 WR - 2.389 FAP + 0.1785 IP = ε_{t-1} (0.302)[£] (0.027)[£] (0.236)[£] (0.091)**
Workers' Remittances	WR – 0.9690 YS - 0.9663 DIFS-1.245 IP = ε_{t-1} (0.149)[£] (0.148)[£] (1.196)
Income Growth	YP – 0.070 WR – 1.027 FAP + 0.665 DPOP – 0.581 AGP =ε_{t-1} (0.020)[£] (0.502)** (4.973) (0.560)

*standard error in ( ), **significant at 5%
[£]significant at all significance levels

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To elaborate more, let us look at one of the normalized cointegrating equations, which is the investment cointegrating equation for Saudi Arabia represented in Table 6-5A. In Table 6-5A, from an economic perspective, since oil price fluctuations have a positive sign in the cointegrating equation then the long run relationship between investment and oil price fluctuation is negative. Assuming that the error correction term is positive (if there is a positive shock) then either investment is too large or oil price fluctuations are too large and to reset (adjust to) the long run equilibrium, investments and/or oil price fluctuations have to fall. Therefore, the speed of adjustment coefficients, β's , for both investment and oil price fluctuation should be negative. Also, a combination move in the correct direction from the two variables will lead to an adjustment back to long run equilibrium. Thus, for the investment cointegrating equation in Saudi Arabia, the suitable signs for the speed of adjustment coefficients are $\beta_{INVS} < 0$ and $\beta_{IP} < 0$ which indicate a negative long run relationship between investment and oil price fluctuation. Another example, from the same investment cointegrating equation, we see that since government expenditure has a negative sign, there is a positive long run relationship between investment and government expenditure. If the error correction term is positive, then either investment is too large or government expenditures are too small. To get back to long run equilibrium, either investment has to fall or government expenditures have to increase. Consequently, the speed of adjustment coefficients should be negative for investment or positive for government expenditures. Also, a combination move in the correct direction from the two variables will lead to an adjustment to long run equilibrium. Therefore, for the investment cointegrating equation in Saudi Arabia, the suitable signs for the speed of adjustment coefficients are $\beta_{INVS} < 0$ and $\beta_{GS} > 0$ which

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indicate a positive long run relationship between investment and government expenditures. Thus, these cointegrating variables are reflecting behaviors that are consistent with the economic theories. However, another issue that has to be taken into account to investigate whether these coefficients move to clear the market is the significance of the speeds of adjustment coefficients. So, we have to compare the significance levels for the speed of adjustment coefficients to determine whether both variables are moving or just one of them is moving to maintain long run equilibrium. In the case of two variables moving in the correct direction where one of them is significant and the other is not significant, the long run equilibrium is maintained by movements in the significant variable in the error correction terms. This issue will be explained in more detail in a later section when we explain the Granger causality in the error correction model (ECM). But, before we discuss the Granger causality in the ECM, let us briefly discuss the relationship between the explanatory variables and dependant variables in the cointgrating vectors of our models. This study will be focusing on the variables that are related directly to the interest and focus of this study, that is, the way that oil revenue, oil price fluctuations, and workers' remittances affect oil based and labor exporting economies. Therefore, oil revenue, oil price fluctuations, and workers remittances and their effects on dependent variables will be the main focus of this analysis.

The long run economic relationship between our variables of interest and dependent variables in our models in the cointegrating equations are explained as follows:

For investment in Saudi Arabia, cointegraton test shows that there is a significant negative long run relationship between investment and oil price fluctuation. This result is

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expected because foreign investment, especially in the oil sector, which forms the highest percentage of the foreign investment in Saudi Arabia, is influenced by oil prices.

On the other hand, total labor has a significant positive long run effect on investment in Saudi Arabia. This is also expected since the availability of skilled and unskilled inexpensive labor would encourage investment especially private investment.

For government expenditures in Saudi Arabia, fluctuation in oil prices in Saudi Arabia has negative significant effect on government expenditures. Any fluctuation in oil prices will lead to a negative effect on government expenditures in the long run because when the Saudi government plans its spending, it takes into account oil prices and expected oil prices based on available information. In addition, because oil revenue is the main source of income for Saudi Arabia and almost the only source for the government, it has a significant positive relationship with government expenditures. These significant relationships between government expenditures and both oil revenue and oil price fluctuations are expected since oil is the main source to finance government spending in Saudi Arabia.

For income growth in Saudi Arabia, Table 6-5A shows that oil revenue has a significant positive effect on income growth in Saudi Arabia in the long run. The interesting behavior here is that while oil revenue has significant negative relationship with investment (as expected because of the effect of oil price fluctuations on foreign investment in Saudi Arabia), oil price fluctuations have an insignificant negative effect on income growth in Saudi Arabia in the long run. This could be a result of Saudi Arabia being the biggest oil producer in the world with the highest oil reserves. This allows Saudi Arabia to reduce the severe consequences of oil price fluctuations by adjusting its

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oil production to overcome the problems of oil price fluctuations. In a way, Saudi Arabia as the leader of OPEC has a partial oil price setting power. We can recognize this during the 1980's and 1990's when the Saudi economy, totally dependent on oil, was able to deal with the decrease of oil prices. The Saudi economy remained one of the strongest in the Middle East during that period because of high oil production and reserve that enabled the Saudi government to adjust its oil policy when necessary to deal with the consequences of the decrease in oil prices and thus make the effect of oil price fluctuations to be less significant on the economy.

For investment in Pakistan, there is an expected positive significant long run relationship between investment and workers' remittances. This means that a significant percentage of workers' remittances is invested in the long run rather than consumed which in turn means those workers' remittances are used in a productive way for the economy of Pakistan. Also, oil price fluctuations have a significant negative relationship with investment in Pakistan in the long run. This could be for two reasons. First, Pakistan is a small producer of oil and thus affected by oil price fluctuations because of oil import costs. Second, Pakistan's location is a factor. It is close to oil producing countries such as Azerbaijan, Uzbekistan, and Russia, which makes Pakistan a target for oil exploration types of investment. Pakistan is trying to encourage private firms, including foreign firms, to invest in and develop oil production or to establish oil pipes through Pakistan to make transferring oil cheaper. Thus, any oil price fluctuation is going to negatively affect investment in Pakistan. Therefore, this result shows that the effect of oil prices on Pakistan as a producer and as a place for oil investment for oil firms exceeds the effect of oil prices on Pakistan as a consumer. The other variable that significantly affects

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investment in Pakistan is foreign aid and this is expected since a large percentage of foreign aid is used for investment and to help economic growth in the country.

For workers' remittances, there is a long run significant positive relationship between workers' remittances to Pakistan and economic growth in Saudi Arabia. This is expected and shows how an improvement in economic activities and prosperity in Saudi Arabia would lead to increase in money transferred through Pakistani workers to Pakistan. The increase in the workers' remittances to Pakistan can happen through increasing demand on labor from Pakistan (either skilled or unskilled labor) and/or increasing job opportunities for Pakistani workers in Saudi Arabia. Increasing economic prosperity in Saudi Arabia as a result of increasing economic growth would lead also to an increase in unskilled laborers taking second jobs such as washing cars and helping in building houses. These second jobs will generate extra income and a considerable amount of money for Pakistani workers, which will lead to an increase in money transferred to Pakistan. Also, we expect the inflation rate in Saudi Arabia to have a negative relationship with workers' remittances, but it turns out that workers remittances to Pakistan have a significant positive relationship to the inflation rate in Saudi Arabia in the long run. It could be that in the case of increasing inflation, Pakistani workers (foreign workers in general) tend to consume less and save more so they can send money to their families in their home country. This is not a surprise since during economic crises foreign workers in Saudi Arabia usually practice different kind of behaviors that make them consume less and save more. This might include a group of nationals living in a small house and/or eating only one to two meals a day. On the other hand, oil price fluctuations appear not to have a significant effect on workers' remittances in the long run.

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As expected, workers' remittances have a positive significant effect on income growth in Pakistan in the long run. Since a significant amount of workers' remittances to Pakistan goes to investment and thus have a positive effect on investment as it was shown in the investment model, this effect will also have a long run significant positive effect on income growth in Pakistan. Moreover, part of workers' remittances goes to consumption and this assures the strong positive significant relationship between workers' remittances and income growth in Pakistan. Foreign aid to Pakistan also has a positive significant relationship to income growth. This is expected since foreign aid has a positive significant relationship to investment in Pakistan. Surprisingly, both agriculture and population do not have significant relationships to income growth in Pakistan. I believe that the reason is related to the fact that the economy of Pakistan is in transition from a traditional to an industrial economy. However, when we analyze the error correction model later in this study we will see how each variable individually affects income growth in Pakistan in the long run.

6.6 Error Correction Model and Granger Causality:

6.6.1 Case of Saudi Arabia:

Before we discuss the Granger causality, let us investigate which variables are adjusting to reset equilibrium in the model in the long run. The focus here will be on the error correction term coefficients (also called speed of adjustment coefficients). They are the main focus because they capture the speed of adjustment at which every variable reacts to deviation from long run equilibrium. Thus, the long run causality based on the error correction model is represented by error correction terms. To determine which

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variable is moving to correct or maintain the long run equilibrium based on ECM, we compare the signs of the cointegrating vectors with the signs and significance levels of the error correction terms coefficients produced in vector error correction estimates by E-views. Note that in the next section we will see how the significance of variables will also determine whether a variable Granger causes another variable in the short run. For example, in Saudi Arabia, since investment is positive in the cointegrating equation and negative and significant in the error correction (as shown in Table 6-6), it means that investment is going to adjust to reset long run equilibrium. On the other hand, IP in the same model has opposite signs but it is not significant in the error correction; thus it is not going to adjust in the long run to reset equilibrium. Table 6-6 shows the error correction terms for the models of Saudi Arabia and their significance.

For the investment cointegrating equation in the ECM, the error correction for investment is significant and has the correct sign. Therefore, investment is going to adjust in the long run to clear the market or correct long run disequilibrium. On the other hand, the error correction terms for other variables in the model are very small. This is expected since they are not significant and thus these variables are not going to adjust to reset equilibrium in long run. Consequently, clearing the market in this model will occur through adjustment in investment alone. For the government cointegrating equation in the ECM, the error correction term for GS is not significant as it is not going to adjust to clear the market in the long run. In this model, it is obvious that the only variable that is significant with the correct sign is INVS. Then clearing the market in the long run in this model will happen through adjustment in INVS alone. The long run equilibrium movement in INVS indicates the significance of Saudi spending on social capital

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investment as well as the importance of this spending to clear the market in the long run and thus achieve equilibrium in the long run. For the income growth cointegrating equation in the ECM, the adjustment in this model towards long run equilibrium will occur through YS and ORS. This is expected and it makes sense because oil sector plays a significant role in the economy of Saudi Arabia since it is the biggest determinant of income growth for the country. Therefore, I expect that any adjustment in oil revenue would cause YS to adjust as well, since oil is the main good in the economy. Moreover, Table 6-6 shows that the nonoil sector is not significant enough to adjust to reset long run equilibrium.

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Table 6-6: Vector Error Correction Estimates for Cointegrating Equations for Saudi Arabia

Investment Equation:		
Variables	ε_{t-1}	T-Statistics
INVS	-1.382	[-3.132]£
YS	-0.083	[-1.274]
IP	0.020	[0.784]
GS	-0.029	[-0.092]
DLS	0.014	[0.423]
Government Expenditures Equation:		
GS	0.046	[0.651]
ORS	-0.265	[-0.860]
INVS	0.370	[3.338]£
IP	0.056	[1.095]
Income Growth Equation:		
YS	-0.099	[-2.731]**
ORS	-2.985	[-3.510]£
NOS	0.171	[0.523]
IP	-0.284	[-1.974]***

£indicates significance at all levels, ** indicates significance at 5% and 10%.
*** indicates significance at 10%.

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6.6.2 Short Run Causality in ECM for the Models of Saudi Arabia:

As noted earlier, the existence of cointegration among variables allow us to use the error correction model to study causality relationships among the dependent variables and their determinants. In this section we investigate the relationships or causality among variables in our models in the short run. In other words, we are trying to study which one of the independent variables Granger causes the dependent variables in our models in the short run. Also, we investigate whether the feedback effects exist among the variables in our models in the short run. We observe the causality through error correction terms. This section will help us to understand the economic relationship among our variables in order to analyze the effect of each variable on other variables in the short run. To increase reliability, two methods are used to confirm conclusions on the short run relationships. The first method is running dependent variables on the lagged values of themselves and on the lagged values of the other independent variables in the models, using t-statistics of error correction terms to test the significance of lagged values. The absence of significance in the lagged variables indicates no short run causality among variables. Usually, one or two lagged values of each variable are considered to be enough to investigate the short run effect on the dependent variable. The second method is the Wald Chi-square test. The Wald Chi-square test in this study is used to test the joint significance of the sum of the lags of the independent variables. Both methods are derived from the error correction model (ECM). Tables 6-7 and 6-8 report the results of the tests. Table 6-7 shows that for the investment model in Saudi Arabia, only oil price fluctuations and government expenditures are Granger causing investment in the short run since they are significant in the second lags. This is expected since investment in

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Saudi Arabia, especially foreign investment, is largely related to oil prices and government spending on infrastructure (or social capital investments) that create incentives for foreign companies and other investors to enter the market. On the other hand, Table 6-7 shows that there is no short run causality running from any of the independent variables to government expenditures in the government expenditure model since none of these variables is significant. This might be because usually the Saudi government sets up long run plans (such as Five Years Development Plans) that take into account a range of oil prices and oil revenues for that period of time. Thus, this effect might take place in the long run rather than in the short run, as we will see when we investigate long run effects. Being totally dependant on oil, we expect Saudi oil revenue to be the most influential factor on government expenditures in the long run. For the income growth model we found that the only variable that affects income growth in the short run is oil revenue. This result is also expected since again the Saudi economy is dependant on oil. Note that the nonoil sector is not causing income growth in Saudi Arabia in the short run which means this sector's contribution is insignificant to the income growth in the country in the short run. Later we will investigate whether this sector causes income growth in Saudi Arabia in the long run. If the nonoil sector does not contribute significantly to income growth in Saudi Arabia, then Saudi development plans are not effective enough to decrease dependence on oil.

The Pairwise Granger Causality Tests reported in Table 6-8, which test for the null hypothesis of no causality, demonstrate the same results that we obtained by using the lagged values of the models variables. For each equation the output displays (Wald) statistics for the significance of each on the other lagged endogenous variables in that

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equation. The null hypothesis of no causality is not rejected if p-values are greater than significance levels of 1%, 5%, and 10%. The Pairwise Granger Causality Tests, besides studying short run causality between independent variables and dependent variables, shows short run causality from dependent variables to independent variables and the short run causality among independent variables as well.

Table 6-8 shows that for the investment model in Saudi Arabia, there are only two variables that have an effect on investment in Saudi Arabia in the short run, which are IP and GS. The short run causality runs from IP to INVS and from GS to INVS which confirms the results that we got earlier. The last cell which is titled "all" shows that overall, all independent variables as a group in the investment model Granger cause INVS in the short run at 5% and 1% significance levels. This shows the huge influence of both IP and GS variables on investment in Saudi Arabia in the short run; both variables affected overall significance of short run causality from independent variables to investment in Saudi Arabia. On the other hand, Table 6-8 shows that investment does not Granger cause any of the other variables in the investment model. So, the feedback effect does not exist.

For the government expenditure model, the Wald test confirms our earlier results which show that there is no causality running from any of the independent variables to government expenditures in the short run. This means that government expenditures are an exogenous variable in the short run. The reason might be that government expenditures are planned or based on long run development plans. Another explanation is that much of government expenditures go to salaries or high priority social investments that can not be changed by the government in the short run even when there is a change

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in oil revenue. In the long run, however, these categories can be changed based on changes in oil revenue that mainly finance government spending. The last cell titled "all" shows that overall all independent variables as a group in the government expenditure model does not Granger cause GS in the short run at any significance level. Since none of the independent variables Granger cause GS in the short run, the overall short run evaluation of no Granger causality is expected. On the other hand, Table 6-8 shows that GS does not Granger cause any of the independent variables in the short run, which means the causality between of the variables does not exist in the government expenditure model.

For the income growth model, the Wald test shows that the only variable that affects income growth in Saudi Arabia in the short run is oil revenue. This is also expected since the economy is heavily dependent on oil. Thus, the oil sector is the only sector in the economy that affects the growth in Saudi Arabia in the short run. This result is consistent with economic theory since the structure of the economy suggests that the source of income for the country mainly is oil. In general, the Wald test shows that there are some other causality relationships within the model:

There is a short run causality running from ORS to NOS, from NOS to ORS (feedback effect), from IP to NOS and from NOS to IP (feedback effect). Since this study is not intended to investigate these relationships (which can be investigated in further studies); however, these short run causalities are consistent with economic theory since the Saudi government uses oil income to develop the nonoil sector. Therefore, we expect this model to show how significant oil revenues are to the nonoil sector and income growth, and thus to the economy in the short run in Saudi Arabia. Notice that there are many short

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run relationships in this model compared to the two previous models. The reason for these many short run effects is that usually, income growth captures most of the effects of the variables in the economy. The last cell titled "all" shows that overall all independent variables as a group in the income growth model Granger cause YS in the short run at all significance levels. This shows the huge influence of oil revenue on income growth in Saudi Arabia in the short run; ORS affected over all significance of short run causality from independent variables to income growth in Saudi Arabia.

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Table 6-7: Dependant Variables as a Function of Lagged Values based on ECM for Saudi Arabia*

Error Correction: D(INVS)	Error Correction: D(GS)	Error Correction: D(YS)
D(INVS) -1.382355 [-3.13234]	D(GS) 0.046593 [0.65137]	D(YS) -0.099791 [-2.73136]
D(INVS(-1)) -0.008304 [-0.02834]	D(GS(-1)) -0.084303 [-0.35111]	D(YS(-1)) -0.071240 [-0.38187]
D(INVS(-2)) 0.207725 [1.11813]	D(GS(-2)) -0.186168 [-0.78100]	D(YS(-2)) 0.374188 [2.35552]**
D(YS(-1)) -1.820197 [-0.71306]	D(ORS(-1)) 0.022306 [0.24586]	D(ORS(-1)) 0.026494 [2.09324]**
D(YS(-2)) -1.936860 [-0.80251]	D(ORS(-2)) -0.052001 [-0.57308]	D(ORS(-2)) -0.023127 [-1.64926]
D(IP(-1)) -0.907715 [-1.60987]	D(INVS(-1)) 0.044568 [0.33189]	D(NOS(-1)) 0.029376 [1.44770]
D(IP(-2)) -1.40391 [-2.55991]**	D(INVS(-2)) 0.002798 [0.02481]	D(NOS(-2)) -0.001109 [-0.05160]
D(GS(-1)) 0.384701 [1.08852]	D(IP(-1)) 0.366415 [0.75330]	D(IP(-1)) 0.093806 [1.36901]
D(GS(-2)) 1.054681 [3.21316]$^{£}$	D(IP(-2)) 0.534409 [1.15716]	D(IP(-2)) 0.118007 [1.68066]
D(DLS(-1)) -2.21362 [-0.70047]	C 1.822573 [2.01513]***	C 0.141669 [0.83337]
D(DLS(-2)) 1.48649 [0.44394]	-	-
C 1.218767 [0.62056]	-	-

*t-statistics in [ ], $^{£}$indicates significance at all levels
indicate significance level at 5%, 10%, * indicate significance level at 10%

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Table 6-8: Granger Causality Tests based on ECM for Saudi Arabia

	Chi-sq (X^2)(Wald) Statistics* Dependent Variables				
	D(INVS)	**D(YS)**	**D(IP)**	**D(GS)**	**D(DLS)**
D(INVS)	-	0.345 (0.841)	0.781 (0.676)	0.035 (0.982)	1.050 (0.591)
D(YS)	0.718 (0.698)	-	1.582 (0.453)	0.702 (0.703)	2.736 (0.254)
D(IP)	7.486 (0.023)**	4.024 (0.133)	-	0.808 (0.667)	0.891 (0.640)
D(GS)	12.25 (0.002)£	2.242 (0.325)	0.001 (0.999)	-	3.020 (0.220)
D(DLS)	0.693 (0.706)	1.585 (0.452)	0.669 (0.715)	3.570 (0.167)	-
All: 17.63 (0.024)**					

	Chi-sq (X^2)(Wald) Statistics* Dependent Variables			
	D(GS)	**D(ORS)**	**D(INVS)**	**D(IP)**
D(GS)	-	0.673 (0.713)	1.483 (0.476)	0.056 (0.972)
D(ORS)	0.537 (0.764)	-	1.823 (0.401)	2.157 (0.340)
D(INVS)	0.139 (0.932)	2.913 (0.233)	-	1.270 (0.529)
D(IP)	1.460 (0.481)	1.693 (0.428)	1.568 (0.456)	-
All: 4.129 (0.659)				

	Chi-sq (X^2)(Wald) Statistics* Dependent Variables			
	D(YS)	**D(ORS)**	**D(NOS)**	**D(IP)**
D(YS)	-	1.043 (0.593)	0.944 (0.623)	1.333 (0.513)
D(ORS)	8.435 (0.014)**	-	5.397 (0.067)***	5.784 (0.055)
D(NOS)	2.104 (0.349)	10.694 (0.004)£	-	13.766 (0.001)£
D(IP)	3.615 (0.164)	0.204 (0.902)	5.387 (0.067)***	-
All: 31.47 (0.000)£				

*P-values are in parentheses, £ indicate significance at all levels,
** indicate significance at 5% and 10%. *** indicate significance at 10%

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6.6.3 Case of Pakistan:

Table 6-9 reports the error correction terms for the models of Pakistan. It shows that for the investment cointegrating equation in ECM, error terms are significant for both WR and FAP with the correct signs. Thus, both WR and FAP are going to adjust to clear the market or reset the long run equilibrium. Adjustment in the investment model for Pakistan to reset equilibrium in the long run is made by WR and FAP. Since both variables are important for the economy of Pakistan, especially if their use is in a productive way such as investment, then these movements by these variables make sense. Regarding the workers' remittances cointegrating equation in ECM, there is only one variable that is significant with the correct sign - DIFS. Since this variable affects workers' remittances as it was explained before, this movement by inflation rate can be justified. Therefore, long run equilibrium in the workers' remittances model is maintained by movement in the inflation rate in Saudi Arabia.

For the income growth cointegrating equation in ECM, there are two variables that adjust to reset long run equilibrium. As it was for the investment model in Pakistan, long run equilibrium for income growth model in Pakistan is maintained by movements in both WR and FAP as well. Again, this shows the importance of WR and FAP for the economy of Pakistan. Both workers' remittances and foreign aid are main factors that generate foreign exchange to Pakistan, by which its economic growth is enhanced.

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Table 6-9: Vector Error Correction Estimates for Contegrating Equations for Pakistan

Investment Equation:		
Variables	ε_{t-1}	T-Statistics
INVP	0.076	[0.811]
YP	-0.169	[-1.635]
WR	-1.819	[-2.051]**
FAP	-0.731	[-4.754]£
IP	0.644	[1.320]
Workers' Remittances Equation:		
WR	0.104	[2.470]**
YS	-0.072	[-0.785]
DIFS	-1.026	[-3.911]£
IP	-0.041	[-1.430]
Income Growth Equation:		
YP	-0.003	[-0.041]
WR	-1.442	[-2.146]**
FAP	-0.360	[-2.064]***
DPOP	-0.005	[-1.019]
AGP	-0.062	[-0.656]

£ indicate significance at all levels, ** indicate significance at 5% and 10%.
*** indicate significance at 10%.

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6.6.4 Short Run Causality in ECM for the Models of Pakistan:

Tables 6-10 and 6-11 report results on the short run causality in the ECM for Pakistan. Table 6-10 shows that for the investment model in Pakistan, the only variable that affects or Granger causes INVP in the short run is YP. However, Table 6-11 shows that FAP also causes INVP. In general, the Pairwise Granger Causality Tests reported in Table 6-11 demonstrate the results that we obtained by using the lagged values of the model variables except in the case of the investment model for Pakistan, which showed that there is another variable affecting investment. This confirms that besides income growth in Pakistan, FAP (foreign aid to Pakistan) also Granger causes investment in Pakistan. However, the variable foreign aid as it is shown in the Chi-square table is close to being insignificant. Thus, we might conclude that the Chi-square test gives more precise results since it tests for the joint significance. These short run relationships are consistent with economic theory since output and foreign aid play an important role in the economies of developing countries. The main goal of foreign aid is to help the development process in developing countries which affects the level of investment and accumulation of capital stock in those economies.

On the other hand, Table 6-11 shows that INVP Granger causes only one variable in the short run, IP. As explained earlier, this might be due to oil investment in Pakistan and the country's location close to oil producing countries. Usually, the oil market reacts quickly to any breaking news regarding oil production and/or oil investment. In general, the Wald test shows that there are other causality relationships within the model: there are short run causalities running from WR to YP, from FAP to YP, from YP to FAP (feedback effect), and from FAP to WR. Note that WR is not Granger causing INVP in

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the short run. This might be expected since we expect that households use workers' remittances in the short run to fulfill their consumption needs and to pay other expenses such as debt, and thus it takes some time for households to save and invest. So, we expect that worker' remittances are going to take an effect on investment in the long run, as we see when we analyze the long run effects. The last cell titled "all" shows that overall, all independent variables in the investment model do not Granger cause INVP in the short run at any significance level.

For the workers' remittances model, the Wald test show that there is short run causality running from YS to WR. This demonstrates, as expected, how economic growth in Saudi Arabia is a crucial factor for workers' remittances to Pakistan by increasing job opportunities for Pakistani workers in Saudi Arabia and increasing demand on labor, including Pakistani labor. This result confirms the huge influence of workers' remittances from the Saudi Arabia to the Pakistani economy as shown in Table 4 in Chapter Two. On the other hand, Table 6-11 shows that the inflation rate in Saudi Arabia has no effect on workers' remittances to Pakistan in the short run. The reason might be that usually workers do not pay attention or do not take into account the inflation rate in Saudi Arabia when they decide to transfer money to their home countries in the short run. On the other hand, feedback effects show that workers' remittances have an influence on the instability of oil prices in the short run. While instability of oil prices was expected to affect workers' remittances by affecting jobs opportunities and demand on foreign workers, it turns out that workers' remittances affect oil price fluctuations in the short run. The last cell titled "all" shows that overall, all independent variables in the workers' remittances model Granger cause WR in the short run. This demonstrates the huge

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influence of YS on the workers' remittances model; YS affected overall significance of the short run causality from independent variables to workers' remittances to Pakistan in the workers' remittances model.

For the income growth model, the Wald test shows that there is short run causality running from WR to YP and from FAP to YP. Since WR does not affect investment in the short run (as we saw in the investment model) then this means that most of the workers' remittances go to consumption in the short run and consumption is one of the components of income in Pakistan. The short run effect that is running from FAP to YP, is expected since FAP affects investment in the short run. These results show the influence and importance of WR and FAP on YP in Pakistan in the short run. On the other hand, Table 6-11 shows that YP is Granger causing WR in the short run which means there is a feedback effect in this model between YP and WR. In general, the the Wald test shows that there is another causality relationship within the model. There is a short run causality running from FAP to WR. The last cell titled "all" shows that overall, all independent variables in the income growth model Granger cause YP in the short run at all significance levels. This shows the huge influence of workers' remittances and foreign aid on income growth in Pakistan in the short run; WR and FAP affected the overall significance of short run causality from independent variables to income growth in Pakistan.

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Table 6-10: Dependant Variables as a Function of Lagged Values Based on ECM for Pakistan*

Error Correction: D(INVP)	Error Correction: D(WR)	Error Correction: D(YP)
D(INVP) 0.076887 [0.81122]	D(WR) 0.104901 [2.47074]	D(YP) -0.003517 [-0.04133]
D(INVP(-1)) -0.240010 [-1.01841]	D(WR(-1)) -0.158701 [-0.62268]	D(YP(-1)) -0.031144 [-0.16098]
D(INVP(-2)) 0.352925 [1.44201]	D(WR(-2)) 0.118376 [0.55492]	D(YP(-2)) -0.140142 [-1.38673]
D(YP(-1)) 0.424054 [2.49802]**	D(YS(-1)) 0.237953 [2.38872]**	D(WR(-1)) 0.008023 [0.31447]
D(YP(-2)) 0.000797 [0.00920]	D(YS(-2)) 0.220819 [2.06567]**	D(WR(-2)) 0.051833 [2.27086]**
D(WR(-1)) -0.036889 [-1.74578]	D(DIFS(-1)) -0.023897 [-0.71656]	D(FAP(-1)) 0.066055 [0.60538]
D(WR(-2)) -0.005811 [-0.26579]	D(DIFS(-2)) -0.034093 [-1.08209]	D(FAP(-2)) 0.441943 [4.02185]£
D(FAP(-1)) -0.207514 [-1.30880]	D(IP(-1)) -0.150732 [-0.54869]	D(DPOP(-1)) 5.836816 [1.21337]
D(FAP(-2)) 0.070834 [0.63372]	D(IP(-2)) -0.458921 [-1.60934]	D(DPOP(-2)) -0.893613 [-0.19007]
D(IP(-1)) 0.055013 [1.52436]	C -1.651542 [-1.99991]***	D(AGP(-1)) -0.072349 [-0.31598]
D(IP(-2)) 0.036097 [1.02909]		D(AGP(-2)) -0.246100 [-0.92699]
C 0.301821 [2.07303]**		C -0.099117 [-0.21347]

*t-statistics in [ ]

indicate significance level at 5%, 10%, * indicate significance level at 10%

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Table 6-11: Granger Causality Tests Based on ECM for Pakistan

	Chi-sq (X^2)(Wald) Statistics* Dependent Variables				
	D(INVP)	**D(YP)**	**D(WR)**	**D(FAP)**	**D(IP)**
D(INVP)	-	2.020 (0.364)	0.354 (0.837)	0.150 (0.927)	5.250 (0.072)***
D(YP)	6.247 (0.044)**	-	2.971 (0.226)	6.596 (0.036)**	1.393 (0.498)
D(WR)	4.123 (0.127)	8.469 (0.014)**	-	0.109 (0.946)	3.321 (0.190)
D(FAP)	4.969 (0.083)***	18.842 (0.0001)£	9.330 (0.009)£	-	0.924 (0.629)
D(IP)	2.861 (0.239)	1.238 (0.538)	1.213 (0.545)	0.173 (0.916)	-
All: 10.51 (0.23)					

	Chi-sq (X^2)(Wald) Statistics* Dependent Variables			
	D(WR)	**D(YS)**	**D(DIFS)**	**D(IP)**
D(WR)	-	0.522 (0.770)	3.648 (0.161)	6.388 (0.041)**
D(YS)	13.04 (0.001)£	-	3.657 (0.160)	1.288 (0.525)
D(DIFS)	1.255 (0.533)	2.960 (0.227)	-	2.365 (0.306)
D(IP)	2.652 (0.265)	2.447 (0.294)	4.482 (0.106)	-
All: 13.26 (0.039)**				

	Chi-sq (X^2)(Wald) Statistics* Dependent Variables				
	D(YP)	**D(WR)**	**D(FAP)**	**D(DPOP)**	**D(AGP)**
D(YP)	-	7.529 (0.02)**	2.051 (0.358)	1.282 (0.526)	0.465 (0.792)
D(WR)	6.610 (0.036)**	-	3.163 (0.205)	2.129 (0.344)	2.193 (0.333)
D(FAP)	17.340 (0.000)£	5.850 (0.053)***	-	0.516 (0.772)	0.454 (0.796)
D(DPOP)	1.662 (0.435)	1.416 (0.492)	1.252 (0.534)	-	0.798 (0.670)
D(AGP)	0.867 (0.648)	0.155 (0.925)	3.022 (0.220)	1.718 (0.423)	-
All: 30.680 (0.000)£					

*P-values are in parentheses, £ indicate significance at all levels
** indicate significance at 5% and 10%. *** indicate significance at 10%.

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6.7 Long Run Causality in ECM for the Models of Saudi Arabia:

In this attempt to investigate the relationship among variables in the long term, two different methods are also used to obtain a clear picture about how a shock (innovation) in an endogenous variable would affect that variable and other variables in the system. These methods are: Variance Decomposition and Impulse Response Function. Both Variance Decomposition and Impulse Response Functions are used to study the interactions or relations among variables in the Error Correction Model. The Variance Decomposition and Impulse Response Function are used because ECM depends on these two methods largely since the individual coefficients in the VAR model are hard to interpret (Sweidan, 2004). Dickey (1988) argued that these two techniques are more powerful in explaining the coefficients in the cointegration system.

According to E-views 5 (2004), variance decomposition divides the variation in an endogenous variable into the shocks to all variables in the VAR system. Therefore, the variance decomposition gives information about the significance of each random shock (innovation) in affecting the variables in the system. Also, according to E-views 5 (2004), impulse response function traces the consequences or effects of a shock to one of the innovations on the present and future values of the other endogenous variables in the system through the lag structure of the system. If the innovations are contemporaneously uncorrelated, then a specific innovation to one of the variables is going to affect that specific endogenous variable. Usually, innovations are correlated and can not be connected to a specific variable. In order to be able to interpret the impulses, we usually make sure that innovations are not correlated and thus apply transformation to the innovations.

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6.7.1 Investment for Saudi Arabia:

Table 6-12 shows the percentage of forecast error variance of the investment model at different horizons (periods) credited to earlier shocks (innovations) for every other variable in the system including INVS. Table 6-12 shows that YS and GS are explaining more variation (fluctuation) in INVS over time which means that both YS and GS are becoming more significant in explaining variation in INVS in the long run. However, it is obvious that YS explains a larger percentage of variation in INVS than any other variable in the system, especially in the long run horizons. YS and GS explain about 38% and 10% of the variation in INVS respectively. The interesting point here is that when we were studying the short run relations, YS was not causing an effect on investment in the short run; however in the long run horizons YS is the biggest contributor in explaining variation in investment. This is expected since most of the investment in Saudi Arabia is in oil, which is the main contributor to GDP in Saudi Arabia. On the other hand, DLS (lagged labor supply) explains a very small (insignificant) variation in INVS in the long run. The reason might be that most of the demand on labor in Saudi Arabia goes to house services such as maids and drivers or shepherds. These laborers are not skilled and thus their contribution to investment in Saudi Arabia is small. Another reason might be that some skilled labor can not be as productive without the appropriate technology and sometimes this technology is not available outside the oil sector in Saudi Arabia. On the other hand, Table 6-12 shows that INVS does not Granger cause DLS in the long horizon and thus there is no long run causality running between INVS and DLS, which is an unexpected outcome for the investment model in Saudi Arabia.

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The IP was able to explain about 8% of the variation in investment in long horizons. Sweidan (2004) used about 6% percent to be considered significant enough to conclude that a long run horizon exists between two variables. That is, if a variable is able to explain about 6% of the variation in another variable in the long horizon then we can conclude that there is a long run horizon relation running from that variable to the other variable. Thus, there is a long run horizon relationship running from IP to INVS. This is a logical outcome since a large part of investment in Saudi Arabia is dependent on or goes into the oil sector and thus any fluctuation in oil prices is expected to affect investment in Saudi Arabia in the long run. To see whether the feedback effect exists from investment to other variables in the model, the variance decomposition of IP in Table 6-12 shows that in long run horizon, only investment explains a large percentage of variation in IP, even more than IP itself. However, the percentage decreases over time from about 75% in the first period to about 68% in the 10^{th} period. Thus, the effect of investment in Saudi Arabia on IP is much stronger than the effect of IP on investment is Saudi Arabia since INVS explains more variation in IP than IP explains in INVS. This could be because Saudi Arabia is the largest oil producer and has the highest oil reserves in the region and thus investment in the oil sector in Saudi Arabia will affect oil prices, especially with discoveries of more oil reserve in the country.

On the other hand, while YS explains a large amount of variation in INVS, we find that investment explains only a small but significant variation in YS, which means the effect of YS on INVS is stronger than the effect of INVS on YS within our investment model. Conversely, while GS explains a relatively small amount of variation in INVS, we find that INVS explains a large percentage of variation in GS, which means

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that the effect of INVS on GS is stronger than the effect of GS on INVS within our investment model. The impulse response function in Table 6-1 shows that besides INVS to itself, YS and IP have a permanent positive effect on investment. As expected, a positive shock in investment will have an immediate and strong permanent impact on itself. Also, a positive shock in YS will have a strong positive impact on INVS starting from the first period and establish a permanent impact. The impact of YS on investment reaches its peak around the sixth period; it then decreases and begins to increase again to become permanent. This is consistent with the results that we obtained in the variance decomposition analysis where YS was the most influential variable on investment. Also, investment will respond to a positive shock in IP gradually starting from the first period and beyond.

However, the positive impact of a positive shock in IP on investment is less than the positive impact of a positive shock in YS on investment. The positive shock in IP will reach its peak effect on investment around the fourth period and then will have a permanent positive effect on INVS. On the other hand, unexpectedly, a positive shock in GS will have a positive effect on investment until after third period and then it becomes a permanent negative effect on investment. Thus, the long run impact of a positive shock in GS on investment is permanently negative. The explanation for this negative impact could be that a large amount of government spending in a political crisis usually goes to enhance its army and security by importing more weapons, which affect investment negatively. Since the region is classified as a conflict or unstable region, most of the government spending goes to national security such as purchasing weapons, which affects spending on productive investment in the long run. In addition, in the 1970's,

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1980's, 1990's, and 2000's, there were many conflicts and wars in the region where Saudi Arabia is supporting one side against another financially, which affects its spending on investment inside the kingdom in the long run. Another reason could be that a major increase in oil prices is usually followed by a large decrease in oil prices, which affects government spending on social capital investments which are a large component of total investment in Saudi Arabia. A positive shock in DLS, in general, will have a permanent, small negative effect on investment. However, as shown by variance decomposition this impact can be ignored because it has a small (insignificant) impact. Thus, impulse response functions demonstrates that YS, IP, GS have a long run effect on investment.

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Table 6-12: Forecast Error Variance Decomposition from ECM for Investment in Saudi Arabia:

Variance Decomposition of INVS:					
Period	INVS	YS	IP	GS	DLS
1	100.0000	0.000000	0.000000	0.000000	0.000000
2	73.55539	14.14692	4.299072	0.348532	7.650084
5	56.90611	24.56565	9.745184	6.730502	2.052558
8	45.77439	34.92960	7.908836	9.755885	1.631291
10	43.23410	37.51049	7.554582	10.12834	1.572500
Variance Decomposition of YS:					
Period	INVS	YS	IP	GS	DLS
1	11.79054	88.20946	0.000000	0.000000	0.000000
2	18.03463	70.49827	4.504718	5.529951	1.432434
5	11.20641	72.39341	2.613228	13.15492	0.632034
8	8.391036	73.43792	1.887669	15.56875	0.714624
10	7.571076	73.89660	1.665302	16.09209	0.774936
Variance Decomposition of IP:					
Period	INVS	YS	IP	GS	DLS
1	75.16642	0.035189	24.79839	0.000000	0.000000
2	74.39159	1.968280	21.72043	0.019297	1.900397
5	70.60541	3.484977	20.75515	0.743842	4.410622
8	68.37524	4.244625	20.65994	1.817864	4.902324
10	67.80086	4.537144	20.61847	2.085601	4.957925
Variance Decomposition of GS:					
Period	INVS	YS	IP	GS	DLS
1	15.70365	1.907989	2.352798	80.03557	0.000000
2	27.88645	2.157380	8.875668	56.44345	4.637045
5	38.13577	1.957631	16.56607	27.62463	15.71590
8	39.04627	2.675962	18.07247	21.52994	18.67536
10	39.59022	3.037157	18.56101	19.37501	19.43660
Variance Decomposition of DLS:					
Period	INVS	YS	IP	GS	DLS
1	0.329489	22.71946	11.89822	4.996425	60.05640
2	0.141321	32.42425	7.361054	3.449568	56.62381
5	0.597703	29.88647	5.517913	9.556345	54.44157
8	0.809796	31.30654	4.790042	10.13263	52.96099
10	0.821438	31.60361	4.611557	10.26064	52.70275

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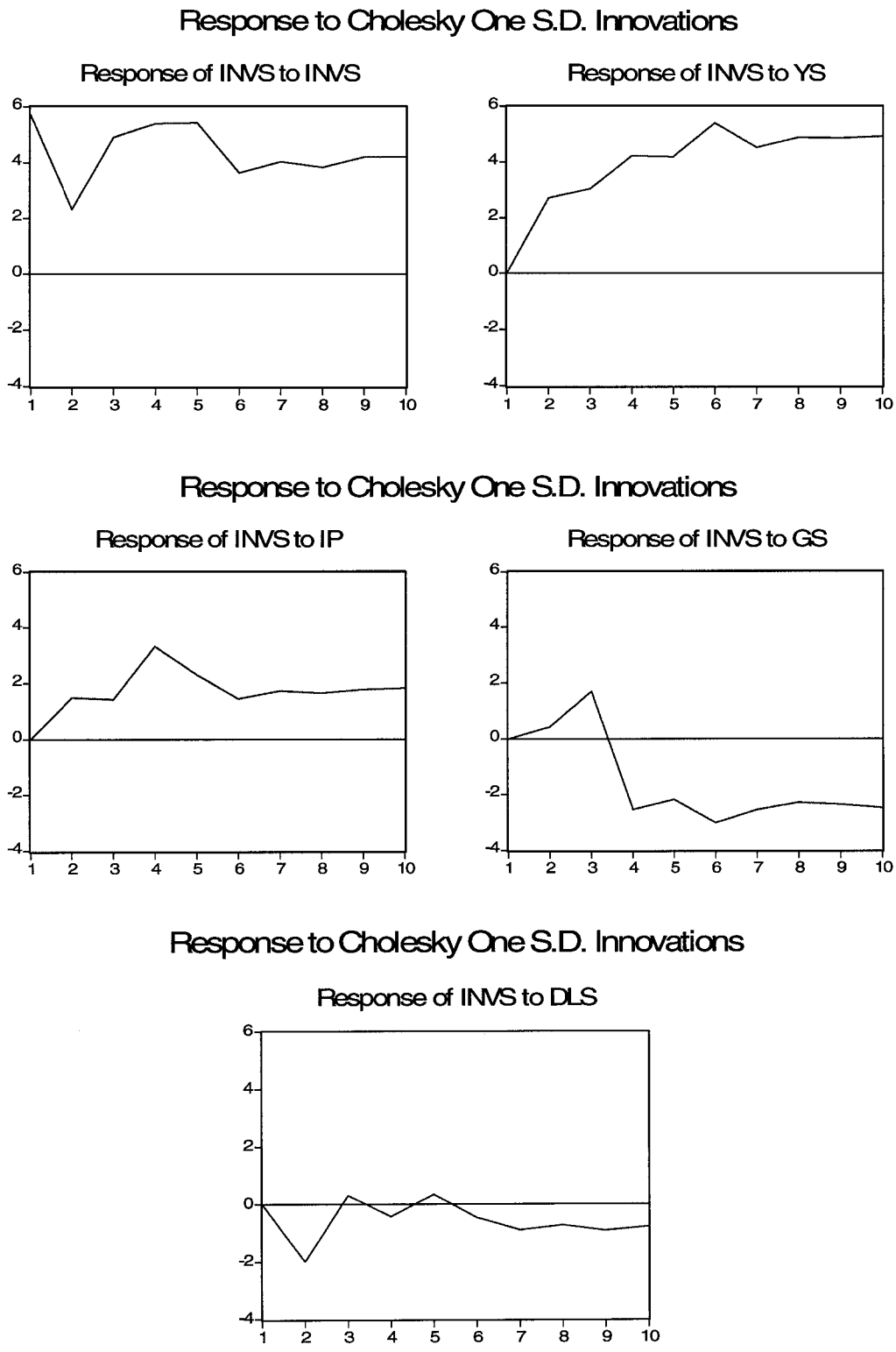
Figure 6-1: The Impulse Response Function from ECM for INVS:



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6.7.2 Government Expenditures for Saudi Arabia:

Table 6-13 shows the variance decomposition for government expenditures for Saudi Arabia. It is clear that GS explains the preponderance of its own values in the long horizon. For the long run effect, ORS explains quite high variation in government expenditures where it explains more than 19% of the variation in government expenditures in the long run. Overall, the percentage of variation in GS explained by itself decreases over time while the percentage of variation in GS explained by ORS increases over time. This means that oil revenue has more impact on government expenditures over time. This result is expected since GS is related highly to oil revenue in Saudi Arabia where oil revenue is the main source of financing government spending. Usually, when oil revenue increases, the Saudi government increases its expenditures on development and other social services. Table 6-13 shows that the only long term relation in the government expenditure model is the one running from ORS to GS. On the other hand, to see whether feedback effect exists from GS to ORS in the model, the variance decomposition of ORS in Table 6-13 shows that a feedback effect does exist between GS and ORS where GS explains about 20% of the variation in ORS. The reason for the feedback effect is that the Saudi government affects oil revenue by increasing its spending on the oil sector whenever oil revenue is high. This increase in spending on the oil sector is to modernize it, in order to minimize the cost of extracting and refining oil and maximize its profit from oil. This is clear from the fact that Saudi government built two small modern industrial cities (Jubail and Yanbu). These two cities specialize in generating energy and investing in petrochemical markets.

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INVS and IP were not able to explain much of the variation in GS which means that INVS and IP have no long run impact on government expenditures. IP does not explain much of the variation in government expenditures in the long run. I think this is because of the large Saudi oil reserve that allows the Saudi government to change oil production in the case of oil price fluctuations to finance high government spending and thus minimize the severe consequences of oil price fluctuations on government spending. On the other hand, GS explains about 31% and 23% of the variation in INVS and IP respectively in the long horizon. The reason for the unidirectional relationship is that, usually, when oil revenue increases, the Saudi government increases its expenditures to modernize the oil sector and invest more in social capital, which will in turn affect total investment in Saudi Arabia. Also, increased spending by the Saudi government on the oil sector might lead to this effect on oil prices since investing more in the oil sector will make the Saudi government step up to produce more oil when there is a shortage in oil supply that affects oil prices. Since one of the main goals for government expenditures is to help to diversify income for the country, this unidirectional causality between GS and INVS and IP in the long run makes sense. Figure 6-2 demonstrates the Impulse Response results where it shows that, as expected, positive shock in GS will have an abrupt and strong positive impact on itself immediately. In addition, it shows that the only impact on GS in the long run comes from ORS. This effect will sharply increase in the first three periods and then becomes permanent over time. For the reaction of GS to a positive shock in both INVS and IP, Figure 6-2 showsthat both impacts are very small and insignificant on GS, as was shown by variance decomposition as well. Thus, we can conclude that the only variable that has a positive long term permanent effect on GS in

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this model is ORS, which is expected since the main source to finance government spending is oil revenue in Saudi Arabia.

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Table 6-13: Forecast Error Variance Decomposition from ECM for Government Expenditure in Saudi Arabia:

Variance Decomposition of GS:				
Period	GS	ORS	INVS	IP
1	100.0000	0.000000	0.000000	0.000000
2	92.45297	6.990435	0.292888	0.263709
5	79.70361	19.31739	0.464715	0.514280
8	80.17243	19.16174	0.303834	0.361992
10	80.10190	19.30744	0.278223	0.312442
Variance Decomposition of ORS:				
Period	GS	ORS	INVS	IP
1	13.76305	86.23695	0.000000	0.000000
2	13.16155	86.48208	0.003960	0.352406
5	17.98709	74.85410	5.379815	1.779003
8	19.76046	73.16936	5.404649	1.665531
10	20.19495	72.73400	5.385010	1.686037
Variance Decomposition of INVS:				
Period	GS	ORS	INVS	IP
1	5.897535	22.25053	71.85193	0.000000
2	13.56481	36.96643	36.79172	12.67704
5	27.03183	50.22025	15.34677	7.401149
8	30.20624	48.40007	13.60586	7.787828
10	31.04763	48.93346	12.43205	7.586858
Variance Decomposition of IP:				
Period	GS	ORS	INVS	IP
1	14.48272	52.93282	0.056860	32.52760
2	17.80055	65.56857	0.652063	15.97882
5	20.84011	70.22787	0.322508	8.609507
8	22.44931	70.26435	0.233085	7.053254
10	22.83601	70.56161	0.187337	6.415040

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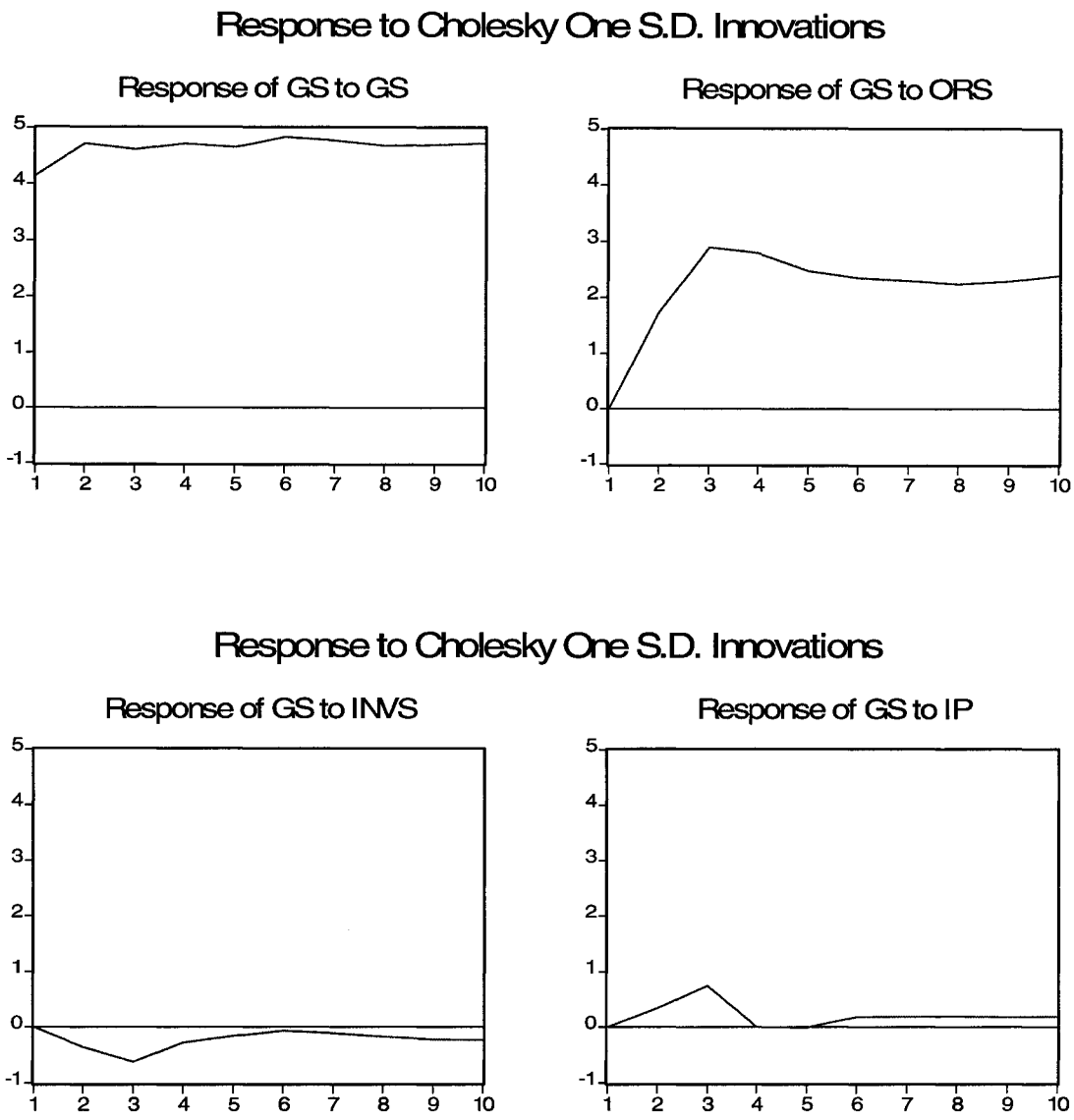
Figure 6-2: The Impulse Response Function from ECM for GS:



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6.7.3 Income Growth for Saudi Arabia:

Table 6-14 shows the variance decomposition for income growth in Saudi Arabia. As expected, oil revenue explains about 35% in the variation of income growth in Saudi Arabia. Note that this percentage increases over time indicating how important oil revenue is to the economy of Saudi Arabia in the long run. The short run causality using Chi-square shows that oil revenue was causing YS in the short run, too. This is consistent with our prediction that oil revenue plays the most important role in explaining variation in income growth in Saudi Arabia in both the short and long runs since the economy is largely dependent on oil. Thus, with regard to the long run relationship between the two variables, variance decomposition shows that there is a long horizon relation running from oil revenue to income growth in Saudi Arabia. Nonoil revenue does not explain much of the variation in YS in the long run. It explains only about 4% of the variation in YS. Unlike oil revenue, the nonoil sector is not causing income growth in Saudi Arabia in the long run or in the short run, as was shown in the Chi-square results. Thus, we can conclude that economic policies and development plans used by the Saudi government to diversify income or to be less dependent on oil are not effective. This is made obvious by the small contribution of the nonoil sector in both the short run and long run to the income growth in Saudi Arabia. Therefore, the Saudi government has to find more effective policies to increase the participation of the nonoil sector in the economy.

Moreover, fluctuations in oil price explain about 6% of the variation in income in Saudi Arabia in the long run and this is enough to conclude that IP Granger causes YS in the long run. This result is expected since any fluctuation in oil prices will be transmitted to income growth in Saudi Arabia through the effect on oil revenue. This shows that even

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with government efforts to reduce the effect of oil price fluctuations by adjusting its oil production, in the long run IP still have some significant effect on income growth in Saudi Arabia.

On the other hand, in considering whether YS explained any significant percentage of the variation in the dependent variables we found that YS explained about 13% of the variation in NOS. Thus, we conclude that there is a long run causality running from YS to NOS. I believe that this is a result of the fact that high oil revenue leads to more income growth in Saudi Arabia, and which in turn leads to more spending on the nonoil sector.

Figure 6-3 shows that overall a positive shock in YS will have an abrupt and strong, positive and permanent impact on itself immediately, which demonstrates the result of variance decomposition. Impulse response function shows that a positive shock in ORS leads to a positive impact on YS in the beginning, when it reaches its peak at period two and then decreases to become negative overtime. The reason could be because a positive shock in oil revenue, as a result of an increase in oil prices for example, will lead to a positive effect on income growth in the beginning. Then demand for oil will decrease, leading to a negative effect in the long run. An example of this is when oil prices increased sharply in the 1970's leading to a huge positive effect on income growth in oil producing countries as a result of high oil revenue. However, the sharp decrease in oil prices in the mid and late 1980's and 1990's led to a negative effect on oil income growth in the oil producing countries. Another reason could be that higher oil revenue as a result of higher oil prices would lead to development of more oil fields around the world especially in other oil producing countries (particularly the non-OPEC member

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countries) and thus affect the demand for oil from Saudi Arabia and consequently affect income growth in Saudi Arabia in long run.

In addition, a positive shock in oil prices will have a small but significant permanent positive impact on income growth in Saudi Arabia. It might be that overall changes in oil prices caused this positive effect. Note that even with oil price fluctuations, oil is still the main source for income and economic growth in Saudi Arabia. For example, when there was a sharp increase in oil prices in the 1970's and early 1980's which led to economic growth in Saudi Arabia, its effect helped the country to overcome the economic crisis in the late 1980's, when there was a major decrease in oil prices due to huge foreign exchange reserves from the1970's and early 1980's. Consequently, the overall effect on income growth was positive on the Saudi economy. A positive shock in NOS will have a positive small impact on YS. This impact reaches its peak at period four and then decreases overtime. Overall, we notice that the nonoil sector has a small fluctuating effect on income growth in Saudi Arabia and thus can be ignored.

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Table 6-14: Forecast Error Variance Decomposition from ECM for Income Growth in Saudi Arabia:

Variance Decomposition of YS:				
Period	YS	ORS	NOS	IP
1	100.0000	0.000000	0.000000	0.000000
2	79.43738	15.78804	1.847107	2.927473
5	77.17160	9.130456	7.561434	6.136510
8	63.37013	25.74586	4.572928	6.311083
10	54.48557	35.33260	4.086095	6.095729
Variance Decomposition of ORS:				
Period	YS	ORS	NOS	IP
1	10.36070	89.63930	0.000000	0.000000
2	5.270049	92.28298	2.434588	0.012386
5	4.204993	74.27201	19.09508	2.427919
8	4.471182	72.02639	20.65166	2.850762
10	4.910509	71.19099	20.43945	3.459055
Variance Decomposition of NOS:				
Period	YS	ORS	NOS	IP
1	3.216978	48.43571	48.34731	0.000000
2	5.669658	51.51138	42.68000	0.138959
5	11.15867	55.86037	31.86959	1.111368
8	12.56779	49.70785	36.14653	1.577837
10	12.64521	47.26070	38.46895	1.625137
Variance Decomposition of IP:				
Period	YS	ORS	NOS	IP
1	0.763892	47.62229	1.132142	50.48167
2	0.537524	62.80573	0.977784	35.67897
5	1.561739	64.04823	13.51905	20.87098
8	1.324300	62.24583	15.61992	20.80995
10	1.274299	61.64676	15.25549	21.82345

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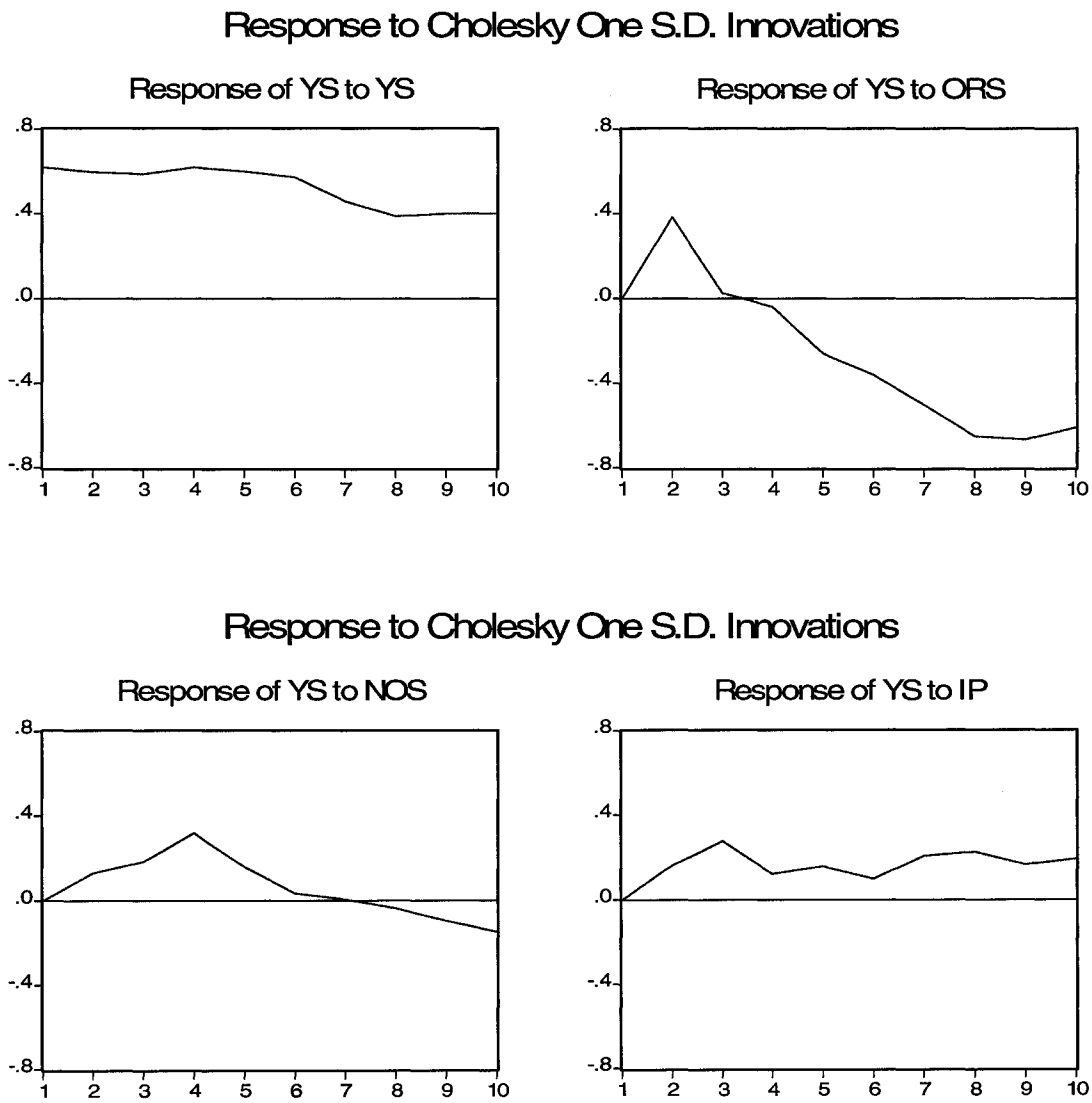
Figure 6-3: The Impulse Response Function from ECM for YS:



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6.8 Long Run Causality in ECM for the Models of Pakistan:

6.8.1 Investment for Pakistan:

Table 6-15 shows the variance decomposition for investment in Pakistan. We notice that YP explains more of the variation in INVP over time. While in the second period YP explains about 9% of the variation in investment in Pakistan, this explanation of variation in investment by output in Pakistan increases over time to be about 16% in the 10^{th} period. This is shown also in Figure 6-4 where, for the relationship between INVP and YP, a positive shock in the YP will lead to a positive permanent effect in INVP, consistent with economic theory. Note that in our short run results using Chi-square, YP also was causing INVP. We notice that a long run relationship is running from all independent variables in the investment model to INVP. Table 6-15 shows that there is a long run causality running from YP, WR, FAP, and IP to INVP in Pakistan. FAP explains about 10% of the variation in INVP. This again shows the importance of foreign exchange generated by foreign aid to investment in Pakistan. It is expected that foreign aid be invested effectively in the Pakistani economy. This is also seen in Figure 6-4 where it shows that a positive shock in the FAP will have a permanent positive effect on investment in the long run as FAP reaches its peak at the third period.

Also, a positive shock in oil price fluctuation will have a positive effect on INVP. This might be because Pakistan is an oil consumer, especially since after its attempt to industrialize or modernize economy it became more dependent on oil. Pakistan as a country is a target for oil investment (for reasons explained before) and therefore we can conclude that oil price fluctuations are more beneficial to total investment for the economy. It is obvious that YP explains a larger percentage of variation in INVP than any

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other variable in the system, especially in the long run horizon which means that YP plays a main role in explaining variation in INVP, more than any other variable in the system.

There are two interesting points in this model. First, while we have seen that workers' remittances are not causing investment in the short run, it is obvious that workers' remittances have an effect on investment in the long horizon. Table 6-15 shows that WR explains more than 6% of the variation in INVP in the long run horizon. We can see that this percentage is relatively small but still significant. This result means that a significant amount of workers' remittances to Pakistan goes to investment and not just for consumption. However, we can conclude that even though workers' remittances are significant to investment, the large percentage of workers' remittances goes to consumption since the effect of workers' remittances on investment is small. Since a large part of workers' remittances goes to consumption, which is a component of output, then we expect a larger effect of workers' remittances will occur in income growth in Pakistan. I believe that this effect of workers' remittances on investment is a result of an increase in savings since most households tend to save more because of uncertainty about the future. Second, a feedback effect exists between INVP and all independent variables in the model; however we notice that a stronger feedback effect exists between INVP and YP, indicating the strong relationship between the two variables. This means that the dependant and independent variables in the investment model are significant in explaining each other.

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Table 6-15: Forecast Error Variance Decomposition from ECM for Investment in Pakistan:

Variance Decomposition of INVP:					
Period	INVP	YP	WR	FAP	IP
1	100.0000	0.000000	0.000000	0.000000	0.000000
2	86.66959	9.095888	2.100859	0.144102	1.989562
5	66.32882	12.19395	6.712890	8.565892	6.198445
8	62.28330	14.50848	6.605920	9.509111	7.093189
10	60.98278	15.58958	6.381906	9.561146	7.484584
Variance Decomposition of YP:					
Period	INVP	YP	WR	FAP	IP
1	1.355163	98.64484	0.000000	0.000000	0.000000
2	9.770564	88.89848	0.029631	0.000611	1.300710
5	15.66758	73.20818	4.889592	5.280382	0.954257
8	17.58774	60.47594	11.88388	9.525159	0.527284
10	17.93518	56.38020	14.49159	10.78715	0.405880
Variance Decomposition of WR:					
Period	INVP	YP	WR	FAP	IP
1	0.031867	6.912467	93.05567	0.000000	0.000000
2	1.055087	4.181963	94.54807	0.186338	0.028538
5	6.214461	6.309558	81.47516	5.806925	0.193900
8	6.847210	4.352013	77.07139	11.62479	0.104596
10	6.731965	3.795885	75.80706	13.56028	0.104814
Variance Decomposition of FAP:					
Period	INVP	YP	WR	FAP	IP
1	12.07450	11.18223	16.58493	60.15834	0.000000
2	16.75003	12.66579	20.16860	42.03734	8.378238
5	32.94579	12.80352	21.53846	25.84666	6.865564
8	35.03730	10.23756	27.10243	21.88511	5.737599
10	35.37414	9.022856	30.77916	19.50536	5.318494
Variance Decomposition of IP:					
Period	INVP	YP	WR	FAP	IP
1	3.190768	0.845803	0.849359	14.61064	80.50343
2	19.35471	0.619509	0.760330	19.81743	59.44803
5	35.12785	1.247484	11.87002	11.99721	39.75744
8	39.94908	0.742962	19.38955	7.428766	32.48964
10	41.19944	0.589773	23.21148	5.759910	29.23940

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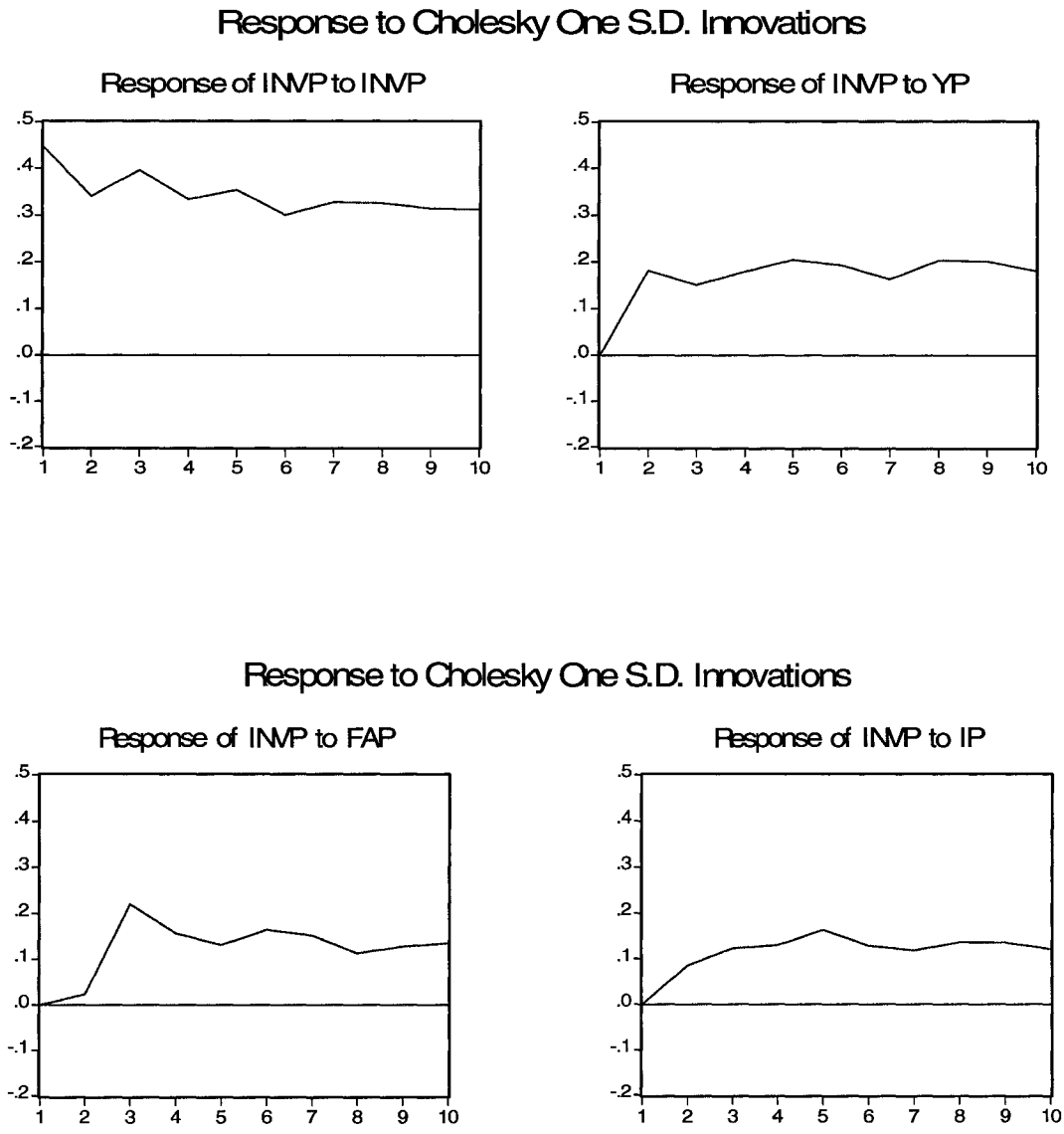
Figure 6-4: The Impulse Response Function from ECM for INVP:



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6.8.2 Workers Remittances for Pakistan:

Table 6-16 shows the variance decomposition for workers' remittances for Pakistan. It shows that the only variable, besides inflation rate in Saudi Arabia, that explains the large percentage in variation in WR in the second period and 10^{th} period, is YS, with about 7% and 64% respectively. This means that the role of YS in explaining variation in WR increases over time, which means that YS becomes more significant in affecting WR in the long run. This huge percentage of variation explained by YS in WR emphasizes one of the goals of this study which is showing the importance of economic growth in Saudi Arabia to workers' remittances, which in turn (economic growth) is affected by oil price fluctuations and oil revenue. Note that in our Chi-square for short run results, economic growth in Saudi Arabia also caused workers' remittances in this model. Thus, in both the short and long run there is causality running from income growth in Saudi Arabia to workers' remittances to Pakistan. This is expected and consistent with the theory that economic prosperity or an increase in economic growth in Saudi Arabia will affect workers' remittance to Pakistan in the long run through increased demand for labor and increasing job opportunities for Pakistani workers. This an indication of the significant amount of money transferred to Pakistan from Saudi Arabia which is related to economic prosperity in Saudi Arabia.

On the other hand, some economists such as Swamy (1981) found that the inflation rate affects workers' remittances. This study supports Swamy's results where the inflation rate in Saudi Arabia explains more than 7% of the variation in WR in long horizons. We notice, however, that the role of inflation in explaining variation in WR decreases over time, but is still significant. Table 6-16 shows that the inflation rate

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explains about 12% of the variation in WR in the fifth period and then decreases to 7% in the 10^{th} period. When we investigate for the feedback effect, we notice that WR explains about 10% of the variation in the inflation rate in Saudi Arabia. There is a large number of foreign workers in Saudi Arabia, including Pakistani workers, and this number of foreign workers is increasing each year. Thus, I believe that the increase in demand on goods and services by those workers in Saudi Arabia will lead to an effect on the inflation rate, especially since most Pakistani workers tend to bring their families with them to Saudi Arabia because of common religious beliefs. Also, some of the workers' remittances are transferred to Pakistan in the form of goods, which means an increased demand in the economy which might cause inflation in Saudi Arabia. Furthermore, oil price fluctuations do not play a part in the Pakistani workers' decisions to transfer money to their home country since IP does not explain much of the variation in WR. Usually, Pakistani workers have long run contracts that are not subject to oil price fluctuations and thus any change in oil prices does not affect Pakistani workers' salaries and wages or the decisions of Pakistani workers when they transfer money to Pakistan. Thus, we conclude that oil price fluctuation does not affect workers' remittances in our model in both the short and long run. On the other hand, the variance decomposition of IP within the model shows that there is a long run horizon running from WR to IP where WR explains about 30% of the variation in IP in the long run horizon. This means that WR is causing IP in both the short run and long run.

Figure 6-5 shows that, as expected, a positive shock in WR will lead to an abrupt, large, permanent and positive effect on itself. Furthermore, Figure 6-5 demonstrates the strong relationship between WR and YS as shown by the variance decomposition of WR.

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The figure demonstrates that a positive shock in the economic growth in Saudi Arabia will have an increasing positive effect over time on workers' remittances to Pakistan. I believe that this positive effect is as a result of increased demand on labor from Pakistan and more job opportunities for Pakistani workers when there is more economic growth in Saudi Arabia.

The inflation rate in Saudi Arabia has a relatively small significant positive effect on WR. This effect reaches its highest level at the fourth period and then becomes stationary and permanent over time. On the other hand, Figure 6-5 shows the negative impact of a shock in IP on WR. This impact gets larger in the long run, but it is still insignificant as shown by the variance decomposition of WR as well.

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Table 6-16: Forecast Error Variance Decomposition from ECM for Workers' Remittances in Pakistan:

Variance Decomposition of WR:				
Period	WR	YS	DIFS	IP
1	100.0000	0.000000	0.000000	0.000000
2	73.21146	18.24887	8.534370	0.005295
5	45.00593	42.63383	12.21715	0.143095
8	31.79299	59.17049	8.042328	0.994197
10	27.84477	63.57037	7.349969	1.234884
Variance Decomposition of YS:				
Period	WR	YS	DIFS	IP
1	0.015171	99.98483	0.000000	0.000000
2	0.381061	99.19652	0.335664	0.086755
5	0.393654	97.15635	0.560125	1.889869
8	0.535704	96.76533	0.447803	2.251161
10	0.630134	96.43854	0.557898	2.373431
Variance Decomposition of DIFS:				
Period	WR	YS	DIFS	IP
1	1.079168	0.708675	98.21216	0.000000
2	2.439096	20.99513	74.44590	2.119880
5	10.85163	24.20369	60.03463	4.910043
8	12.57408	57.00523	27.46942	2.951274
10	10.46766	67.65927	19.63014	2.242935
Variance Decomposition of IP:				
Period	WR	YS	DIFS	IP
1	14.17899	1.245844	7.581317	76.99385
2	18.35329	2.776318	8.879234	69.99116
5	28.52755	23.53135	9.531257	38.40985
8	31.34665	34.55636	6.036636	28.06036
10	29.50028	42.58748	5.032449	22.87979

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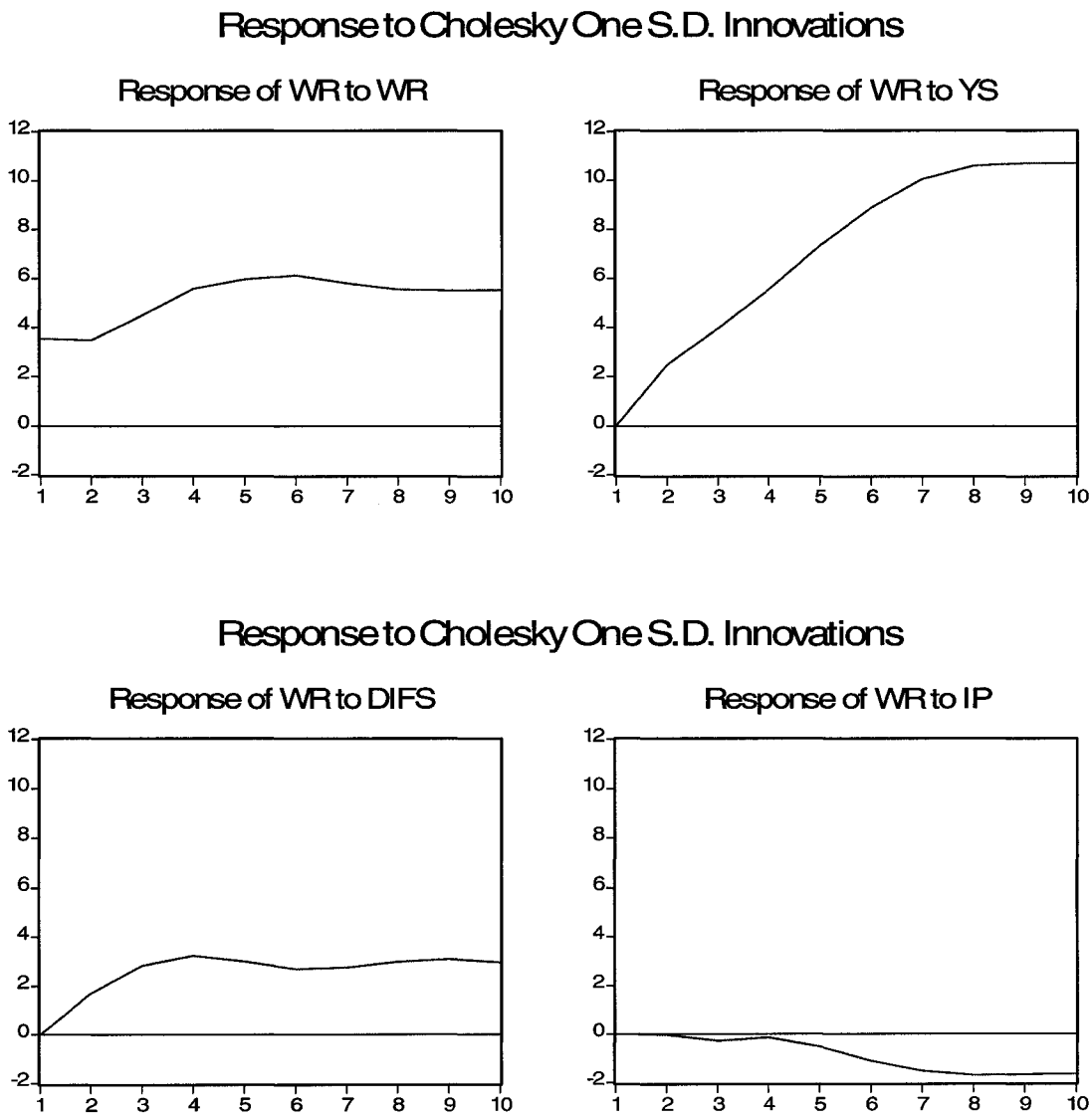
Figure 6-5: The Impulse Response Function from ECM for WR:



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6.8.3 Income Growth for Pakistan:

Table 6-17 shows the variance decomposition of income growth of Pakistan. In the long run, all independent variables explain a significant amount of the variation in YP. By using Chi-square, we have seen that WR and FAP were the only variables causing YP in the short run. Here, besides population growth and agriculture net output, both WR and FAP continue to play an important role in income growth in Pakistan. WR explains more than 7% of the variation in income growth in Pakistan. In the long run a significant amount of workers' remittances to Pakistan goes to investment. This is shown by results on the effect of workers' remittances on investment as shown in Table 6-15 for the investment model. Therefore, part of workers' remittances are used effectively in the economy of Pakistan. However, note that a large part of WR goes to consumption as well, which is one of the components of output in Pakistan. Since workers' remittances generate more foreign exchange to the Pakistani economy, workers' remittances play an important role in income growth in Pakistan. The feedback effect does exist between YP and WR since YP explains about 11% of the variation in WR. Thus, there is a long run feedback effect between WR and YP.

Figure 6-6 shows how significant WR to YP is in the long run. Overall, a positive shock in WR will lead to a permanent significant positive effect on YP, which confirms the results of the variance decomposition. Table 6-17 shows that the most influential variable in explaining variation in YP is foreign aid to Pakistan. Foreign aid explains more than 13% of the variation in YP. This suggests that foreign aid is more beneficial to the Pakistani economy in both the short run and long run, as shown in Tables 6-11 and 6-17. Note that economic aid from the United States to Pakistan was cut since 1990

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(Kronsstadt, 2003). However, the effect of this cut might be decreased or limited by aid from other countries, such as Saudi Arabia. Even though FAP is still significant to the Pakistani economy, Figure 6-6 shows that a positive shock in foreign aid has a positive effect on YP where it reaches its peak at period three, and then starts to decrease over time to be negative after period nine. The reason for this behavior might be a result of the increase in debt for Pakistan since it has to pay interest to other countries for foreign assistance as loans. For a country with limited sources of income such as Pakistan, the chances of paying on time is decreased and thus the burden of debt as a result of interest might be larger than the positive effect of foreign aid assistance in the long run. Also, Pakistan with its limited income resources might not be able to pay those loans any time in the future and thus those loans become obstacle for economic growth. Another reason for this behavior might be explained by the "two-gap" model. According to the model developed by Chenery and Alan (1966), to achieve a given growth rate, a developing country has to have sufficient savings for investment and enough foreign exchange to purchase the capital goods essential for development from the international market. In the case of Pakistan, U.S. aid to Pakistan generally has been prohibited since 1990. This prohibition might have negatively affected economic growth in Pakistan in the long run as shown in Figure 6-6. Moreover, this prohibition might prevent Pakistan from having sufficient savings and foreign exchange even with aids coming from countries such as Saudi Arabia. On the other hand, population growth in Pakistan explains about 9% of the variation in YP. This result is also supported by Figure 6-6 showing that a positive shock in population growth leads to an overall small but significant permanent positive impact on YP. This might be because Pakistan uses a good education system in order to transfer

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the economy to a modern industrial economy. The education system in Pakistan, like its neighbor India, is producing productive labor that is able to deal with new technology which in turn would lead to an increase in the per capita GDP. AGP explains about 9% of the variation in YP in the long run horizon. The amount of variation in YP explained by AGP is expected since the agriculture sector plays an important role for the economy of Pakistan; however Figure 6-6 shows that a positive shock in agriculture net output would lead to an overall small but significant negative effect on YP. I believe that the reason for this negative impact is coming from the fact that the Pakistani economy is in the process of changing to an industrial economy. Thus, any positive shock in the agriculture sector might cause the economy retreat to its traditional stage.

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Table 6-17: Forecast Error Variance Decomposition from ECM for Income Growth in Pakistan:

Variance Decomposition of YP:					
Period	YP	WR	FAP	DPOP	AGP
1	100.0000	0.000000	0.000000	0.000000	0.000000
2	93.26121	0.215664	0.393980	5.949987	0.179159
5	67.85874	3.082923	15.60366	6.714573	6.740106
8	64.29790	5.970591	14.04021	7.367636	8.323658
10	62.03231	7.137451	13.35032	8.525427	8.954485
Variance Decomposition of WR:					
Period	YP	WR	FAP	DPOP	AGP
1	0.040432	99.95957	0.000000	0.000000	0.000000
2	8.079931	88.44490	1.197563	1.602171	0.675432
5	8.352445	81.84620	4.906796	1.424323	3.470235
8	6.563461	85.16205	3.321079	1.981693	2.971715
10	11.21012	79.33059	5.349298	1.850365	2.259630
Variance Decomposition of FAP:					
Period	YP	WR	FAP	DPOP	AGP
1	27.60843	7.318520	65.07305	0.000000	0.000000
2	23.71919	8.794185	56.63566	0.042845	10.80812
5	17.85659	17.87589	55.16591	0.219141	8.882465
8	14.18433	28.60711	49.65911	0.176343	7.373104
10	12.28155	34.02620	47.07027	0.160828	6.461155
Variance Decomposition of DPOP:					
Period	YP	WR	FAP	DPOP	AGP
1	8.754341	9.455662	2.491275	79.29872	0.000000
2	21.50077	3.844989	2.779231	69.67490	2.200108
5	37.16552	4.932823	11.89859	45.39407	0.608994
8	40.21147	6.777300	15.12457	37.30289	0.583768
10	39.72856	7.965282	15.47428	36.22388	0.607995
Variance Decomposition of AGP:					
Period	YP	WR	FAP	DPOP	AGP
1	1.147002	2.910530	23.96236	19.68571	52.29440
2	1.012793	3.868875	27.19847	25.70039	42.21947
5	2.088473	8.667379	28.01053	20.75773	40.47589
8	1.739320	11.17309	27.19933	19.16258	40.72569
10	1.459795	12.19634	26.01166	19.13029	41.20192

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Figure 6-6: The Impulse Response Function from ECM for YP:

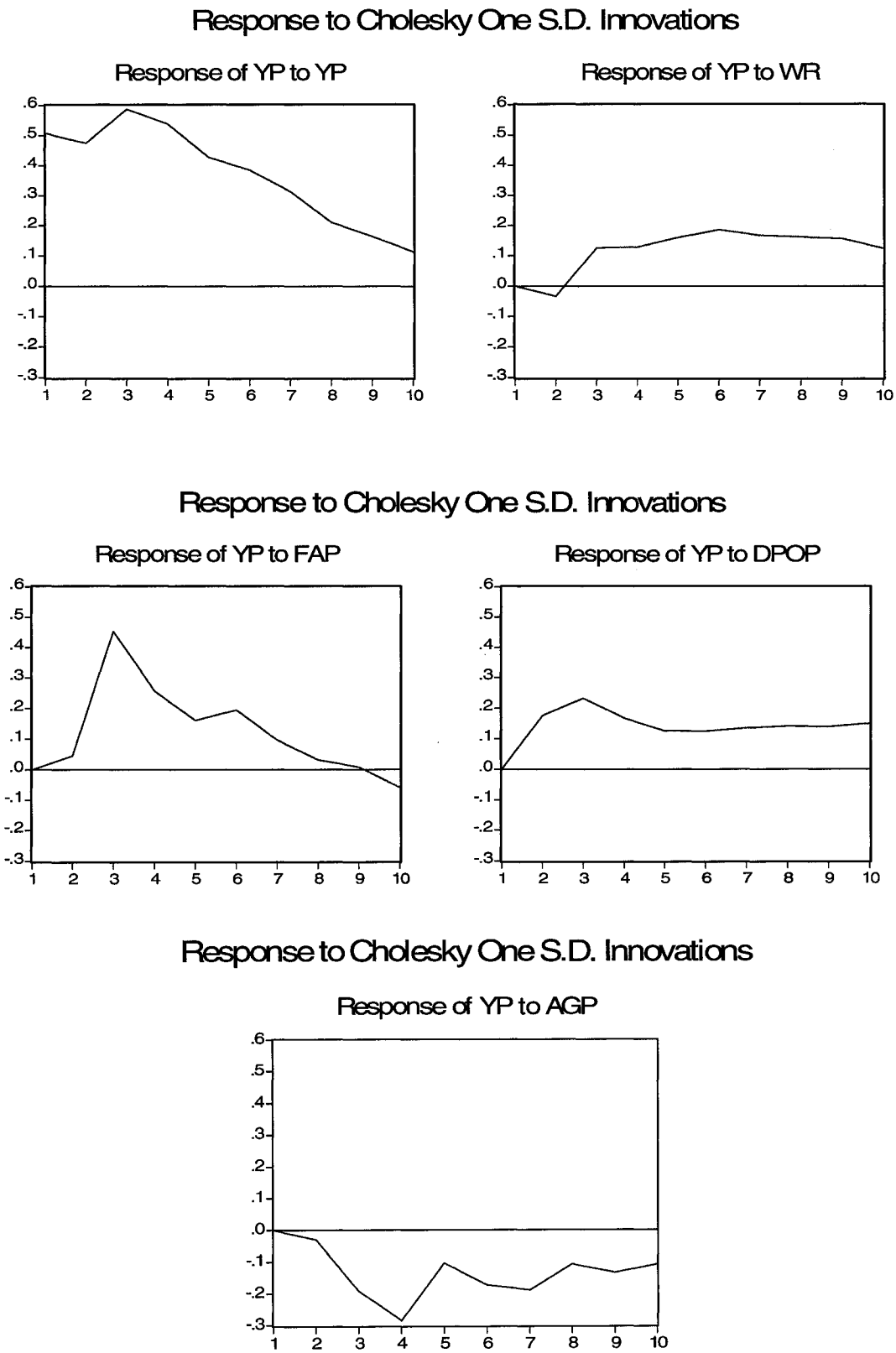

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Table 6-18: Summary of the Empirical Results*

Countries	Models	Johansen-Cointegration Tests	Causality based on Error Correction Term	
			Short Run	Long Run
Saudi Arabia	Investment	Exist	IP → INVS GS → INVS	YS ↔ INVS IP ↔ INVS GS ↔ INVS
	Government Expenditure	Exist	NO	ORS ↔ GS INVS ← GS IP ← GS
	Income Growth	Exist	ORS → YS	ORS → YS IP → YS NOS ← YS
Pakistan	Investment	Exist	YP → INVP FAP → INVP IP ← INVP	YP ↔ INVP WR ↔ INVP FAP ↔ INVP IP ↔ INVP
	Workers' Remittances	Exist	YS → WR IP ← WR	YS → WR DIFS ↔ WR IP ← WR
	Income Growth	Exist	FAP → YP WR ↔ YP	WR ↔ YP AGP → YP FAP ↔ YP DPOP ↔ YP

*"→, ← " represent unidirectional effect
"↔" represents feedback effect.

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Chapter Seven

Conclusion and Policy Implications

Oil is a crucial good for international economies. Therefore, its effects are extended to include not just oil producing countries or industrial countries but also labor exporting developing countries. As the main source of revenue in oil based economies, any fluctuations in oil prices are expected to influence macroeconomic variables in those economies. On the other hand, one of the main channels that transmit the effect of changes in oil prices to labor exporting countries is workers' remittances. As the second main source for foreign exchange after foreign aid, workers' remittances play an important role in generating foreign exchange for labor exporting economies since these economies have limited sources of income. Since their economies are not largely dependent on oil due to lack of industrialization, most of the labor exporting countries do not pay much attention when there is a change in oil prices. One of the aims of this study is to clarify that labor exporting countries should carefully watch the oil market since it is affecting their economies directly and/or indirectly through worker's remittances, one of the main sources for foreign exchange for their economies. Workers' remittances, as this study shows, are affected largely by changes in income growth and economic activities in oil based economies that are affected by fluctuations in oil prices. Understanding how fluctuations in oil price affect macroeconomic variables in both oil based labor importers and labor exporting developing countries will help policymakers in both economies to design economic policies that are able to reduce the effect of oil price fluctuations. Oil

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based economies are represented in this study by Saudi Arabia and labor exporting economies are represented by Pakistan.

The results of this study demonstrate the huge influence of oil revenue and oil price fluctuation on the Saudi economy. Also, the results demonstrate the positive effects of workers' remittances on the Pakistani economy. This chapter will discuss some of the major conclusions and their policy implications. In addition, this chapter will suggest some topics for relevant future research.

7.1 Conclusions for Saudi Arabia:

For the oil based economy (Saudi Arabia), we arrive at the following conclusions:

a. Long run equilibrium among variables in all models exists as shown by cointegration tests. That is, all of the dependent variables in our models have long run relationships with the independent variables as a group (they move together over time). Therefore, the dependent variables can not be sustained without a steady infusion of independent variables.

b. This study shows that oil is the main source for government spending in the long run. On other hand, government expenditures are the main incentive for investment in the country, besides oil, which is the main contributor to GDP. Consequently, any negative fluctuation in oil revenue will lead to a negative effect on these macroeconomic variables.

c. The results demonstrate how dominant oil is in Saudi economy. Income growth in Saudi Arabia is totally dependent on oil in both the short and long run. This implies that the whole economy is subject to fluctuations in oil prices and oil revenues. This is

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obvious since income growth in the long run is dependent on oil revenue and oil price fluctuations.

d. The nonoil sector in Saudi Arabia is not significant to the country's economy at this moment at it was shown by Granger causality effects which means that the nonoil sector is not able to maintain high growth rate despite development plans which tried to increase its share to output. Growth in the nonoil sector in Saudi Arabia is still dependent on income growth which in turn is mainly dependent on the oil sector. This insignificance could be a reflection of ineffective implementation or inefficiency of development plans that were set by the Saudi government to develop the nonoil sector.

7.2 Policy Implications for Saudi Arabia:

1. Results from our empirical findings imply that general reform to the economy of Saudi Arabia has to be undertaken especially for the times of high oil revenue since the government would have the resources to implement economic reform. Lately, the Saudi government has announced plans to reform the economy which include privatization, liberalization and diversification of the economy. However, three major points need to be taken into account when applying this reform. First, the Saudi government needs to learn from mistakes from five development plans pursued in the past. For example, one of the mistakes was trying to increase the contribution of the agriculture sector to the GDP by giving extraordinary incentives (subsidies) to farmers without paying attention to lack of water. The inefficiency of such development plans is obvious, since thirty years after starting implementation of those development plans, the nonoil sector's contribution to income growth is still small. Second, implementing economic reform will not be easy.

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There is a strong conservative opposition from both inside the royal family for political and wealth reasons and from conservative people within Saudi society for cultural and traditional reasons. The opposition may limit this economic reform. One solution to this problem is to reach out to people using methods such as education and free media which might lead to majority support for such reform. Third, even with recent improved oil revenue, the Saudi government may not be able to finance reform in the economy such as diversification without huge participation from the private sector. The private sector plays a big role in the developed economies and therefore the Saudi government has to learn from those countries' experience to improve its private sector. One important incentive to improve the effectiveness of the private sector might be to implement strong enforcement of law, especially in respecting property rights that permit the private sector to work in a nice and safe environment. Note that an effective private sector can not be sustained without expanding government public expenditures especially on infrastructure; therefore government expenditures have to be focused on encouraging the private sector. However, the government has to take into account that infrastructure investment is not enough to stimulate an effective private sector if there are no private (non public) investment opportunities. On the other hand, the Saudi government has to do more to bring additional foreign investors to the kingdom by making the kingdom a more secure (safe) place, isolating traditional groups from the economic picture, and fighting monopoly. These steps would encourage more foreign investors to invest in the country. Thus, high priority should be given to private sector by the government which should use new high oil revenue to develop this sector in order to decrease dependence on oil.

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Establishing a free market, access to capital, incorporation into world economies, creating a safe environment for investment and eliminating institutional rigidities and bureaucracies are major steps that need to be taken in order to have an effective private sector and attract foreign investors.

2. Establishing a new separate agency to control oil and to invest high oil revenues for the future of the country would be a good idea. Currently, the oil ministry controls the oil sector in Saudi Arabia. A new agency must be independent from the government and be given all authority to use oil revenue to implement economic reform, including privatization, liberalization and diversification.

3. Saudi Arabia has to use the times of high oil revenues to save more for future investment. By saving more, the government will accumulate a sizable fund for spending in the future, especially with a growing population; thus the next generations will benefit from oil as well. Therefore, the Saudi government has to use oil revenue to affect the economy positively in the long run by investing in long run productive projects, not mainly just to finance its current spending. By saving more foreign exchange earnings, Saudi Arabia will be able to overcome some problems associated with oil price fluctuation.

4. On the other hand, limited growth policies as a result of dependency on oil can be solved by stressing more efficiency and productivity within the government sector. In Saudi Arabia, a lot of the government's employees go to work late and/or leave their offices during working hours without a reasonable cause. Therefore, to provide an attractive environment for foreign investors and encourage economic reform these problems have to be eliminated.

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5. It is Saudi Arabia's best interest to stabilize oil prices. Historical evidence shows that usually after each oil boom there is a sharp decrease in demand for oil. Therefore, the Saudi government as the biggest oil producer, has to work along with OPEC to stabilize oil prices and focus on the benefits in the long run, not in just the short run. Stabilizing oil prices will allow the Saudi government to sustain an adequate income growth rate and implement its development plans based on a solid base of oil revenue.

6. The main reason for importing skilled labor to Saudi Arabia is to develop nonoil sector. This study shows that the nonoil sector is insignificant to the economy of Saudi Arabia. Therefore, Saudi government has to evaluate the costs/ benefits of foreign labors on a time base (for example, each five years). There must be plans to make foreign workers more productive such as providing them with the appropriate updated technology, proper daily working hours, clear priorities and goals, and encouraging team work.

7. Since the structure of the economies of the oil producing countries is similar to the Saudi economy, the results of this study could be applied to those economies as well.

7.3 Conclusions for Pakistan:

For the labor exporting developing economy (Pakistan), we arrive at the following conclusions:

a. The long run equilibrium among variables in all models exists as it was shown by the cointegration tests. That is, all of the dependent variables in our models have long run relationships with the independent variables as a group (they move together over time).

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Therefore, the dependent variables can not be sustained without a steady infusion of independent variables.

b. This study shows that oil price fluctuations and oil revenue affect income growth in Saudi Arabia which in turn affects workers' remittances to Pakistan. On the other hand, workers' remittances have positive effects on investment in the long run in Pakistan. This means that a considerable amount of workers' remittances are used for saving which will lead to a positive effect on investment as economic growth theory predicts. Thus, we can conclude that workers' remittances are used rationally in Pakistan; however, the effect of workers' remittances on investment is still small. To become even more significant, the government has to improve incentive schemes to direct remittances to productive investments, as discussed in the next section on policy implications.

c. This study shows that Pakistan has a "double" problem with oil price fluctuations. Oil price fluctuations affect investment in Pakistan in the long run and also affect workers' remittances to Pakistan through its effect on income growth in Saudi Arabia.

d. Workers' remittances are positively affecting income growth in Pakistan in both the short run and long run. Since workers' remittances are used for both investment and consumption, which are both components of output, workers' remittances play an important role in the economy of Pakistan. Moreover, as a huge source for foreign exchange, workers' remittances are very important for economic growth in Pakistan, especially with limited sources of income for the country.

e. Foreign aids play an important role in investment and income growth in Pakistan in both the short and long run. However, the Pakistani government has to evaluate whether the cost of foreign aid such as interest rate paid exceeds its benefits in the long run. As it

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was shown by the impulse response function, the effect of foreign aid on income growth in Pakistan in the past was positive and then declining overtime until it became negative in the long run. Also, since Pakistan is nuclear powered and is a place to fight terrorism, industrial (rich) countries might be willing to limit their economic aid to Pakistan more and more in the future. Consequently, workers' remittances are one of the best alternatives for Pakistan as a source for foreign exchange and a source to increase saving and thus improve investment, especially since workers' remittances are a more stable source for foreign exchange.

f. This study shows that the agriculture sector is still significant to the economy of Pakistan. The attempts of the government to industrialize the economy have not affected the importance of agriculture sector to the economy.

Overall, error correction terms, short run, and long run causalities emphasize the importance of both workers' remittances and foreign aid to the Pakistani economy. This importance is expected in an economy such as Pakistan's which is dependent on such factors as sources for foreign exchange, especially with limited economic resources in the country.

7.4 Policy Implications for Pakistan:

1. This study shows that labor exporting countries are affected by oil price fluctuations as much as if not more than industrial countries. The reason is that while industrial countries have many sources for income, labor exporting countries have few and limited sources of income. One of the major sources of foreign exchange for labor exporting countries is workers' remittances. In addition, this study showed how part of workers' remittances

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goes to investment and the other part goes to consumption, which contributes to income growth in the labor exporting economies represented by Pakistan.

However, workers' remittances are largely affected by economic growth in oil based economies as shown by this study. This economic growth is related directly to oil revenue and thus any negative effect on oil revenue is going to affect workers' remittances to Pakistan.

Since workers' remittances are shown to be beneficial to income growth in labor exporting countries represented by Pakistan, labor exporting countries must apply political and economical pressure (if they can) on oil based countries and/or employ their good relationships with oil based economies to encourage them to import more labor. Instead of giving economic aid in the form of loans to labor exporting countries that can be lost to corruption, oil based countries can import labor as an economic aid to labor exporting countries. In this case, economic aid goes directly to the people in labor exporting countries. At the same time labor exporting countries do not have to worry about paying this economic aid back in the future. Moreover, labor exporting countries have to convince oil based economies that importing labor as economic aid is productive for oil based economies as well.

2. Furthermore, economic aid is subject to unstable factors such as income growth, political situations, economic crises in rich countries, but workers' remittances provide a more stable source for foreign exchange for labor exporting countries. Thus, labor exporting countries have to develop plans to try to send more workers to oil based economies instead of relying on economic aid from rich countries.

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3. Usually, unskilled laborers abroad are from low income groups with low education. Therefore a labor exporting country must have an agenda and plans to educate laborers on how to use and invest their savings in their home countries in a proper way through official banking system. For example, setting up programs to create entrepreneurs and encourage immigrant workers with high savings to invest their money in proper investment areas by creating wide opportunities for them would be a productive use of remittances for the benefit of those countries. Therefore, labor exporting countries have to create programs that convert migrant savers into entrepreneurs in order to stimulate more investment and thus encourage workers to contribute more to economic growth in the country.

4. The studies on international immigration show that a huge amount of workers' remittances go through informal channels, therefore labor exporting countries have to come up with macroeconomic and monetary policies reform that allow for a realistic sustainable exchange rate and low cost transfers. Also, trade liberalism would allow for a smooth inflow of workers' remittances to labor exporting countries. In addition, establishing a network of commercial banks with a wide range of branches, especially in rural areas, that provide efficient and speedy services to compete with the informal market would be one of the main incentives to assure a solid flow of workers' remittances to labor exporting countries. On the other hand, labor exporting countries must establish a system or mechanism and management facilities that work alongside with effective commercial banks to assure more inflow of workers' remittances to their countries, and thus increase benefits from workers' remittances to labor exporting

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economies. Also, they have to create programs that encourage people to transfer funds through official channels.

5. Finally, since the structure of the economies of South and South East Asian countries are similar to the Pakistani economy, the results of this study could be applied to those economies as well.

7.5 Suggestions for Further Studies:

The empirical results of this study contribute to the literature regarding the role of oil in oil based economies and workers' remittances from oil exporters to the labor exporting countries. This study shows that there are many other points related to this subject which could be investigated in the future. These areas include:

a. Although the nonoil sector makes a small contribution to Saudi economy, future studies could investigate issues related to the connection between foreign workers and the nonoil sector. For example, researchers could investigate what are the reasons that made the nonoil sector less developed compared to the oil sector in oil based economies even though one of the main reasons to import foreign labor is to develop nonoil sector. In other words, future studies could consider how to evaluate the benefits and costs of imported labor in terms of workers' remittances flow out of oil based countries comparing to contribution to the nonoil sector.

b. If data are available on variables such as the wages of Pakistani workers in Saudi Arabia, the number of Pakistani workers in Saudi Arabia, and weekly work hours of Pakistani workers in Saudi Arabia, further studies can investigate the relationship between oil price fluctuation and workers' remittances more precisely.

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c. Further studies could investigate possible solutions for unofficial markets channeling workers' remittances (such as Hundi) to increase the benefits of workers' remittances to labor exporting countries. Available data from unofficial markets would give more precise results since we will have precise numbers on workers' remittances.

d. If data are available for all labor exporting and oil based countries, future studies could extend this study to include all of those countries to determine whether workers remittances are productive in labor exporting countries in general, or how their role differs from country to country. At the moment, I only have data for Saudi Arabia and Pakistan and it was difficult to find data for other oil based and labor exporting countries. Also, availability of data on skilled and unskilled labor would help to investigate the subject of saving to determine which group saves more and thus contributes more to investment in labor exporting countries.

e. The globalization of financial markets would make the subject and the role of workers' remittances bigger and more important. Some key issues that need to be investigated include:

1. The role of informal remittances in the development process in the labor exporting countries, if data is available;
2. The role of financial institutions in limiting the official money transfer and steps to be taken by governments to improve incentive schemes to direct workers' remittances to more productive investments;
3. Steps to be taken to improve banking and financial institutions system to compete with informal systems; and
4. The effects of political crises on workers' remittances.

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