

The Impact of the Recent Financial Crisis on the Economic Growth of Saudi Arabia

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Abstract: Since the economic crisis started in 2007, many developing and developed countries have suffered severely. This paper empirically examines the impact of the current financial crisis on Saudi Arabia, which has been chosen as the sample because of its important role as the world's largest oil exporter. The hypothesis is that although the financial crisis has significantly affected developing countries, this does not include Saudi Arabia. The paper applies regression technique with real GDP for Saudi Arabia as dependent variable, whilst US real growth, real oil price and VIX Index are taken as independent variables. Prior to regression analysis, all the variables are tested for Stationarity applying Augmented Dickey- Fuller test. The results show that although Saudi growth was affected by the financial crisis, the sharp increase in oil prices helped the country through this period of crisis.

1. INTRODUCTION

Much has been written about economic issues, such as banks and companies going bankrupt, massive increases in unemployment rate and high increases in inflation rate. No doubt the subprime crisis of August 2007 was the worst financial crisis in the US since the 1930s. Furthermore, it is the first time that the IMF has forecast negative world growth and trade. The crisis started in the US housing sector and it spread into the banking sector and financial markets until it reached all the other sectors of the economy (Economic Outlook, 2008). In simple terms, the mortgage lenders in the US were lending money to people considered not credit worthy, but willing to pay higher interest rate to take the loan. In the case of default, the lender (banks) placed the house again on the market at a higher price. Therefore, many people could not sell their property and fell into debt. By the end of 2008, many US companies and financial organisations announced bankruptcy; for instance, Lehman Brother bank in September 2008 and General Motors (GM) in July 2009. Moreover, this crisis spread to others countries until it affected most economies whether in developed or developing countries. In particular, the EMU fell into a sovereign debt crisis starting in Greece in 2009, and it continued to affect other countries such as, Ireland, Spain and Portugal. (Economic outlook, 2010)

Many studies show that developing countries are most affected by the crisis because they are more vulnerable and less equipped against any economic shocks (Furceri and Zdzienicka, 2011). From 2002 to 2007, many developing countries thrived and achieved a very high rate of growth. For example, the Latin American countries were in a much stronger financial situation in 2007 in comparison to the crisis period of the 1990s. Also, the emerging markets in Asia enhanced their current account position by increasing their exports to the world markets. However, as soon as the subprime crisis emerged in the West, changes affected the financial situation of developing countries and many empirical studies examined this fact. Notably, Soumitra Kumar wrote a seminal paper ('The incredible hulk in Indian economic growth', 2011) studying the external sector of India and analysing the impact of the crisis on the country – this work will be mentioned in detail in the literature review section. Unfortunately, the impacts of this crisis on developing countries are double those of the impacts of the Asian crisis in the 1990s (Actionaid, 2009, p. 2). In the next decade, this may result in the death of more than 700,000 children in Africa alone, according to the World Bank's chief economists for Africa (Overseas Development Institute, 2008. page 2).

The first sign of the impact of the global financial crisis on Saudi Arabia was a decrease in the growth rate of 3.4% in 2007. Moreover, since that year, the Saudi economy has suffered from high inflation rate. For instance, in the first quarter of 2008, the inflation rate reached 10%. Saudi Arabia is well equipped and organised to withstand a financial crisis even though it relies heavily on oil income, whilst strong economic relation with the US makes it vulnerable to any shocks. Importantly, Saudi import prices increased in 2007 because of the strong economic relationship between Saudi Arabia and the US as the Saudi currency is pegged to the US dollar (Datamonitor, 2009, p. 7).

The intention of this paper is to study the impact of the current financial crisis on developing countries' growth. The hypothesis is that although the current financial crisis has affected developing countries severely, this is not the case with Saudi Arabia. The Saudi economy has been chosen as the case study because of its crucial role in the world economy. To date, studies on the impact of the crisis on Saudi Arabia are very few.

The paper is organised as follows. The next section provides a brief background on Saudi Arabia, discussing the most important aspects of the country. The subsequent literature review is divided into two parts: theoretical literature and empirical literature. In the final part, the empirical analysis of all tests is in this sequence: Stationarity test then cointegration test. The last step is the error correction model. Any recommendations will be mentioned in the conclusion part.

1.1 Brief background on Saudi Arabia

Saudi Arabia is ruled by a monarchy system. The king is responsible for the country's external and internal policies. The Saudi currency (Riyal) is pegged to the American dollar, and this is the case with the other Gulf countries. Although Saudi Arabia is still recognised as a developing country, it exercises political and financial weight globally. Financially, oil money is the main source of the economy strength and politically, Saudi Arabia is the centre of the Islamic religion. More than one and a half billion Muslims around the world pray five times a day facing Mecca.

Saudi Arabia is considered to be the world's largest exporter of oil. More precisely, in January 2011, Saudi crude oil exports reached 6.39 million barrels per day. Indeed, there are plans to boost oil exports to 10 million barrels per day by the end of this year. In fact, the main reason behind this massive change in oil exports is the political instability in the Middle East, especially in Libya, where oil exports froze at the beginning of March this year. Significantly, Saudi Arabia has a quarter of the world's oil reserves, which has helped the economy to survive during the crisis (Bloomberg, 2011).

The US was the top global customer of Saudi oil. However, this changed in 2009, when it was overtaken by China, and part of the Saudi plan is to protect their economy by having closer economic ties with the Chinese. Moreover, this plan involves huge changes in their economy. For instance, the government intends to spend more than \$400 billion by the end of 2013 on new public investments such as health, education and domestic infrastructure. More precisely, government spending on investment increased by 37% in 2009, and it is predicted to be higher in the following years (Datamonitor, 2009, p. 7). In addition, the Saudi government has built six new economic cities across the country to diversify the economy and to reduce the reliance on oil exporting in the future as a main source of income. These six economic cities will play a crucial role in reducing the unemployment rate and attract foreign investments. Most if not all the investment projects in Saudi Arabia including the economic cities are linked to the price of oil money. Therefore, these projects became more noticeable after the sharp increase in oil cost, but the main disadvantage of this is high inflation rate.

The inflation rate increased steadily between 2000 and 2007 – on average 3.44% – and the main factor of keeping inflation at a low level are government subsidies especially on food. However, after 2011, it is expected that the average inflation rate will increase slightly to be around 5.6% annually (US- Saudi Arabian business council, 2011). In the following graph (see figure 1) the vertical axis shows the percentage change in inflation rate and the horizontal axis represents the time period. It can be clearly observed that the Saudi's inflation rate was at low level in the period prior to the crisis approximately around 3%. However, it reached its highest level during 2008 to be around 9% on average and this is associated with high increase in oil prices. At the same time period the price of oil per barrel exceeded \$100. Although the inflation rate increased in Saudi Arabia during the crisis, it was much less than the other developing countries.

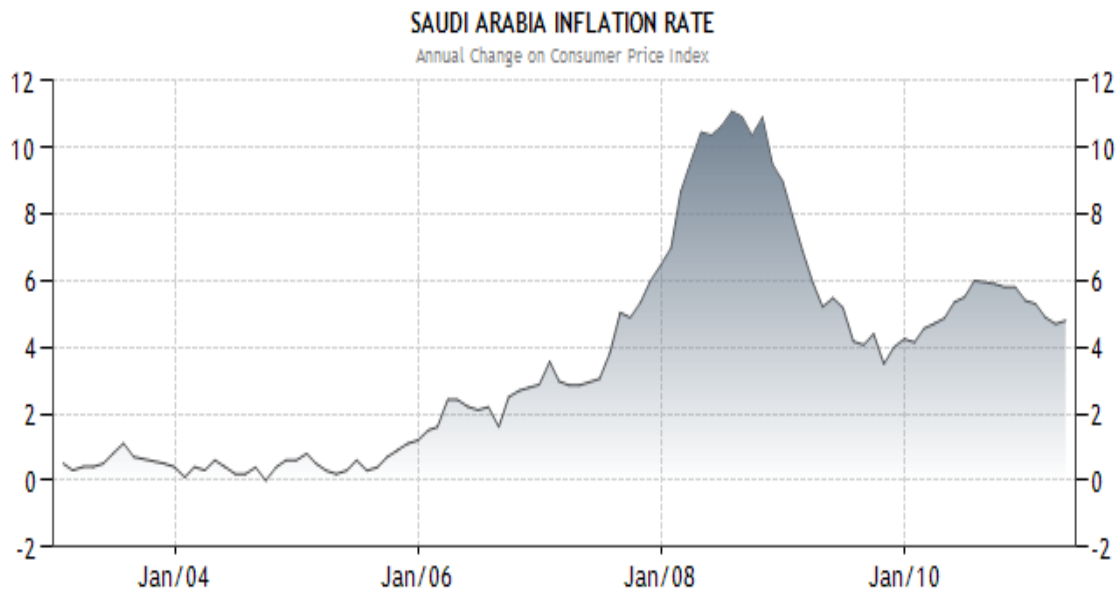


Figure 1: Saudi Arabia inflation rate

(Trading economics, 2011)

The modern state of Saudi Arabia was founded 80 years ago. This is quite young in comparison to developed countries, although all its sectors have developed very fast. No doubt oil has supported this development in the middle of the Arabian desert because it is the basis of the Saudi economy. More than 80% of Saudi budget revenues are derived from the petroleum sector and there are 90% export revenues (Theodora, 2011). The following table illustrates Saudi growth during the period between 1980 and 2010. The horizontal axis represents the time period and the vertical axis shows the percentage change of the Saudi's GDP at current prices.

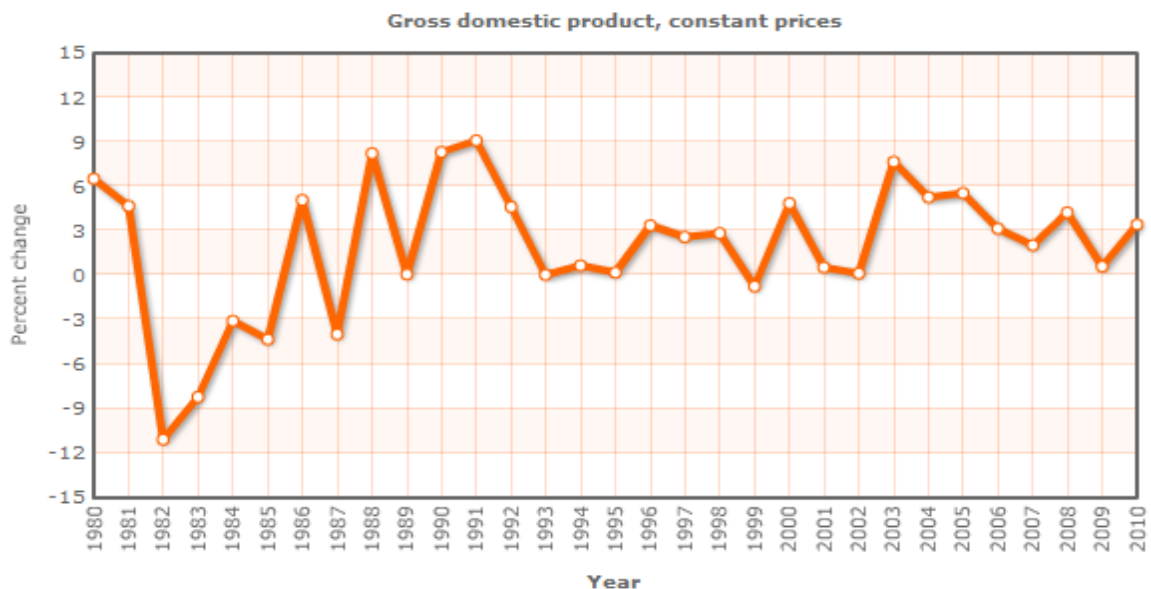


Figure 2: Saudi Arabia GDP at current prices

Source: (Indexmundi, 2011)

One of the main concerns of the Saudi government is unemployment. Although the country has been thriving from a high growth rate, unemployment has increased in the last 10 years. For instance, the unemployment rate reached 26% in 2007. According to Datamonitor, the main reason behind the high rate of unemployment is "The country's education system which is often blamed for its failure to equip young Saudis with the right skills" (Datamonitor, 2009, p. 6).

2. LITERATURE REVIEW

2.1 *The Theoretical Literature*

2.1.1 *Previous crises*

Learning from previous experience gives us a very good understanding of the current world crisis. A similar crisis gripped the Asian financial market in the 1990s. It started in Thailand in July 1997 and spread to neighbouring regions very quickly and caused a sharp fall in the growth rate of many Southeast Asian countries. Many economists considered this an Asian financial crisis because many Asian currencies were affected severely. Moreover, this crisis spread amongst Southeast Asian countries as they had similar financial activities, and those considered to be the worst affected were Thailand, Indonesia, Malaysia and South Korea. Others, such as China and Vietnam, are believed to have escaped from the crisis with very small losses. Interestingly, the crisis affected the Southeast Asian countries in different ways. For instance, it affected private external capital flow, the net private foreign bank lending and, most importantly, the FDI (Thangaelu, Yong and Chongvilaivan, A. 2009, p. 5-12).

The Southeast Asian countries had relatively high interest rate compared to developed countries, which was one of the reasons that made this area attractive for investors. The massive increase in foreign investments led to an increase in assets prices until a very high level was reached, which created a bubble in the markets. However, this started to fall by the middle of 1996, forcing some individual investors and firms to default on their debt. Also, it is believed that the Asian crisis occurred as a result of the Thai government's decision to float its currency and break its peg with the US Dollar. Eventually, the decision contributed to bankruptcy and to worsening crisis in Thailand. When this situation deteriorated, the IMF decided to step in to bailout Thailand and other countries to the tune of \$40 billion. Fortunately, the plan succeeded in stopping the crisis in a short period.

Of further interest is the Latin American crisis of the 1970s and 1980s, which is considered the third world debt crisis. This occurred as a result of the oil price shocks. In fact, there were two shocks. The first shock caused an increase in oil price by 400% in 1973. According to Hawkins and Maese, during the first oil price shock "The unspent dollars were invested in short-term deposits of the large international banks. Acting as a financial intermediary, the international banks were then faced with the task of lending funds to qualified borrowers. The oil price shock contributed to a deep recession in the US economy during 1974-75, so the domestic demand for loans was low" (Hawkins and Maese, 1986 p. 61). Even though there was low domestic demand for loans in the US, the developing countries, especially the oil importer countries, were making a huge demand on loans. After they received their loans in 1976, the oil prices stabilised at this time, but the developing countries continued to borrow from commercial banks. Unfortunately, most of these loans were not used properly; they were used in current consumption instead of investing them in profitable projects. As a result, the total debt of the Latin American countries increased by 21.7% annually until 1979 and the inflation rate reached a high level. Then, the second oil price shock occurred, but this time the increase in oil price was only half the increase of the first shock. Surprisingly, however, the developing countries did not stop borrowing funds from banks. After the occurrence of the second shock, there was a recession across the world causing a drop in commodity prices, which prevented the developing countries from paying their debts. For example, Mexico's debts exceeded \$100 billion by the end of 1983 (Dymsky and Pastor, 1991).

In 1990, there was another financial crisis in Europe and, as a result, the British pound left the Exchange Rate Mechanism (ERM) on 16 September 1992, when they could not keep their currency above its lower level. Chun-Yeh and Ho in their recent paper ('ERM crisis in retrospect', 2011) highlighted three main causes for this crisis; firstly, the unification of Germany in 1991; secondly, the lack of credibility of the Maastricht convergence criteria; and finally, the recession that hit Europe in the same period. In the words of Buitert, Corsetti and Pesenti ('Interpreting the ERM crisis: country specific and systematic issues', 1998, p. 3) "the reunification of Germany, as well as sizable asymmetries in the macroeconomic and political conditions in many European countries, generated strong tension of increasing severity in the EMS. The main factor underlying the eruption of the ERM crisis in September 1992 was the unwillingness by European policymakers to agree on a cooperative policy response to these tensions". Bad policies and lack of regulations in fact exacerbated this turmoil across European countries. Many economists believe that the stability of the exchange rate amongst the European currencies is important for preventing inflation and increasing unemployment (Buitert, Corsetti and Pesenti, 1998, p. 4). What happened in the ERM crisis is actually a combination of bad luck – the reunification of

Germany and bad policies. No doubt that deregulation in an economy will eventually lead to a crisis. This is what has been observed from previous crises, and it should be emphasised in order that they are avoided in future.

2.1.2 Pre-Crisis Period

Before studying the impact of the financial crisis, it is worthwhile examining the situation in the period before the shock, especially the years between 2002 and 2007. In 2002, there was an expansion of fiscal and monetary policy in the US to prevent deeper effect of recession as a result of the stock market slump in 2001. Although the aim of this expansion was to help the economy, it created a bubble in the housing sector because householders own a large share of housing stocks. Moreover, in some developed countries the situation was similar to the US as housing prices increased, but the interest rate was at a considerably low level (Yifu Lin, 2008, p.28).

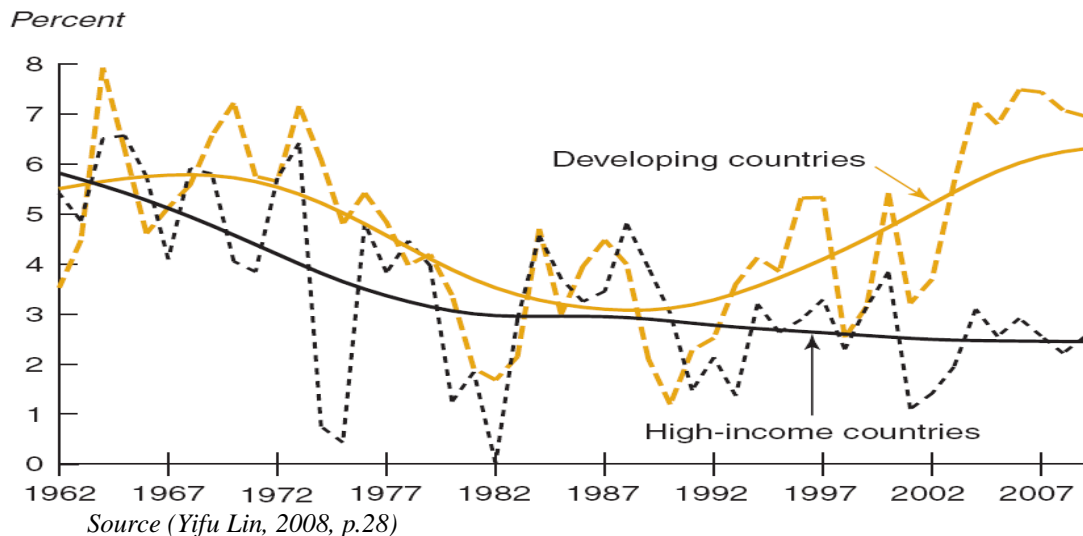


Figure 3: Collective GDP for developing and developed countries

Figure 3 illustrates the collective GDP for two groups of countries; the brown line represents the developing countries and the black line represents the developed countries. It can be seen that both developed and developing economies decreased from the 1960s to the end of the 1980s, but at the beginning of the 1990s the collective GDP for developing countries increased sharply especially after 2000 – it reached 6% by the end of 2006, which is the period before the crisis. In comparison, developed countries were struggling to achieve a high rate of growth; it was increasing on average around 2.5%, which was nearly half what the developing countries were achieving.

2.1.3 The Impact On Developing Countries

Many studies show that the losses of developed countries from the crisis are huge, but those in developing countries are also very significant. In fact, many economists argue that there exist two crises; a financial crisis and a recession. It is crucial to see the differences between them and to know how each has affected the economy most.

Firstly, the financial crisis has mainly affected the FDI, interest rate, equities and bank lending. Amongst these factors mentioned previously banking was affected most. For instance, in 2008, foreign bank lending to developing countries dropped by 60% and by 100% in 2009. On the other hand, the FDI was affected much less; it decreased by more than 30% by the end of 2009. Some countries raised money from private and public sectors through issuing bonds. However, the impact of the crisis has increased the cost of these bonds, especially bonds issued to poor countries because lenders became risk averse. In general, financial crisis made borrowing more and more expensive in developing countries as money become less available for borrowers, but it did not increase the bond cost in countries responsible for the crisis such as the US. In fact, this has intuitive meaning as the US treasury bill is the least risky bond. For example, the interest rate charged for bonds in developing countries rose by more than 5% in one year after the crisis (Actionaid, 2009, pp.4-5).

Secondly, the recession affected trade's revenues mainly, but this impact varied depending on the export of different countries. The following table shows the financial inflows and exports earnings before the crisis in 2007 and after the shock of some low and middle income countries.

Table 1: Change in developing countries GDP

Country	Total inflows 2007	Total inflows 2009	% change 2007-2009
Sub Saharan Africa	368,373	319,077	-13
South Africa	118,022	62,307	-47
Estonia	19,509	11,200	-43
Ghana	6,748	6,698	-22
Turkey	167,316	109,871	-34
Brazil	255,005	176,816	-31
India	247,932	175,344	-29
Nigeria	95,900	71,133	-26
China	1,372,763	1,075,844	-22
Malaysia	193,857	161,791	-17
Uganda	4,650	4,228	-9

Source: (Actionaid, 2009, p.4)

Developing countries are the main victims of this crisis. They have experienced massive losses in employment, a liquidity crunch and sharp decrease in exports and growth rate. According to the overseas development institute (ODI), developing countries are affected by the crisis in two ways (ODI, 2008, p.3).

- 1- The possibility of financial contagion: in May 2008 all stock markets in developed and developing countries fell sharply. For instance, when the USA stock market dropped, the Indian stock market lost 8% in the same day and this perhaps occurred because of the strong financial links between them.
- 2- Different channels of impact on developing countries:
 - A- Remittances: in a recession there are fewer migrants to developed countries. This means fewer remittances.
 - B- Trade: manufacturing businesses in countries like China and Malaysia require significant amounts of natural resources (oil, copper, etc) for production. However, the shock in 2007 reduced the exports and imports activity around the world. Even poor countries in Africa supplying natural resources were affected by the slowdown in the production sectors.
 - C- Foreign direct investment: after the credit crunch in 2007, financing new projects came under pressure.
 - D- Commercial lending: many banks in developing countries were unable to lend money to investors as much as before 2007. As the money available decreased, this led to a fall in investment around the world (ODI, 2008, p.4).

2.2 The Empirical Literature

The most important aspect of studying any economic crisis is to assess its impact on the world generally and on a country specifically. Many economists have presented very interesting work to date; some of them focused on advanced economies, whilst others were more interested in examining the impact on developing countries and emerging markets. The impact of the financial crisis actually varied from country to country. Some economies were affected more severely than others, but the question here is why these differences occurred.

The answer can be found in an interesting article by Gaston Gelos, Rennhack and Walsh (2010). This paper is considered to be the first study to show how the impact of financial crisis across developing countries differed. Empirically, in order to illustrate how some factor can derive growth forecast revisions, they used cross-country regression in 126 developing countries within two datasets of projection: consensus forecasts and world economic outlook forecasts. The dependent variable is GDP growth and the independent variables are a wide range of explanatory variables. The aim of their paper is to study four main channels, which are considered to be benchmarks for measuring the impact of the crisis on developing countries:

- 1- **Trade Linkages:** because of the strong relationship between developing countries and the developed world, the massive decrease of demand in advanced economies was expected to affect more significantly emerging markets. The set of variables used here is very precise. For example, in order to capture the direction of trade, they chose the share of trade with advanced economies and the share of commodities in total exports to measure the trade composition.

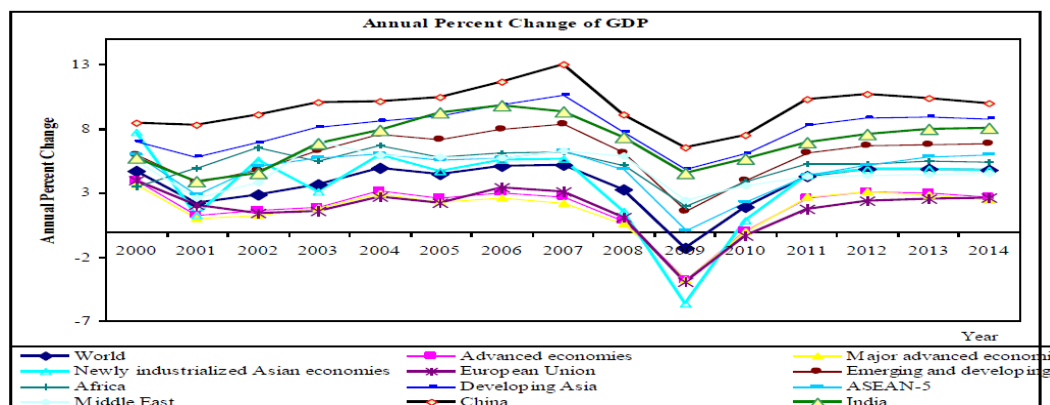
- 2- **Financial Linkage:** the stronger the financial relationship with developed countries, the more severely the impact will be. This was the most difficult channel to examine because of the difficulty of measuring the financial link amongst 126 countries. Therefore, many different variables were used to measure the linkage such as capital account and share of remittance. The result of this study showed a strong positive correlation between borrowing from developed economies and suffering from the crisis.
- 3- **Underlying Vulnerability and Financial Structure:** before the crisis period some countries were more immune to external shocks than others as they were benefitting from their position in the world markets. The result showed that countries were more vulnerable to crisis if they entered the crisis with low reserves, strong credit growth and current account deficit.
- 4- **Overall Policy Framework:** many different variables were used to measure the strength of monetary and fiscal policy. For instance, countries with pegged exchange rate were affected by the crisis much more than the countries with flexible exchange regime.

In addition, they found some factors contributed to how far the economy was affected and the following are the most important. Firstly, countries with high rate of lending to the private sectors suffer more than the countries with lower rate. Secondly, countries that export food are less affected by the crisis than those which depend on manufactured goods exports. Thirdly, the countries with pegged exchange rate regimes are affected more severely than countries with flexible exchange rate; such is the case with Saudi Arabia and the US (Gaston Gelos, Rennhack and Walsh, 2010,p. 4).

In addition, the Overseas Development Institute gave a clear view on which countries would be affected most during the financial crisis, and their forecast was similar to that in a previous paper by Pelin, Gaston, Robert, James and Walsh. However, they present more specific indicators for any given country to be more affected by the crisis than others and they are as follows:

- a- High government and current account deficit.
- b- High level of export to the most affected countries by the crisis.
- c- Depending on remittances as a source of income.
- d- Weak regulated stock markets.
- e- Exporting products whose prices are negatively affected, such as the copper in Zambia (ODI, 2008, p.5).

Even though some developing countries like China and India are the engine of the world economy and play a crucial role in world economic growth, they have suffered severely from the financial crisis. According to the World Economic Outlook in 2008, "The economic cycle in emerging Asia started to turn in early 2008, and more weakness is expected ahead in response to slowing demand from advanced economies and growing strains in regional financial markets" (World Economic Outlook, 2008 p.63). The main affect was in the external sector because countries like India and China depend heavily on the export of domestic products, which accounts for a large proportion of the budget revenue.



Source: International Monetary Fund, World Economic Outlook Database, April 2009

Source: (Soumitra Kumar, 2010, p.4)

Figure 4: Annual change of GDP globally

A further attempt to explain the differentiation of the financial impact on economies was made by Shehzad and De Haan in 2010. In their paper ('Is financial crisis in 2007 universal'), they focused on the impact of the crisis in advanced economies, and argued that only high income countries were affected by the crisis (OECD). In their analysis, they divided the financial crisis into three periods and analysed each one individually. The first period was from January 2007 to August 2008 and the second period from September 2008 to March 2009, when the crisis reached its peak. Finally, the third period started in 2009 and concluded in 2010. In the latter period some recovery signs were noticed as many stock prices started to increase especially those of banks. The model they used was simple; they ran an OLS regression and the dependent variable was an average monthly bank stock price growth for 1500 banks in 70 different countries. They also used the two following independent variables: size of the banks and reliance of banks on interest or operating revenue. Significantly, the results supported their argument that the crisis was not universal and limited to high income number. More precisely, the impact was greater on larger smaller banks even when they excluded the largest 500 banks. Also, the impact on banks which relied on interest revenue was worse than the impact on banks which relied on operating revenue. Although this paper empirically found that the impact of the current crisis was limited to high income countries, it examined the impact within financial institutions only (Shehzad and De Haan, 2010,p.18).

On the other hand, most of the empirical studies support the argument that developing countries and emerging markets are the most affected by the current crisis. A recent study by Furceri and Zdzienicka (2011) showed different results from the previous article. They investigated the impact of the financial crisis on the real output of 11 European transition countries (CEECs). They estimated an equation called Autoregressive with distributed lags (ARDL), although this method was actually initiated by Romer and Romer in 1989. However, they used this method to study in particular the impact of the financial shocks on real output. In order to assess the impact in the short and long run, they derived the IRFs impulse response function, and to identify the financial crisis the following two methodologies were used:

A- The market performance index (MPI).

B- The International Monetary Fund (IMF) database to make a dummy for the crisis.

The results from using these two methods are that the dummies have significant effect on growth, but there were small variations between them. The dummy from the IMF all its lags showed significance, but in the case of the MPI only the first three lags are significant. More precisely, when the MPI was used, it showed the financial crisis reduced the real growth by 12%, whereas the IMF had higher impact on growth by an extra 5%. However, when they used quarterly GDP the impact appeared to be much higher in both methodologies; the MPI dummy reduced growth by 28% and the IMF reduced growth by 26%. More interestingly, they applied the same tests on 15 European countries that were more developed than the 11 CEECs countries. They found that impact on growth in the 15 European countries was much less than the CEECs countries; the difference was nearly 10% (Furceri and Zdzienicka, 2011).

Similar results were found recently in Karin and Karsten ("The impact of the global financial crisis on output performance across the European Union: vulnerability and resilience", 2011), who studied the crisis amongst the European Union members. They focused on analysing the output performance of all the EU members. Therefore, they included, for example, pre-existing vulnerability and resilience as a measure of the output performance. The findings showed that the impact of the financial crisis varied amongst 27 countries in the European Union. The countries affected most by the crisis and that suffered from great losses in their output have high financial leverage and rapid financial deepening. Interestingly, debt stocks and government deficit did not have significant affect on output during the crisis period (Kondor and Staehel, 2011).

Soumitra Kumar (2011) further supports the argument that developing countries are most affected by the current crisis. In his paper ('The incredible hulk in Indian economic growth and external sector', 2010), he proved that India was affected by the financial recession as a result of a sharp slowdown in Indian external sector activity. Indian growth was thriving between 2003 and 2006, reaching a 10% growth rate with significant increases in exports and imports. This was mainly because of the low oil price and the high demand for Indian products in that period especially from advanced economies. This is the reason why Soumitra Kumar conducted his econometrics tests, which included variables on external sectors only, such as exports, imports and FDI. His empirical study specifically examined the impact of the current crisis on Indian economic growth and the external sector. In his regression the dependant variable is the Indian GDP and the independent variables are exports, imports, FDI and foreign institutional investment. However, firstly all variables were tested for Stationarity using Augmented Dickey-Fuller test. Then, he tested the data for seasonality because it showed

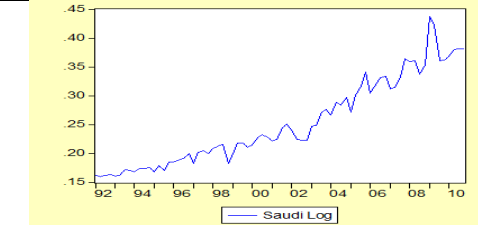
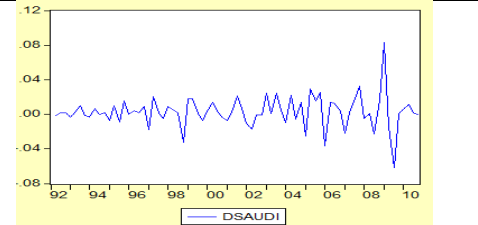
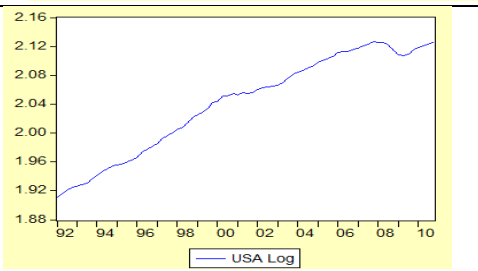
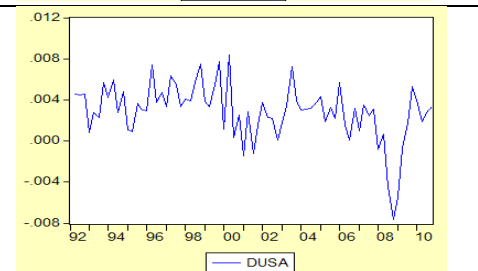
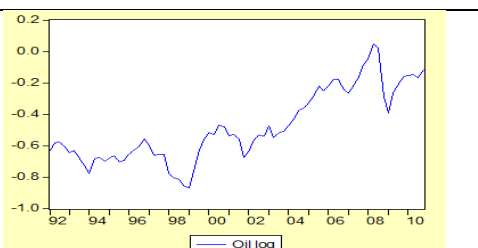
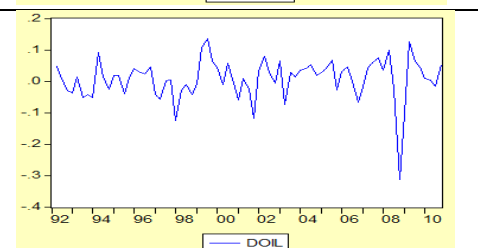
Stationarity but in different levels. The result revealed that Indian GDP was affected by the crisis in the developed world as all the independent variables showed positive impact on growth especially FDI. Nevertheless, although the history of the Indian economy has proved the validity of Soumitra Kumar’s argument and the validity of his reasons, this working paper cannot be applied to all developing economies because each country has its own factors that affect its output growth (Soumitra Kumar, 2010, p. 4). To clarify, let us take Saudi Arabia as an example. The tests in his paper cannot be applied to the Saudi economy because the economic activities are totally different to those in India. The Saudi economy is an oil based economy and most of its revenues depend on oil income, whereas India has an industrial economy. Similarly, the Chinese economy depends heavily on production activities and trade. Professor Al-Hamid, in his paper (‘The global financial crisis: impact on Saudi Arabia’, 2010), studied the role of domestic financial intermediation during the crisis period. He states that “While many economies around the globe, especially developed countries, were severely and negatively affected by the crisis in 2008 and 2009, the Saudi economy continued to show resilience and strong economic growth”. This supports the argument that the Saudi economy was not affected by the crisis as much as developed countries. Also he emphasised on that although during the crisis period there is financial instability, the Saudi’s banking sector showed an extraordinary strength and stability. For example, in 2008 the rate of return on the Saudi’s average equity was around 20%, and in 2009 it reduced slightly to be at 16%. In the next section the validation of the argument will be tested empirically on Saudi Arabia using statistical techniques.

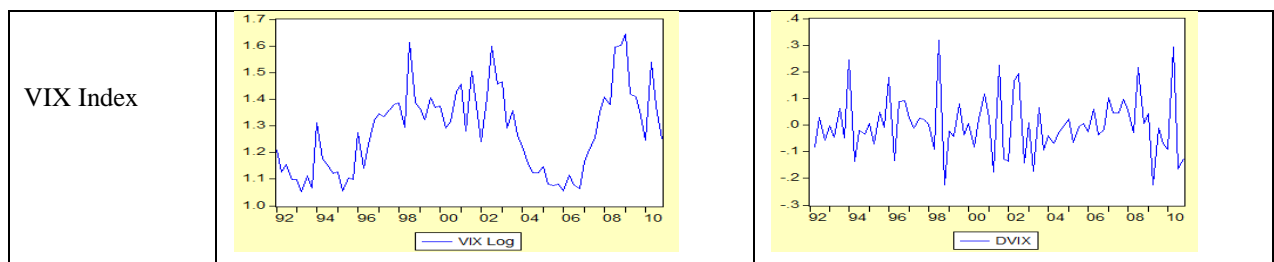
3. DATA AND METHODOLOGY

3.1 Data Description

The purpose of this section is to study closely the impact of the current financial crisis on Saudi Arabia’s growth. All the data analysed are from four sources: International Monetary Fund, International Financial Statistics, Yahoo Finance and OPEC database). The sample period is from 1/1/1992 to 30/12/2010, but as a quarterly frequency, since it is the only frequency available for the Saudi’s data. The US is also considered in the following discussion. In order to capture the shock, the VIX index has been used to present the global financial condition. Also oil prices included as it has the most effect on the Saudi’s growth. The next table provides plot of all the data in their natural logarithm and its first differences, then all variables will be discussed in details prior to econometrics tests.

Table 2 : Plot of all variables

Data	Natural logarithm	First difference
Saudi Arabia		
USA		
Oil price		



- 1- The real Saudi GDP level: Saudi GDP has been taken at current prices in US dollar currency, but in order to get the real Saudi GDP level, the Saudi GDP at current prices has been divided by the Saudi GDP deflator using exactly the same time period from 1992 to 2010 in quarterly basis. The Saudi real GDP level is considered to be the benchmark of the Saudi growth in this study. Therefore, this is the dependent variable in all regressions. Saudi GDP level is plotted against the US GDP level in figure 5.
- 2- The real US GDP level: Exactly the same methodology of the Saudi GDP level has been applied to the US data. US GDP has also been taken at current prices. Then, it has been divided by the US GDP deflator to elicit the real GDP level. The Saudi economy is linked tightly with the US economy, as was mentioned previously. Moreover, the Saudi Currency (Riyal) is pegged to the American dollar. This strong link between the two countries indicates that the Saudi economy might be affected positively or negatively by US economic conditions and vice versa. In the empirical analysis, we will examine the relationship between the two economies through the cointegration regression as this variable is one of the independent variables in the cointegration (OLS) regression.

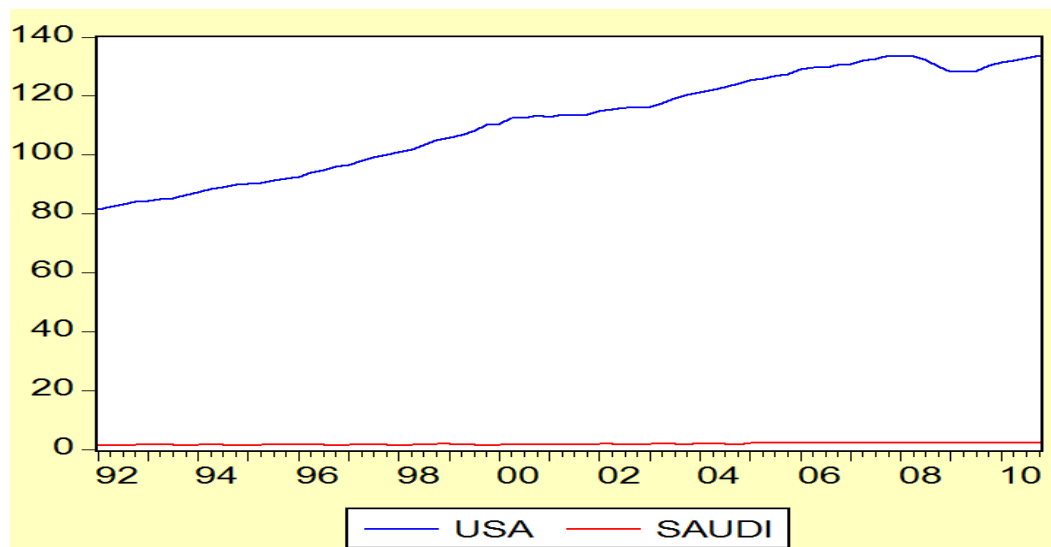


Figure 5: plot of real US GDP and real Saudi Arabia GDP

Both data, the real US GDP level and the real Saudi Arabia GDP level, are plotted using Eviews software as shown in figure 5 above. It is noticeable that the real GDP for the USA (blue line) has been increasing gradually since 1992, but with a drop at the end of 2007, which was the effect of the subprime crisis. In comparison, in the same period the real GDP for Saudi Arabia (red line) has also been increasing, but very slightly in comparison to the US. This is because of the huge difference in size between the real US GDP level and the real Saudi GDP level. The correlation coefficient between the two variables is (0.877), which is very close to one and this proves what has been assumed about the strong relationship between the two countries.

- 3- Real oil price level: The nominal oil price was collected from OPEC database in US dollar. However, in order to use it in our tests, it must be transformed to the real oil price, as the case of real GDP for Saudi Arabia and the US. Therefore, the real oil price was generated by dividing the nominal oil price on the US GDP deflator because the nominal oil price is in US dollar. Historically, the oil price was at its highest level in 1979 during the Iranian revolution. However, the oil prices decreased by half by the end of 1986. Moreover, the oil price reached a very high level at the beginning of the 1990s during the Iraqi war and continued into the current millennium.

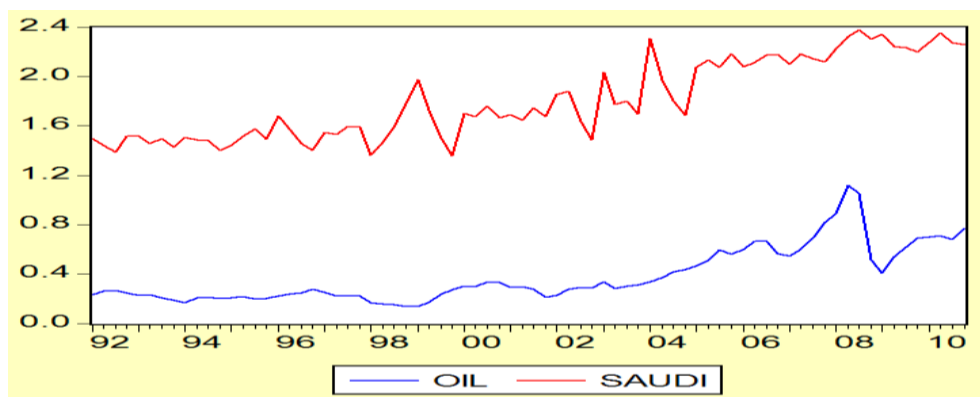


Figure 6: Plot of real oil price and real GDP for Saudi Arabia

Figure 6 is the plot of the real GDP level for Saudi Arabia and the real oil price level in a quarterly frequency. It is clearly observed that there is a co-movement between the two variables during the same period. From 1992 to 2000 there was a big fluctuation in the real GDP for Saudi Arabia but without any noticeable increase, compared to the real oil price which was more stable at the same period. Also, from 2000 to 2007 both variables were increasing gradually, but again the real oil price was much more stable in the increase movement than Saudi Arabia. In 2008, the year after the crisis occurred, the oil prices plummeted from \$121 per barrel in the second quarter of 2008 to \$44 per barrel in the first quarter of 2009. However, the real Saudi GDP was not affected severely by this shrink in oil prices and after 2009 both variables increased gradually. The correlation coefficient between the two variables is (0.923), which indicates a high relationship.

4- The Chicago Board Options Exchange Market Volatility VIX (CBOE): The VIX index was initially introduced in 1993, in a paper by Professor Robert Whaley, but it did not start empirically in the market until 26 March 2004. This index is a famous measure of the S&P 500 index options. In fact, it is considered to be the world's premier barometer investor sentiment and market volatility. Many corporations are using the VIX index in capital allocation and risk management (CBOE website). The VIX index is used in this study to present the global financial instability and to describe the market movement during the crisis period.

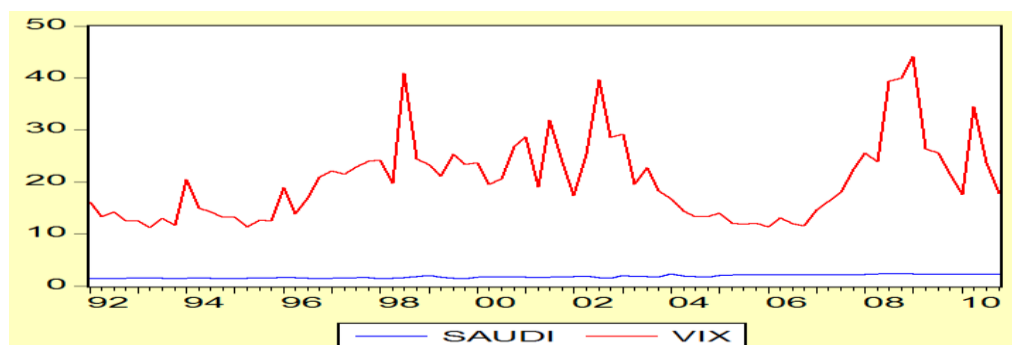


Figure 7: Plot of VIX and real Saudi GDP level

The VIX index data were plotted against Saudi Arabia real GDP data and the result is shown in figure 7 above. The Saudi real GDP was stable during the same period that the VIX was fluctuating until it reached a peak by the end of 2008, before it plunged to the bottom in 2010. It can be seen that there are no relation in the movement between the two variables as each is behaving very differently from the other and the value of the correlation coefficient is (0.236). This is positive and close to zero and supports the visual representation in figure 7 that there is almost no correlation between the two variables.

3.2 Methodology

All the econometrics tests in this study were performed using two software: Micro-fit and mainly Eviews. The analysis of the model was implemented using cointegration and error correction model, in order to solve the problem of non-stationary time series in the data as this causes spurious regression. Empirically, the first step in the analysis is to do a unit root test to check for Stationarity for all of the variables (Saudi GDP, US GDP, Oil price and VIX index), but after taking

their natural logarithm. Secondly, a cointegration test is made between the Saudi real GDP as the dependent variable and all the other independent variables (Oil price, US GDP and VIX) to check for long-run relationship. Then, as a final step of the model, according to the Engle and Granger two-step method, an error correction model must be applied to examine the short-run dynamic behavior, which is the last part of the empirical analysis. In all of the tests, we consider 5% level of acceptance.

4. EMPIRICAL ANALYSIS

4.1 Stationarity Test

An Augmented Dickey-Fuller test was made for all of the variables after tacking natural logarithm to check for Stationarity. For all of the series the null hypothesis H_0 of non Stationarity can be rejected at a 5% critical value.

In order to test for Stationarity, the Augmented Dickey-Fuller test was applied to test for all of the variables and the lag length is automatic based on Eviews Schwarz information criteria. The purpose of the ADF test is to check whether there is a unit root. Therefore, we consider the null hypothesis of presence of a unit root.

Table 3: ADF test on all variables

Series	Intercept	5% Critical value	Intercept & Trend	%5 Critical value
Saudi GDP	.428899	-2.9023	-3.0531	-3.473
US GDP	-2.14625	-2.9023	-0.6229	-3.473
Oil price	-0.62596	-2.9023	-3.2373	-3.473
VIX	-2.33936	-2.9023	-3.3368	-3.473

Note:

Saudi GDP: is the real GDP level for Saudi Arabia.

US GDP: is the real GDP level for the US.

Oil price: is the real oil price level.

VIX: is the VIX index.

Table (3) shows the results of the Augmented Dickey-Fuller test for all of the four variables, including both cases intercept only and intercept with trend. Considering the results from the intercept only, it is clear that in all cases the t value is greater than the 5% critical value. Therefore, we fail to reject the null hypothesis that variables have a unit root. In order to solve the unit root problem in the data an ADF test has been applied after taking the first difference of all the variables. The results are shown in the following table.

Table 4: ADF test on first difference of all variables

Series	Intercept	5% Critical value	Intercept & Trend	%5 Critical value
Δ Saudi GDP	-9.468	-2.9023	-9.5112	-3.473
Δ USA GDP	-3.266	-2.9023	-5.5986	-3.473
Δ Oil price	-6.971	-2.9023	-7.0094	-3.473
Δ VIX Index	-12.263	-2.9023	-12.1859	-3.473

Note:

Δ Saudi GDP: the first difference of the Real Saudi GDP level.

Δ USA GDP: the first difference of the real USA GDP level.

Δ Oil price: the first difference of real oil price level.

Δ VIX Index: the first difference of the VIX Index.

From table (4), it can be clearly observed that in all cases we can reject the null hypothesis of presence of unit root. Even if we include intercept only or intercept with trend, as the t-value of all variables is smaller than 5% critical value. Therefore, all of the variables became stationary. Considering the importance of the model with an intercept and linear

time trend, it can be concluded that it is better to consider all the variables in this study by an I (1) process. Thus, they are integrated of order one I (1) variables.

4.2 Cointegration Test

In accordance with Engle and Granger's two-step method, first we check for Stationarity and then if cointegration exists, an error correction model has to be made as a second step. Cointegration often appears between non-stationary variables. In fact, cointegration implies that deviation from equilibrium is stationary. More precisely, if the residuals from the cointegration regression showed Stationarity, we can confirm then that all variables are cointegrated. It is clear from the ADF in the previous section that all the variables were non-stationary as it showed a unit root. We concern the cointegration test with the null hypothesis of non-cointegration between Saudi GDP and the other independent variables (USA GDP, Oil price and VIX). In this study the following regression has been estimated via Ordinary Least square (OLS) regression using Eviews software to test for cointegration:

$$\ln \text{SaudiGDP} = \alpha + \beta_1 \ln \text{USAGDP} + \beta_2 \ln \text{Oilprice} + \beta_3 \ln \text{Vix} + \varepsilon_t$$

Table 5: Cointegration test

Variable	Coefficient	t- statistic	Std. Error	Probability
ln USAGDP	0.5692	6.741	0.084	0.000
ln Oilprice	0.1469	6.104	0.024	0.000
ln Vix	0.0356	1.605	0.022	0.112

Note:

ln *SaudiGDP*: natural logarithm of the real Saudi GDP level.

ln *USAGDP*: natural logarithm of the real US GDP level.

ln *Oilprice*: natural logarithm of the nominal oil price.

ε_t : the error term.

ln *Vix*: natural logarithm of the VIX index.

α : the constant term.

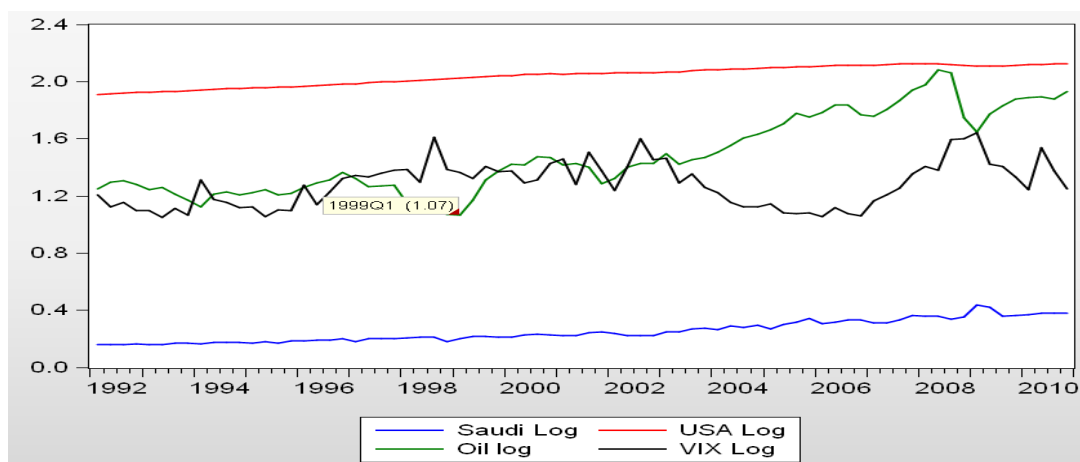


Figure 8: Plot of all variables

The results from the table above show that DW (0.7621) is less than 2 and this gives a positive serial correlation between the errors of the static model. Moreover, it is clear that the R squared (0.88819) is greater than DW (0.7621). Also it can be noticed that all variables show significance especially the US GDP and the real oil price and most importantly they have positive signs. The second step of the Engle and Granger method involves an ADF test on the residuals of the cointegration regression. Therefore, after running the cointegration regression above the residuals were saved in order to be used in an ADF test to check for Stationarity. Testing for Stationarity on the residual using an Augmented Dickey-Fuller test is an effective method to check for cointegration. If the ADF test shows that the residuals are a stationary time series then it is assumed that cointegration exists. The null hypothesis H0 is that non-cointegration exists in cointegration regression residuals.

Table 6: ADF test on the residuals

T- value	5% critical value
-4.977	-3.4716

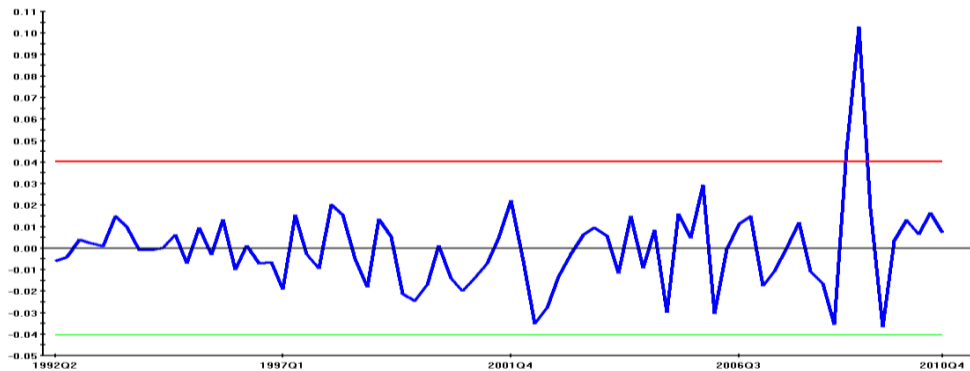


Figure 9: Plot of residuals

It is clear from table (6) that the results from the ADF test show Stationarity as the t-statistics, which is more negative than the 5% critical value. Thus, we reject the null hypothesis and this indicates a long-run relationship between Saudi GDP and the other variables (USA GDP, Oil price and VIX index). After we found from the previous tests that cointegration exists between the variables, an error correction model can then be made to check for short-run relationship.

4.3 Error Correction Model

To complete the Engle and Granger methodology, the cointegration test of the previous part must be followed by an error correction model to check for short-run relationship. In order to do an error correction in this analysis, the residuals and the fitted values from the cointegration regression are saved and it is added as an independent variable in the following regression:

$$\Delta SaudiGDP = \alpha + \beta_1 \Delta fit_t + \beta_2 \Delta fit_{t-n} + \gamma_1 res_{t-1} + e_t$$

Note:

$\Delta SaudiGDP$: the first difference of the Saudi real GDP level.

$\beta_1 \Delta fit_t$: the first difference of the saved fitted values from the cointegration regression.

$\beta_2 \Delta fit_{t-n}$: lags of the first difference of saved fitted values from the cointegration regression.

$\gamma_1 res_{t-1}$: the first lag of the residuals from the cointegration regression.

The above regression has been applied using OLS regression. The first lag of only the residuals was used and two lags of the fitted values to make sure the error correction model is well fit and not suffering from heteroscedasticity and autocorrelation. The results of the test are shown in the following table.

Table 7: ECM test

Lags of fitted values	$\gamma_1 res_{t-1}$	t-value	probability	Probability (F-statistic)	DW	Adjusted R square
Fit (-1)	- 0.361	-5.077	0.0000	0.00001	1.951	0.337
Fit (-2)	- 0.364	-4.279	0.0001	0.00003	1.940	0.327

Note: Fit: is the fitted values lag saved from the co integration regression

After running the OLS regression, it is clear from the results in table 7 that there is no serial autocorrelation given that the Durbin-Watson statistic is close to two. To make sure that the model is correct and do not suffer from autocorrelation and heteroscedasticity; the fitted values were used up to the second lag. Furthermore, the probability of F-statistic in the first and the second lags shows that the model will fit as the F-statistic is significant at 5 % level of significance. The

coefficient of the error term ($\gamma_1 res_{t-1}$) is statically significant and negative between 0- and -1. Therefore, it will correct any deviation from long-run equilibrium. More precisely, if actual equilibrium value is too low, the error correction term will raise it and vice versa.

5. DISCUSSION

The empirical findings from the previous section show that all the variables in this study (Saudi GDP, US GDP, Oil price and VIX index) are cointegrated. Most importantly, from the cointegration tests results all the independent variables (US GDP, real oil price and VIX index) have positive effect on the Saudi real GDP level. This, in fact, proves what has been assumed in the hypothesis, that Saudi Arabia has been affected by the current financial crisis differently. However, this effect was more associated with the increase-decrease in oil prices than the US economy. Moreover, the increase in oil prices during the crisis period is the key to the survival of the Saudi economy. Even though the Saudi real GDP is cointegrated with the real GDP of the US, Saudi Arabia has not been affected by the crisis as much as the US and this is because of the huge differences in the economic activities between them.

In addition, although the results show very weak correlation between the VIX index and the real Saudi GDP, the VIX entered with a positive sign in the cointegration regression. This means that the Saudi economy has benefited from the global economic turbulence. Indeed, when financial crisis causes instability in oil prices, the first beneficiary from this increase are oil producer countries. To clarify, in the first quarter of 2007, the nominal oil price was \$57.19 per barrel and Saudi Arabia GDP was \$365.903 at current prices, but when oil prices increased to \$121, the Saudi GDP also reached its peak at \$498.439 by the second quarter of 2008.

6. CONCLUSION

This study offered a detailed empirical investigation of the impact of the current financial crisis on Saudi Arabia real growth over the period 1992-2010 using quarterly frequency. The techniques of cointegration and error correction models were employed in order to test for the crisis effects on the Saudi economy.

Both the theoretical literature and the empirical literature provided support for the argument that developing countries were most affected by the financial crisis. However, Saudi Arabia and possibly many oil producer countries, such as, the UAE, Kuwait and Iran performed differently during the crisis in comparison with the other non oil producing developing countries. Even though the Saudi economy is closely connected to the US for many reasons, the impact of the crisis was different in both countries. Moreover, it is clear from all the test's result that the Saudi economy is connected tightly to oil prices movement, so we can say that the Saudi economy's growth is affected mostly by the oil revenues. In the brief background section it was mentioned how the Saudi government started to undertake many new projects as soon as oil prices started to rise, for instance, the building of six new economic cities. The plan of diversifying the economy is an ideal methodology to make Saudi Arabia more immune towards any type of crisis in the future.

Our results provided evidence of an existing strong relationship between the real Saudi GDP level and both real US GDP level and real oil price level. Although, the result showed a weak correlation between the VIX index and real Saudi GDP, the VIX index in the cointegration analysis had a positive sign. This confirms that Saudi Arabia has benefitted from the current financial crisis, but this does not necessarily mean that the Saudi government has benefitted in all sectors. For example, the Saudi economy suffered from high interest rate and high inflation rate during the crisis. However, the aim was to study the impact of the crisis on Saudi growth.

We believe that the political turmoil in the Middle East and North Africa will increase Saudi growth as the huge shortage in oil makes Saudi Arabia's share of oil sales very significant. Eventually, this will push up the real growth rate. Saudi Arabia has escaped the current crisis with the help of the increase in oil prices. Therefore, a different source of income must be created to make its position more secure in case of other crises in the future.

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LIST OF ABBREVIATIONS

ADF: Augmented Dickey-Fuller
ARDL: Autoregressive with Distributed Lags
DW: Durbin-Watson
EMU: European Monetary Union
ERM: Exchange rate Mechanism
FDI: Foreign Direct Investment
GDP: Gross Domestic Product
IMF: International Monetary Fund
IRFs: Impulse Response Function
MPI: Market Performance Index
ODI: Overseas Development Institute
VIX: Volatility index