OIL PRICE SHOCKS AND THE NET OIL-EXPORTING ECONOMY:

THE CASE OF SAUDI ARABIA

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To my parents, my wife, my sisters, my brother, and my children

To my Kingdom of Saudi Arabia

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ABSTRACT

This dissertation contributes to the available literature on Saudi Arabia by gathering scattered data from primary and secondary sources into a single database. Additionally, it expands on the economic analysis by adding a historical narrative dimension as it evaluates government policies alongside empirical research. Utilizing the qualitative and quantitative dimensions, the research investigates the relationship between oil prices, government expenditures and revenues, equity markets, and macroeconomic factors of Saudi Arabia. The variables are segmented into two groups and transformed into real logs. The first group evaluates the relationship between oil prices, oil revenues and government expenditures in both itemized and aggregate specifications using annual data from 1963 to 2013; while the second group investigates the relationship between the national equity index Tadawul All Shares Index (TAS), oil prices, money supply (M1), Real Effective Exchange Rate (REER), Saudi Arabian Interbank Offer Rate (SAIBOR), and the S&P 500 using monthly data from December 1992 to February of 2014. Using unrestricted Vector Autoregressive (VAR) models, and Vector Error Correction Models (VECM), the results indicate that oil revenues impact total expenditures, while total expenditures and oil prices show a bi-directional relationship in affecting each other. In addition, sectoral analysis reveals that education and economic development are least sensitive to oil prices shocks. For the second group, the results indicate that the TASI is negatively related to the SAIBOR and REER, while positively related to oil prices and M1. There is bi-directional impact

between the TASI and SAIBOR, while the direction of influence flows from M1 and REER to the TASI. The VAR model provides a better fit for both groups of data based on the post-estimation results, and is superior to the VECM specification.

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INTRODUCTION

Sustainable growth in output and employment is the product of sound fiscal policy that aims to maintain price stability. The Kingdom of Saudi Arabia is well endowed with oil sources, a highly demanded commodity. It is crucial that decision makers understand the relationship between oil prices, and how it may impact the macroeconomic factors and national accounts; in turn, they are able to identify and correct fiscal imbalances. Investigating the type of impact that exists for oil exporting countries is particularly challenging because of highly volatile oil prices. The increased incidence of government budget deficits in developing economies has furthered the need for definitive conclusions on this controversial subject.

Net-exporting oil economies face a complicated set of dynamics with respects to oil price shocks and spending. For Saudi Arabia, Oil sales constitute 80% of total government revenues, and 90% of exports revenue. While oil price hikes can be beneficial and lead to budget surpluses its long-term effect is still controversial with respects to trade accounts. Oil price shocks affect oil revenues and in turn have an impact on expenditures, but identifying the direction of impact is crucial to determining the proper policy recommendations.

One aspect to consider is that spending programs are sticky, because the government must maintain them to meet the expectations of the public; even in the face of declining oil prices. This commitment may create a perceived[1] temporary shift in causation from expenditures to revenues, across the lifecycle of the expenditure programs. Another issue to consider is that net-oil exporting economies have major net-oil importers within their trade circle. Oil price hikes

[1] A perceived observation of a shift in causation does not necessarily reflect the real underlying relationship between the variables, but may be observed due to data-related relationships. Rationally, if expenditures are sticky then revenues should not affect expenditures in the long-term. Additionally, expenditures cannot affect revenues in the absence of a real taxation system. One approach to uncover this relationship is to use a larger sample period which may reveal the true linkages between the variables and in turn the true causality.

create additional costs for such importers, and is then transferred back, in the medium to long-run, to the net-oil exporters in the form of higher prices for imported products. This creates a pressing need to understand the type of causation between government revenues and expenditures so that proper fiscal management can be applied to promote growth.

While numerous studies (Al-Qudair, 2005; Alshogeatheri 2011; Joharji *et al.* 2010; Al-Jarah, 2005; Alotaibi, 2006) have demonstrated a positive correlation between expansionary fiscal policy and economic development, there are other engines of economic growth that focus on the mobilization of private capital. Equity markets facilitate interactions between borrowers and lenders. Naturally, the more developed the equity market, the greater the efficiency of this facilitation, and in turn the larger the benefits to the economy.

Well-functioning equity markets contribute to the economy through two conduits. First, through a boost to savings that is assumed to increase as the market provides investors with assets that conform to their risk profile and liquidity needs (Alexander and Leigh, 1997). In addition, efficient markets weed out unsuccessful companies through a reduction in their stock prices. This price mechanism creates a 'survival of the fittest' environment in the economy where only successful and efficient companies are competing. The second conduit becomes the efficient allocation of resources in the economy.

Equity markets are characterized by their relative volatilities, which is interpreted as the amount of risk in the market. A highly volatile market is typically associated with higher uncertainty in its movements (Mandelbrot 1963; Black 1976; Alexander 2007). Despite a positive correlation between risk and return, excessive volatility can hinder the smoothing function of equity markets, and have adverse effects on the economy. Fischer and Merton (1985) argue that economists must consider stock market movements to have a better prediction of

business cycles and a good lead indicator of consumer spending. For example, Garner (1988) demonstrated that the 1987 crash in the U.S. stock market reduced consumer spending in the U.S. economy. In understanding the relationship between the macroeconomic environment and equity markets, governments need to be able to coordinate their fiscal behavior with these business cycles to achieve desired objectives and targets of development.

In an optimal setting, expansionary fiscal policy and efficient equity markets work together to promote economic growth. However, this relationship may face a number of challenges stemming from oil price shocks, especially when considering the asymmetric impact of oil price fluctuations on the macroeconomic environment (Al-Otaibi, 2006). Oil price shocks and government expenditures, as well as equity markets and the macroeconomic environment have received ample attention in the literature; yet, these empirical studies and narratives are mostly confined to developed economies, while the research on net-exporting and developing economies has been profoundly scarce.

This dissertation attempts to bridge the gap by analyzing the dynamics of oil price shocks, government expenditures, equity market development, and overall macroeconomic environment of a net-exporting oil economy. The first chapter includes the objective and significance of the research. The second chapter discusses stylized facts of Saudi Arabia, as well as a detailed discussion of the oil and energy markets, equity markets, and relative fiscal policies. The third chapter recalls the important findings and theories of the literature as they relate to these topics. Chapter four presents the data used, and the empirical results are presented in the fifth chapter. The discussion and policy implication of the main findings is presented in the sixth chapter, with the seventh chapter housing the supporting materials.

1.1 Objective

The objective of this dissertation is to analyze the economic health of Saudi Arabia with considerable emphasis on oil price shocks and how it impacts oil revenues, government expenditures, and equity markets. The evaluation and analysis is carried out on three dimensions: theoretical, empirical, and historical. The theoretical dimension analyzes basic economic theory and identifies its relative usefulness in the economy of Saudi Arabia; which may be modified to take into account the unique fiscal institutions of the Kingdom such as limited taxation and heavy reliance on the export of a single commodity.

In turn, the empirical investigation aims to uncover the relationships between the various variables in an attempt to collaborate the predictions of economic theory. Finally, the historical narrative attempts to identify the policies of the various monarchs in Saudi Arabia, and evaluate their roles in promoting economic development against the backdrop of the theoretical underpinnings discussed.

Each of the aforementioned dimensions will be applied to two main topics: real oil prices shocks, real government revenues and expenditures; as well as the equity market and macroeconomic environment. More specifically, the empirical investigation of the first topic and group of variables seeks to answer the following questions:

1. What is the direction of influence between oil revenues and government expenditures?
2. How do the sectoral government expenditures respond to oil price shocks?
3. Which sector of expenditures is most sensitive to oil price shocks? Which is least sensitive?
4. What are the short and long-run dynamics between oil price volatilities and government expenditures?

While these questions can be viewed as related to each other, they are independent in their implications. Collectively, their answers will aid policy decisions towards sustaining a stable source of income, and sustainable expenditure programs. In addition, it will expose weak points in the revenue-expenditure dynamic, which will lead to better risk management and consumption smoothing. This is particularly true in the case of Saudi Arabia since oil revenues represent a large share of government income. Furthermore, it will indicate what the Saudi government thinks is more essential or privileged to receive funding and ultimately capture the political economy of the Kingdom.

The second topic addresses the Saudi Arabian stock exchange development and its relationship to macroeconomic factors, including the impact of oil price shocks on the market's performance. Specifically, the research analyzes long and short-run dynamics between: real narrow and (M1), real crude oil prices (OP), the real three-month Saudi Arabian Interbank Offer Rate (SAIBOR) as a proxy to the short-term interest rate, the real Standard and Poor's 500 index (SP500), the Real Effective Exchange Rate (REER), and the real Tadawul All Shares Index (TASI) which is the national equity index. The empirical investigation of the second topic and group of variables seek to answer the following research questions:

1. What is the relationship between these variables? What is the direction of sway between the TASI and the five economic variables?
2. How does the TASI adjust to shocks from the macroeconomic variables?
3. What is the nature of the volatilities relationship between the TASI and macroeconomic variables?
4. How do innovations in the macroeconomic variables impact the TASI's performance?

Answers to the aforementioned research questions will paint a short and long-run picture of the type of relationship between the macroeconomic variables and the Saudi stock market, as well as the impact of oil price shocks. The research questions indicate the direction of the empirical dimension and its exploration. The narrative and qualitative scopes attempt to evaluate and answer inquiries related to development, growth, future potential, and supporting government policies across the time sample. In general, it attempts to answer the following general questions, and may expand on them:

1. How did the oil and energy industry in Saudi Arabia develop? What were the main factors leading to its command of the Saudi Arabian economy?
2. What is the current status of the oil industry in the Saudi Arabia? How has it been affected by a turn towards alternative energy in the global markets?
3. How has the equity market in Saudi Arabia developed since its inception in 1935?
4. What factors contributed to its growth and performance?
5. How does the market development compare to neighboring countries of the GCC? The Arab world? And to developed economies?
6. Did the policies, segmented by Monarch's rule, seek to promote the development of the financial market? Which periods observed less attention to equity markets?
7. What sort of impact was absorbed by the Saudi financial system in light of the global financial crises 2008? Were there other seemingly exogenous shocks that may have impacted the market such as the Asian Financial Crisis, the Russian Rubble Crisis, or the Arab Oil Embargo?

While some of these questions can be approached empirically, they are mostly evaluated from a theoretical and historical perspective, and serve to aid the discussion of the empirical analysis's results. In combination, the three dimensions provide a complete picture for each of the two topics. In turn, these two topics can be regarded as providing a comprehensive economic view of Saudi Arabia.

1.2 Significance of the Research

The value of this research can be captured by providing a comprehensive view on the economy of Saudi Arabia and its sensitivity to oil price shocks. The literature has few studies on GCC countries with narrow topics or included in a cross-sectional study. Given Saudi Arabia's substantial role as the one of the largest oil producers, a founding member of OPEC, as well as housing the two out of three holy Islamic shrines, its status warrants a comprehensive analysis of its economy. To the best of my knowledge, this is the first empirical investigation that attempts to link oil price shocks to government expenditures, equity market performance, and exchange rate dynamics in Saudi Arabia. This dissertation aims to narrow that gap by presenting a qualitative analysis alongside the empirical results as they relate to the economy. Adding a historical dimension to the research allows for a better understanding of the undercurrents between the variables and the development of the institutions within the country. Secondly, my efforts have produced a single database housing time-series variables of macroeconomic, oil prices, and equity market values across the largest sample period available for Saudi Arabia. Data collection from multiple sources, including primary reports of government departments, ensures data integrity and accurateness. While most of it is available across scattered public access venues, no single source contains a comprehensive list of the data.

CHAPTER 2

SAUDI ARABIA STYLIZED FACTS[2]

The Kingdom of Saudi Arabia is a centralized oil-based economy with significant state intervention. While there are private businesses and privatization programs, the government has a monopoly over the energy industry. Modern day Saudi Arabia has considerable global significance because of its dual role as one of the largest oil exporters in the world and as the birthplace of Islam.

First, the Kingdom houses two of the three holiest shrines[3] in Islam: Al-Harram Al-Makky Al-Shreef (the Holy Mosque in Mecca), and Al-Masjid Al-Nabawy Al-Shreef (The Prophet Mohammed's, PBUH, Mosque in Medina). As a result, Saudi Arabia is considered by many to be the Muslim capital of the Islamic world. As such, it has a significant religious role that bears responsibilities towards managing visitors to these holy regions. Secondly, Saudi Arabia has an influential role as a supplier of petroleum, and ranks as the largest exporter[4] as of 2013, with the largest reserves as well. It is the founding member of the Organization of Petroleum Exporting Countries (OPEC), and plays a major part in the energy industry.

[2] Stylized facts of Saudi Arabia are adopted from the Central Intelligence Agency World Fact Book report of 2014. See CIA World Factbook: Saudi Arabia.

[3] The third being Al-Aqsa Mosque in Palestine

[4] The U.S. overtook Saudi Arabia and Russia to become the largest producer of oil in 2014

The Kingdom of Saudi Arabia was unified in 1932 under Abdul-Aziz bin Abdul-Rahman Al-Saud (Ibn Saud), a mission that started in 1902[5]. Since 2005, King Abdullah Ibn Abdul-Aziz, the founder's tenth son, serves as the sixth head of state[6]. Saudi Arabia has a total land area of 2.149 million square kilometers (about one-fifth the size of the United States), and is bordered by Iraq, Jordan, Kuwait, Oman, Qatar, UAE, and Yemen. The Kingdom's environment is categorized as harsh desert, and lacks renewable water resources. Its natural resources are petroleum, natural gas, iron ore, gold and copper, and it has arable land of 1.45% or roughly 31,000 square kilometers. Its exposure to the coastlines of the Red Sea and Arabian Gulf provide it with access to shipping, especially useful for the export of crude oil. It is the largest country in the world without a river, and is heavily dependent on water desalination plants as a source of water. It has a population of 27.345 million, with close to 30% of the population categorized as expatriates. The demographics of Saudi Arabia show that 45.4% of the population is aged between 25 and 54, with 19.3% between 15 and 24 years old, and 27.6% between 0 and 14 years old. The total dependency ratio is at 46.1%, where 41.8% of it is youth-dependency. The median age is 26.4 years old with a population growth rate of 1.49%. Urbanization rate of the population is estimated at 82.3%, with the major urban cities being Riyadh (the capital), Jeddah, Mecca, Medina, and Ad Dammam in the Eastern Province. As noted, the median age of the population shows a country with mostly young adults, which may be a contributing factor to modernization and efficiency in the economy. The kingdom has a high literacy rate of 87.2% of the population, but also has a high unemployment rate of 28.3%.

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[5] Please refer to Annex 1: Table A1-2 for a summarized list of major accomplishments for all Saudi Arabian Monarchs.

[6] To signify the religious role of the Kingdom, The King's title, adopted by King Fahad, is the Custodian of the Two Holy Mosques. This title serves as a reminder to future kings of Saudi Arabia to their first priority towards the Muslim population.

The thirteen provinces of the Kingdom are governed by Shari-a Law (Islamic) legal system. Its executive branch shows that the monarch is both chief of state and head of the government, with the crown prince being Salman Ibn Abdul-Aziz, and the deputy crown prince being Muqrin Ibn Abdul-Aziz.

The cabinet is composed of ministers appointed directly by the reigning monarch on a four year term, while the monarchy itself is hereditary[7]. The consultative council is the legislative branch in Saudi Arabia (composed of 150 members) with members selected by the monarch to serve four year terms as well. Recently, Saudi Arabia employed open elections for local offices and districts.

The economy of Saudi Arabia is heavily dependent on oil production and demand, and to that extent it is a major concern for oil importers to understand the Kingdom's economy. In this section, the stylized facts of the Kingdom are presented in three main sections. First, a brief economic review of Saudi Arabia; second, I will discuss the oil and energy industry in the Kingdom by analyzing its history, development, and government policies across time. Finally, the third section discusses the equity market and relevant policies.

2.1 Economy Brief

The Kingdom of Saudi Arabia has achieved great accomplishments under the direction of the ruling family and subsequent monarchs since its unification by King Abdul Aziz Ibn Saud in 1932. In 1938, Saudi Arabia struck oil at a depth of 1,440 meters in the Dammam oil field (OPEC, 2013); yet, the Kingdom's notable economic growth did not take shape until the early-

7 Ascending to the throne is hereditary by sibling, and not offspring. That is, the next in line for the throne is the King's brother and not his son. In addition, the Allegiance Commission created by royal decree in 2006 created a committee of Saudi princes that will play a role in selecting the future king; however, this process will not be in effect until King Abdullah's successor ascends to the throne.

1970s when government revenues increased due to oil sales. As a result of Saudi Arabia's growing importance, alliances were forged with developed economies, government spending was aligned with promoting socioeconomic development, and the Kingdom consolidated its important role in the global oil production.

According to OPEC, Saudi Arabia possesses 18% of the world's proven oil reserves (265.85 billion barrels), and is the largest petroleum exporter as of 2013 (second largest as of 2014). The oil and gas industry constitute more than half of the Kingdom's Gross Domestic Product (GDP), and close to 90% of export earnings. GDP per capita as reported by OPEC's 2013 Annual Statistical Bulletin is at 24,911 USD with a 388.37 billion USD value of exports.

The Kingdom exports 77.40% of its oil production on a daily basis. According to the Saudi Arabian Monetary Agency (SAMA) total revenues in 2013 were 829 billion SAR (5.67 billion in real terms), or at an exchange rate of SAR/USD 0.266, 211.06 billion USD. Oil revenues are estimated at 727 billion (4.972 billion in real) SAR, or roughly 87.7% of total revenues.

In addition to housing the Two Holy Mosques, the newfound wealth of the Kingdom has further reinforced its power and high status within the region. It successfully demonstrated this ability during the 1970s Arab Oil Embargo. The subsequent shocks that followed this effort to restrict oil exports negatively impacted many developed economies including the U.S.

Since the discovery of oil in 1938, Saudi Arabia has witnessed huge leaps of economic development due to positive wealth shocks. While a number of economic-related initiatives and investments were established, such as the foundation of the Organization of Petroleum Exporting Countries (OPEC) in 1960, most investments were ad-hoc that lacked regulation and direction. It was not until 1970, that a focus on economic reform and planning became part of the

government policies. The first five-year economic plan[8] was set into motion by King Faisal in 1970, and since then, the Saudi Arabian economy has demonstrated resilience and a true commitment to development.

Saudi Arabia promotes foreign direct investments and private enterprises, yet it is still heavily dependent on state-directed activities. This reliance impacts not only budget policies, but also state enterprises such as Saudi ARAMCO, Saudi Arabian Telecom Corporation, and the Saudi Arabian Airlines. Due to these factors, and a number of other institutional processes, the Kingdom of Saudi Arabia has a form of state capitalism governing its economic activity.

This could be a contributing factor towards having restricted economic growth in Saudi, in comparison to neighboring countries[9]. While country-specific factors such as population size and large landmass area may have contributed to this delay in development, it is more likely a case of restricted growth due to the inefficiencies resulting from state, and not private, ownership. However, in recent years, the government of Saudi Arabia has taken initiatives to proceed with privatization activities with efforts such as presenting an Initial Public Offering (IPO) on STC, and Saudi Arabian Airlines.

[8] Please refer to Annex 1: Table A1-1 for a detailed objective of the economic plans from 1970 - 2014

[9] According to the World Bank (2013) actual data on GDP (PPP) per capita, Qatar, Kuwait, UAE, and Saudi Arabia rank at 1st, 3rd, 7th, and 8th on the global scale, respectively. Qatar's estimated PPP is at $142,564 followed by Kuwait with 85,660 and 58,042 for the UAE; while actual PPP for Saudi Arabia was 53,780. This is directly related to country demographics i.e. population size and composition, since the countries share similar levels of government revenues.

Government sponsored committees were formed to ease the transition of from state owned to privately operated industries. One of such institutions is The Supreme Economic Council, which was fashioned to properly assess, evaluate, monitor, and guide economic activities with a specific mandate on increasing privatization activities (SEC, 2014). Privatizations sparked much needed competition in the telecom, aviation, and other major industries[10].

The turn towards privatization programs, alongside other development initiatives spearheaded by King Abdullah Ibn Abdul-Aziz since he assumed the throne in 2005, including induction into the World Trade Organization (WTO), have contributed towards measureable economic growth. Tim Callen of the IMF noted that Saudi Arabia's economic growth is estimated to be above 4% for 2014 and 2015 due to government spending and privatization strategies (Callen, 2014).

The IMF report further notes that Saudi Arabia's role as an oil producer is necessary for stabilizing the global oil market, which is positively correlated to the advancement of the global economy. The Kingdom continues to diversify its economy and create jobs with assertive economic reforms and investments. Such programs, as noted in the report, focus on developing the infrastructure, and improving business attractiveness while developing human capital and employing Saudi nationals in the private sector.

The fiscal surplus Saudi Arabia has recently enjoyed is expected to decline following large government spending commitments, and as such it could be anticipated that budget deficits are in the future of Saudi Arabia; as such, Callen (2014) notes that the government should slow

[10] For example, Saudi Arabian Airlines is no longer the sole air-travel service as other companies have emerged such as NAS and Al-Maha, not to mention chartered airline companies. As for the telecom, although the Saudi Telecommunications Company maintains a large market share, other companies are able to compete such as Mobily and Zain.

the growth of their expenditure programs. While the fiscal countermeasures accumulated over the past decade could provide an excellent buffer in the face of negative oil price shocks, aggressive spending could offset these safety buffers.

Investments in education, human capital development, military defense programs, and infrastructure depended heavily on oil production as it represented a large share of government revenues. With its status as a rentier state, the Kingdom's economic health is sensitive to the dynamics of the energy markets. Fluctuations in oil prices would affect the revenue stream of the government and in turn would dictate the feasible shares of budgetary spending on local developments that are linked to economic indicators. Although efforts in the Kingdom have been directed towards diversification of the proceeds torrent, and large investments in non-oil-dependent economic activity, Saudi Arabia still remains a net oil exporting country and heavily dependent on its oil and gas production as a main source of government revenues.

As discussed by Ramady (2010) a number of challenges for the Saudi Arabian economy remain despite diversification efforts. Noting that under the planned output of 12.5 million bpd; theoretically Saudi Arabia would cease to export in the next six decades, if global oil demand continues to grow on a linear trajectory. The feasible solutions to such problems include notable growth in diversification of production and income as well as inter-sectoral, regional, and global economic integration.

Noting that the Kingdom is, for the foreseeable future, heavily invested in energy industries, understanding the dynamics and the impact experienced from volatilities in these markets is necessary to understanding the economic status of the Kingdom. . Ramady (2010) noted that during the 2005 – 2010 periods, nominal oil prices fluctuated from $27 per barrel to $147 per barrel, which directly impacted budgetary planning of Saudi Arabia.

2.2 Oil and Energy

Currently, Saudi Arabia's value of petroleum exports is estimated at 336.12 billion USD and crude oil production is estimated at 9.763 million bpd (barrels per day) with a refinery capacity of 2.107 million bpd. In addition, its internal oil demand is estimated at 2.873 million bpd, and crude oil exports are at 7.557 million bpd. Output of petroleum products is at 1.972 million bpd, and exports of petroleum product are 862.1 thousand bpd (OPEC, 2013).

Figure 2.1 shows the evolution of oil revenues in contrast to other revenues[11], adjusted by the price level, in Saudi Arabia from 1963 to 2013. As it will be discussed in the upcoming section, the development of control over these revenue sources had a slow start. It was not until the early 1980s that Saudi Arabia assumed full control of its oil processes. Specifically, between 1959 and 1982, oil revenues constituted an average of 23.5% of total revenues. Starting from 1983 onwards, the average share of oil revenues has more than tripled to reach 75.42% of government revenues.

Figure 2.2 shows the annual percentage change of oil revenues across the same period. These could be perceived as a result of price shocks. The largest positive shock took place during 1973-1974 – the Arab Oil Embargo – where government revenues from oil increased to a little over 100% in 1973, and over 600% in 1974. The largest negative shock is associated in 1998-1999, which coincided with the aftermath of the Asian Financial Crisis of 1997, and the Russian Rubble Crisis of 1998.

[11] Other revenues include pilgrimage and Holy sites income, taxes, and oil royalties

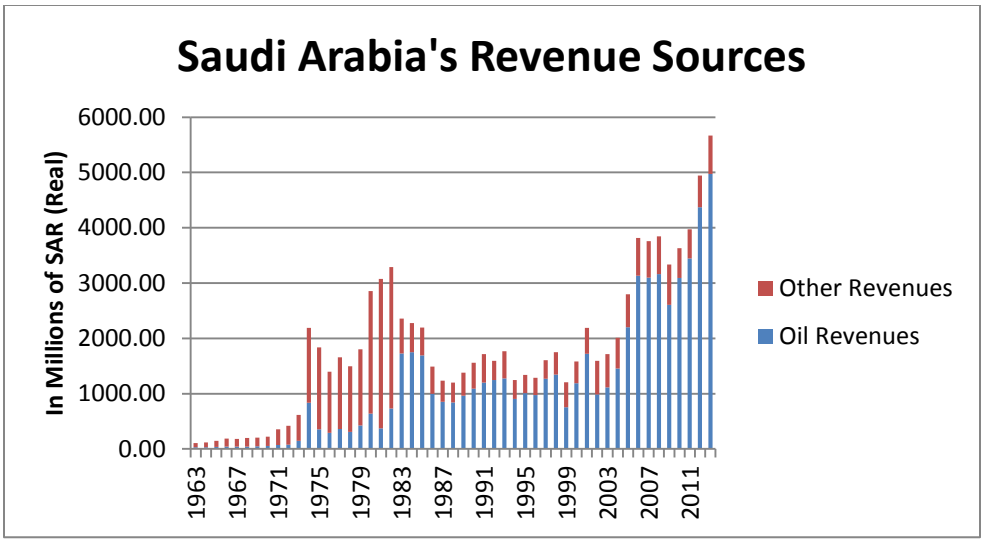

Figure 2.1 Real Revenue Sources 1963 – 2013. Source: Appendix A

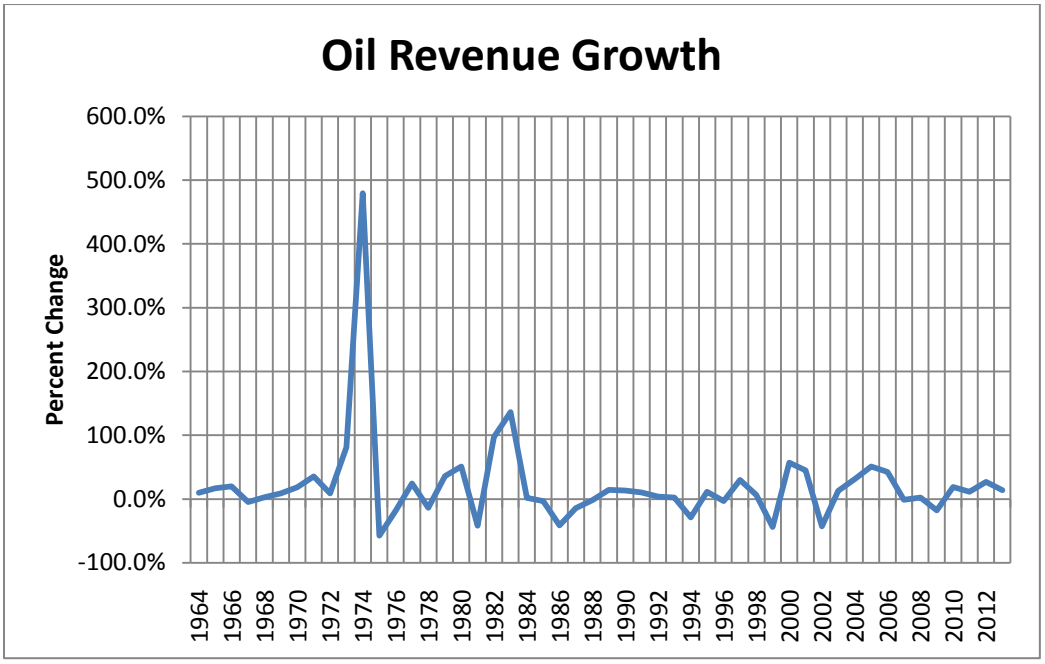

Figure 2.2 Oil Revenues Growth 1963 – 2013 (Calculated)

Across the sample period, oil revenue fluctuation has remained fairly stable with an average of 14.53%. The dependence on oil sales becomes apparent in Figure 2.1 as the percentage and magnitude of revenues increases. Since 2005, the non-oil private sector has

shown great strides in relative growth. The Ministry of Economy and Planning reported an average growth of 7.6% in non-oil private sector, and 11.68% growth in non-oil exports (MEP Economic Indicators, 2014). While a number of initiatives under King Abdullah were taken to diversify the economy and revenue sources, endogeniety becomes an issue.

In other words, the Kingdom is dependent on oil revenues to finance non-oil industries in the form of subsidies, government aid, Specialized Government Lending Institutions, and government spending. However, it is long before the non-oil sector achieves a self-sustaining source of revenue. Until then it is dependent on oil production as the main apparatus for its development.

These advancements were possible due to stable macroeconomic environment and constant government support cradled by favorable oil revenues. Shocks to any of these factors can create a ripple effect which will propagate through these projects and non-oil sector development. It becomes a greater problem if we assume that such programs are sticky, as it is the case when considering government expenditures and public expectations. If the non-oil sector is reliant on government aid and similar capital provisions, then in the face of persistently negative oil price shocks they are doomed to failure.

For example, the 1980s oil glut featured a significant and large drop in oil prices. Surplus of crude oil occurred because of falling demand following the Arab Oil Embargo of the 1970s. In real 2004 US dollars, the price of oil fell from $78 in 1981 to a little over $26 per barrel in 1986 or a 66% decline in less than five years. Additionally, oil prices declined in the early 1990s as production increased by OPEC[12]. A persistent surplus plagued oil producers as unsold oil was estimated to be 90 million barrels in 1991.

[12] With the invasion of Iraq on Kuwait, OPEC member states had to increase production quotas to make up for quantities lost due to the First Gulf War.

It was not until the Asian Financial Crisis and the Russian Rubble Crisis that OPEC decided to cut down production to boost the prices of oil in March of 1998 (OPEC, 2013). Despite enjoying favorable oil market conditions in the recent decade, such risks must be accounted for if Saudi Arabia is diversifying its economy.

Recently, the U.S. has overtaken Saudi Arabia and Russia to become the world's largest oil producer in 2014 (Smith, 2014). Increased production would lower the price of oil, not to mention the U.S's reduced dependence on the Middle East for its oil needs. Macalister (2014) reported that oil prices declined by more than 25% since June of 2014 to be in the range of $83 to $85 per barrel. OPEC, which holds 60% of the global reserves, and provides 30% of its demand, is facing a power struggle to reassert its dominance.

2.2.1 History and Development

Saudi Arabian oil was discovered at Dammam field[13], in the Eastern Province, in 1938 (Grutz, 1999). There were a number of factors that prompted the search for oil in the Arabian Peninsula: first, oil was discovered by the Anglo-Persian oil Company in the mountains of north-western Persia in 1908. While most geological census agreed that there was no oil in the Arabian Peninsula, the discovery in Persia prompted additional research. A number of theories on the existence of oil in the Arabian Peninsula asserted that oil fields will most likely be found in the Eastern province city of Al-Qatif (Morton, 2006).

Second, the stability achieved by King Abdul-Aziz allowed for ease of exploration in contrast to neighboring countries such as Yemen and Oman. In addition, the Saudi Arabian government wanted to find alternative means of income in the face of the Great Depression. As noted by Grutz (1999), the main income for the Hijaz region, which by the 1930s became part of

[13] Discovery of commercial quantities in Well number 7, what is known today as the city of Dahahran.

Saudi Arabia, was taxes and commerce fees paid by pilgrims making their way to Makkah and Al-Madina. With the great depression, this number fell from 100,000 to under 40,000 per year. In turn, King Abdul-Aziz was open to potential sources of revenue, including that of exploration for natural resources.

Finally, the demand for oil during the First World War triggered a desperate need to secure oil supply for purposes of production and industry. This became more evident when Germany's shortage of oil supplies led to a decline in the ability to produce war machines; in turn, the allies anticipated the need for oil and started with a thorough search for oil fields all across the globe (Grutz, 1999).

With the government supporting the exploration, U.S. based companies began the search. The Standard Oil of California (SOCAL) through its subsidiary California Arabian Standard Oil Company (CASOC) and in partnership with Texas Oil Company formed CALTEX in 1936 and proceeded with geological analysis for petroleum extraction and detection in Saudi Arabia. The likely candidates were regions in the Eastern Province in Saudi Arabia. They identified a promising region and called it Dammam No. 1; over the next 24 months, and six wells later, the team struck oil in Dammam No. 7 under the urgency of chief geologist Max Steineke (Grutz, 1999). Since March 3, 1938, oil revenues presented a crucial source of wealth for the Kingdom of Saudi Arabia. It became a stable source of revenues due to its inelastic demand, even in the face of the great depression and recovering economies. Oil exports were on the rise especially as the world approached the Second World War. In 1943, CALTEX became the Arabian American Oil Company (ARAMCO). The new company agreed to pay the government higher payments than the original terms in the contract, as well as providing it with free kerosene and gasoline. Less than a decade later, the percentage share between the Saudi government and ARAMCO was

equated to 50% for each. In 1982, the concession area of search was reduced to 220,000 square kilometers from 930,000, as the Kingdom's government began to flex its command over its resources. By 1988, ARAMCO was officially purchased by the government and became known as Saudi Aramco (Grutz, 1999). Since its purchase, Saudi Aramco has served as the public face for the oil and energy industry in Saudi Arabia. In 2013, its total assets were $30 trillion and it had revenues of $311 billion. It currently employs 57,283 professionals in various fields. It still maintains the world's largest proven crude oil reserves (260 billion barrels), and one of the largest daily oil production opeartions (Saudi Aramco, 2013). It manages the largest onshore, and the largest offshore oil fields, Ghawar and Safaniya, respectively.

2.2.2 Policy

Fostering and promoting the oil and gas industry in Saudi Arabia has been the first priority for King Abdul-Aziz and his successors. It represents the lifeline that keeps Saudi Arabia functioning as it provides capital for development, defense, and investments. While the concept of diversification of revenues came with the new generation of Kings in the 1970s, King Abdulaziz's main objective was to find and benefit from a stable revenue source.

King Abdul-Aziz realized that dependence on pilgrimage revenue was not enough to sustain Kingdom's capital needs. First, there is a religious morality issue which restricts the increases in revenues due to higher prices. While it is a source of capital for Saudi Arabia, pilgrimage was still a holy journey and any materialistic interest conflicted with the concept of housing the two holy shrines of Islam.

Second, pilgrimage revenues were seasonal and unstable. The start of the season is on the first day of the 12 month of the Hijiri Calendar – *Thu Al-Hija*[14] – and it would last for 10 days. In addition, within the requirements of making an acceptable Haj – pilgrimage – Muslims must be sane, have reached adulthood, and are able to finance their travel out of their pocket[15]. These requirements made revenues from pilgrimage and holy shrines visits more volatile and unreliable as a source of revenues. When King Abdul-Aziz noticed how the Great Depression has actually affected the number of visitors (a drop of roughly 60%), he realized that a form of stable revenue should be sought out.

Acting on the pressing urge to find oil fields, the U.S. based companies found support in a hopeful King Abdul-Aziz, and the gamble paid off. King Abdul-Aziz's policy was to use oil royalties to continue building the infrastructure of Saudi Arabia. However, realizing that there were sustainable sources of petroleum in the Kingdom, King Abdul-Aziz threatened to nationalize the country's oil facilities unless the original contract was modified in terms of revenue percentages. In 1950, the Arabian American Oil Company (ARAMCO) agreed to an equal share of profits with Saudi Arabia, as well as concession reduction in the search area (Citino, 2002). During King Abdul-Aziz's reign, the Safaniya oil field was discovered in 1951, the world's largest offshore field.

King Abdul-Aziz's nationalization threat exhibited the first instance that Saudi Arabia uses oil as a negotiation tool. This demonstration of power would not be exhibited until the Arab Oil Embargo in 1973, by King Faisal. During the reign of King Saud, the Ghawar Field was

[14] Literal translation means month of pilgrimage and it is considered one of the holiest months in the Arabic Calendar alongside Ramadan, and Muharam the 9th and 1st months of the year, respectively.

[15] The prerequisites of Hajj, require a Muslims to have no debt outstanding, and are able to finance the trip from his or her own pocket. In the case that there are loans or debts, the individual is better off repaying the owed amount, or asking permission from the lien holder to perform Hajj. These prerequisites exhibits that while it is one of the five pillars of Islam, Hajj is heavily dependent on the current financial status of the individual, and thus reflects a 'disposable income' and seasonality characteristics.

discovered in 1957, but his policies reflected little interest in the petroleum industry. King Saud's political strategy was different from his father's – King Abdul-Aziz – and featured large hemorrhaging of capital and poor allocation of resources. The spending habits of King Saud created a struggle for power with King Faisal, who realized that prudent financial management was necessary for the future of Saudi Arabia. In 1962, King Faisal – crown prince then – forced King Saud to abdicate with the support of the royal family and implemented a ten-point reform plan to save the Kingdom from bankruptcy; Faisal's policies on modernizing and developing Saudi Arabia started with this reform, and ended with his assassination in 1975. King Saud's contribution to the oil and energy industry of Saudi Arabia would be the establishment of OPEC in 1960, which played a major role in reinforcing the position of Saudi Arabia and its dominance in the global marketplace (OPEC, 2013).

Following the first economic plan in 1970, King Faisal prudent financial policies aided the Kingdom in securing a 25% stake in ARAMCO before 1973. As a response to the US support for Israel during Yom Kippur War, King Faisal launched the Arab Oil Embargo, which, in turn, created the 1973-1974 energy crises. By 1974, under the direction of King Faisal, Saudi Arabia acquired 60% of ARAMCO. The death of King Faisal in 1975 marked the reign of King Khalid and the new crown prince Fahad (later King Fahad). King Khalid followed through Faisal's economic plans for the Kingdom, and in 1980 the Saudi Arabian government acquired full control of ARAMCO (SAE, 2013).

During his post as crown prince, King Fahad exhibited an interest in domestic policy including education, infrastructure, and development. He understood the need for Saudi Arabia to take complete control of its natural resources, and worked towards that goal with King Khalid. Assuming the throne in 1982, King Fahad turned his attention towards foreign relations, and

reinforcing the role of Saudi Arabia is an oil-industry monopolist. He wanted to communicate that Saudi Arabia is in control of its own oil price and production policy; and in 1988 a royal decree was issued to change the name from Arabian American Oil Company (ARAMCO) to the Saudi Arabian Oil Company, or Saudi Aramco (SAE, 2012).

The 1980s featured slow-down of economic activity in industrial countries following the 1970s energy crisis, which became known as the 1980s oil glut. This directly impacted Saudi Arabia's ambitious development plans and sparked the use of oil as a form of payment in barter deals with industrial and developed economies such as the U.K and Al-Yammamah arms deal[16], and the purchase of ten Boeing 747 for the Saudi Airlines fleet (34.5 million barrels of oil). Oil barter deals created additional pressures to find more oil fields. In 1989, high quality oil was discovered in the south of the capital, Riyadh (Saudi ARAMCO, 1990).In less than two years, Saudi Arabia would face a great threat from the First Gulf War. Although the prices of oil increased, their magnitude was not as large as previous price spikes in the 1970s and declines of the 1980s. However, the 1990s oil price shock is widely believed to be a determining factor of the recession that followed (Roubini, 2004).

Despite unfavorable fiscal conditions, the Saudi Arabian government spent vast amounts of money in response to the invasion of Kuwait by Iraq. These expenditure items came in the form of foreign military assistance and related expenses, as well as providing asylum and shelter of many Kuwaiti nationals and the Kuwaiti government. As depicted in Figure 2.3, Saudi Arabia has had an average of 19.16 million real SAR deficits across the sample period. Its ability to withstand such demands on the fiscal accounts may be attributed to the previous surplus enjoyed;

[16] The controversial Al-Yammamah deal between the U.K. and Saudi Arabia has been paid for by the delivery of 600,000 barrels (95,000 cubic meters) of crude oil per day since 1985 until 1999 (BBC News, 1999). The first sale occurred in 1985 and the most recent was for 72 Eurofighter Typhoon Aircrafts in 2006 with BAE Systems. In 2005, it was estimated that BAE systems earned sales of 43 billion pound sterling from this deal (O'Connell, 2006).

but even then, the expenditures were difficult to control. King Fahad's vision in taking control of the oil policy of Saudi Arabia has paid off, as Saudi was able to finance these expenditures, when it otherwise would not. King Abdullah assumed the throne on August 1st, 2005, and by September of the same year Saudi Aramco was the world's largest company with an estimated market value of $781 billion (Financial Times, 2006). King Abdullah's policies focused on propelling the Kingdom into faster development and economic growth via technology, human capital, diversification, and research. Some of these policies included privatization programs for state-owned entities, as well as the establishment of nuclear power plants[17].

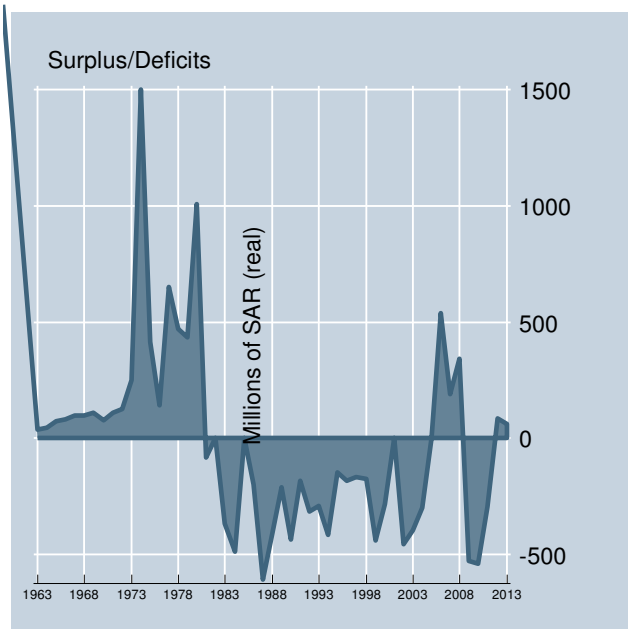

Figure 2.3 Real Surplus/Deficits of Saudi Arabia 1963 – 2013. Source: Appendix A

In contrast to other monarchs of Saudi Arabia, King Abdullah's reign faces global challenges that threaten the lively source of revenues. Global market shifts in the oil industry has placed additional pressures on Saudi Arabia's oil production. The U.S. surge of oil production, as

[17] Saudi Arabia plans to construct 16 nuclear power reactors over the next two decades at an estimated cost of $80 billion and first reactor to be online in 2022 (Garwan, 2013).

discussed previously, has allowed oil prices to drop by more than a quarter in under two months. While macroeconomic conditions of Saudi Arabia are favorable such as economic growth of 4%, growth of non-oil sector and non-oil GDP, Saudi Arabia still faces a crucial supply decision.

As noted by Fattouh (2014), Saudi Arabia is considered a swing-oil producer that aims to stabilize prices. In response to current production increases and price declines, the Saudi oil minister Mr. Ali Al-Naimi indicated that the Kingdom is comfortable with lower prices in the short-term (Retuers, 2014). Factors that help Saudi Arabia in its current position include a large accumulation of foreign assets, small amounts of debt and large borrowing capacity.

Yet, the long-term result is still vague, and in turn the current policy of Saudi Arabia is to wait and see. Projections for oil demand growth remain low, and as such the Kingdom has no incentive to increase oil prices through production cuts. Saudi Aramco officials indicated that Saudi Arabia's oil policy is no longer geared towards maintaining market share at any cost (Hubbard *et al.*, 2014). Understanding the long-term impact on revenues and expenditures is crucial to direct the best possible policy in the Kingdom aimed at promoting economic growth. Thus far, the prudent savings of Saudi Arabia and investments, under King Abdullah, has prepared it to withstand production competition, at least in the short-run.

In analyzing the equity market and its progress, the political environment and policies can be segmented into two stages: pre-1985 and post-1985 in the regulations that were established. The issuance of the royal decree on November of 1984 marked the accelerated development of the equity market and a greater focus on its growth by the government. The first stage featured the rule of King Abdul-Aziz (1932 – 1953), King Saud (1953 – 1964), King Faisal (1964 – 1975) and King Khalid (1975 – 1982). The second stage or post-regulation of 1985 featured the rule of King Fahad (1982 – 2005) and King Abdullah (2005 – current).

2.2.2.1 Pre-1985 Regulation

During this era, the demand for the equity market was limited due to several endogenous and exogenous factors. Locally, the Saudi Arabian state was only beginning to take shape as a unified country under the leadership of King Abdul-Aziz Ibn Saud. From his accomplishments, little can be directly linked to the development of financial markets as these did not constitute a priority. King Abdul-Aziz's main concern was how to unify scattered tribes and establish a country. In addition, he realized that Saudi Arabia must become the Muslim capital of the world, since it housed the two holy mosques, and as such should assume the role of facilitator for all Islamic activity.

Working towards the goal of initial development, King Abdul-Aziz wanted to establish a royal railway extending from the Persian Gulf to Riyadh, with a future extension to the Western Province including Jeddah, Mecca, and Medina. At a cost of $70 million, the railroad was completed in 1951 which extended to Riyadh, and was paid for by the King's own royalties. After his death the railway was used commercially, and contributed to the modernization of the capital, Riyadh. A decade later paved roads were established, and the railway lost its traffic (Nehme, 1994).

Like the railway project, most investments in Saudi Arabia during that time came from royalties, and in turn there was little need for an equity market to secure capital.
The railway's concept was to provide means of commuting between the holy cities, the capital, and main ports. After the completion of the first phase from the Eastern Province to Riyadh, the project was abandoned upon his death. Evidently, he laid the groundwork for the development of the infrastructure and succeeded in uniting feuding tribes for the purposes of establishing a country (Canberra Times, 1953).

With the newfound wealth of Saud Arabia, government project and infrastructure development was directly financed through royalties, and did not trigger a need for a private capital or financial markets. During his reign, oil was discovered in Saudi Arabia in 1938 following the First World War, by Standard Oil of New York. Authority over these fields was granted to American oil companies in 1944.

With the availability of government funding, citizens of Saudi Arabia had their credit needs met by Government Specialized Lending Institutions[18] (GSLI). The existence of such GSLI created an endogenous factor that delayed the development of the equity market. Although these government lending programs exhibited a temporary dampening on demand for capital, they were a necessary and integral part of development. These programs continue to be in existence in current times; however, given the increase in population and investment opportunities, they serve as a secondary source of capital for those with limited access to credit.

As demonstrated in Appendix A: Table 3A, the Agricultural Development Fund (ADF) was established in 1962, and made its first loans in 1964 for 4.39 million SAR. The Saudi Credit and Savings Bank (SCSB), as well as the Public Investment Fund (PIF) were established in 1971; followed by the Saudi Industrial Development Fund (SIDF) and the Real Estate Development Fund (REDF) in 1974. The largest outstanding loans belong to the REDF, followed by the PIF with an average of 61 billion SAR, and 28 billion SAR, respectively.

Comparing the compounded annual growth of these funds we observe that the ADF has the largest rate with 17.71% since its first loan. This is followed by the SCSB with 15.34%, the REDF with 8.36%, 7.94% for PIF, and 6.98% for SIDF. From the historical figures we are able to deduce that GSLIs served as an important backbone to the development of the economy on

[18] The Agricultural Development Fund, the Saudi Credit and Savings Bank, The Public Investment Fund, the Saudi Industrial Development Fund, and the Real Estate Development Fund. Established between the 1960s to the 1970s and played a major role in financing domestic needs for capital.

several fronts that relate to agriculture, industries, and investments. In 1976, the total outstanding loans granted by these GSLIs are estimated at 11,884 million SAR. In three and a half decades, the total outstanding loans of GSLIs are estimated at 193,926 million SAR.

GSLIs alleviated the issue of securing capital for innovation and investments, as well as developing the country. While the efficient use of these funds by the citizens might be in question, the government support is all but lacking. As noted by Joharji *et al.* (2010), the impact on economic growth in Saudi Arabia can be traced to two channels: government policies formulation or reform, and the implementation of such policies through administrative institutions. Although, both categories have a notable effect on development, the latter has a larger magnitude of impact[19].

The combined effect of the wealth shock captured by the discovery of oil in Saudi Arabia, alongside an administration dedicated towards achieving domestic stability and unification, little room was left to develop economic plans seeking economic growth. Such targets were not truly implemented until King Faisal assumed power following King Saud in 1964. It was not until 1970 that King Faisal inaugurated the first economic plan of the Kingdom, a little under four decades since the unification of the Kingdom. The lack of these plans is not attributed towards the inability to implement them, but rather they did not constitute a pressing priority for Kings Abdul-Aziz and Saud. Several exogenous events may have also demanded the Kingdom's resources, and thereby compounding the delay even further.

While we could hypothesize that at the onset the GSLI satisfied the demand for capital in Saudi Arabia, the growing number of investors coupled with various business opportunities led to an increase in demand for such resource. As such, individuals and businesses started to seek

[19] This directly relates to the cultural aspect, and the mindset, education, and cognitive ability of the citizen and government employees. Despite the existence of government programs that support economic growth, they are somewhat insignificant if the administrative and institutional processes are inefficient.

capital in financial markets and establish joint-stock companies. As noted by Abdeen and Shook (1984) there was a surge in the number of joint-stock companies between the 1960s and 1970s. Additionally, the spending habits of King Saud, which was characterized by many as lavish and geared towards personal consumption left little excess capital for lending; which may have contributed towards a pressing need for alternative means of obtaining funds by the public and businesses. Finally, the issue of foreign banks operating in the Kingdom created some reservations by investors in seeking loans. With the nationalization of these banks in the 1970s as part of the economic plan, a new obstacle took shape and was relative to the sinful nature of usury or interest[20]. Collectively, these endogenous factors worked in random synchronization to amplify the demand for capital via equity markets.

The true consideration of the financial system and subsequent equity market could be marked with the inauguration of the first economic plan in 1970 by King Faisal. Although it did not include a direct focus on equity market development, it was a necessary step towards that goal as it featured a number of economic milestones geared towards development. King Faisal promised a ten-point reform plan which included education development, especially for females, Television broadcasting and media industry development, the abolition of slavery, and reforms within the government (get a citation). He created three five-year economic plans, but only lived to see the first being implemented before his assassination in 1975.

While King Abdul-Aziz is considered a statesman and the father of Saudi Arabia, King Faisal is credited with rooting the infrastructure of country and laying the foundation for its economic development. Due to his financially prudent policies, and a true dedication towards economic growth via human capital development and industry, subsequent monarchs were able

[20] Under Islamic law (Shari'a Law), usury is prohibited or charging interest, which has created such reservations on obtaining credit from banks in general. This problem continued until the establishment of Islamic banking systems in the Kingdom which offered Shari'a law-compliant lending. See Ramady (2009).

to achieve great strides towards modernizing the Kingdom, and leading to the Golden Age of Saudi Arabia in the years that followed. After King Faisal's assassination in 1975, King Khalid assumed the throne with Prince Fahad as the crown prince.

King Khalid continued on with Faisal's second economic plan which focused on education development as the number of schools increased from 3,913 to 7,206 in just five years (citations). In 1980 he launched the third economic plan with a budget of $250 billion SAR which included the establishment of the ministry of Industry and Electricity, the acquisition of ARAMCO, as well as military contracts with the US[21]. In addition, King Khalid pushed for foreign labor acquisition to aid with the country's development that included building international airports, medical cities and other infrastructure-related tasks.

The reign of King Khalid echoed that of King Faisal in which he completely focused on infrastructural development and laying in the necessary groundwork for economic growth. With the passing of Khalid, King Fahad assumed the throne in 1982, which marked the second year of the third economic plan. King Fahad established himself as political heavy weight at an early stage of the country's development. He was the first minister of education, a post held from 1953 to 1962, and was a key person to the development of the educational system in Saudi Arabia. His appointment as first deputy minister and crown prince in 1975 allowed him to handle a much more significant and powerful role in the government.

It is argued that King Fahad's most active and contributory efforts towards economic growth were witnessed during his post as crown prince (The Economist, 2005). While he is widely known for his foreign policy, King Fahad's contribution towards the development of Saudi Arabia could be traced back to his post as the minister of education and subsequent

[21] King Khalid struck a deal with President Carter to sell 60 fighter planes to assist in countering communist aggression in the area (citation).

government positions. Through his efforts and focus on human capital[22] and infrastructure development, Saudi Arabia had the necessary ingredients to improve its economic health. With the start of the fourth economic plan in 1985, the equity market started to develop and receive long-overdue attention aimed at regulation and development.

A number of geopolitical factors in the Middle East made it difficult to focus on internal economic policy. From 1932 to 1985 Saudi Arabia faced a number of events that were domestic and global such as the First and Second World War, the rise of communism, the Arab-Israeli war, Nasserism and the Arab Nationalism movement, the start of the Iran-Iraq War, and the first terrorist act on Saudi Arabian soil. Considering that some of these events impacted Saudi Arabia indirectly, and others had a direct significant impact, they were all related and required prudent policy on behalf of the ruling government.

Arguably, due to economic significance, the most noteworthy of these events is the Arab-Israeli war which led to the Arab Oil Embargo causing a significant impact on energy markets in 1973. Politically, King Faisal's decision to withhold oil exports demonstrated the political power of the Kingdom, and reinforced its role as a Muslim and Arab country leader[23]. Consequently, in 1975, the Arab Oil Embargo allowed for a large financial windfall to Saudi Arabia and supported an economic boom in infrastructure development including education, health care, and industrial development during King Khalid reign. The key point to note is that these exogenous and domestic events, that may have sought to disrupt the political stability of the Kingdom, either in

[22] After he left the post of education Minister in 1962, The King Fahd University of Petroleum and Minerals was established in 1963. It is ranked by the QS World University Rankings at 208 out of the top 300 universities. It is the premier educational institution for males in Saudi Arabia. See KFUPM (2013).

[23] It is a widely accepted notion in the Arab and Muslim worlds that the Arab Oil Embargo spearheaded by King Faisal ultimately led to his assassination. While U.S. reports on Faisal bin Musa'id, the assassin, show him as a drug addict that was mentally unstable and sought revenge from King Faisal. King Faisal called for the development of the media, and the first television broadcast was in 1965. In 1966, his nephew Khalid bin Musa'id, the brother of his future assassin Faisal, was killed in a protest against television broadcasting in Saudi Arabia. See Vassiliev (1998)

a direct or an indirect manner dampened the priority of the financial and equity market establishment. While testing the resolve of each King and relative administration, it only made matters worse in the economic sense. Such events demanded scarce resources, time, and funds, and left little opportunity for economic growth to grab hold in Saudi Arabia.

2.2.2.2 Post-1985 Regulation

The development stage was during the reign of King Fahad Ibn Abdul-Aziz, the fifth monarch. Crown Prince Fahad assumed the throne on June 13, 1982 after King Khalid died from a massive heart attack (Herald Journal, 1982). King Fahad was greatly impacted by his elder brother King Faisal, and followed in his steps of modernizing the Kingdom. He was the first person to be appointed the minister of education in 1953 and held that position for nearly two decades (Sicherman, 2005). His focus on education allowed the human capital component to flourish, and assisted in future developments across all industries including the financial markets.

Most of his contributions were captured during his post as Crown Prince, which focused on infrastructure and educational development. During his reign, King Fahad established himself as a keen diplomat and gave the Saudi Arabian state a significant international role. Major events during this era included the invasion of Kuwait by its Iraqi neighbor (the Second Gulf War), and the Bosnian War. These two conflicts would outline King Fahad's domestic and international policy and push for a strengthening relationship with the United States.

King Fahad focused on building the military strength of Saudi through one of the largest military arms deal in history[24]. His decision to allow U.S. troops on Saudi Arabian soil to aid in the First Gulf War created a stir between the government and Muslim extremists such as Osama Bin Laden; ultimately, this action would set precedent to future terrorists attack in Saudi Arabia, and against the United States[25].

However, his decision was well-thought out, and strategic. Although a difficult choice for King Fahad, seeking the aid of the U.S. military was necessary to keep to Kingdom safe from disruptions that threaten its existence and its citizens. In the Arab World, King Fahad developed a successful peace plan to resolve conflicts in Algeria and Morocco, and ended the Lebanon conflict with the Taif Accord in 1989 (Sicherman, 2005). In the economic arena, King Fahad's commitment to a partnership with the U.S. is best captured by the decision to peg[26] the Saudi Riyal to the US dollar at a rate of 3.754 SAR/USD in 1986 (SAMA, 2004). In addition, he established the Supreme Council of Islamic Affairs in 1994, with the ultimate function of regulating Islamic activity and views on education, economic, and foreign policy matters (Ibrahim, 1994). King Fahad's reign witnessed the 1990-1991 oil crises due to the Gulf War, and the 1994, 1998 stock market collapses as well as the pricing bubble of 2003 - 2005. The declines of the 1990s were mostly attributed to exogenous events that impacted the macroeconomic, and thereby the equity market, environment. Although the pricing bubble started while King Fahad

[24] See Al-Yammamah deal

[25] These attacks were centered on Al-Qaeda terrorist group led by the Yemeni (Saudi born), Osama Bin Laden. Their protest against foreign troops on Saudi soil led to 1992 Yemen Hotel Bombing, 1995 car bombing in Riyadh, 1998 bombings of US embassies in Kenya and Tanzania, USS Cole Bombing, the 2001 September 11 Attacks, the 2003 Riyadh Compound bombings, and the 2004 Kohabr massacre in Eastern Province, Saudi Arabia. See Al-Qaeda timeline attacks.

[26] Refer to footnote 34 in the equity market section. A number of the GCC countries were pegged to the IMF's Special Drawing Rights (SDR), which translated to a fixed peg to the US dollar. Most of the GCC countries were pegged to the USD by the early 1980s, with Saudi Arabia being the last to fix its exchange rate in 1986.

was on the throne, it was due to unforeseen dynamics of development that led to speculative activity. Specifically, the pricing bubble was part of a 'perfect storm' phenomena that included high market volatility, increased transaction execution, lower transaction costs, and high lines of credit. Rather than aiding the market, these events which were triggered by the CML and market regulation caused speculative behavior to exponentially increase.

King Fahad is mostly remembered for his accomplishments when he was the Crown Prince in the domestic realm; while he is praised for his foreign policy during his reign. His prudent foreign policy and subsequent diplomatic decisions kept the Kingdom in a stable status, which allowed development to flourish and take hold as it had the right ingredients to do so (enhanced education systems, available capital, established government infrastructure and institutions, foreign entities investments in financial systems and development of banks).

Abdullah ibn Abdul-Aziz, the sixth Saudi Arabian monarch, was formally enthroned on August 3, 2005 following the passing of King Fahad. His intentions for Saudi Arabia followed that of his predecessors, which is to modernize the Kingdom and improve its overall economic health. King Abdulla's policy is fixated on government spending and diversifying the economy.

Domestically, King Abdullah's reign observed the first collapse of the Saudi Arabian exchange market after its regulation. Despite efforts to support the equity market, it eventually collapsed in 2006 as the price bubble burst. In addition, financial distress rained again in 2008 with the financial crisis. Despite these setbacks, King Abdullah's policy has been directed towards economic growth via large investments. One of the many government expenditure programs implemented by King Abdullah was a government-sponsored scholarship program to

educate the young men and women of Saudi Arabia[27]. The scholarship program is part of numerous education reforms, which focused on the development of education for females. King Abdullah appointed Norah Al Faiz, the first female responsible for girl's education in Saudi Arabia (Boucek, 2009). King Abdullah included a $37 billion spending program including unemployment benefits, education, and housing subsidies in response to the Arab Spring movement surrounding Saudi Arabia. Moreover, he pledged a total expenditure of $400 billion geared towards education, health care, infrastructure, and technology development in the Kingdom (Pitachrd-Evans, 2011). There were various investments set in place such as the creation of the Supreme Economic Council, The National Security office, King Abdullah University of Science and Technology, and King Abdullah's Petroleum Studies and Research Center – the first think tank of Saudi Arabia. King Abdullah Financial District is a new government-sponsored investment focused on enhancing financial and capital markets. The project is estimated to cost the government 29 billion SAR, or $7.8 USD, and has a total area of 1.6 million square meters. In 2011, it was the largest project seeking green building accreditation (O'Sullivan, 2011).

Seeking a balance between domestic and foreign policies, King Abdullah has exponentially carried the economy of Saudi Arabia to new heights. The well-rounded and efficient investments focus on various dimensions of developing the economy such as education and human capital, infrastructure, foreign investments, financial systems, and social welfare. With an estimated economic growth of 4% as indicated by the IMF (2014), King Abdullah's reign is considered the modern age of Saudi Arabia.

[27] The program pays for tuition, expenses, and health insurance based on the duration of the degree, excluding the 18 months for foreign language education if needed. It is estimated that there more than 70,000 students studying in 25 countries. Major destinations included the United States, Australia, and the United Kingdom. (PR Newswire, 2010).

Even though not all of the Kingdom's monarchs focused on financial markets, it is because of their efforts that the equity market developed rapidly and quickly. While King Abdullah modernizes Saudi Arabia through economic growth and investments, between King Abdul-Aziz and King Khalid, the necessary infrastructure for development was formed. Each of the passed kings contributed to the development of Saudi Arabia; either through a focus on foreign relations, domestic policy, or a combination of both. The various domestic and exogenous shocks across their reigns demonstrated their resolve, and their well-deserved right to rule the Kingdom.

2.3 Equity Markets

If we define the existence of an equity market as a financial center that is regulated and monitored by a government agency, then the Saudi Arabian equity market was officially established in 1985. However, the first Saudi Arabian public joint stock company was recorded in 1934 as the Arab Automobile Company (Tadawul, 2014). In the mid-1950s, the Arabian Cement Company launched its first Initial Public Offering, which was followed by the privatization of three electric companies[28]. Throughout the 1960s and 1970s, the number of joint companies started to increase, especially with the nationalization of foreign banks. Yet, the regulation, monitoring, and the trading of ownership shares were limited. A number of exogenous factors may have hindered the development of the equity market or its regulation. In order to follow the chronological development of the financial market in Saudi Arabia, we distinctly note three eras: inception, development, and growth. The following sections analyze each of these stages in greater detail.

[28] Please refer to Annex 2: Table A2-1. The Chronology of the Saudi Stock Market

2.3.1 Inception: 1935 – 1982

Although the first public joint-stock company was established in 1934, the number of companies was limited until the early 1980s. Little attention was given to the development of the equity market due to other pressing needs. As noted by Alshogeathri (2011), early economic development phase focused on building infrastructure, development of human capital and living standards in the Kingdom. Thus, there was little excess capital and resources to be directed towards enhancing the primitive and informal equity market. Additionally, credit and capital access was available through government specialized lending institutions. In turn, it dampened the need for equity markets as a source of capital in Saudi Arabia.

The inception stage coincided with the discovery of oil, which constituted a secondary income for the government in the form of royalties. The sudden endowment of wealth allowed the government to create credit institutions, Government Specialized Lending Institutions (GSLI), with the purpose of dispersing interest free loans to corporations and individuals. As such, the demand for equity markets was not warranted since the seller side i.e. corporations, had access to capital (Molivor and Abbondante, 1980). Examples of credit institutions included the Saudi Arabian Agricultural Bank, the Public Investment Fund, the Saudi Industrial Development Fund and the Real Estate Development fund. Except for the agricultural fund founded in 1963, all of the other institutions were created in the mid-1970s and offered interest free financing and loans[29]. Characteristics of the inception stage demonstrate a lack of organized structure for the development of the equity market. The monitoring and management roles were spread across three departments, each of which assumed an independent role in the financial market.

[29] Please refer to Appendix A: Table A3 GSLI outstanding loans

As noted by Abdeen and Shook (1984), the Ministry of Finance and National Economy, SAMA, and the Ministry of Commerce were all engaged in independent activities to try and command the equity market. The lack of leadership and structure created further problems for development such as the presence of 80 untrained and unlicensed brokers, and no restrictions on price-setting by large-share owners or institutional investors (Azzam, 1997). All of these aspects contributed to limiting the channels for investments in the Saudi economy during the inception stage. Abdeen and Shook (1984) contend that without a variety of investments and the availability of excess cash speculative behavior was inevitable in the early stages of the Saudi equity market. Until 1975, there were only 14 traded companies listed on the stock market, and by the early 1980s the number of companies increased to 38 due to policy reforms that allowed foreign-owned banks to enter the market (Tadawul 2013; Molivor and Abbondante 1980).

2.3.2. Development: 1983 – 2002

On November 23, 1984, Royal Decree No. 1230/8 mandated the establishment of the Saudi Share Registration Company (SSRC), and charging the Saudi Arabian Monetary Agency with the supervision and control of the equity market (SAMA Annual Report, 1986). The development stage started with the formation of a governing body composed of the three competing departments aforementioned. Namely, the Ministry of Finance and National Economy, the Ministry of Commerce, and the Saudi Arabian Monetary Agency formed a committee charged with the regulation and governance of the equity market. Each of these entities had a separate role, but their efforts were interdependent and complementary.

For example, the Ministry of Commerce was charged with primary market activities such as offering and underwriting. Furthermore, it regulated and supervised public joint-stock companies. On the other hand, SAMA was responsible for the management of the daily operations, while the Ministry of Finance and National Economy assumed the general overseeing role for regulation and development, (Al-Dukheil, 2002; SAMA Annual Report, 1997).

The development stage included major developments that targeted several dimensions related to regulation, operation, and structure (SAMA 1997; Al-Dukheil 2002; Ramady 2005). Key improvements included the regulation of intermediation services, development in technological systems, creation of market specific entities such as the National Center for Financial and Economic Information (NCFEI) and the Consulting Centre for Finance and Investment (CCFI). The past institutional inadequacies were identified and addressed during this period. First, brokerage and intermediation services were restricted to twelve commercial banks, and a capped commission of 1% was put in effect. Its creation was in response to the unprofessional and unlicensed brokerage activities that took place in the inception stage.

In 1984, the Saudi Share Registration Company (SSRC) was created by these banks to centralize the registration activities and assumed the role of a clearing house. The NCFEI, a subsidiary for the Ministry of Finance and National Economy, created the first general index for the equity market in 1989. A similar index was created in 1995 by the privately owned CCFI (Al-Dukheil, 2002). It was not until 1990 that SAMA launched the Electronic Share Information System (ESIS), a centralized location that managed buy and sell orders as well as ownership transfers requests from the licensed brokerage houses. This was the initial step to address the management and tracking of shares. A decade later, in 2001, the ESIS received additional modifications to include full integration of trade, clearing, deposits and settlement system.

In addition, it had the capability of handling online trading, increased capacity for various instrument such as bonds, and mutual funds. Lastly, it enabled direct announcements, and financial statement reporting to be submitted by public companies. The new system was named Tadawul[30] All Shares (TAS), and served as the premier centralized mainframe for the all equity trading in Saudi (Tadawul Annual Report, 2002).

Although the development stage propelled the status of the financial market to something that resembles a stock exchange, a number of obstacles were still lingering. One of the major problems was a lack of a regulatory and independent institution. The roles of management were still segmented in what now has become a conflicting and overlapping issue. Daily operations were still managed by SAMA, but the two Ministries of Commerce and Finance had significant roles in primary market activities. While the clearing of trades, transfer of ownership, buying and selling and basically all secondary market activity was centralized, there was a lack of complete centralization between primary and secondary markets.

In addition, transparency was lacking, and insider trading was prominent in the market as noted by Niblock and Malik (2007). Companies, although required to submit financial statements and performance results on a quarterly frequency, faced no penalties in failing to do so. This gave rise to incentives of illegal trading activities, and withholding financial information to investors. Most of the market's movements were serving the interests of major traders and market makers. Finally, the commercial banks charged with brokerage and research activities had conflicting interests in the market i.e. their shares were being traded without the existence of governing policies, which did not restrict their portfolio holdings. The market needed an independent brokerage and research houses to avoid the conflict of interest (Alshogeathri, 2011).

[30] Tadawul is an Arabic name translated as Trading between multiple parties at multiple frequencies. The national index is Tadawul All Shares Index or known as TASI.

Al-Dukheil (2002) measured the liquidity of the market, based on the turnover ratio of valued traded to market capitalization, at 29% in 2002. The lack of performance progress can be attributed to three main factors. First, given that the infrastructure development was still evolving, the equity market lacked a reliable base from which its performance can prosper. Second, there was the issue of limited firms listed on the market in comparison to those registered as public companies. Moreover, share ownership structure contributed to the shortage of free-floating shares. Most of these companies had large government ownerships, family ownership, and institutional investors (Niblock and Malik, 2007).

For example, Saudi Arabia Basic Industries Company (SABIC) had 30% free-floating shares while 70% was owned by the government (Al-Dukheil, 2002). There were only 68 companies listed on the market in 2002 in comparison to 6,000 limited companies, 1,400 joint-venture firms totaling 85.5 billion SAR in capital (Ramady, 2005).Finally, the market was relatively closed for foreign investments. GCC citizens were allowed to invest in the stock market; however, other nationalities could only invest through mutual funds. Even GCC citizens had a restriction on the maximum number of shares owned in one company. For example a Qatari citizen can invest directly in SABIC, but cannot own more than 25% of the company through shares purchase. In comparison to other stock exchanges, the equity market in Saudi Arabia was considered closed for foreign investment (Al-Dukheil, 2002).

2.3.3 Growth: 2002 – current

Noting the enduring problems, the Saudi authorities continued to develop the financial market and address major obstacles from the development stage. The start of the growth stage is indicated by the creation of the Capital Market Authority (CMA) in 2003 by Royal Decree enacting the Capital Market Law (CMA, 2009). An independent government authority charged with the regulation, monitoring, and management of the capital market in Saudi Arabia.

Specifically, the CMA must regulate and develop the exchange market in all its aspects including technological systems, procedures, and risk management. Moreover, it handles all primary market regulation such as the issuance of securities, underwriting, and creating transparency in transactions. According to the CMA's annual report (2007) major advancements appeared after the creation of the regulatory authority.

The establishment of the Saudi Stock Exchange (SSE) was a priority for CMA, and it was launched in 2007 under the name of Tadawul[31]. It is an independent joint stock company that is owned by the Public Investment Fund, and operates with a capital of 1.2 billion SAR. Tadawul's activities included the management of trading services, providing settlement and clearing services, as well as the registration, dissemination and depository processes of shares. Its creation might seem redundant at first; however, CMA (2009) explains that the creation of the SSE (Tadawul) segregated the supervisory and operational dynamic within the equity market. Tadawul is charged with the operation segment of the stock exchange, while CMA retains the supervisory authority.

[31] Tadawul is the Arabic term for trade. Since its launch, it has been the official term for the equity exchange.

With regards to the transparency and disclosure, the CMA required key information from market participants attempting to launch public subscriptions. Requirements included adequate description of the firm, information and profiles of executive management and the board of directors as well as major shareholders, a clear prospectus of the shares offered including volume and price, and financial statements that were audited by an independent party. Moreover, for existing companies traded in the market, full disclosure is required of financial statements, quarterly reports, major or significant projects, purchases, or incidence. Failure to continuously provide these requirements would result in suspension[32] from trading (CMA, 2009).

Thus, the CMA acts as a sentinel that promotes an efficient stock exchange. Part of its mandate stipulates that "the CMA can suspend or cancel the securities listing if it considered that the issuer operations' level or its assets do no justify the continuous trading of its securities in the market" (CMA, 2013). In an effort to promote fairness and transparency, the CMA publicly shares vital information surrounding the activity of the stock exchange such as the names of shareholders owning more than 5% of company shares, trading restriction periods on board of directors and other investors who have a conflict of interest with the securities being traded, and the publication of major transactions. Additionally, it has adopted the Resolution of Securities Disputes with the objective of regulating litigation procedures.

[32] In 2007, Al-Baha Investment and Development Company shares were suspended from trading due to failing to report financial statements. This suspension was in effect until the company submitted financial statements and reports in accordance with the CMA rules and regulations. Recently, the CMA has suspended trading on Al-Baha Company due to the company's failure to meet specific standards. Its preliminary financial statements of 2013 exhibited losses for the year that reached 70 million SAR due to accumulated losses in excess of 115% of the company's capital. The CMA's power extends to its ability to cancel any securities in the market, or suspend its trading, even due to losses or inefficiencies.

As part of its market liquidity and deepening activity the CMA had split the nominal shares of all listed companies from 50 SAR to 10 SAR, granted GCC citizens access to investment and share ownership, the permission for foreign residents to invest in the stock market. In 2008, the CMA allowed non-resident foreign investors to enter the equity market through Swap Agreements (CMA, 2009).

The modern era of the stock market did feature a number of reforms and changes that promoted, and sustained growth of securities trading as well as investors' protection. However, as it will be discussed in the upcoming sections, these dynamics might have led to speculative activity causing the first large collapse of the market in 2006. Between 2002 and 2005, the Saudi Arabian stock market exhibited signs of asset price bubble formation fueled by large credit availability, lack of investor prudence and knowledge, rumor-based trading, and greed for profitability on behalf of banks. Financial institutions that provided these credit lines to investors were also the same that provided investments services. This created a conflict of interest, and an incentive to coordinate these activities, which is more than likely a large contributor to the formation of the bubble, and its collapse in 2006. The market went through difficult periods, such as the financial crisis of 2008, where it assumed a supporting role for capital accessibility. In 2008, the CMA in accordance with CML segregated the roles of financial institutions and commercial banks. Brokerage services, investments, and research houses are to be operated independently, and the CMA authorized 110 independent brokers in the end of 2009 (CMA, 2013). In 2014, the Saudi Arabian government indicated that it will allow foreign investors to participate in its stock market as early as 2015. It is a way to support the $130 billion spending plan to boost non-oil sector growth (Almashabi *et al.*, 2014).

It is clear that true development of the market came with the establishment of the CMA in 2002. The CMA was able to address the problems that plagued the Saudi stock market – unregulated, conflicts of interest, lack of transparency, illiquid and shallow. However, there are some issues of restricting credit access to reduce speculative behavior[33]. Despite these setbacks, the Saudi stock market is growing into a crucial role that supports the diversification of the Saudi Arabian economy.

2.3.4 The Role of Islamic Banking[34]

The role of Islamic banking, Islamic financing, or Shari-ah compliant financial services has recently become the interest of financial literature. In the Middle East and Southeast Asia, Islamic banks are many as noted by El-Qorchi (2005) there are more than 300 banks in over 75 countries with an estimated growth rate of 15% per year. It is crucial to understand the role of this type of financial services since it has become an important component of financial systems in most Muslim countries, especially Saudi Arabia.

Shari-ah compliant financial services are built on the concept of risk and reward sharing through partnership. Specifically, usury or any type of interest is extremely prohibited. In addition, financial services that are used in prohibited or unacceptable products under Islamic law is prohibited i.e. selling alcohol, recreational drugs, selling pork products, non-Islamic media and gambling operations. Islamic banks differ from commercial banking structures in that they carry more inherent risk through their contracts.

[33] Although the incidence of margin trading has declined since the 2006 collapse, an underdeveloped credit-check system reinforces the tenacity of this problem, which in turn creates speculative behavior. See Hanware (2014).

[34] Please refer to Annex 2: Table A2-2: Islamic Banking Services and equivalent commercial banking services for a detailed list of Islamic financing options

While Profit-and-Loss sharing agreements (PLS) allow shifting credit risks from borrowers to their investment depositors, it also increases the overall degree of risk on the asset side of the bank's financial statements. As a result, this makes Islamic banks more vulnerable to risks that are correlated with equity investors, rather than debtors or commercial banks. From an economic standpoint, information asymmetries, adverse selection, and moral hazard create inefficiencies in the operations of financial institutions. To that extent, solutions were formulated to align the interests of both parties involved such as collateral for loans. Under Islamic banking, PLS cannot be carried out with a dependence on collateral or guarantees to reduce credit risk (Cihak *et al.*, 2008). In such circumstances, it is evident to see the inherent risk increase with Islamic financing.

Continuing on the concept of risk, Islamic banks are also restricted in their risk-mitigation and hedging options, adding complexities to the operational risk of these institutions as noted by Cihak *et al.* (2008) Islamic banks often operate in underdeveloped or non-existent money markets. Hearn (2010) note a number of fundamental differences between commercial and Islamic financing that relate to concepts of information and allocative efficiency. More specifically, modern equity market theories depend on the role of arbitragers to correct imbalances in the market. These are traders that are able to expose price differences and acting to close pricing and information gaps by the use of short-selling (associated with speculative trading).

In Islamic financing, short-selling is unacceptable as well as gambling, and *Gharrar*[35] (speculation). In addition, information asymmetry is not a familiar concept under Islamic doctrine. This is based on the assumption that traded securities constitute a partnership of equal risk-burden and reward for both seller and buyer; thus, information disclosure is considered within the mutual benefit of both parties (Hearn, 2010).

A second fundamental difference relates to the concept of valuation and time-value of money. The discount rate is a significant and crucial component of economic and financial theories, which is a function of the prevailing interest rate. However, usury or charging and dealing with interest is prohibited under Shari-ah law. That means that Islamic banks use valuation models based on a substitution of the expected profit for the interest rate. Yet, this valuation approach is not standardized, as people's profit expectations can differ greatly (Siddiqui, 2005). Markowitz (1959) investment models are acceptable in Islamic banking since they are built on the notion of profit and loss sharing as well as partnership contracts; therefore, all risk is distributed equally. Yet, the concept of risk-free asset is not available; in turn, standard valuation models such as the capital asset pricing model are ruled out[36]. How do these dynamics impact the equity market? They simply spell out larger volatility of Islamic based indices, financing and trading. There is greater risk bore by financial institutions due to the PLS agreements, valuation models that are based on profit expectations, and limited mitigation of risks. In addition, a higher probability and impact of market imperfections are likely because information sharing is assumed in good faith and not enforced through incentive mechanisms.

[35] Gharrar is translated in the traditional Arabic language as in excess of, which when taken into context means excessive risk due to speculative behavior.

[36] In recent years, there has been renewed interest in the use of expected profit rate, with an adjustment, to use as substitute for risk-free rates when valuing Sukuks (Islamic bonds). Sukuks behave like zero-coupon bond, and thus pay no interest by definition.

Naturally, one might deduce that as the size of the bank increases, so does the exposure to risk in its operations, and in turn it is more volatile. Reconciling the findings of Amelie *et al.* (2012) and Cihak *et al*. (2008), Islamic banking in Saudi Arabia could have contributed to higher volatility due to risks, moral hazard, and an increase in information asymmetry[37]. Ironically, in combination along with other institutional reforms, these dynamics resulted in *Gharrar* (speculative) activity in the stock market, which they were trying to avoid[38].

Mass investing, as a fad, developed in Saudi between 2003 and 2005, with the formation of the asset pricing bubble the preceded the 2006 collapse. These investments were rumor-based trading for the most part, characterized by huge range of products on behalf of the banks to attract investors. As noted by Ramady (2010), Saudi Banks were among the most profitable in the region, and had higher rankings in the global marketplace. This is to be expected since Islamic financing amplifies the risk, and therefore the reward, due to the positive correlation between the two concepts. Speculative activity increased, even with the presence of Islamic financing, as a number of banks offered attractive services in mudarba, musharka, and various credit lines extensions without ka-fala[39].

[37] Amelie *et al* (2012) found that Islamic based indies are slightly more volatile than conventional indices due to the removal of non-Shari-ah compliant firms. Cihak *et al.* (2008) found that small Islamic banks in Sudan are financial stronger than both large Islamic and Commercial banks. In addition, they have found that large commercial banks are more financial stable than large Islamic banks. This directly relates to the ability to manage and mitigate risks which is positively correlated with size in Islamic banking. Smaller Islamic banks are better equipped to mitigate risks and manage cash flows because their exposure is small relative to their assets.

[38] The Global Banking and Finance Review (2013), notes that there are six large banks in Saudi Arabia that have 50 – 70% of Shari-ah compliant activities: Islamic Development Bank, Bank Al-Jazeera, ICIEC, Al Baraka Investment & Development Co., National Commercial Bank, and Al-Rajhi Banking and Investment Corporation. Other banks due offer Islamic financing, but they are considered to be commercial banks since most of their products and services are not Shari-ah compliant. In combination, Saudi Arabia ranked first in the Global Islamic industry with an estimated $207 billion of Islamic Assets (Ernst & Young;s World Islamic Banking Competitiveness Report, 2013).

[39] Refer to Table A2-2 in Annex 2 for definitions.

These contracts of PLS agreements had ‘fine print’ components that resemble that of commercial banking’s collateral for credit and margin calls for portfolios. For example, the amount of credit extended to the client depends on the portfolio size with a 50% share for each party, or a 200% increase in the initial portfolio value.

A client with a one million portfolio value can obtain a credit line of one million, with 50% of the profits and losses attributed to the bank. However, the contracts stipulate that if the market value of the portfolio declines beyond a certain threshold percentage, the bank has the right to liquidate the portfolio and satisfy the debt. These clauses had prominent impacts on the collapse that magnified its duration and total value lost. The market in 2006 may have been heading to an aggressive adjustment phase; but the margin call and liquidation of these portfolios by these banks shifted the adjustment into a prolonged collapse. As investors, without credit lines, noted the rapid decline, they too started to liquidate their portfolios. This vicious cycle, despite the restrictions on price movements – a ceiling and a floor of 10% per day – continued to push down the index to unprecedented levels. This confirms to the observation that Islamic banking and financing does magnify the returns and the losses; while small Islamic banks contribute to faster development through a micro-finance-mechanism, the larger the bank the more it becomes financially unstable and at risk (Cihak *et al.*, 2008). Various fundamental changes need to be made in the stock market and overall financial system to make them more accustomed to Islamic financing. Most financial systems were constructed to support commercial banking activities. Even then, speculative activity cannot be avoided as it was the case with the 2008 Financial Crisis, and the negative impact is larger due to the risk exposure of Islamic financing.

Given the growth of Shari-ah compliant financial institutions and the increase in their asset size, failing to adapt existing institutions and support system in the economy will hinder the Islamic banking's ability to contribute to development and superiority to commercial banks[40].

The CMA and the Saudi stock exchange have similar mechanisms in place such as the restriction on stock price movements. While the CMA is transparent i.e. announcing publicly if 5% of floating shares have been purchased or sold in real time and direct identification, there are restrictions on certain mutual funds, but not all institutional investors. However, the market is still not fully compatible with the optimal structure for Islamic financing and banking system[41].

2.3.5 Analysis & Performance

As reported by Table 2.1, there were 46 companies listed on the exchange in 1986, and it increased to 163 in 2013 through specific periods of rapid expansions[42]. Between 1986 and 2005 company listing growth remained relatively low (an average of 2 companies per year). However, average company addition per year from 2006 to 2013 was eleven, which coincided with many

[40] El-Gari (2000) mentions a number of solutions that are Shari-ah compliant, and would help stabilize the dynamics of Islamic financing and its risk exposure. One would be a tax on capital gains of a certain percentage within a specified short-period of time. Another would be restrictions on institutional investors, as well as the application of price floors and ceilings for trading. Derivatives could be formulated and structured to be Shari-ah compliant, and introduced in the market to help diversify the overall risk-return portfolio. For example, a call option could be replicated through the concept of *arboon*, which the Arabic term for a small down payment. See (El-Gari, 2000).

[41] Implementation becomes more difficult given the degree of globalization. Islamic banks prohibit businesses with firms that deal with non-Shari-ah compliant activities, which includes banks (since they charge interest and engage in usury). Even with the domestic adaptation of the infrastructure to accommodate Islamic banking, foreign markets are still built on commercial banking fundamentals; this creates an incompatibility between the two banking systems, and would restrict the pool of foreign business partners for Islamic banking to revolve around those that are Sharia-ah compliant.

[42] Although there was some activity prior to 1986, the complete records were not available, and some data was missing. For example, the number of listed companies shows discrepancies across various sources. The quantity of shares traded (in millions) was reported to be 5 million (Niblock and Malik 2007; Al-Dukheil 2002). Other available information showed that the value of shares traded, transactions, and share price index to be 76 million riyals, 7,840, and 690.88 (1985 = 1000), respectively. For the sake of this study, we use the 1986 as the starting point for the performance analysis. The average reported listing of the companies in 1985 was 44 calculated by the research from various resources; this gives a 2.2% change in the number of listed companies in 1986.

of the CMA's action plans to take hold, and a successful attempt to facilitate between buyers and sellers of capital (Figure 2.4). There was a temporary decrease in the number of listed companies at the end of 2002 mainly due to the consolidation of electric companies (SAMA, 2003).

Table 2.1. Historical Data on Equity Market (Annual)

	Company		Shares Traded (millions)		Value of Shares Traded in billions (real)		Executed Transactions (thousands)		Real Share Price index 1985 = 1000	
Year	Listed	% Chg.	Qty	% Chg.	Value	% Chg.	Executed	% Chg.	TASI	% Chg.
1986	46	2.22	5	25.00	9.47148	11.7%	10.83	38.14	7.3721	-33.92%
1987	51	10.87	12	140.00	19.61747	107.1%	23.27	114.87	9.0616	22.92%
1988	52	1.96	15	25.00	23.02701	17.4%	41.96	80.32	10.0687	11.11%
1989	54	3.85	15	0.00	38.00174	65.0%	110.03	162.23	12.2921	22.08%
1990	57	5.56	17	13.33	48.1022	26.6%	85.3	-22.48	10.7115	-12.86%
1991	60	5.26	31	82.35	88.84426	84.7%	90.6	6.21	18.3859	71.65%
1992	60	0.00	35	12.90	146.0109	64.3%	272.08	200.31	20.1287	9.48%
1993	65	8.33	60	71.43	181.639	24.4%	319.58	17.46	18.7634	-6.78%
1994	68	4.62	152	153.33	258.7986	42.5%	357.18	11.77	13.3499	-28.85%
1995	69	1.47	117	-23.03	230.8301	-10.8%	291.74	-18.32	13.5895	1.79%
1996	70	1.45	138	17.95	249.3648	8.0%	283.76	-2.74	15.0306	10.60%
1997	70	0.00	312	126.09	611.897	145.4%	460.06	62.13	19.3034	28.43%
1998	74	5.71	293	-6.09	512.7312	-16.2%	376.62	-18.14	14.0660	-27.13%
1999	73	-1.35	528	80.20	566.6443	10.5%	438.23	16.36	20.3156	44.43%
2000	75	2.74	555	5.11	664.1913	17.2%	498.14	13.67	22.9734	13.08%
2001	76	1.33	692	24.68	855.6807	28.8%	605.04	21.46	24.8732	8.27%
2002	68	-10.53	1736	150.87	1359.654	58.9%	1033.67	70.84	25.5902	2.88%
2003	70	2.94	5566	220.62	6037.551	344.1%	3763.4	264.08	44.9148	75.52%
2004	73	4.29	10298	85.02	17845.67	195.6%	13319.52	253.92	82.5576	83.81%
2005	77	5.48	12281	19.26	41140.16	130.5%	46607.95	249.92	166.1296	101.23%
2006	86	11.69	73440	498.00	50839.13	23.6%	96095.92	106.18	76.6501	-53.86%
2007	111	29.07	58860	-19.85	23209.71	-54.3%	65665.5	-31.67	101.4152	32.31%
2008	127	14.41	58727	-0.23	16344.3	-29.6%	52135.93	-20.60	39.9916	-60.57%
2009	135	6.30	56685	-3.48	10095.93	-38.2%	36458.33	-30.07	48.8958	22.27%
2010	146	8.15	33007	-41.77	5751.364	-43.0%	19536.14	-46.42	50.1572	2.58%
2011	151	3.42	48260	46.21	7905.324	37.5%	25550	30.78	46.1707	-7.95%
2012	158	4.64	82540	71.03	13360.94	69.0%	42110	64.81	47.0999	2.01%
2013	163	3.16	52500	-36.39	9210.342	-31.1%	28970	-31.20	57.3976	21.86%

Source: Tadawul (2014) and Global Financial Database (2014)

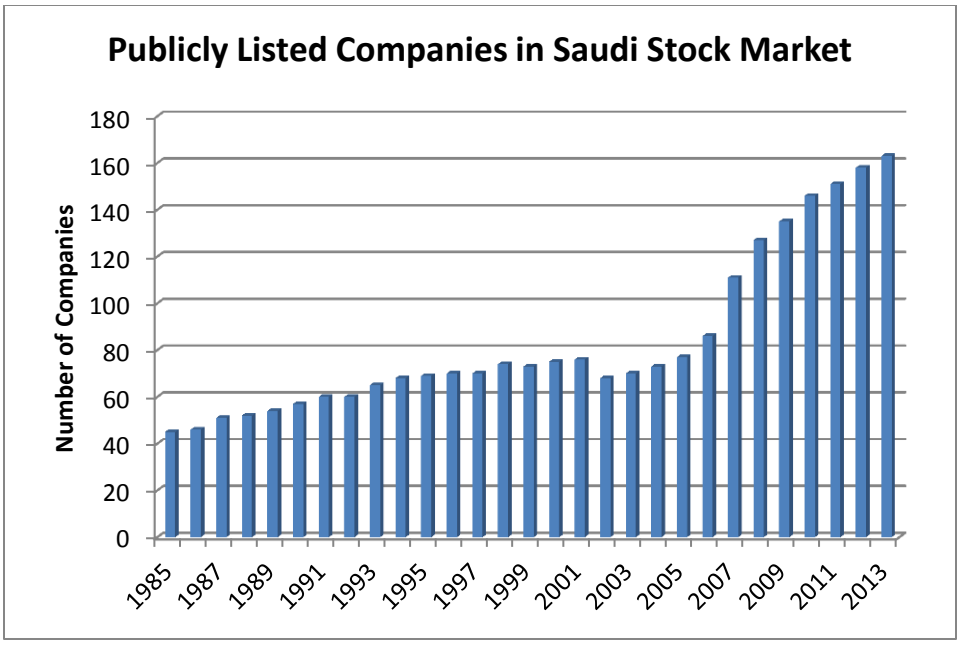

Figure 2.4 Company Listing Growth 1986 – 2013. Source: Tadawul (2014)

Based on Table 2.1 and Figure 2.5, we are able to see a constant increase in the shares traded and the value of these shares. Before 2006, the IPOs were launched with an initial book value of 50 SAR per share. In the time period that followed, the book value of shares was reduced to 10 SAR after a stock split with a ratio of 1:5 – for each share with a book value of 50 SAR is equal to five shares priced at 10 SAR[43]. Given the rate of development, the CMA's intentions were to add liquidity and depth by attracting investors with small portfolios. The number of shares traded jumped from 12,281 million to over 73,840 million instantly (Figure 2.5).

[43] Face value of first Initial Public Offering for any company had a minimum price of 50 SAR/share due at issuance. After 2006, in an effort to increase market depth and liquidity, all subsequent IPOs had a face value at issuance of 10 SAR; in addition, all previous joint-stock companies were adjusted to reflect the new book-value in retrospect. As such, IPOs launched before 2006 were split in 1 to 5 ratio.

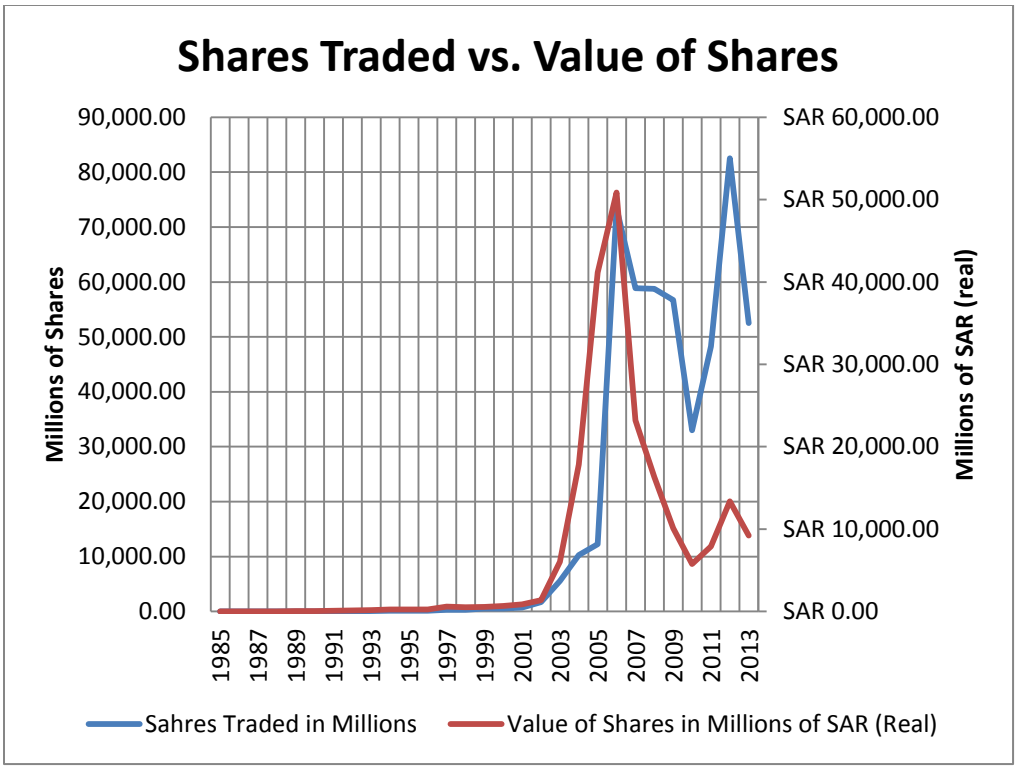

Figure 2.5 Number and Value of Shares Traded 1986 – 2013. Source: Tadawul (2014)

Figure 2.6 demonstrates the performance of the market on the whole. There was a mildly flat increase in the real TASI from 1986 until 2003. A drastic increase in the TASI is witnessed from July of 2003 through the peak in February of 2006. This structural break of the data confirms a real price bubble in effect, that rapidly declined within 10 months. A closer look at the TASI's growth rate (Figure 2.7) provides insights of major events that impacted the financial market in Saudi. There are five notable real declines across the sample period: 1994 bond market collapse, the Asian Financial Crisis and the Russian Rubble Crisis that followed in 1997 and 1998, respectively. The 2002-2003 declines in the SAIBOR, the 2006 peak of the TASI, and the financial crisis of 2008 are also notable shocks, with the most severe being in the latter two. The following section discusses these declines in order of occurrence.

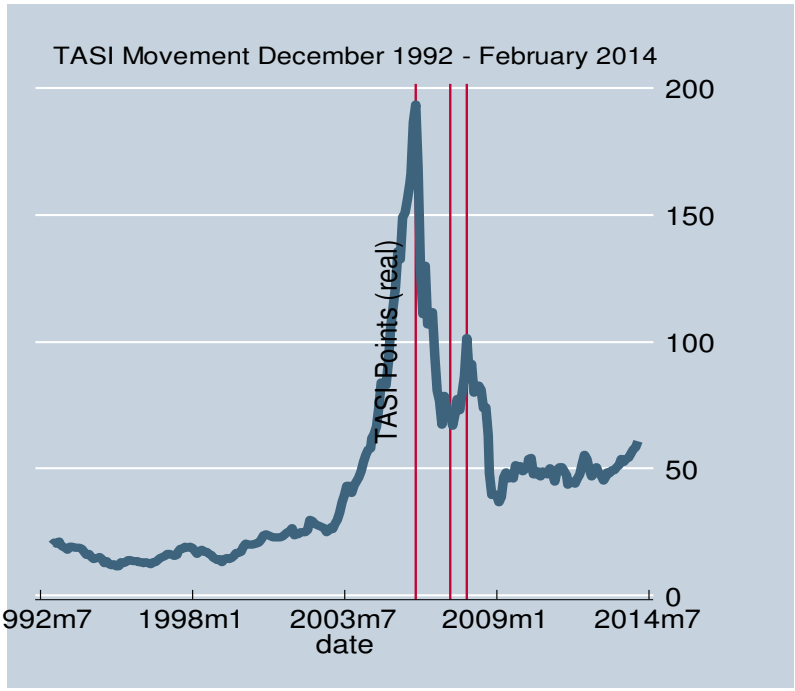

Figure 2.6 TASI in Real Levels (1985 = 1000) 1986 – 2013. Source: Appendix B

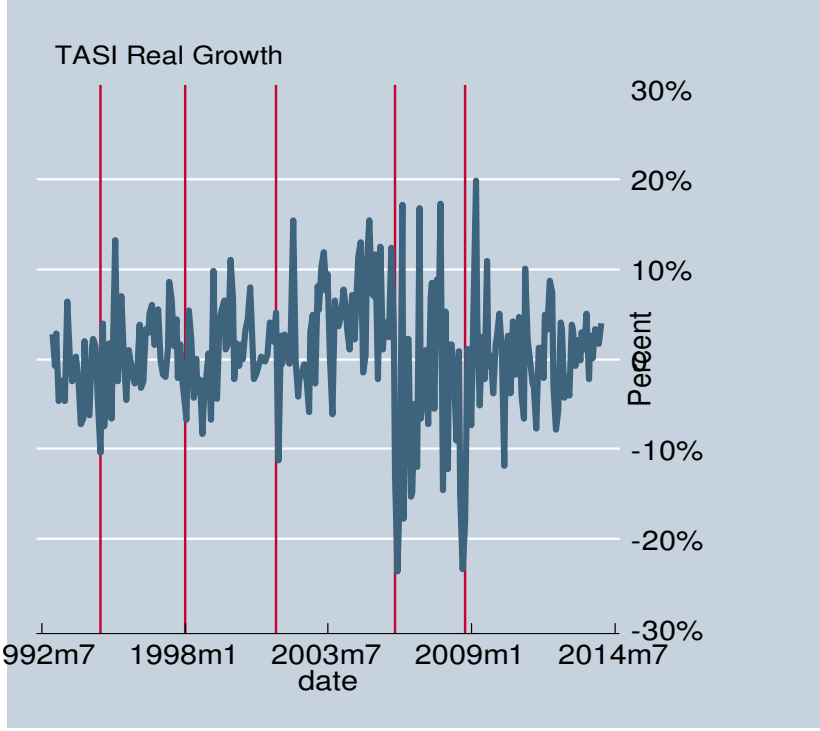

Figure 2.7 Tadawul All Shares Index Annual Growth 1986 – 2013 (Calculated)

2.3.5.1 Market Declines and Collapses

A detailed analysis or empirical evidence regarding the 1993 and 1994 decline is not present in the literature. In an attempt to define a cause, we can formulate a number of hypotheses based on global market events that may have affected the performance of the Saudi equity market. We must first realize that given the fixed exchange rate system of Saudi Arabia, as well as shadowing the monetary policy of the US, we expect shocks in the U.S. economy to transfer over to the Saudi market. However, when considering that Saudi Arabia is a net oil exporter, deviations and discrepancies could arise in the form of not having a direct one-to-one relationship between the two economies.

In 1993 and 1994 a number of major events took place, some of which are plausible to have affected the Saudi market. First, there was the recession of the early 1990s experienced in the United States, and the other economic impacts of the U.K and neighboring countries between 1990 and 1993. This economic downturn has, without a doubt, impacted the economic performance of the U.S. and would have constituted adjustments in monetary policies as well as changes in the U.S. equity markets. Moreover, there was the bond market selloff in 1994, and the shock it created in the global market specifically the U.S. and Japan.

The crucial impact of these deficits left the U.S. dollar overvalued, gaining immense strength against other currencies, which in turn dampened exports and increased imports. The Federal Reserve's monetary tightening of 1988 could be linked to the growth in the TASI (Figure 2.7) from 1988 to 1989. Since the Saudi Riyal was fixed against the U.S. dollar, the appreciation of its value may have created excess funds to be invested.

The decline that followed at the beginning of 1992 and through to the end of 1994 could be characterized as a latent effect of oil price shocks on oil exporting economies. Initially, the oil price would create surplus revenues for Saudi, and cause negative effects in developed economies or oil importers. However, as argued in the literature, the negative impacts could transfer over to the very same oil exporting economy due to the terms of trade or through exchange rate dynamics.

Perhaps the most obvious shock to the global financial market was the 1994 bond market turbulence. Within a period of nine months starting from January of 1994, the 30-year bond yield increased by 1.50% to reach 7.75%. As noted by Mattich (2010), the possible culprit was the increase in interest rate due to contractionary monetary policy in the U.S. following the 1991 housing bubble. However, Borio and McCauley (1995) assert that there were more factors to consider. They conclude that the market's own dynamics is strongly correlated to the selloff of 1994. In addition, volatility spills from other markets, substantial withdrawals of foreign investments, and limited evidence of monetary and fiscal policies are strong contenders in explaining the turbulence of the bond market.

There was a demand for dollars as interest rates became attractive both in the short and long-term. Appreciation of the dollar translated into an appreciation of the SAR, which meant a flux of imports due to the higher currency value. The decline in the market could then be attributed to two issues. Either investors were demanding liquidity to invest in the U.S., and thus started to liquidate portfolios in the local market; or, investors found other alternative to investing locally i.e. the foreign exchange market.

From 1994 to the end of 1997, the TASI regained some of its lost points. Alshogeathri (2011), asserted that the Saudi market was not directly impacted by the Asian Financial Crisis (AFC) of 1997. Based on his observation, he deduces that the equity market is not linked to international markets. However, as demonstrated in the real TASI's growth rate, these global events may have impacted the Saudi Arabian equity market; perhaps the impact is due to latent oil price shocks. Arguably, it has also led to the Russian Financial Crisis of 1998. As noted in the IMF (2012) report on the Russian Federation, the AFC resulted in decreased demand for crude oil, and thus impacted its prices. Mete (2004) examined the crisis and concluded that the AFC resulted in a direct hit to Russia's energy and metals prices, causing a decline in GDP, an increase unemployment, and liquidation of Russian assets by foreign investors. Simultaneously, a cascade effect took place in U.S. financial markets due to fears of AFC and the Russian crisis[44].

The Dow Jones Industrial Average decreased by 984 points in only three days. The unstable state of the U.S. market continued from August of 1998 until the Federal Reserve reduced interest rates in October (Kotz, 1998). Thus, the AFC and the Russian Crisis in 1997 and 1998, respectively, may have had a dual impact on the Saudi Arabian economy, and the stock market. First, a direct negative impact is associated with a decline in crude oil prices. Second, an indirect impact is absorbed through the United States economic slowdown due to these crises. As such, it could be argued that the Saudi Arabian economy had a compounded and reinforcing negative response in this period.

[44] See Kotz (1998); Mete (2004); IMF (2012).

The drop in oil prices, coupled by turbulence in the global market affecting the US economy then shows how sensitive the Saudi economy to global changes. The TASI dropped in 1998 by 27% from the previous year. In the following years, the TASI gained momentum and started to grow at an average rate of 32% per year, reaching its peak in 2005. The performance during the 2003 – 2005 could be attributed to a number of factors such as the continued growth of non-oil private sectors, structural reforms in the government, strong financial standing of joint-stock firms, the positive oil price shocks, and the influx of investors (SAMA, 2006).

A main contributor to the increase in the TASI is related to the high demand of capital for the purposes of investing, coupled with an increase in the availability of credit (Al-Twaijry, 2009). Banks offered various forms of credit lines to investors (due to a decline in the real SAIBOR), which aided in increasing their profitability but at the same time creating a bubble in the equity market. This is a plausible argument considering that free floating shares in the Saudi equity market were at 35% from total shares issued across the period (Alshogeathri, 2011).

The highest close of TASI was registered on February 25, 2006 reaching 20,634.86 points (193.479 in real points). Across that year, the TASI declined rapidly despite the safeguard controls[45] in place to reach 12,701 (67.4446 in real) points or retaining 34.8% of its all-time high. SAMA (2007) reported that investment funds decreased by 505.75 million SAR (real). Investors defaulted on their lines of credit, and a large majority of the market participants incurred a substantial amount of debt. The collapse of 2006 as indicated by Al-Twaijry (2007; 2009) could be due to several factors such as increased volatility in the market and an increase in speculative

[45] The Saudi market operates with a price floor and price ceiling equaling 10% of the stock's value. Once the 10% limit is reached (either increase or decrease) the stock price does not change until the next day. For example if a stock costs 10 SAR, then the upper limit is 11 SAR and the lower limit is 9 SAR. Reaching the upper limit means the demand for the stock is larger than the supply, and it will remain at that point until additional sellers enter the market to drive the price down i.e. provide shares to sell by market close; otherwise, the stock would open at the previous last price of 11 SAR, and a new upper/lower limit is calculated at 10% of the current value. The same is applicable in the case of reaching the lower 10% limit.

activity. The decline could also be attributed to offloading and liquidation of portfolios by more seasoned investors in light of the increased volatility in the market. In simple terms, the market began to readjust and the inflationary price bubble had burst.

SAMA (2009) noted that the collapse of the 2008 resulted in a decrease of 29% in investment fund assets, and the TASI closed at 4,803 (39.9916 in real) points. Arguably, it could be related to the financial crisis of 2008 in which all global markets experienced the shock. It could be another readjustment period as indicated by Al-Twaijri (2009), or a combination of both. Harvey (1995) commented that these collapses in emerging markets are expected since developing economies are more volatile in comparison to developed economies. It is demonstrated by Al-Twaijri (2009) that the Saudi and the Kuwaiti stock market are the most volatile in the GCC countries, yet they are the most profitable due to these rapid movements. Since 2008, the equity market regained some of its strength by increasing close to 30% since the previous year. There was a minor readjustment period in 2011 where the market dropped by 3% and it could be linked to the Arab Spring movement which started in December of 2010. According to SAMA (2013) the number of registered customers increased by 3% to reach 4.22 million; while online traders increased by 91.8% to reach 98,397. The TASI's performance has been consistent with that of emerging markets, especially when considering that it is in the process of developing the financial structure. In recent years, the stock market has received ample attention and has been one of the top priorities of the Kingdom. Its forecasted performance cannot be determined accurately without an empirical investigation of the various dynamics in play such as the macroeconomic environment and oil price fluctuations. Hypothetically, as markets mature they become more stable and develop into a leading indicator of the economic health.

This performance can be directly linked to the CMA's establishment and commitment to regulating and promoting the equity market. Effectively, the existence of the CMA could mark the true commitment of the Saudi government to the development of the financial market. This does not discount any prior efforts, but rather places a significant attachment to passing the CML and creating the regulatory authority.

The market collapses could be classified as unforeseeable results of due to the existence of perfect conditions to form asset price bubbles. First, transaction costs and ease of access were lowered with the ESIS introduction, in 1990, as transaction growth increased by 200 percent. Moreover, the modified version of the ESIS launched in 2001 had a stronger medium-term effect on transaction growth increasing from 2001 until 2006 as demonstrated in Figure 2.8.

Second, the decline in the real SAIBOR rate tempted banks to increase credit access and financial products for investors. The structural reforms that took place in the equity market may have caused some 'adjustment-period ripples'; however, participation and activity was observed as the market continued to develop. Coupled with the volatility profile of Islamic banking, all of these factors allowed the TASI to experience a period of higher prices. The real value of shares increased from 855 million in 2001 to 50.839 billion SAR in 2006. Executed transactions increased from 784 thousand to over 96 million at the end of 2006 (Figure 2.8). Such movement is expected as developing equity markets adjust to new conditions and reforms.

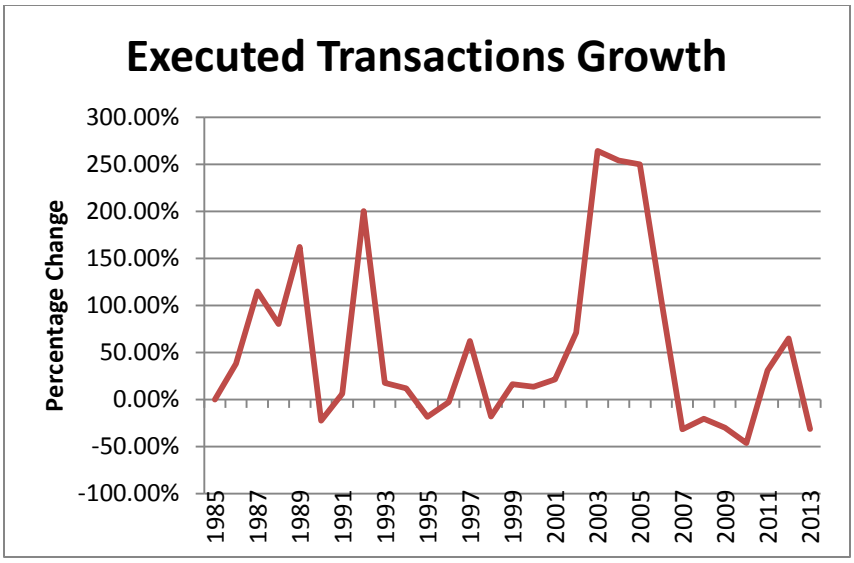

Figure 2.8 Executed Transactions Growth in Equity Market 1986 – 2013 (Calculated)

2.3.5.2 Equity Market Activity and Liquidity

The research suggests the use of three indicators to indicate the level of development in the market: first, the ratio of market capitalization to GDP; second, the ratio of the value of shares traded to market capitalization; and finally, the ratio of the value of shares traded to GDP. The first ratio is usually associated with the size of the stock market, while the remaining two are used to indicate the liquidity (Levine and Zervos, 1996; Victor, 2006).

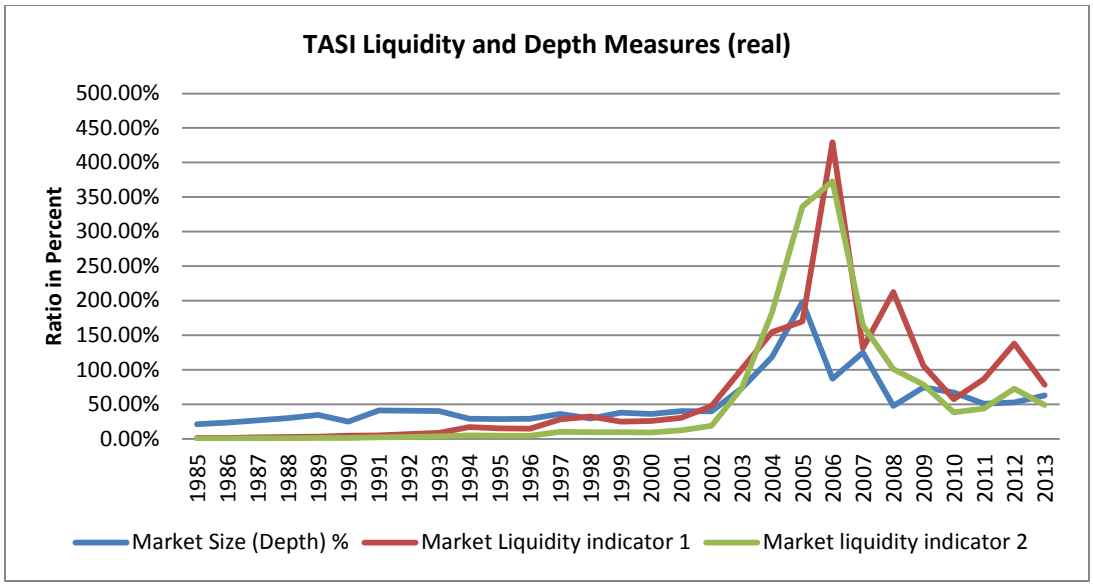

Figure 2.9 Saudi Arabian Equity Market Size and Liquidity 1985 – 2013 (Calculated)

Figure 2.9 exhibits these indicators in a graphical format[46]. Market size, or depth, is measured as the market capitalization divided by the GDP in each year. There is a steady increase in market depth, which started at 21.34% in 1985 up to 40.93% in 1991. In 2003 through to 2005, market depth increased in an exponential fashion reaching nearly 200% in 2005. This increase is due to the surge of investors, as well as the peak of the asset price bubble formation. Except for a brief surge period in 2007, where it reached 124%, the depth of the Saudi Arabian equity market remained below 70% of GDP.

Victor (2006) noted that developed equity markets usually demonstrate market depth ratios in excess of GDP. While these ratios did exceed 100% in 2004, 2005, and 2007, they were not sustained. A number of factors could be linked to this issue such as the low number of companies in the market, in contrast to the average of developed markets, as well as the formation of a stock-price bubble – which is the likely culprit.

[46] Source: SAMA Annual reports, various. IMF and GFD for GDP. Please refer to Appendix A: Data and related, Table 2 for the data values.

The latter could have been fueled by the CML, and CMA establishment that motivated more investors and market participants to enter the market. Yet, for the most part, the equity market in Saudi Arabia does demonstrate developing characteristics. Compounded annual growth of the market depth is estimated at 3.92% from 1985 to 2013. Market liquidity indicator (1), is the ratio of the value of shares traded to market capitalization. The second ratio, market liquidity indicator (2), is the ratio of the value of shares traded to GDP. Both ratios describe the ease of transaction execution in the market; hence as noted by Victor (2006), Levine and Zervos (1996), higher liquidity ratios are associated with reduced transaction costs due to supporting government policies and overall development.

Naturally, the first indicator is less taxing since we are dividing by a smaller base i.e. market capitalization versus GDP. However, these two indicators should move together. Market liquidity based on the first indicator has a ratio of 1.13% in 1985, which has slowly progressed in small increments to 8.77% in 1993. Similarly, the second indicator estimates a ratio of 0.24% in 1985, and through slow increments reached 3.51% in 1993. Large increases or jumps are noted in the years that follow, reaching 47.66% and 18.92% in 2002, for the first and second indicators, respectively.

In 2003 through 2005, a peculiar observation occurs. The second indicator exceeds the first. For example, in 2005, market liquidity based on market capitalization is estimated at 169.74%, but if we use GDP as the divisor, it is observed at a whopping 336.27% in the same year. The large discrepancy has occurred due to the fact that market capitalization exceeded GDP by more than 200% in 2005.

This also features the all-time high of market depth of 198.10%, and the peak of the price bubble before the 2006 crash. Market liquidity reached an all-time high of 429.24% (first indicator) and 372.79% (second indicator) in 2006, due to the splitting of nominal book values (1 to 5 ratio) and the inflationary pressures of the price bubble. Liquidity dropped at an accelerated rate to 131.41% in 2007, and continued to do so with the exception of 2012, to reach 78.14% and 49% in 2013 for the first and second indictors, respectively.

The high liquidity ratios indicate lower transaction costs associated with trading and investing in the equity market. This observation is verified with the establishment of the CMA in 2003 and the CML. In addition, the increase in transaction executed during the same period due to various channels of trading (telephone, online, in person). Despite the benefits of regulation and low transaction costs, arguably the low percentage of free-floating shares in comparison to the total shares issued may have sparked speculative behavior. In turn, low transaction costs, that were expected to be beneficial to the market, led to speculative activity that created a price bubble. When we consider the role of credit extensions and various portfolio-solutions offered by banks during that time, it is hard to imagine anything but inflated prices for the equity market.

Analyzing the market as whole the data confirms that the equity market is still developing. We expect to witness higher volatilities, and additional market ‘adjustment’ periods to come. While transactions costs may remain low, which will contribute to a faster pace of development, the demand for credit and portfolio solutions from banks are likely to decline. Investors, in rational expectation and risk aversion, would rather avoid the great losses experienced in the 2006 and 2008 collapses. These credit lines led to a compounded negative impact on their portfolios, and many investors are still recovering from those losses.

2.3.6 Comparison

A comparison to developing markets can uncover some global links. For example, we can observe if emerging markets suffered an exogenous shock by noting the trends in their performance. Moreover, it can uncover possible correlation in the performance and may shed some light on spillover effects. First, we will compare the Saudi stock market to its closest neighbors in the GCC countries. The second comparison will look at various emerging markets outside of the Middle East region. Finally, a comparison to various Arab markets is presented.

2.3.6.1 GCC Equity Markets[47]

The TASI shocks have occurred in 1993-1994, 1998, 2002, 2006, and 2008, as discussed previously. Some of the data from the GCC countries does not include the time period pre-1994. Therefore, we will treat this as the first incident of comparison. Referring to Figure 2.10, which exhibits the index growth of each GCC country, only the Bahrain SE echoes the shock experienced by TASI in 1994. The TASI declined by 28.46% and the BSE declined by 21.23%. Kuwait and the UAE had a minor decline of 2.10% and 4.94%, respectively. Oman was the only stock exchange which showed gains of 28.54% during 1994.

In 1998, the GCC countries with the exception of UAE recorded losses of 27.82%, 40.32%, 5.25%, 8.03%, and 52.46% for Saudi, Kuwait, Bahrain, Qatar, and Oman, respectively. The collapse of 2006 unites Saudi, Kuwait, UAE, and Qatar with a decrease of 52.53%, 12.04%, 39.77%, and 28.12%, respectively. Bahrain had a 0.99% increase, and Oman had a 14.49% increase in the same year.

[47] GCC countries of Saudi Arabia, Kuwait, United Arab Emirates, Bahrain, Qatar, and Oman Stock Exchange Data is acquired from Global Financial Database. Not all data was available from the sample period 1985 – 2013. Some exchanges were established fairly recently such as the Dubai Stock Exchange and the Abu Dhabi SE (2000).

The 2008 Financial Crisis impacted all GCC countries with the exception of Qatar which showed gains of 24.75% in its equity market. The Saudi index dropped by nearly 57%; Kuwait, Bahrain, and Oman, averaged 36% decline in their indices, and the UAE had an 11% drop. There is some degree of correlation between the GCC indices as exhibited in Figure 2.10. For example, the 1994 shock experienced by Saudi Arabia had an almost mirrored positive effect in Oman. The only country to experience the same magnitude is Bahrain. While Kuwait and UAE showed minor drops in their indices, these declines were only a tenth of the decrease in the TASI.

Since the 2006 shock to the TASI was due to a price bubble, we can use it as a base of comparison to the degree of connectivity between the GCC markets. The UAE showed the highest affected index, followed by Qatar and then Kuwait. The Bahraini index movement was insignificant and could be labeled as unchanged.

These correlated declines could be linked to a shift of investment across the GCC markets; the fact that the Omani index increased by 15% could be justified as a flux of GCC portfolios seeking a safe haven. Having that GCC economies share similar attributes such as source of revenue, natural resources, cultural, and religious ideologies, economic impact should be witnessed as being uniform across these countries. In other words, the similarities of these countries present a natural fixed country effects model, from an empirical perspective. However, it is puzzling that these shocks are not propagated across the markets – especially when considering that with the exception of Kuwait[48], all GCC countries have a fixed exchange rate system to the U.S. dollar. As such, global shocks that affect the U.S. economy and the Saudi Arabian market should also be observed in the GCC countries.

[48] From 1975 to 2003, the Kuwait Dinar was pegged to weighted current basket. From 2003 to 2007, the pegging currency was switch to the USD at a rate of 0.29963 dinar per one USD. From 2007, the Kuwaiti Dinar was re-pegged to a basket of currencies. The SAR to USD = 3.75 since 1986; Qatari Riyal to USD = 3.64 since 1975; Omani Riyal to USD = 0.3844 since 1986; UAE Dirham to USD = 3.6725 since 1978; Bahrain Dinar to USD = 0.376 since 1980.

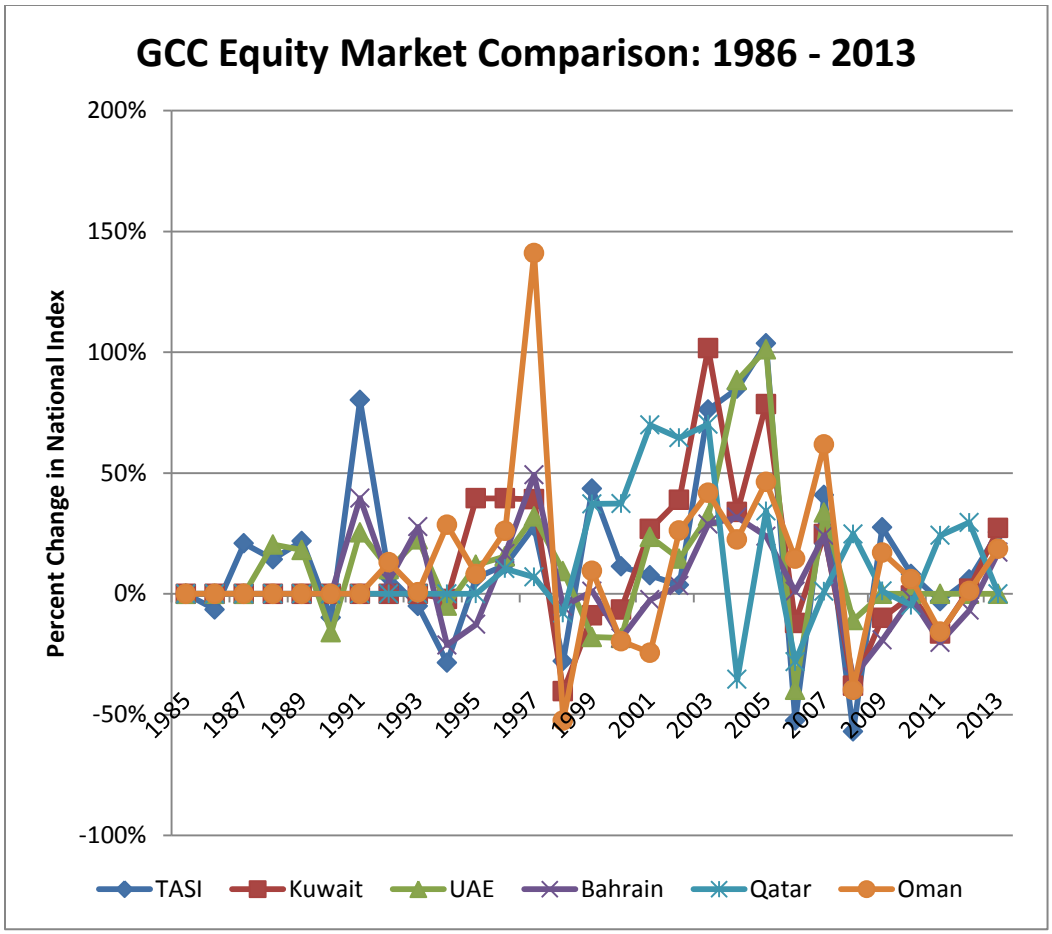

Figure 2.10 GCC National Indices Growth Rates. Source: Arab Monetary Fund (2014)

One possible explanation to this puzzling case could be linked to the difference in sizes of the markets such as the number of companies, the number of sectors, and other market-related attributes such as liquidity and depth. Another explanation might relate to the demographics of these countries such as population size, investor spirits and sentiments, as well as access to credit or banking efficiency. As demonstrated by AlMusehel (2013), bank efficiency tests in the GCC countries change significantly when country and demographic attributes are accounted for. In addition, the volatilities, which are due to the size of the market as noted by Al-Twajiri (2009) play a major role in the sensitivity of the market to such shocks and its ability to reflect these shocks in the asset's prices, and in turn the index.

2.3.6.2 Developing Equity Markets

The comparison of the GCC countries stock exchanges revealed the dynamics of the region. Keeping in line with the previous comparison, this section places that TASI against developing markets. Data is collected on the Russian, Iranian, Nigerian, and Malaysian stock exchanges in Figure 2.11. In 1994, only Saudi Arabia and Malaysia were affected, and exhibited a similar response to the bond crisis, with a decline of 26% in their stocks. Interestingly enough, Iran, and Nigeria registered above 33% gains in their stock markets.

The 1997 AFC exhibited gains in the TASI of 28%, and the Russian index in a whopping 164% increase. The latter could be an indication of a precursor bubble to the 1998 crash. Malaysia, being in the heart of the crisis registered a decline of more than 50% in its stock exchange, followed by Iran with a 17% drop. Directly, we are able to observe the 1998 Russian crisis inducing a decline in these six exchanges. On average, the indices dropped by 25%, with the largest drop being in Russia with 56.3%, followed by Saudi Arabia by 28%.

Evidence shows that the 2006 collapse of the TASI was not due to exogenous factors, but rather to the market's own volatility and bubble formation in the previous years. None of the exchanges registered a decline, which could also indicate that the stock price drop in Saudi Arabia had no impact on its oil production or sales[49]. Finally the 2008 financial crisis shows a drop across all indices with an average of 35%; Saudi Arabia registered a decline of more than 55%, followed by Nigeria with 45%, and Malaysia with 40%.

[49] The Iranian stock market showed a decline of 1% during 2006, which is considered insignificant and could be attributed to adjustment periods. Since Saudi Arabia is the largest oil producer and exporter, any change to its economic environment may affect the oil sector, at least temporarily. Being that the stock market crashed in 2006, and the stock exchanges used for comparison are from net oil exporters, we can deduce that the stock volatility or movement is independent of the oil industry. This is based on a graphical analysis, and only in the case of Saudi Arabia. The results of the second group of variables in the upcoming sections will either confirm or reject this preliminary observation.

This comparison sheds light on stock exchanges and oil industries behavior. The comparison countries are developing and net-oil exporters, which would indicate a similar response to oil price shocks. The 1998 Russian crisis did impact crude oil prices, and that impact was seen affecting all stock exchanges in comparison. While domestic financial crisis do not exhibit a spillover effect i.e. the AFC, and the 2006 collapse of the TASI, global financial recessions induce a uniform negative shock. The only difference seems to be the severity of the shock which may depend on the economy structure or safeguards in place.

This observation can lead us to witness the direction of impact, at least from the graphical analysis, to be flowing from oil prices to stock exchanges. In addition, economic downturns that originate from developed economies i.e. the 2008 financial crisis, seems to affect the stock exchange directly due to trade relationships with these countries[50]; while domestic shocks are confined to the borders of that very country. Alshogeathri (2011) indicated that the Saudi Arabian stock market was immune, or did not resemble sensitivity, to exogenous shocks and spillover effects; however, as the comparison to GCC and developing net-exporting oil economies, Saudi Arabia may in fact vulnerable to exogenous shocks. Such observations at the preliminary stage of analysis are consistent with some of the findings in the literature. For example, Sedik *et al.* (2011) analyzed the impact of global and regional spillovers to GCC equity Markets. Although the magnitudes of spillovers were smaller in comparison to mature markets, they found it to be statistically significant. Considering the degree of openness, the financial channel transmits volatility to these markets; as such, GCC equity markets are not insusceptible to global and regional financial shocks.

[50] This is a logical deduction since developed economies are mainly net-oil importers. Financial and economic distress leads to a drop in the demand for oil; in turn, reduction in exportation is exhibited in the developing net oil-exporters. This leads to a decline in revenues, for example Saudi Arabia, and therefore a decline in government spending, which would dampen consumption and investment.

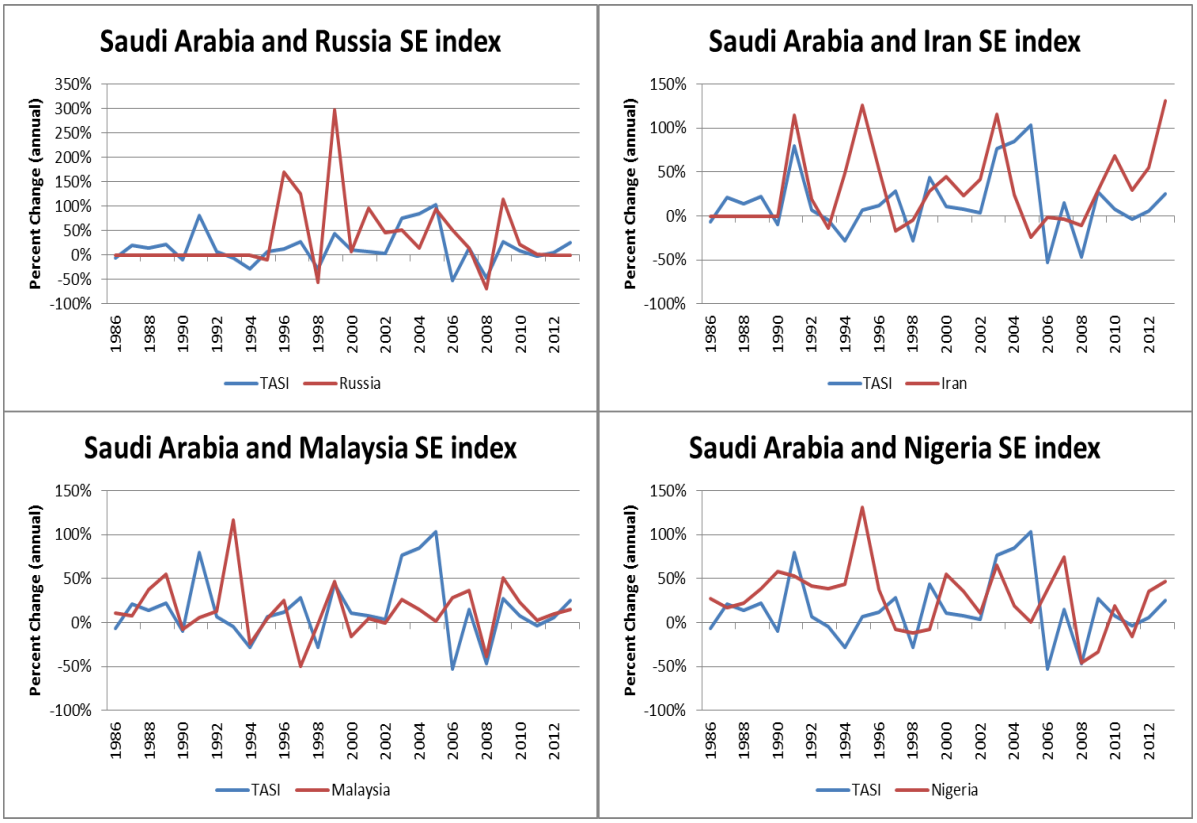

Figure 2.11 Tadawul All Shares Index Comparison. Source: GFD

More specifically, the graphical analysis of the TASI suggests that it is sensitive to shocks affecting the oil industry or its demand. While the impact may not be direct, it still manages to trickle down and affect the stock market's performance. Pending the results of the empirical analysis, the aforementioned observations may lead us to reject the hypothesis of decoupling between the GCC and other equity markets, despite the maturity classification.

2.3.6.3 The Saudi Arabian Exchange & the Arab World[51]

In comparison to the Arab World, the Saudi Arabian stock exchange takes a strong commanding lead. As demonstrated in Figure 2.11, the total value of shares traded in the selected stock exchanges is 483,260.66 million USD, while Saudi Arabia's stock exchange takes 75% of that amount. From 2010 to 2014, the average Compounded Annual Growth Rate (CAGR) for all stock exchanges is 20%. The Dubai and Abu Dhabi Stock exchanges are superior in growth, in comparison to Saudi Arabia, with 48% and 40% respectively. Yet, Saudi Arabia ranks in the third position with 24% CAGR, which demonstrates its ability to outperform the average.

Alshogeathri (2011) noted that the number of companies is greater in older stock exchanges within the Arab World such as Egypt, Jordan, and Kuwait with 306, 272, and 205, respectively. However, their performance and market activity are significantly less than that of Saudi Arabia (163 companies as of 2013). As demonstrated by Table 2.2, The Saudi Arabian liquidity outranks the remaining stock exchanges. Saudi Arabia has consistently ranked above the market average for value of shares traded and market capitalization, since 2010 through to 2014. In addition, Figure 2.13 shows the superiority of the Saudi Stock exchange in the number of transactions executed. These figures indicate that the Saudi Arabian market is more active with a higher value of companies being traded, in contrast to the other Arab markets. However, there are other factors that may impact these results such as investors' population size, investment capital available, and institutional support i.e. policies, and banks.

[51] Data Source: Arab Monetary Fund Statistical Report. All currency values have been transferred to USD as a common vehicle currency for comparison.

Table 2.2. Liquidity Measure (Value of Shares/Market Capitalization)

	2010	2011	2012	2013	2014
Abu Dhabi SE	12.8%	9.4%	7.9%	19.8%	25.8%
Jordan SE	30.2%	14.6%	10.3%	16.2%	8.4%
Bahrain SE	1.4%	1.5%	1.6%	3.0%	2.9%
Lebanon SE	9.3%	3.0%	2.3%	2.0%	3.0%
Morocco SE	20.6%	13.8%	13.7%	13.4%	6.0%
Syria SE	0.0%	10.2%	3.3%	3.3%	2.2%
Qatar SE	14.4%	16.8%	13.6%	13.0%	20.2%
Dubai SE	33.8%	17.5%	26.5%	61.6%	88.1%
Egypt SE	43.1%	37.1%	33.8%	25.1%	32.4%
Oman SE	15.5%	12.9%	12.2%	21.1%	14.9%
Palestine SE	17.0%	12.5%	9.5%	10.5%	8.8%
Saudi Arabia SE	54.5%	84.7%	137.8%	78.8%	83.2%
Tunis SE	16.3%	11.4%	13.9%	10.4%	7.3%
Total	35.5%	45.4%	68.5%	47.5%	53.5%

Source: Calculated from Arab Monetary Fund (2014)

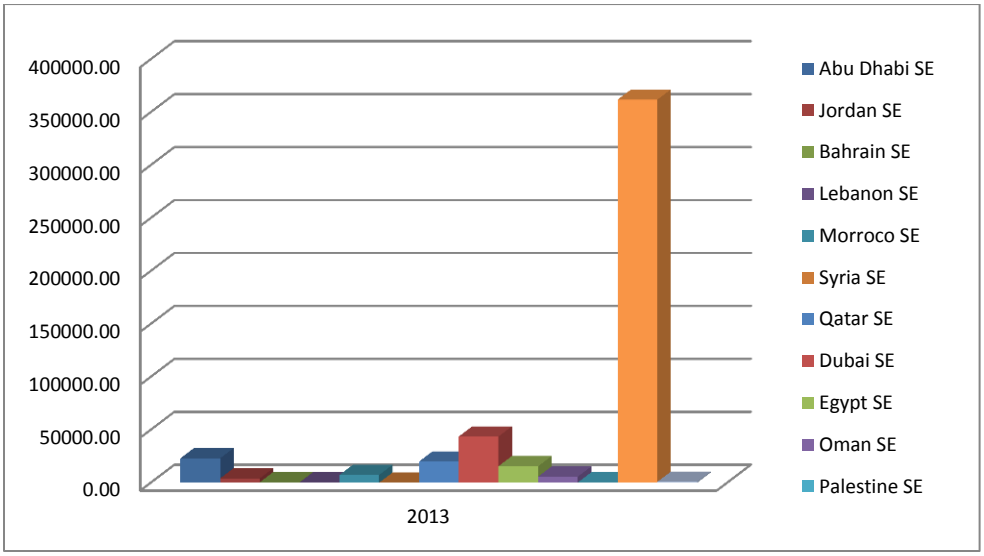

Figure 2.12 Value of Shares Traded in Millions of USD; Source: Arab Monetary Fund (2014).

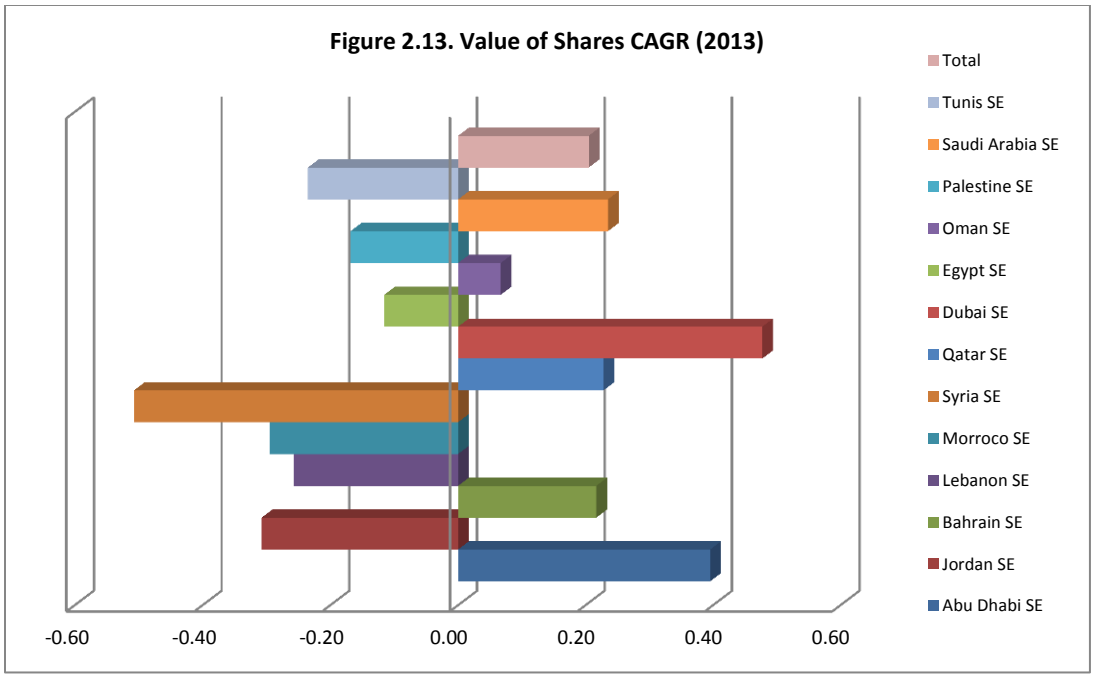

Figure 2.13 Value of Shares Traded CAGR. (Calculated)

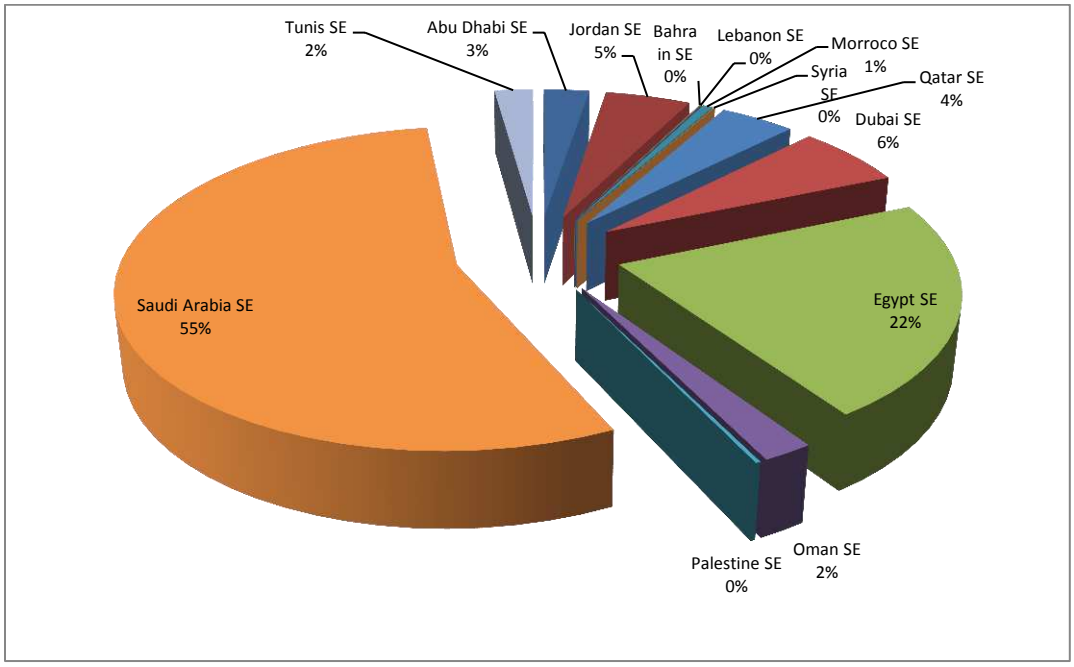

Figure 2.14 Number of Transactions Executed in 2013. Source: Arab Monetary Fund (2014)

The Saudi Arabian stock exchange favorable performance could be a result achieved through the regulation of the market and government support. Government spending, private credit availability and development in human capital were possible because of large budget surpluses; which were realized due to oil price hikes. Callen (2014) noted in the IMF report that although government spending, accumulation of foreign assets, and budget surpluses of the Kingdom have cradled and supported its economic growth (4%), they have also increased investor confidence and entrepreneurship activity. In turn, stock market activity and prices have increased. While it could be favorable, it is two-edge sword, which could also hurt the economy[52].

[52] Rapid increases or strong performance is a usual suspect behind price bubble formation, speculative activity, and stock market overheating. While government spending plans are doing wonders for the economy of Saudi Arabia and its infrastructure, its negative side-effects must be monitored closely, and associated risks with speculative behavior in the market must be mitigated.

CHAPTER 3

LITERATURE REVIEW

The following sections discuss and present the relative literature concerning oil price shocks and the net oil exporting economy. Specifically, this section is segmented into two major areas. First, we discuss the theoretical underpinnings, relative to oil price shocks, government revenues and expenditures; secondly, a review of relative empirical studies on developed and developing economies. The same process is carried oud on equity markets and the macroeconomic environment. Segmenting the literature review aids in providing a coherent understanding of how the topics are related, and allows us to view the Saudi Arabian economy in a broader setting, against the backdrop of developing and developed economies.

The main focus of the theoretical literature concerning oil price shocks and government revenues and/or expenditures revolves around the direction of causality. Narayan and Narayan (2006) discuss four main causality relationships between government revenues and expenditures. Each of these has its own policy dynamics and recommendations to stabilize and match the cash inflow with the outflow. As such, understanding the direction of causality can help governments to manage their expenditure and revenues accounts, as well as adjust accordingly to oil price shocks.

A second dimension of theoretical application revolves around the short and long-run impact of oil price shocks and the type of economy. Net-oil exporters face a different impact of oil price shocks than net-oil importers. It could be argued that it is a zero-sum game, at least in a myopic view of wealth transfer. However, due to supply, demand, terms of trade, and political dynamics, the relationship becomes more complex and has different implications in the long and short-run for each type of economy (Kilian, 2009).

In understanding the causality between revenues and expenditures, we are able to determine the relationship of public expenditures and economic growth. More specifically, we can observe the indirect impact of oil price shocks on equity markets and in turn the macroeconomic effect in a specific country. A starting point of analysis is the Efficient Market Hypothesis (EMH) pioneered by Fama (1965). It serves as the preliminary gateway to analyze the equity market and the economy. Yet, for more practical applications, and in reference to behavioral economics, a number of theories that stemmed from the EMH are better suited for analysis; such as the Arbitrage Price Theory (APT), and the Present Value Model (PVM). At the core, these theories depend on the idea of rational expectations, and how market participants utilize the available information to make investment decisions.

3.1 Oil Price Shocks, Causality, and Government Expenditures

The fascination of the relationship between government expenditures and government revenues is demonstrated clearly in the literature. While the interests are the same, the empirical findings are not. The results, and in turn the policy recommendations, differ on the direction of causality between the two variables of interest. The theoretical dimension is best described by Narayan and Narayan (2006) where they discuss four main hypotheses on the relationship between government revenue and expenditures.

One theory advocates that the direction of the causality flows from revenues to expenditures. In other words, more revenues lead to more expenditure. If that were the case, then budget deficits can be avoided or controlled through policies that stimulate and smooth out government revenues. The second theory proposes that the direction of causality flows from expenditures to revenues. Advocates of this theory assert that governments would spend first, and then seek out revenues, through the form of raising taxes or revenue generation, to cover the

expenditure. The third theory deals with fiscal synchronization. It asserts that the causality may be bidirectional and the two variables are interdependent. If that is not the case, then the fourth hypothesis stipulates that expenditures and revenues are completely independent of each other.

Devlin and Lewin (2004), indicate a specific relationship between government revenues and macroeconomic variables. Since oil revenues are at the discretion of governments, in most oil-exporting countries, the government itself becomes a channel that disperses oil revenues in the economy. If these revenues are unstable, due to market dynamic volatilities, then subsequent macroeconomic variables will suffer and mimic the instability. For what once considered a blessing, the natural resource becomes a curse where the fiscal policy controls play a key role in preventing its occurrence.

Thus, one of the questions answered in this research pertains to the direction of impact between government revenues and government spending. A revenue-spending causality indicates that a rise in revenues leads to more expenditures; in turn this would worsen the governmental budgetary balance (Friedman, 1978; Buchanan and Wagner, 1978). Considering that government spending promotes economic activity, Friedman (1982) points out that spending programs are sticky and lack the necessary adjustment speeds for changes in revenues. As such, if revenues create ‘sticky’ spending, and in periods where there is a negative revenue shock, the causality could temporarily shift to be flowing from expenditures to revenues.

While Friedman believes the relationship is positive, Buchanan and Wagner (1978) hold that there is a negative causality between revenues and expenditures. The public perceives cutting taxes as a decrease in the cost of government programs, and as such would demand more programs from the government. This could lead to additional government spending, and worsening the budget deficit. Although this might hold true in economies where taxation serves

as the bulk of government revenues, it might not be applicable in an oil-exporting economy. Therefore, it is likely to see Friedman's theory in action rather than Buchanan and Wagner's negative causality. Musgrave (1966) and Meltzer & Richard (1981) argue that the causality may be bidirectional between expenditures and revenues (taxes). Locals would decide the level of spending and revenues through the comparison of benefits relative to government and citizen's marginal cost (Narayan, 2005). Implicitly, the interdependent relationship pulls the lagging variable to the one that is advancing. On the other hand, it could be the case that both variables are completely independent of each other as discussed by Baghestani and McNown (1994). Each of these variables is determined by the sustainable growth which takes into account the structural and institutional separation between government revenues and expenditures. In the case of Saudi Arabia, government revenue generation is largely dependent on oil production and sales. It is improbable to observe the second theory as the Kingdom does not depend on taxes, and its oil production is not completely independent[53]. Thus, it is more than likely that there exists a revenue-to-expenditure causality, or an interdependent causality as proposed by the first and third theories, respectively. The direction of impact is crucial to tailor policies that are able to sustain long-term expenditures, because an increase in public spending is positively correlated with economic growth as stated by Wagner's Law.

Specifically, government spending targeted at the promotion of the state's welfare may be achieved through a focus on the economic, socio-political, and historical dimensions. Investments in sciences, technology, research and developments that are well supported by the government create opportunities for advancing the economic front. The socio-political dimension

[53] The OPEC was founded for the purposes of regulating oil production. If the Kingdom sought to create additional revenue it would increase production up to a point where its marginal cost is equal to its marginal revenue of sales. However, this process requires that OPEC members adjust their supply, and global aggregate demand must absorb the addition, which could push the price of oil down due to excess supply.

revolves around the general welfare of the society. For example, investments by the government in human capital development, retirement insurance, and natural disaster funds allow for a reduction in savings –by citizens – and frees up such wealth for investments or entrepreneur activities. Finally, the historical dimension indicates that the state's debt and interest sums are increasing (Musgrave, 1969).

In the past, public expenditures in Saudi Arabia may have been possible due to its role of 'swing producer', as it stabilized the price of oil in face of shocks. Oil production would increase (decrease) if oil prices increased (decreased) beyond a specific threshold. Two outcomes are achieved with this action: an increase in government revenues, and a control of oil prices. The point that determines the stabilization equilibrium, for Saudi Arabia, is the point that protects its market share (Fattouh, 2014). However, in light of recent jumps of U.S. oil production, Saudi Arabia advocated a neutral position, and is no longer assuming the role of stabilizer in the market. This action is mostly relative to political strategy. First, the Saudi Arabian government has accumulated enough assets to withstand a decline in oil prices, due to higher supply, for a prolonged period. The Saudi Aramco mindset would insinuate that if it were a short-term burst of oil production exhibited in the U.S., then there is no need to act upon it.

Rather, letting the market dynamics force the price movement as supply begins to drop in the next few years. In turn, Saudi Arabia will distance itself from the role of swing-producer, at least in the short-run. In light of such events, understanding the relationship between expenditures and revenues can aid in making policy decisions that ensure the sustainability of public spending, and ultimately achieve higher economic growth in both the oil and non-oil sectors as foretold by Wagner's Law.

3.1.1 Empirical Studies on Saudi Arabia

Al-Hakami (2002) and Al-Obaid (2004) examined the causal relationship between government expenditures and GDP in Saudi Arabia and found evidence of Wagner's Law. Their findings indicate that government expenditures and GDP share a positively correlated long-run causation running between the share of public spending in GDP and GDP per capita. The results indicated that government expenditures based on GDP, in oil states, is an ineffective policy tool.

Al-Yousif (2000) demonstrated that the method to determine the size of the government can influence its relationship with economic growth based on Ram's (1986) percentage change in government expenditures, and Landau's (1983) ratio of government expenditures to GDP. For the first definition, the results demonstrate a positive relationship to growth. However, for the second definition, the relationship becomes negative. In turn, researchers must consider how they calculate and define their variables when testing for Wagner's Law, as the results may change sign and could lead to contradictory results.

Kireyev (1998) examined the relationship between non-oil GDP growth and public spending using data from 1969 – 1997 in Saudi Arabia. His results show that there is a positive relationship between public spending and growth in the non-oil sector where a 1% increase in public spending causes about a half percent increase in non-oil GDP. In comparison, Ghali (1997) found no evidence that public expenditures increased with output growth despite including various forms of expenditures i.e. total expenditures, or expenditures on consumption and investments.

Ageli (2013) explored the validity of Wagner's Law in Saudi Arabia from 1970 to 2012 for real oil GDP and Non-oil GDP. Their findings support the existence of a positive relationship between economic growth and expenditures for both sectors, and a strong causality between all variables in the long-run. Wijeweera and Garis (2009) investigated Wagner's Law in Saudi Arabia using the Engle-Granger two-step cointegration model. They demonstrate that there is a positive long-run relationship between government expenditures and economic growth. Additionally, income elasticities were not large enough to conclude that growth in expenditures exceeds growth in government revenues.

Al-Jarah (2005) analyzes the causation relationship between economic growth and military expenditures in Saudi Arabia. Utilizing data from 1970 – 2003, his findings support the bidirectional causality between real economic growth and defense spending, while there is a unidirectional causality running from non-oil economic growth to defense spending.

On the other hand, Joharji and Starr (2010) examined the relationship between government spending and non-oil GDP in Saudi Arabia. Using data from 1969 to 2005, they demonstrate evidence of Wagner's Law as increases in government expenditures had a positive and significant long-run effect on non-oil GDP growth. Their results confirm major finds in the literature on the existence of Wagner's Law. However, they note that a contradiction is found in contrast to Al-Jarah (2005) who found a negative effect of military spending on real non-oil GDP, and Ghali (1997) who found inconclusive results.

For Saudi Arabia, we would expect to observe Wagner's Law in action. This fact is not only supported by data included in this dissertation and subsequent graphical analysis, but also by the available literature, and current economic measures of Saudi Arabia as published by the IMF (2014). Economic growth is projected to maintain a 4.5% level for the next three years in Saudi Arabia, which as noted in as a result of large government expenditures programs.

3.1.2 Regional Studies and Causality

Intuitively, we would expect that government expenditures lead economic growth; yet, Wagner's Law does not specify the direction of causality, but states that there a positive correlation is observed. Fasano and Wang (2002) investigated the direction of causality between total government expenditures and revenues in the GCC countries. They applied a cointegration and error-correction modeling framework to a sample period from 1975 – 2000. Results indicate revenue-spend causality in Bahrain, Oman, and the UAE; as such policy implications entail a focus on altering the expenditure framework to a medium-term horizon to allow for some isolation from variant short-term revenues. Kuwait, Qatar, and Saudi Arabia demonstrated bidirectional causality. Al-Qudair (2005) examined the long run equilibrium relationship between government revenues and expenditures in Saudi Arabia. Using an Error Correction Model, he finds evidence of a bi-directional causality, confirming the fiscal synchronization hypothesis in Saudi Arabia found by Fasano and Wang (2002).

Al-Otaibi (2006) sought to examine the effects of oil price shocks on GCC economies from 1960 – 2004. He examines the impact of oil prices on GDP growth, real exchange rates, price levels, and budget and trade deficits. Results support the twin deficits hypothesis where budget deficits can cause trade deficits. In addition, his findings support the application of real business cycle models of the economy, as supply shocks outweigh demand shocks in a rentier

state economy. Moreover, oil price shocks have a persistent effect on the GCC countries, despite variant market shares of the oil exportation market. Negative oil price shocks have a larger impact than positive movements on GDP growth via government spending.

These asymmetric effects on GDP provide an incentive for policy makers to achieve stabilization of oil prices by lowering the standard deviation of movements around some mean. The results demonstrate that expenditures are lagging to revenue which could be explained by the way that governments record expenditures. According to the study, governments base current expenditures on the previous year's oil prices. As such, an oil price shock will note an expenditure lag, and would create a rise in the budget surplus (Al-Otaibi, 2006). Chun (2010) examined five oil rich economies including Saudi Arabia and Kuwait using a sample period from 1997 to 2007. The results show that military spending has an inelastic demand and concluded that despite oil price shocks, defense spending budgets were unaffected, confirming the findings of Al-Jarah (2005).

Elyasi and Rahimi (2011), used Iran's annual data from 1963 – 2007 to determine the causality between revenues and expenditures by using bounds testing approach to cointegration, and autoregressive distributed lag. The fiscal synchronization hypothesis was not rejected, and confirms that revenues and expenditures are determined simultaneously. Al-Khulaifi (2012) investigated the case of Qatar and the causality between government revenues and expenditures. The results show that there is a unidirectional causality from revenues to expenditures supporting the revenue-spend theory.

Eltony and Al-Awadi (2001) used quarterly data from 1984-1998 to determine the impact of oil price variability on macroeconomic variables in Kuwait. They opted to use VAR and VEC models and the results indicate oil price shocks impact oil revenues, which in turn would impact government expenditures. Their results show that there is a high degree of correlation between major macroeconomic variables. Specifically, the causality runs from revenues to government development and current expenditures, and then towards the remaining variables. Development expenditures seem to be more sensitive to oil price shocks versus current expenditures.

3.1.3 Developed Economies

Understanding the impact on net-oil importers can also aid in determining the long-run effect of oil price shocks on oil exporters, especially when considering trade relationships. A great deal of the literature and research has focused on developed and net oil importing economies. Similar to the empirical results on net oil exporters, developed economies studies demonstrated inconsistencies of the results and variability in the methodologies used.

Many researchers consider the works of Darby (1982) and Hamilton (1996) to be the starting point for the impact of oil price fluctuation on the US economy. Darby was unable to define a significant relationship between oil prices and macroeconomic variables, while Hamilton determined that oil shocks were a main factor in US recession from 1949 to 1973.

Hess (2000) determined the oil price shocks decreased GDP but only in the pre-1980 US economy. Since then, the variability of prices had no effect on the US economy, and by that, the conclusion is oil price shocks are short-termed and have minimal effect on economic activity in the US. Blanchard and Gali (2010) pinpoint the weakened responses of oil shocks to the reduction in energy intensive activities, flexibility in labor markets, and balancing improvements in monetary policies.

Jimenez-Rodriguez and Sanchez (2004) analyze the impact of oil price shocks on real economic activity in seven OECD (Organization for Economic Co-Operation and Development) countries. Results exhibit that there asymmetric impact on GDP growth, as oil price hikes have a larger and more persistent effect than declines[54]. They conclude that oil price increases have a negative impact on economic activity in net-oil importers, while the results on net-oil exporting countries vary. In advanced economies, oil price shocks are transmitted through the supply channel, demand effect, and terms of trade. Increases in oil prices results in reduction of inputs in production leading to higher production costs and a slowdown of output. From the demand side, higher oil prices increases the level of prices while reducing real income available for consumption; in turn, aggregate demand falls. Finally, in terms of trade, oil importing countries face unfavorable conditions as wealth transfer from oil-import to oil-exporting countries occurs in the short run (Brown *et al.* 2004; Schneider 2004; Lardi and Mignon, 2006; Sill, 2007).

For developed economies, as well as some developing economies, we could observe any of the causality hypotheses due to the structure of revenue generation. That is, diversification equates to flexibility in policy as they can control both revenues and expenditures (Von Furstenberg *et al.* 1986; Hong 2009; Alfonso and Rault 2009).

Rentier states, such as Saudi Arabia and other GCC countries, the sources of revenues are concentrated, and thus policies are more rigid. While the studies discuss developed economies, they do provide insight on the impact of oil price hikes as it relates to trade. Since oil exporting and importing economies are engaged across borders economic activity, the effects on developed economies can be understood as long-run impact on trade partners that are oil exporters. In most cases we are able to observe a reverse effect of oil price shocks between oil exporters and oil

[54] This is an interesting find since Al-Otaibi (2006) found that there were similar asymmetric impacts on GDP growth in the GCC countries; however, oil price declines were more persistent and larger than oil price increases.

importers. However, the robustness of this observation comes into question as some net oil exporters exhibit tendencies that are consistent with their counterparts in developed economies. Generally, the results for both types of economies are inconsistent, and differ depending on the economy, methodology, and data.

3.1.4 Synthesizing the Literature

The literature on the GCC as a group in regional studies, or on Saudi Arabia as a single economy is scarce. Additionally, the results are mixed on the type of causality exhibited between revenue and expenditures, or the cointegrating relationship between economic growth and public spending. The majority of the empirical results, in testing for Wagner's Law, confirms a positive relationship between government spending and economic growth (Al-Hakami 2002; Al-Obaid 2004; Al-Yousif 2000; Kireyev 1998; Ageli 2013; Wijeweera and Garis 2009; Joharji and Starr 2010); while a couple find contradictory evidence (Ghali 1997; Al-Jarah 2005; Chun 2010).

In terms of causality, evidence of fiscal synchronization is found for major oil exporters such as Saudi Arabia, Qatar, Kuwait, and Iran (Fasano and Wang 2002; Al-Qudair 2005; Elyasi and Rahimi 2011). On the other hand, a few found unidirectional causality for the same group of countries and other GCC members (Al-Otaibi 2006; Al-Khulaifi 2012; Eltony and Al-Awadi 2001). The variability of the results could be attributed to a number of issues. First, the literature focuses on aggregate expenditure accounts such as total, capital, or current expenditures. Second, the data frequency changes between annual and quarterly, and even the sample size varies; in turn it may contribute to loss of information in the individual expenditure items when aggregated.

Other possible reasons may include model selection and suitability, variable identification and attributes i.e. GDP ratios, and whether exogenous shocks were accounted for using dummy variables. This dissertation aims to address the shortcomings in the literature by using a larger sample size, properly identifying exogenous shocks based on time series structural breaks, and ensuring a best fit model for the data. Additionally, the analysis is carried out not only on aggregate accounts, but on sectoral expenditure items for a more accurate analysis.

3.2 Equity Markets and the Macroeconomic Environment

Understanding the relationship between stock market performance and the economic environment is a crucial step towards achieving a clearer picture of economic activity in a certain country. A large debate exists of whether stock market crashes can lead to economic recessions, and was revisited as part of the new theories of boom and bust which analyze asset pricing bubbles, specifically in the last financial crisis of 2008.

There are many different theories on the Great Depression and the stock market crash; some believe that the U.S. equity market crash is one of the main factors in causing the depression (Pettinger, 2013). Others, such as Schumpeter, Kondratiev, and Mitchell, believe that the crash of 1929 is merely part of an economic cycle. Friedman and Schwartz (1963) minimize the role of the stock market crash, business cycle, and protectionism in causing the great depression, and advance the concept that the failure of the banking system led to the great depression alongside monetary policy decisions.

In its simplest form, a stock market acts as a mechanism to bring buyers and sellers of capital together. An exchange is made by selling shares (ownership rights) for a certain value (capital). These rights vary in their benefits[55], but the basic concept is the same across all types of shares. Therefore, if the performance of the company is favorable, ceteris paribus, the ownership rights (shares) will pay out benefits. In other words, the wealth of the capital providers increases either through income in the form of dividends, or through an appreciation of the stock[56].

There is a wealth effect associated with the performance of the stock. If we assume the price of the stock falls due to poor performance, then the wealth of the investors will decline. A significant drop in the price of the share can create a sell-panic in the market and may alter expectations. Current investors would be hesitant to spend additional funds if the decline is significant; As this motion spreads across market participants, the overall sentiment of investing becomes reserved and conservative, which may lead to a decline in consumer spending (Pettinger, 2013).

More importantly, the effect of the stock market relates to expectations of investors and conventional wisdom of average citizens. Often, the performance of the stock market is associated with the performance of the economy, at least in the perspective of the average investor (Pettinger, 2013). Similar to the way that bank runs can occur, stock market collapses can follow a similar pattern due to the large number of average investors that follow the mass movement in the market.

[55] This refers to the various ownership types such as preferred shares and their classes, common shares, warrants and options. For example, some preferred shares act as a debt instrument by providing a coupon payment to the holder. Others have accumulated dividend rights. All of these can be understood as perks to attract specific types of investors and reach diversity in risk profiles.

[56] The stock would appreciate since it has become an attractive investment for other investors, or even those that have already invested in it. The demand for the stock pushes the price up so long as the supply of the shares remains unchanged.

If they believe that the economy is performing well, they will pursue additional investments which may inflate the share prices. By the same token, a poor performance can lead to a decline in the demand for shares. The direction of causality could be a bidirectional one.

Changes in wealth and its impact on the market may be a short-lived, so long as the panic does not spread to financial institutions and banks. In countries where credit is easily obtained for investment, this might have a prolonged effect. For example, in Saudi Arabia during the 2003 – 2005 market booms, banks were extending various forms of credit to their customers. As the stock market began to collapse, a large number of consumers began to default on their loans. More specifically, some of these loans were constructed in a way that allows the bank to take hold of the shares and sell them at market value to satisfy the debt, making matters worse.

Freidman and Schwartz (1963) view might be correct in stating the collapse of the financial system is what caused the depression of the 1930s. However, the role of the stock market should not be discounted since it could have attributed to the bank failures. In addition, the monetary policy decisions stipulated whether this event will have a long or short-term effect on the economy. As such, the stock market performance may affect the economy through an indirect channel – wealth effect, consumer spending, bank runs, monetary policy – or through a direct channel of market expectations.

The literature provides various theories that attempt to explain the relationship between the macroeconomic environment and the equity market. Some are based on underlying economic relationships, while others take a behavioral approach in developing their models. Such theories are based on Western financial and economic principles that involve the use of interest and time-value-of-money concept, which contradict Sharia-ah compliant financing at its core.

Modern Islamic banking models due to depend on these general theorems of economic, finance, and agent-interaction, but with adjustments to extract non-Sharia-ah compliant components[57]. Therefore, the basic principles should be the same, especially when considering that since most financial systems and equity markets are not completely 100% Sharia-ah compliant, and that most Muslim countries conduct businesses and trade with non-Muslim economies, the general Western financial and economic models can still be relative to the economy of Saudi Arabia. Among the relevant theories there are the Efficient Market Hypothesis (EMH), the Arbitrage Price Theory (APT), and the Present Value Model (PVM).

3.2.1 Efficient Market Hypothesis (EMH)

Developed by Fama (1965), the EMH assumes that since asset prices reflects all available information, investment strategies become useless when attempting to achieve abnormal profits. In other words, the market is efficiently adjusting to pieces of information instantaneously, so that no investor can capitalize on them – information – and cannot anticipate those changes.

Strategies would also fail since asset prices exhibits a stochastic movement as indicated by the random walk hypothesis. The EMH requires rational expectations and normal utility maximizing investors. With the release of information, market adjusts and agents update their expectations. Implicitly, agents or investors are not expected to be rational. This is a necessary assumption that leads to the random and normal distribution pattern of investor's reactions. Abnormal profits cannot be achieved due to these assumptions, especially when considering the existence of transactions costs. Thus, a single investor, or all investors, could be wrong; however, the collective market is always right.

[57] Such as replacing discounting rates by expected value of profit, while satisfying Islamic doctrine, creates additional volatility. See the role of Islamic Banking in equity markets section for additional details on these extractions and adjustments.

There are three forms of the EMH: Weak-Form (WF), Semi-Strong Form (SS), and Strong-Form (SF). In the WF, there future and past prices are decoupled, such as that future prices cannot be predicted by analyzing past price movements. Therefore, the WF ignores any correlation between the price movements, and any subsequent trends or patterns. Prices follow a random walk, and in turn, market participants cannot systematically profit from inefficiencies via strategies.

In the SS form, publicly available information is updated in the prices at a rapid and unbiased pace. Specifically, agents cannot trade on such information because both fundamental and technical analysis cannot produce excess returns. In the SF of EMH, prices reflect public and private information, and in turn no market participant can achieve abnormal returns.

The EMH assumes that markets are efficient, and that leads to efficient allocation of resources in the economy. In turn, policymakers should not intervene as their actions can disrupt this efficiency. Fama (1991) indicated that the EMH serves as a guideline to analysis rather than being facts of the market. Empirically, it has received a number of criticisms, including the inability to test the strong-form since it depends on private information.

From a behavioral perspective, economists link market imperfections or inefficiencies to cognitive biases such as excessive confidence or reaction, representative or informational biases. Based on various psychological evaluations in the field of behavioral finance, most investors avoid value stocks and pursue ones with high growth prospects at even higher prices (Kahneman 2003; Olson, 2001).

The empirical evidence has been mixed, but the majority does not support the SS and SF of EMH (Nicholson 1968; Basu 1977; Lanstien 1985). When considering economic or equity market bubbles such as the 2006 market collapse of Saudi Arabia, or the 2008 financial crisis, the EMH fails to explain this anomaly. Speculative behavior is the result of increasing market sentiment, and irrational enthusiasm. The underlying value is disregarded, and all fundamental factors give way to rumor-trading. Without the existence of the EMH, it would have been difficult to arrive at behavioral finance. In other words, the determination to disapprove it, has led to the creation of this field that closely resembles the modern investor. Moreover, behavioral models have borrowed a number of assumptions from EMH, especially rational expectations.

3.2.2 Arbitrage Price Theory and CAPM

The Capital Asset Pricing Model (CAPM) was developed by Treynor (1962) and Sharpe (1964) building on the work of Harry Markowitz (1959) in diversification and modern portfolio theory. The underlying concept of Markowtiz's work is to select assets based on their covariance, rather than on their own contribution; in turn, the CAPM, building on the modern portfolio theory, prices individual securities by determining the appropriate required rate of return. This is determined by segregating the idiosyncratic risk from market or systematic risk – also known as the Beta of an asset.

Ross (1976) attempted to synthesize the assumptions of EMH, and the models of CAPM and modern portfolio theory, to develop the Arbitrage Pricing Theory (APT). Expected returns of a financial asset are modeled in a linear function of various macroeconomic variables, and the sensitivity of these factors is measured by the Beta from CAPM.

In turn, the model's rate of return is used to provide the theoretical price of the asset, which is the expected end of period price discounted by the rate of return. Any discrepancy between the theoretical price and the market price would then depend on arbitragers in the market to force it to equilibrium.

Although related, the CAMP and APT models differ in some aspects. The latter has less restrictive assumptions, and allows for explanatory model of asset returns rather than statistical. The CAPM, is a demand-side model, and assumes that all investors hold a market portfolio, while the APT assumes each investor is unique, and each portfolio has different betas. Chen, Roll, and Ross (1986) indicate that some macroeconomic factors can be substituted for market measures such as short-term interest rates, credit spreads of long and short-term rates, a diversified stock index, oil prices, or currency exchange rates.

3.2.3 Present Value Model

As suggested by economic theory, an asset's price should be determined by its future cash flows, discounted by a certain rate (Fisher 1930; Williams, 1938). It stands to reason that any factor affecting that discount rate would have a significant effect on the assets prices. Depending on the type of model, the method of calculating the discount rate would vary. Most instances it is the require rate of return demanded by equity holders. However, a more common approach is to use the Weighted Average Cost of Capital (WACC)[58] to calculate the discount rate as it reflects the risks of the various capital sources. Algebraically, we can represent the present value model as:

[58] The WACC is a simple formula that takes the weights of the sources of capital i.e. equity, debt, preferred shares, and sums the product of those weights and their required (expected) rates of return.

$$\text{PV} = \sum_{t=0}^{n} {CF_t}/{(1+r)^t}$$

Where PV is the present value of future cash flows, for time *t*, discounted by the rate, *r*, or the discount rate obtained from the WACC. As noted by Filis *et al*. (2011), increases in oil prices would lead to increased costs, constraining profits, and ultimately a decrease in shareholders' value. Therefore, declining oil prices should be accompanied by increasing prices of stocks. However, this observation is more attributed towards the dynamics of a net-oil importing economy.

The general impact of oil price hikes on net-oil exporting economies, such as Saudi Arabia, can be positive in the short-run, but negative in the long-run. Oil price increases lead to higher revenues and in turn higher expenditures in the net-oil exporting economy; in turn, there is more productivity, investments, and lower unemployment, and a positive reaction by the stock market to favorable economic conditions (Bjornland 2009; Jimenez-Rodriguez and Sanchez 2005). In the long run, these effects could reverse due to various dynamics such as the increase in the costs of imports, relative decline in revenues as oil prices stabilize and expenditure programs remain at previous levels. In that sense, the net effect depends on whether the short-run gains are larger than the long-run costs.

Filis *et al.* (2011) argue that the effect on the stock market depends on the origin of the shock (demand or supply-side). Demand-side shocks lead to positive movements in the stock market, while supply shocks have a negative impact. Therefore, the implications of the PVM in the face of oil price shocks, and macroeconomic impacts, on the discount rate are significant for the duration equal to the persistence of those shocks. Its assumptions play a large role in

determining the accurateness of the results; yet, the PVM is a necessary concept for behavioral financial models such as the APT and the CAPM.

From an investors' perspective, the PVM is one of many tools used to value firms and make investment decisions via fundamental analysis. While the EMH argues that in the WF and SS forms, fundamental and technical analysis will not provide investors with strategies to earn abnormal profits, both types of analyses became a standard in evaluating investment decisions. The PVM is included as one of the primary theories of financial economics due to its implications on the value of stocks, which impacts the demand and supply dynamics of the equity market.

3.2.4 Developing Economies

Malik and Ewing (2009) indicate that there is little paid attention to the issue of volatility in GCC markets. They are often excluded from empirical work due to the imposition of significant restrictions on capital mobility and foreign investments. In addition, there is a lack of common standards, data, and corporate transparency as well as regional economic and political unrest. Studying these markets is warranted due to their role as major supplier of oil and natural gas to the global market, as well as a promising area for diversification and investments.

Empirical studies on developing and net-exporting oil economies began to appear in the last decade, and are scarce in comparison to studies on developed economies. Filis *et al.* (2011) examined the dynamic correlation between stock market returns and oil prices in oil exporting and importing countries. The results shows that time varying correlation does not differ between the two types of countries; however, positive correlation increases in response to aggregate demand oil price shocks due to global business cycles or world turmoil. From the supply-side, oil price shocks do not have any significant impact on the two types of economies. In addition,

lagged correlation indicate that oil prices have a negative effect in all stock markets despite the shock's origin (the only exception is the 2008 global financial crisis where lagged oil prices exhibited a positive correlation with the stock market). Arouri *et al.*,(2011) investigated the return links and volatility transmission between oil markets and stock markets in the GCC countries using daily data from 2005 to 2010. The results show that there is a substantial return and volatility spillovers between world oil prices and GCC stock markets. They attribute the spillovers to financial globalization assuming the role of catalyst, and contributing to the spread of the spillovers across the markets. In addition, they find direct transmission of conditional volatility from the oil market across all sectors in the equity market.

In comparison, Jouini (2013) examined the return and volatility interaction between oil prices and stock markets in Saudi Arabia using weekly data from 2007 to 2011. His results conflict with Arouri *et al.* (2011), as it shows that spillover effects are unidirectional from oil to some sectors, but bidirectional for volatility patterns with more emphasis on sectors to oil.

Mohanty *et al.,* (2011) examined oil price movements and stock market returns in the GCC countries. Results show, with the exclusion of Kuwait, that country level markets have a significant positive exposure to oil price shocks. However, in comparison to sectoral impact, only 12 out of 20 sectors exhibited positive correlation to oil price movements. They conclude that oil price change have asymmetric effects on stock market returns. More recently, Gusemi and Fattoum (2014) analyzed the return and volatility transmission in oil importing and exporting countries. The importing countries were USA, Italy, Germany, Netherlands, and France; and the importing countries were UAE, Saudi Arabia, Venezuela, and Kuwait. Their results show that dynamic correlation is not sensitive to the type of economy.

In addition, they find similar results of Filis *et al.*, (2011), where cross market co-movements respond positively in response to aggregate demand born out of global business cycle fluctuations. They arrive at the same conclusion that oil assets are not a good safe haven for protecting against stock market losses during period of turmoil.

Fayyad and Daly (2011) examined the GCC countries with the UK and the US, to determine the relationship between oil price shocks and the stock market. They use daily data from 2005 to 2010 on Kuwait, Oman, UAE, Bahrain, Qatar, UK, and the US. Their results show that oil price hikes led to deficits in the U.K and U.S, while they generated a surplus for the GCC. In addition, there is a predictive power stemming from oil prices to stock returns especially after an increase in oil prices and during global financial crises.

Hammoudeh and Choi (2006) analyzed the relationship between oil prices, U.S interest rates, S&P 500 and the various stock exchanges of the GCC countries. Their results show that the U.S. T-bill rate had a direct impact on some of the GCC markets, while that S&P 500 and oil prices did not. In addition, the VDC analysis revealed the oil prices explained 30% of the variation in Saudi stock market, and 19% of Oman. Kuwait, Bahrain, UAE, and Qatar market volatility was attributed to their own shocks.

Alshogeathri (2011) found a significant long-run relationship between the equity market, and macroeconomic factors using the Johansen cointegration test. The VECM suggests a significant unidirectional and short-run causality, between the market index, broad money supply, and inflation, and a negative relationship with narrow money supply, short-term interest rates, inflation, and the U.S. stock market. The FEVD results point to an 89% of the variation in the market index is due to its own shocks.

3.2.5 Developed Economies

Pioneering empirical studies of Fama (1981, 1990), Geske and Roll (1983), and Chen, Roll and Ross (1986) have set the standard in examining the relationship between stock markets and macroeconomic environment. A good portion of the literature analyzes the integration of stock markets across economies (Arshanapalli and Doukas 1993; Becker *et al.* 1995; Kasa 1992). For the purposes of this research, the literature review pertains to determining the impact of the macroeconomic factors on stock prices and volatility.

Hashemzadeh and Taylor (1988) explored the relationship between the S&P 500, money supply, and the return of U.S. Treasury bills. Using weekly data from 1980 to 1986, the results show a positive relationship between the narrow money supply and the stock index. In addition, the causality starts with the U.S. T-bills to the stock market. However, their findings suggest that these variables do not provide an accurate forecast of the stock market. As such, they conclude that the stock prices incorporate all available information.

Malliaris and Urrutia (1991) examined the link between industrial production, money supply, and the S&P 500 using monthly data from 1970 to 1989. They conclude that M1 leads the index, and the index affects the industrial production. Contrary to Hashemzadeh and Taylor (1988), they found that the stock return's volatility were a leading predictor of real economic activity. However, the causal relationships between the variables were not statistically significant. Darrat and Dickens (1999) examined the same dataset of Malliaris and Urrutia (1991) and in contrast, found strong evidence of causality, and arrived at the same conclusion that stock market volatility is key predictor of monetary policy and real economic activity.

Dhakal, Kandil, and Subhash (1993) used money supply, short-term interest rates, price levels, real output and the stock index from 1973 – 1991. The results demonstrate that changes in the money supply have a direct impact on share price changes, and an indirect impact through the interest and inflation rates. More importantly, they show that share price volatility causes real output volatility in the U.S. market. Abdullah and Hayworth (1993) used the S&P 500, monetary supply, budget and trade deficits, inflation, short-term rates, and industrial production. Their results demonstrated that all these variables granger caused the S&P 500. While stock returns were positively related to inflation and money growth, stock returns were negatively associated with deficits and the interest rates as predicted by economic theory.

Sadorsky (1999) analyzed the impact of oil price shocks, industrial production, and interest rates on the U.S. stock market. Using monthly data from 1947 – 1996, the results suggest that positive oil price shocks depress real share returns. However, the effect was not constant overtime, in comparison to the effect of interest rate changes. Based on the Forecast Error Variance Decomposition, oil price movements explain a large portion of the volatility in real stock returns.

Thornton (1998) investigated the long and short-run relationship between real money supply, income, interest rates, and stock prices in Germany from 1960 to 1989. The results show that real stock prices have a significant and positive wealth effect on the steady state demand for money supply. In addition, there is a unidirectional causality from interest rates to real stock prices.

Mukherjee and Naka (1995) found similar results using six macroeconomic variables and that Japanese equity market index. Gjerde and Saettem (1999) analyzed the stock market returns and macroeconomic variables in Norway across a sample period from 1974 to 1994. Their findings suggest that real interest rates affected the stock returns and inflation. In addition, the stock market's response to oil price changes was significant. Finally, there was a lagged response of the stock market to changes in domestic activity.

Schwert (1989) used Bollerslev (1986) Generalized Autoregressive Conditional Heteroskedasticity (GARCH) model to analyze the relationship between the U.S. stock market volatility, real and nominal macroeconomic volatility, as well as financial leverage using monthly data from 1857 to 1987. His evidence show that macroeconomic volatility did not help forecast stock and bond return volatility. Yet, there was evidence that the volatility of financial assets helped predict future macroeconomic volatility. This indicates that speculative assets react faster to new information about economic events, as arbitragers return the market to equilibrium.

Leon (2008) examined the effects of interest rate volatility on stock market return volatility in Korea using weekly data from 1992 to 1998. The results show that there is a negative relationship between stock market returns and interest rates. He concluded that interest rates have a significant predictive power for stock returns in Korea, but insignificant for volatility; as such investment decisions should be adjusted to reflect changes in the monetary policy.

3.2.6 Synthesizing the Literature

While the literature is scarce on developing economies, it seems somewhat more robust in its findings. Based on cross-country comparisons and global markets, oil price hikes are positively correlated with stock markets in periods of global turmoil or business cycle fluctuations. However, in the long-run there is a disagreement on the causality, and volatility transmission. Moreover, most of the literature reviewed, especially those that analyze the GCC countries, exclude the Saudi Arabia index citing its restrictions on foreign investors in its equity market. A significant find in the literature demonstrates that when examining equity indices and macroeconomic factors, the general conclusions are not swayed by the type of economy i.e. oil exporters versus oil importers (Filis *et al.* 2011; Gusemi and Fattoum 2014). However, this holds true when analyzing national equity indices, but would present conflicting results if various sectoral indices are used (Mohanty, 2011).

Consensus in the literature validates the role of the PVM in accounting for oil price shocks and how they would impact the equity markets. There are conflicting empirical results on the role of EMH, and whether stock prices exhibit a statistically significant predictive power on the macroeconomic factors, or vice-versa. The two significant finds of Alshogeathri (2011), Hammoudeh and Choi (2006) are directly related to the Saudi Arabian economy, but the results presented are mixed.

Hammodeh and Choi found that 30% of the volatility in the TASI is due to oil price movements, while Alshogeathri found that 89% is due to its own shocks. Additionally, the direction of causality differs between the empirical studies on Saudi Arabia.

While Jouini (2013) found unidirectional causality from oil to some sectors, Alshogeathri (2011) found no significant relationship between the equity market index and oil prices. However, his results may be affected by the use of two measures of money supply (narrow and broad money supply) as well as the addition of the CPI in the model rather than using real variables to eliminate the effects of inflations on the results.

In regional studies, some the research excluded Saudi Arabia index – either due to lack of data availability or not fitting the selection criteria – which basically has only extended the gap in the literature on Saudi Arabia. This dissertation aims to explore the relationship between the Saudi Arabian equity index and macroeconomic factors, including oil prices, by extending the sample period and using real variables for its analysis. Refining the variable selection may find more reliable results in comparison to recent studies on Saudi Arabia.

CHAPTER 4

DATA

Data collection is a crucial segment of empirical analysis. Since the model estimates, results, and in turn policy implications depend on the accurateness of the data and its availability, researchers must secure and investigate their data sources. For Saudi Arabia, data availability is hard to come by due to several reasons. While most national accounts and SAMA reports are available and accessible, equity market and joint-stock companies reports have only recently became available. In addition, in comparison to other economies, such as the United States, time series data in the Kingdom is limited[59].

The first reason relates to the age of the Kingdom as a unified state. Saudi Arabia became a country in 1932, and in relative comparison to other advanced economies it is a young country. Secondly, the Kingdom had other pressing priorities that called resources away from statistical record keeping such as domestic issues, government stability and establishment, as well as other exogenous events. Thirdly, equity market regulation and establishment was initialized in 1985, despite having a number of firms that were joint-stock companies. Finally, it was not until the early 2000s with the establishment of the Capital Market Authority that financial statement reporting became a necessary and legal task of all joint-stock companies. This is not to say that it was not demanded in 1985 and the subsequent years; however, it was not heavily enforced and no punishment system existed in case these companies failed to file the required documents.

Currently, most of the data and statistical reports can be obtained from various government departments, international organization such as the International Monetary Fund or World Bank, and other private institutions. However, to this researcher's knowledge, there is no

[59] Saudi Arabian Monetary Agency reports extend to 1959, while equity market reports extend to 1985. On the other hand, data availability in the U.S. extends well beyond 100 years of data.

single database that houses all of the available data on Saudi Arabia's economy in a single location[60]. One of the contributions of this research is to gather the available information on the Saudi Arabian economy, and place it in a publicly accessible database[61]. Availability of this information and dataset will help future research explore multiple dimensions of the Saudi Arabian economy, and continue to add value to the literature on Saudi Arabia, net oil exporting, and developing economies.

4.1 Sources

There are a number of sources the report data on the Saudi Arabian economy. The Saudi Arabian Monetary Agency houses data on national accounts, monetary aggregates, and overall narrative of the economy. They are accessible through SAMA's archives in scanned document format, and thus require the manual transfer of data into spreadsheets[62]. The first annual report was published in 1959, and extends to current times, having a total of 55 annual reports. Across the years, the reports increased the amount of information being reported, and started to reflect the available technology of analysis such as graphical analysis and representation, sectoral grouping, and so on. Data on itemized expenditure items, project spending, sectoral development, fiscal policy, and oil revenues can be found in these reports.

[60] Arguably, Global Financial Database houses information on Saudi Arabia but requires a membership either through higher educational institutions, or through expensive annual dues. In addition, it obtains the data from multiple sources, making it a secondary source, and is heavily dependent on electronic data availability. Most of the data in Saudi Arabia is available electronically; however its time range is limited and requires investigation of actual records and transforming them into electronic form.

[61] Currently, the data will published via excel format and houses the variables and dataset used for this dissertation. This dataset will be updated frequently, and additional variables will be added as time passes by.

[62] Although there are software solutions which aid in the transfer and digitizing of scanned data, researchers must validate the observations manually and check for errors.

However, the most comprehensive data source comes from the Ministry of Economy and Planning (MEP), which houses data from the 1965 until 2010. These data include statistics on economic progress, social development, government services, and geographical statistics. The MEP's statistics do not include an analytical narrative of the data; however, the reported data is detailed and resemble a government survey structure. For example, data is presented on the education system, number of schools, graduates, and teachers. Another example is the availability of data on health care which includes number of hospitals, beds, expenditure items and so on. This resource is a goldmine for researchers attempting to investigate time-series and cross-sectional topics within the Kingdom of Saudi Arabia.

The Ministry of Finance houses data on all financial matters in Saudi Arabia including cost of living indices, budget, merchandise trade, national accounts, and public credit institutions. Unfortunately, while these statistics directly relate to this dissertation, the data availability is limited. Data is available in an electronic format but would only extend to the year 2000. In addition, it is not as detailed as the aforementioned sources.

Tadawul and the Capital Market Authority present data on the equity market in Saudi Arabia. In most cases, data extends to the late 1990s. While the data is detailed relative to companies, share prices, and national index, it still features periods of missing data. Most of the data is available on the website and would require manual transfer into spreadsheets rather than direct download.

Finally, Global Financial Database (GFD) houses various data on the Kingdom, and in a few cases data that is not available or accessible from the aforementioned resources. The GFD allows for multiple variable selections, frequency specification, and other data attributes to be selected and downloaded for analysis.

There are cases where the data shows minor discrepancy in comparison to the primary source, and lacks the extreme details presented in the statistical reports of MEP. However, it is still a credible secondary source of data that can be used for discrepancy checks and data validation.

Collectively, these data sources alongside other such as the Ministry of Petroleum and Mineral Resources (MPMR), Organization of the Petroleum Exporting Countries (OPEC), and the Ministry of Commerce and Industry, present a complete dataset on Saudi Arabia. It presents demographic, socioeconomic, industrial, financial and economic data extending from 1959 and onwards.

Given that there are multiple resources reporting various data on the Kingdom, there are bound to be overlapping reports, and with that there are bound to be some discrepancies. In addition, the data is not streamlined for easy access. While some offer the statistics in electronic format with custom reporting, others present the data in images of scanned documents, or as tables on their websites. Researchers must then manually transfer the data, and conduct validity checks. While GFD presents a solution to this tedious task, it is still a secondary source of data, and may present discrepancies in comparison to the primary source. In addition, some of the data and statistical reports are only reported by the MEP and are not available on GFD. Moreover, GFD requires a membership which can be obtained for free by a contracting university's students and faculty; but would require a membership for other users.

4.2 Data Collection Methodology

Each of the aforementioned resources has been examined and used to collect the necessary data for this dissertation. More specifically, data concerning government expenditures, oil revenues, other revenues, as well as equity market statistics has been selected. Thus, the first step was variable identification – which will be discussed in the upcoming section – in each of these resources. Primarily, MEP and SAMA's annual reports were used at the first stage of the data collection. This required manual transfer of observations into electronic form or spreadsheets, separately for each resource.

Once each of these primary sources was combed through for the data, discrepancy checks were performed across each observation. The same process of data collection was used for the subsequent resources contingent on the fact of the identified variables being available. In total there were five separate spreadsheets for SAMA, MEP, OPEC, MPMR, and MoF, which represented sources of primary data, and GFD as a secondary source of the data.

The variables of interest were oil revenues, other revenues, total revenues, total expenditures, and detailed expenditures items from the government budget. Each of these variables were gathered from each of these spreadsheets and grouped by year. A discrepancy check was performed for each year across these sources. Most of the observations reported exact values for each of these variables; however there were a few observations which showed 1-2%[63] discrepancy in the value of the variable.

[63] These observations were reported in millions of Saudi Riyal, a 1% discrepancy refers to an increase or decrease of the relative value of the variable with a minimum discrepancy of 100,000.

At such an instance, the primary source of the observation is reviewed and checked for the validity of the discrepancy to avoid user or input error. If the discrepancy is valid in the primary source, the source of the discrepancy is investigated in the narrative provided by that source. If there are no explanations or rationale for the discrepancy, then it is assumed that a reporting error from the source is observed. As such, the data point as averaged across the sources and the resulting value is used in the sample for that specific data point.

The second group of variables features three main datasets from GFD, Tadawul and CMA, and SAMA and selects variables related to the equity market. The chosen data reflects the performance of the equity market by reporting the TASI, as well as other market data such as number of companies, transactions executed, and floating shares and so on. The same process is repeated for discrepancy checks, and the same two-step solution is applied. In addition, the second group of variables includes macroeconomic data such as monetary aggregates, consumer price index, exchange rates, gross domestic product, and Saudi Arabian Interbank Offer rate. Other variables such as macroeconomic measures, prices and the Standard and Poor's 500 (S&P 500 index) were obtained from GFD and cross-checked with Bloomberg for reporting errors.

4.3 Variable Selection and Specifications[64]

There are two main groups of variables analyzed in this dissertation. The first group includes government revenues and expenditures items that are segmented and detailed, from 1959 to 2013 in annual frequency. Revenues are categorized as oil revenues and other revenues that include royalties, income tax, customs, general reserves and other non-oil related revenues. Brent oil prices[65] are used in both the first and second group of variables.

[64] Refer to Appendix A: Data and Related, Table 1 for a detailed list of the variables and sources

The data sources report oil revenues and other revenues as well the total revenue for a specific year. Expenditure items are reported in details until the mid-1970s which included budgets for recurring expenditures as well as project budget for various institutions. Since the mid-1970s, annual reports of SAMA started to report sectoral budgets, and the detailed lists of expenditure items were no longer reported. The annual reports did not indicate how these sectoral groupings occurred, or what expenditure item list from previous years was included. However, there are general purpose explanations of these projects or what they entailed, as well as a description of the general sectors.

The sectoral expenditure items as reported by SAMA group government spending as: human resource development, transport and communications, economic resource development, health and social development, infrastructure development, municipal services, defense and security, public administration and others, government spending, government lending institutions, and subsidies. First, recurring expenditure items and values are reported for these sectors. Second, project expenditure items are reported, and finally, the adjusted expenditure for each sector is presented in the annual reports.

The adjusted report includes re-allocations from government spending, others, and subsidies to various sectoral budgets, and thus it becomes problematic to track in details each Saudi Riyal spent, or how is it allocated. While the totals are the same, allocation methods are not described. Therefore, extensive research has to be conducted to attempt and track these allocations for the purposes of coherent grouping across the time period being analyzed. We identify eight variables in the first group to be analyzed using two econometric models.

[65] The Brent, West Texas Intermediate, and Dubai-Oman are used as benchmarks for oil pricing. Bassam and Fattouh (2006) note that most oil traded outside the Americas and Far East is priced based on Brent oil prices. Differences are miniscule, and as such Brent Oil prices are used in this analysis. For more information see Bassam and Fattouh (2006), and Alshogeathri (2011).

As demonstrated in table 4.1 we group these variables based on their general purpose as described in the annual reports of SAMA and MEP. Human resource development includes spending on education, institutions, training, and overall the advancement of human capital in Saudi Arabia. Infrastructure development has been formatted to include infrastructure, transport and communications, as well as municipal services. Economic development includes economic resources spending, subsidies, government lending, and government spending programs. The health, defense and military spending items remain unchanged.

The second group of variables analyzes how the equity market performance may be affected by the macroeconomic environment. The second group includes the Tadawul All Shares Index (TASI), the Saudi Arabian Interbank Offer rate (SAIBOR) as the 3-month proxy of interest, the Nominal Effective Exchange Rate (NEER), Brent Oil Prices (OP), narrow money supply (M1) and broad money supply (M2), and the Standard and Poor's (S&P 500) index. The rational and significance of each variable in the second group is discussed in the upcoming section.

Table 4.1: Expenditures and Revenues Details

Category	Variables (in Real Millions of SAR except Prices)
Oil Prices (OP)	Oil prices in SAR
Education (EDU)	Human Resource Development
Health (HLTH)	Health and Social Development
Defense (DFS)	Defense and Security
Infrastructure (IN)	Infrastructure, Transport & Communications, Municipal Services
Economy (ECON)	Economic resource development, subsidies, government spending and government lending programs
Oil Revenues	Oil revenues
Total Government Expenditure	All expenditure items

4.3.1 TASI- Tadawul All Shares Index

The Tadawul All Shares Index is the only national index for the Saudi Arabian equity market. There are a number of industrial and sectoral indices, but unlike the United States where are there several national indices i.e. S&P 500, NASDAQ, Dow Jones, TASI is the only index of relevance to this study. Similar to its counterpart the S&P 500, the TASI is calculated based on a weighted average market capitalization method. In 2007, the method of calculation was modified to exclude shares owned by the Saudi Government and its institutions, foreign entities that require transaction approval from the Capital Market Authority (CMA)[66], a founding partner[67], and any entity that owns 10% or more of a company's shares (Tadawul, 2014). There are currently 163 companies traded on the Saudi stock exchange, and based on the new method of calculation, it includes 45.814% of free floating shares[68].

At first glance, the new calculation method may impact the variable; however, a closer look to the restrictions reveals that the exclusions only include investor types with long-term investment horizons. Government shares are commonly associated with support to the financial market, while foreign investors, founding partners, and entities owning more than 10% represent a segment of investors interested in building wealth, or as a part of a large investment portfolio in the economy.

[66] Foreign entities that do not require approval can be included in the TASI. According to Tadawul (2013), ownership of 5% of issued shares and above would require approval on transactions.

[67] Founding partners or major investors have a restrictive period of two years on average, before they are able to sell their shares. While this period can extend beyond the two years, founding partners' shares can be sold after the restriction period, and thus will be included in the TASI calculation.

[68] Total issued shares amounted to 46.429 billion, and shares included in the TASI calculation amount to 21.270 billion.

It could be argued that the new calculation aids in obtaining short and medium term affects attached to the TASI's performance. Aside from the method of calculation, the TASI reflects the performance of the equity market, and as such it is an aggregation of the market value of all firms.

4.3.2 SAIBOR – Saudi Arabian Interbank Offer Rate

Stemming from rational expectations, asset prices are based on future revenue streams discounted to present value. Bjornland *et al.* (2009) view monetary policy shocks as having a direct effect on the discount rate used to value assets since it uses interest rates as a main tool for policy implementation. For stock prices, future dividends are based on expectations of growth potential and the required rate of return demanded by investors. The latter component is directly impacted by the short-term interest rate. Hence, an increase in the interest rate leads to an increase in the required rate of return; in turn, the future dividends decline in present value. Declining stock prices pushes investors to seek alternative investments that offer a higher value due to the interest rate increase i.e. bonds (Bernanke, 2003).

The Saudi Arabian Interbank Offer Rate (SAIBOR) is the rate at which banks offer to lend unsecured funds to other banks in the wholesale money market. It is selected as a proxy for the short term interest rate. While the hard peg to the US dollar might justify the use of the U.S. 3-month T-bill rate, the two rates are not perfect substitutes as they do not move "one-to-one"; while some studies relating to the Saudi economy choose U.S. interest rates as a proxy variable, selecting the SAIBOR[69] offers a better variable proxy for the purposes of this study. Figures 4.1

[69] The interbank offer rate is defined as the interest charged on short-term loans between financial institutions. Its determination is based on the money supply, length of the contract, and relative rates. It could be argued that prevailing interest rates of the U.S. have an indirect impact on the SAIBOR, yet there are fewer restrictions in determining the interbank offer rate.

and 4.2 present a head-to-head comparison of the 90-day Treasury Bill Rate, and the 90-day SAIBOR, and the spread between the two variables, respectively. As the figures demonstrate, the relationship is not a true one-to-one movement. If it were, then the interest rate spread in Figure 4.2 would be a straight line; rather, it shows substantial deviation from zero with an average of 1%.

In addition, even if such differences between the two variables were statistically insignificant, then the selection of the T-bill or the SAIBOR would not impact the model; however, given that the SAIBOR is used in the Saudi Arabian banking and financial system, it provides a better representation of how loans, including those relative to Islamic financing, behave within these domestic banks.

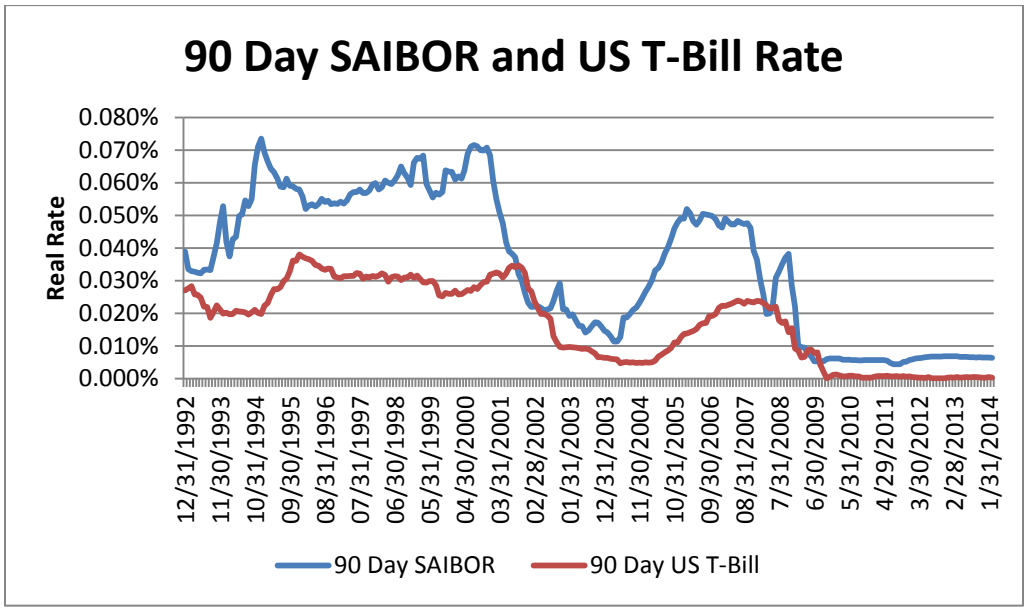

Figure 4.1 SAIBOR and 90-day US T-Bill: Dec 1992 – Feb 2014. Source: Appendix A

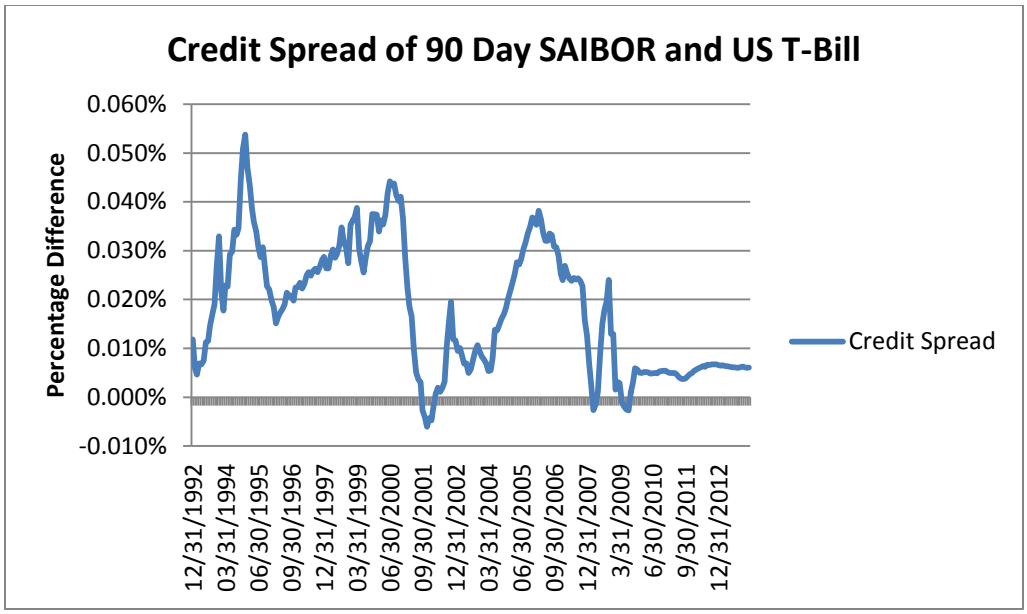

Figure 4.2 90 Day SAIBOR-US T-bill Spread: Dec 1992 – Feb 2014 (calculated)

4.3.3 CPI – Consumer Price Index

The impact of inflation on the equity market has gained substantial attention in the literature with an equal consideration of theory and empirical evidence. As a starting point, Fisher (1930) developed a mathematical model that relates the nominal, real rates, and expected inflation. The identity states that the nominal rate at a given time period is equal to the real rate plus the expected inflation rate. Based on this identification, Fisher believes that monetary components of the economy demonstrate independence. Specifically, real rates are determined by real factors such as investment horizons of investors, and factor productivity such as capital and labor. In the steady state, nominal interest rates and inflation behave within a one-to-one dynamic to expected inflation. For stock markets, increases in inflation leads to an increase in the nominal return; however, real returns are unchanged.

Building on this concept, researchers proceeded with empirical testing of this theory with the goal of demonstrating that stock markets are a safe haven against inflation (Bodie 1976; Firth 1979; Boudhouch and Richardson 1993). Other studies demonstrate a negative relationship between stock market prices and inflation (Fama 1981; Schwert 1981). Stemming from the original hypothesis of Fisher (1930), the negative correlation argument asserts that inflationary pressures cause investors to adjust portfolios to increase real assets. As such, demand for inflation-sensitive assets, such as stock, declines causing a decrease in prices and therefore a decrease in returns.

A large number of studies include some form of inflation measure to investigate the relationship type between the two variables. The evidence presented in the literature does not favor the negative or positive relationship type. In turn, the CPI is used to obtain real values of the variables for a meaningful analysis of the results.

4.3.4 REER – Real Effective Exchange Rate

There are a number of views explaining the relationship between the exchange rate and stock prices. The goods market view developed by Dornbusch and Fisher (1980) details the relationship by using the trade balance as a base of analysis. Exchange rate changes are correlated to international competitiveness of firms; therefore, a depreciation (appreciation) of the currency leads to an increase (decrease) of exports since the goods are relatively cheaper (expensive) to foreign buyers. More exports translate to higher cash flows of these companies allowing for an increase in investments, which ultimately causes stock prices to increase.

A positive correlation between exchange rates and stock prices is based on the portfolio balance approach. Frankel (1983) explains that investors hold domestic and foreign assets in their portfolios. Exchange rate changes determine the balancing mechanism of the portfolio. Assuming that there is an overall appreciation of local assets the demand shifts away from foreign investments, including foreign currency, giving rise to local currency demand. Frankel (1983) implicitly assumes that the local appreciation outweighs foreign investment appreciation.

The REER is used by the International Monetary Fund (IMF) to represent the value of the SAR to other major currencies. This allows for a more comprehensive view on trade and foreign investment dynamics that are not heavily dependent on the U.S.[70]. As demonstrated in Figure 4.3, the Real Effective Exchange Rate of Saudi Arabia's movement across the sample period differs from the fixed exchange rate. This is because the REER measures the Saudi Riyal in a basket of other currencies, which provides more freedom in movement or volatility. As such, its inclusion allows the model to capture dynamics of the exchange rate and its impact on the equity market without being restricted by a hard peg to the US dollar.

[70] The exchange rate is at 1 USD to 3.754 SAR; inclusion of the REER allows us to capture additional benefits from international trade to other developed and developing economies such as Japan, the U.K and Eurozone.

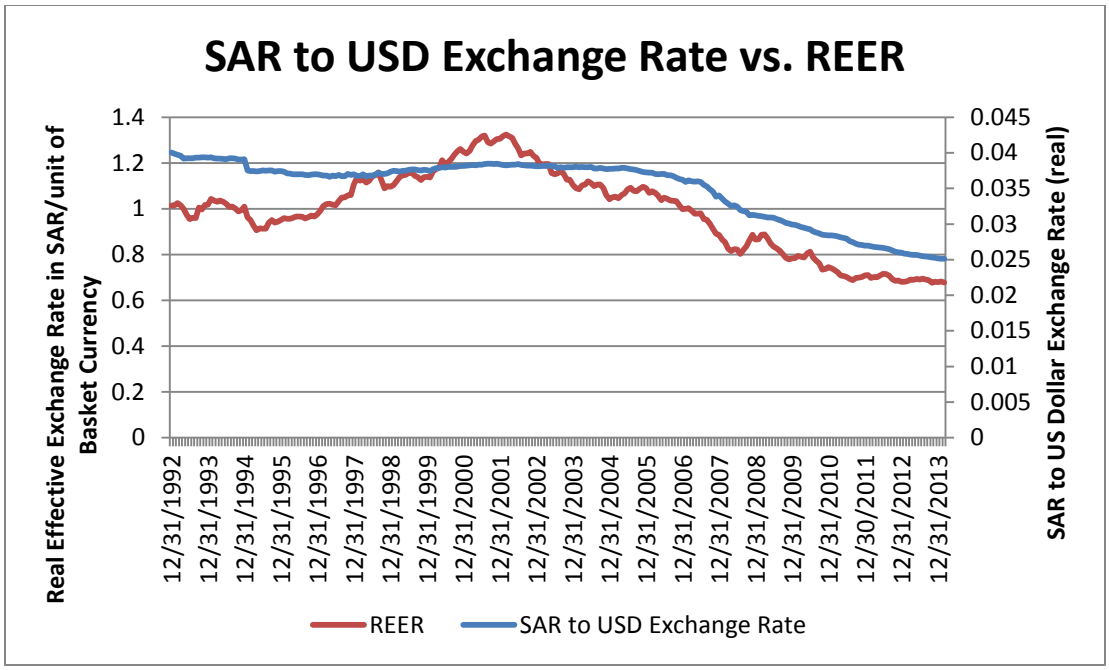

Figure 4.3 Saudi Riyals per US dollar vs. REER: Dec 1992 – Feb 2014. Source: Appendix A

4.3.5 BOP – Brent Oil Prices

Huang *et al.* (1996) describe an increase in the price of oil as having an indirect impact on the stock price. Oil serves as an essential input for modern goods in any economy, and increases in its price will increase the price of the final good. This inflationary pressure on prices is directly linked to present value of future revenues via the discount rate. A higher discounting rate leads to a decline in the present value of the stock.

Another facet argues that the impact of oil price shocks on stock market depends on the state of development, and whether the economy is a net oil-exporter or importer (Chen, Roll and Ross 1986; Cuando and Garcia 2005; Bjornland 2009). Effects of oil price increase on net oil importing economies is expected to be negative, while positive for net exporting economy such as Saudi Arabia. However, it is argued that the net effect is still negative on net oil exporting economies stemming from the trade sector. Higher oil prices lead to an increase in the

government revenue and in turn an increase in aggregate demand, corporate output, earnings, and stock market attractiveness. However, due to the counter-effect experienced by oil importers, imported goods' prices increase to a degree that may offset the benefits received by the oil exporting economy. Subsequently, the Saudi economy will be importing inflation causing increases in forward interest rates and a decline in stock returns.

Saudi Arabia's economy is heavily dependent on oil exports since oil sales make up close to 90% of government revenues. The inclusion of oil prices will help determine what impact is observed on the stock market and the economy in both the short and long run. Brent oil prices are an effective proxy since it is used to price over 65% of crude oil sales (Bassam and Fattouh, 2006).

4.3.6 M1 – Narrow Money Supply

Various studies point that the money supply can affect the present value of cash flows, thereby the traded shares of companies, by its direct impact on the discount rate. Friedman and Schwartz (1963) assert that increases in the money supply born out of an exogenous shock such as monetary policy, can alter the equilibrium point of money in regards to the portfolio's assets. In turn, portfolios are adjusted to reflect the new proportions of assets to reach the desired equilibrium. Specifically, adjustments are based on money balances, and naturally demand for other assets that are substitutes for money balances i.e. equity shares are altered. Therefore, increasing the money supply will create excess money balances leading to an increase in the demand for equity shares, placing inflationary pressure on the prices of those shares.

Another view on the relationship between the money supply and the equity market can be obtained from Bernanke and Kuttner (2005). A share's price can be decomposed to two opposing forces: its monetary value and attached risk. The demand increase for a stock is then either due to an increase in its monetary value, or a decrease in its perceived risk. Contractionary monetary policy leads to an increase in the real interest rate causing an increase in the discount rate. Based on the aforementioned present value formula, an increase in the discount rate leads a decrease in the present value of the stock. In turn, investors look for a higher compensation from holding the shares i.e. higher risk premium on the risky asset. These dynamics, as pointed out by Bernanke and Kuttner (2005) may lead to an economic cooling, and can be correlated with the reduction of profit margins for most firms with public shares. As such, investors seek additional compensation for the risky asset, causing its price to decline further. Including the narrow money supply in the variable list sheds light on how these dynamics interact in a net-exporting oil economy.

4.3.7 S&P 500 – Standard & Poor's 500

Financial crises have demonstrated that global markets are linked and share both desirable and unfavorable effects. Naturally, investors and policymakers alike want to capitalize on the benefits of international market integration while minimizing the impact on their portfolios and the local economy, respectively. A number of studies regard the S&P 500 as the benchmark for the U.S. equity market performance. Therefore, its inclusion is an attempt to capture any dynamics that are impacting the local equity market due to international market performance.

4.3.8 Dummy Variables

The inclusion of dummy variables in both groups is necessary in order to capture endogenous and exogenous shocks which may impact the model. Controlling for these shocks helps us to avoid bias results that may appear. The significance of these dummy variables is assessed in the model's results, and those that are statistically significant will be included in the discussion. Identifying these dummy variables depends on the crucial assumption of having a direct impact on Saudi Arabia's economy, or any of the aforementioned variables, as such the following are considered in both groups:

- First Group
    - Arab Oil Embargo (1973 - 1974)
    - Oil Glut of the 1980s (1980, 1982, 1986, 1988)
    - First Gulf War (1991)
    - Bond Market Collapse (1994)
    - Asian Financial Crisis and Russian Rubble Crisis (1997 - 1998)
    - Financial Crisis (2007 - 2009)
    - Arab Spring (2010)
- Second Group
    - First Gulf War (1991)
    - Bond Market Collapse (1994)
    - Collapse of the TASI (2006)
    - Financial Crisis (2008)

4.4. Data and Variable Analysis

In time-series analysis, data validation and suitability is the first step. The following section preliminarily analyzes the data and the two groups of variables used in this research. This is based on basic statistical summaries and graphical analysis across the sample period. First, we discuss the components of the first group and its subgroup. Second, a discussion of the second group of variables is presented. Statistical testing and other econometric techniques will be discussed in the results section in greater depth.

4.4.1. First Group Variables

Based on SAMA's annual report, there are eleven recurring expenditure items within the government budget. While these items are specific to each program, I consolidate them based on the general purpose served by their execution[71]. Government expenditures are segmented into 11 categories as demonstrated in Table 4.2. The largest expenditure is defense and security amounting to 30.65%, 30.32%, and 34.57% of total expenditures, total revenues, and oil revenues, respectively. The second largest expenditure is human resource development which includes government sponsored training programs, educational scholarships abroad, and other factors that enhance the performance of citizens within the realm of human capital and labor processes. The third largest expenditure is government-related spending.

[71] Please refer to Table 4.1 for a list of these items; the consolidation was not arbitrarily done, but it was based on the annual report of SAMA (2013). The researcher reviewed the description of each expenditure item, and then grouped them by general purpose.

Although the category is somewhat vague, it might refer to maintaining government operations and other expenses that are related to the government requirements[72]. In combination, the three largest expenditures constitute 70.05%, 69.29%, and 79.01% of total expenditures, total revenues, and oil revenues, respectively. Oil revenues for 2013 reached 727 billion and other revenues brought the total to 829 billion. Other revenues constituted almost one seventh of oil revenues, and roughly 12% of total revenues. It seems that Saudi Arabia enjoyed a surplus of nine billion SAR in 2013, as total expenditures made up 98.91% of total revenues. However, we do observe that oil revenues are not sufficient to cover the expenditure programs in 2013.

Given that these eleven are in greater detail than what is needed for this research, we are able to consolidate them into groups without compromising their structure. Each expenditure item's description and objective was reviewed based on the annual report of SAMA (2013); those that were found to share a similar objective and structure were grouped as a single variable.

The SAMA (2013) annual report has discussed the type of expenditure items included in these variables. For example, infrastructure, transport and communications are government programs aimed at the development of the underlying structure within the Kingdom. Municipal services include construction projects (such as the expansion of the Two Holy Mosques), and other infrastructure-related expenditures. Economic resource development is a project focused on creating an economic city in Riyadh, and investment in other supporting industries. For the most part, the segregation of these expenditures into different categories has been conducted for accounting purposes and to detect the funds trail in the government's balance sheet. For our

[72] These might include the seasonal move of the government operations from Riyadh to Jeddah and Mecca during the winter and Haj season, respectively. In addition, it might include hospitality spending for visiting political parties, and the daily expenses of government offices including condiments, lodging, and similar administrative costs.

purposes, the general objective of some items mimics that of others, and as such was grouped together. All variables are converted to real logs.

Table 4.2: Recurring Expenditure Items in the Government Budget for 2013

Expenditure Item	***Value in Millions of Real SAR***	***% of Total Expenditures***	***% of Total Revenues***	***% of Oil Revenues***
Human Resource Development	SAR 1,389.51	24.77%	24.51%	27.94%
Transport & Communications	SAR 150.91	2.69%	2.66%	3.03%
Economic Resource Development	SAR 319.40	5.69%	5.63%	6.42%
Health & Social Development	SAR 485.21	8.65%	8.56%	9.76%
Infrastructure Development	SAR 80.04	1.43%	1.41%	1.61%
Municipal Services	SAR 217.02	3.87%	3.83%	4.36%
Defense & Security	SAR 1,719.05	30.65%	30.32%	34.57%
Public Administration and other	SAR 0.00	0.00%	0.00%	0.00%
Government Spending	SAR 820.44	14.63%	14.47%	16.50%
Government Lending Institutions	SAR 102.26	1.82%	1.80%	2.06%
Subsidies	SAR 324.91	5.79%	5.73%	6.53%
TOTAL EXPENDITURES	SAR 5,608.76	100%	98.91%	112.80%
Oil Revenues	SAR 4,972.64	88.66%	87.70%	100%
Other Revenues	SAR 697.67	12.44%	12.30%	14.03%
TOTAL REVENUES	SAR 5,670.31	101.10%	100%	114.03%

Source: Appendix A and SAMA (2014)

4.4.1.1 Descriptive Statistics

Table 4.4 shows the summary statistics of the first group of variables. All variables were divided by the CPI (2005 = 100) to obtain real values. Crude oil prices are quoted in USD, and the historical exchange rate was used to convert them to the local currency of Saudi Arabia. There are seven dummy variables that were included to capture any exogenous or endogenous shocks that may have impacted oil prices, revenues, or expenditures in Saudi Arabia. As expected defense and military spending has the highest mean of all expenditure items amounting to 601.13 million SAR or about 32.1% of the total mean expenditures. Economic development and education spending rank second and third place with 501 million and 377.60 million SAR, respectively.

There is a large difference of roughly 100 million SAR between the third expenditure item – education – and the fourth which is infrastructure development. Given that the compounded annual growth of these items are within acceptable range relative to each other, it seems that infrastructure and health spending are secondary expenditure items that may turn out to have larger sensitivity to changes in revenues.

In recent years, based on the CAGR, the Saudi Arabian government spending has focused on economic development first, followed by education, and closely followed by health. Economic development has a real CAGR of 10.64%, while education's CAGR is at 10.3% and health is at 9.14%. Naturally, we would expect defense and military expenditures to have the highest bill on government balance sheets. Indeed, defense and military spending had a maximum value of 1.72 billion SAR, followed by economic development at 1.57 billion, and education at 1.389 billion. Health and infrastructure spending still shows a great decrease as it averages around 485 and 803 million, respectively for maximum allocation of funds.

Average oil revenues across the sample period are 1.203 billion SAR with a CAGR of 10.92% and the maximum annual oil revenue achieved was 4.97 billion SAR. Other revenues have a mean of 648 million, with a maximum value of 2.71 billion SAR, but a significantly lower CAGR in comparison to oil income. Saudi Arabia achieved maximum total revenue of 5.67 billion, but an average had a deficit of 19.15 million SAR in the sample period. This could be an indication that spending programs are sticky, where government revenues failed to keep up with expenditure items. It might also indicate a temporary reverse in causality, if the initial causality exhibits revenue-spend framework. On the other hand, it might indicate fiscal synchronization since the deficit is relatively small in comparison to the revenues and expenditure items.

Oil prices in the same period average at 3.84 real SAR per barrel, and reached a maximum of 4.48 SAR. The oil price shocks of the 1980s covered a number of events that have directly affected the revenues. These include specific events such as the start of the Iran-Iraq War in 1980, followed by the increases and declines of oil prices in 1982-1983, and the oil glut of 1986 and 1988. The remaining shocks have low means ranging between 1.96% (single year incident) to 5.88% (3 years incident).

Table 4.3: First Group Summary Statistics (1963 – 2013) Annual

	Variable	Obs.	Mean	Std. Dev.	CAGR	Min	Max
Expenditures (real Millions of SAR)	Education	51	377.60	339.06	10.30%	11.15	1,389.51
	Health	51	143.65	112.82	9.14%	6.12	485.21
	Defense and Military	51	601.13	432.99	8.34%	31.3	1,719.05
	Infrastructure	51	246.97	196.93	8.82%	6.55	803.53
	Economic Development	51	501.00	388.90	10.64%	7.89	1,567.00
	Total Expenditures	51	1,870.35	1,334.79	9.32%	65.11	5,608.76
Revenues (real Millions of SAR)	Oil Revenue	51	1,202.68	1,170.03	10.92%	27.93	4,972.64
	Other Revenue	51	648.52	574.64	4.53%	76.11	2,706.15
	Total Revenues	51	1,851.20	1,292.59	8.33%	104.04	5,670.32
Oil Prices	Exchange Rate SAR to USD	51	3.84	0.34	0.00%	3.32	4.48
	Real Oil Prices in SAR	51	1.07	0.786	4.06%	0.342	3.299
Dummy Variables	Oil Shocks 1980s	51	11.76%	32.53%		0	1
	Gulf War	51	1.96%	14.00%		0	1
	Arab Oil Embargo	51	3.92%	19.60%		0	1
	Bond Market Collapse	51	1.96%	14.00%		0	1
	Russian Rubble Crisis	51	3.92%	19.60%		0	1
	Financial Crisis	51	5.88%	23.76%		0	1
	Arab Spring	51	1.96%	14.00%		0	1

All variables have been adjusted by the CPI (2005 = 100)

4.4.1.2 Graphical Analysis

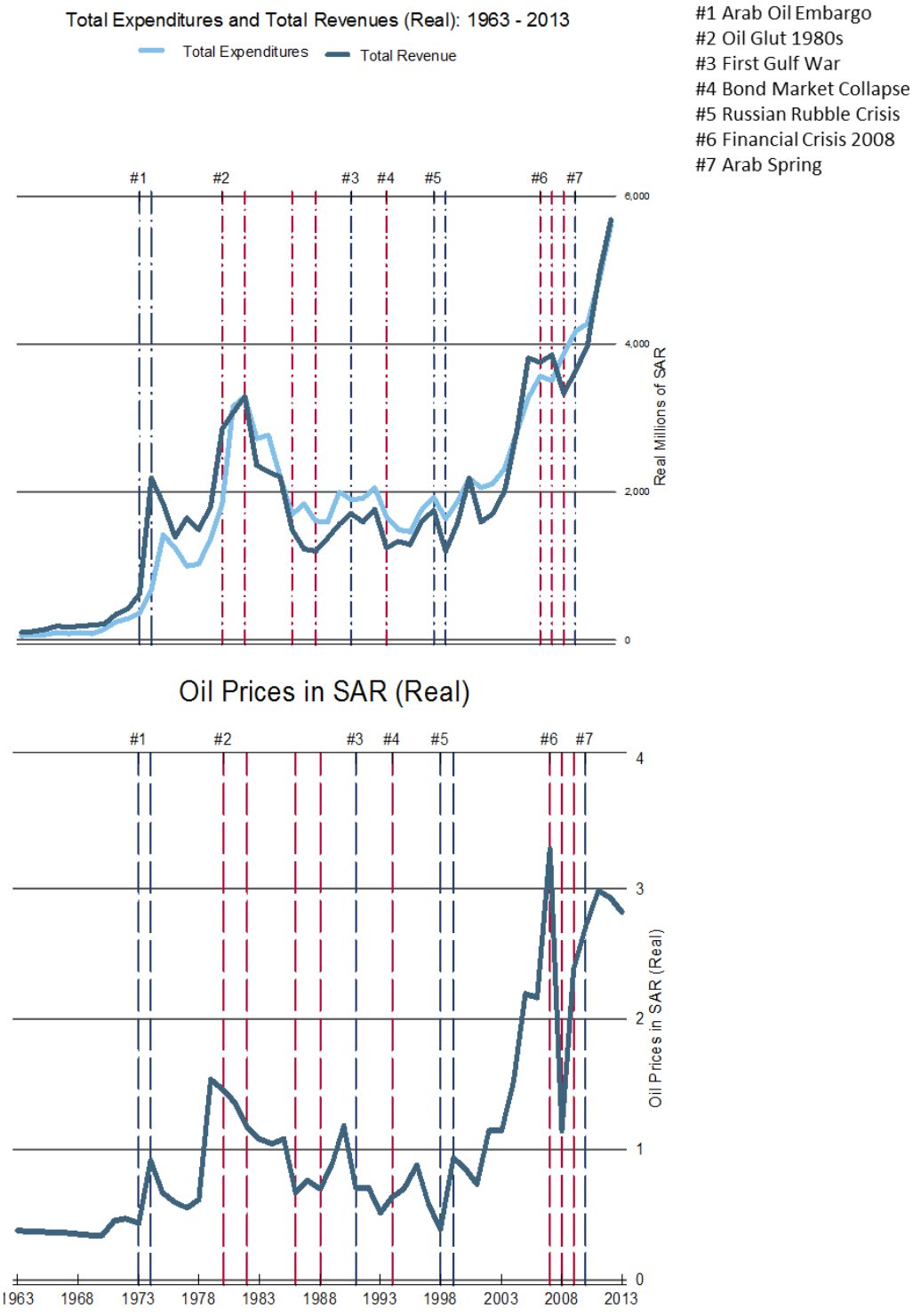

Figure 4.5. Total Revenues, Expenditures, and Oil Prices 1962 – 2013;

Figure 4.5 plots oil prices (SAR), total expenditures, and total revenues from 1963 to 2013. In addition, it indicates periods of endogenous and exogenous shocks that may have affected these variables. We see that before the 1973-1974 energy crises, all variables were relatively static. Following the Arab Oil Embargo shock, oil prices increase in real terms, as well as total revenues and expenditures.

Another hike in these variables occurs before the start of the Iran-Iraq war in 1980. This is directly related to the increase of ownership in oil production and ARAMCO as the Saudi Arabian government began increase its share. Overall, the graph demonstrated a close co-movement of revenues, expenditures, and oil prices.

At first glance, it seems that since 1980, government revenues have lagged behind expenditures until 2003 – 2005. However, we do note a close co-movement with expenditures leading revenues, which point to fiscal synchronization. Since 2010, expenditures and revenues appear to be indistinguishable in the graph.

Figure 4.6 shows the five expenditure items in comparison to oil prices. This provides a clear picture of spending priorities, and confirms our initial analysis. Defense, military, and security spending outranks all other items in the group beginning in the early 1990s. The increases remain relative to each other, almost behaving as a mark-up pricing structure.

Considering the shocks outlined in dashes, it seems that spending hikes lag behind oil prices, which is expected. At the end of the 1970s oil crisis, spending increased for infrastructure in 1975, and remained the top priority until 1981. Real economic spending remained a high priority for the government until the mid-1990s, since then defense and military spending has assumed the larger share of expenditures.

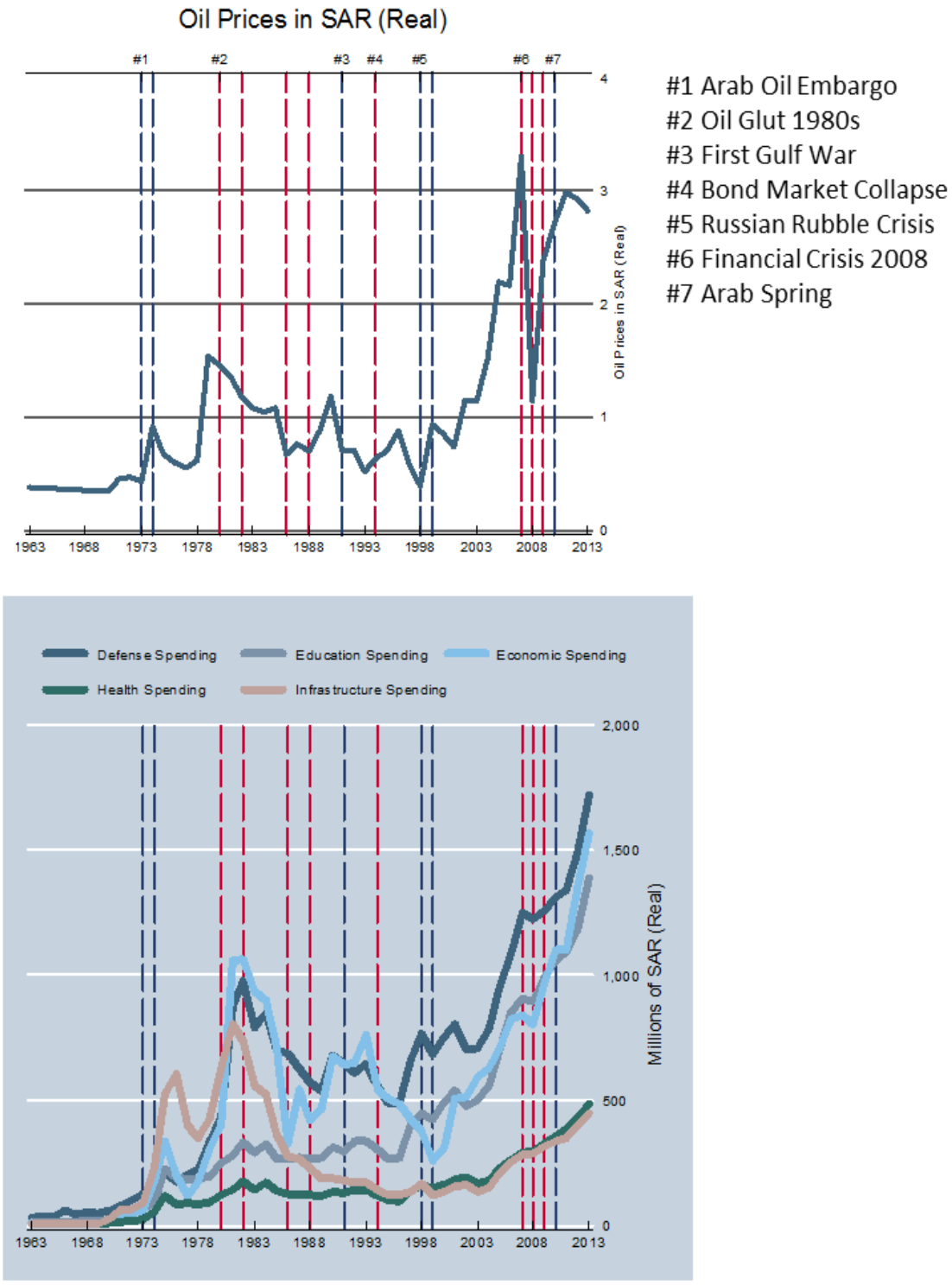

Figure 4.6. Expenditure items and Oil Prices 1959 - 2013

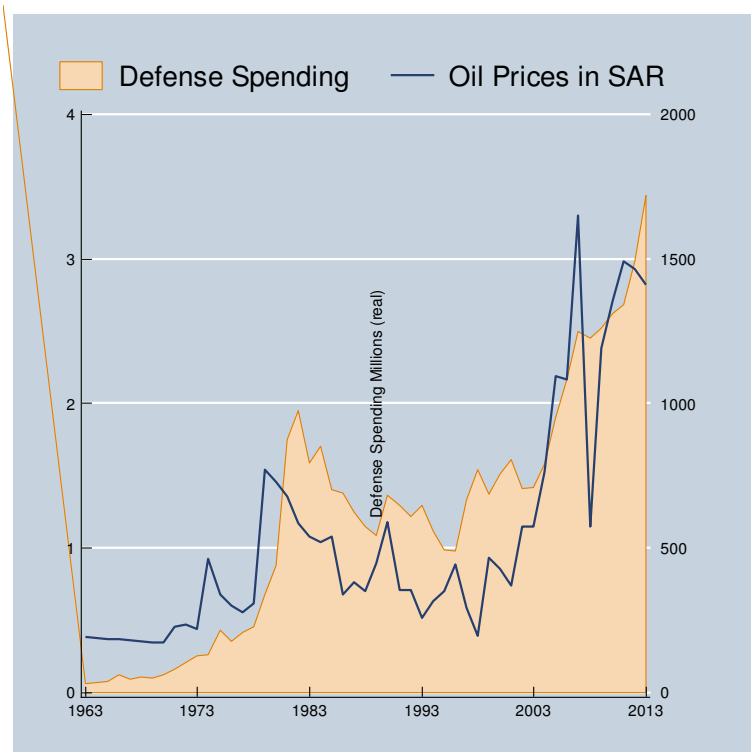

Figure 4.5 Defense and Military Expenditures 1963 - 2013

Figure 4.5 shows the relationship between defense expenditures and oil prices as the prior lags behind oil price increases by roughly one year. However, since 2002 defense expenditures demonstrate an inelastic demand that is not affected by sharp decreases in oil prices. In fact, expenditures for this sector have been on a steady increase since the early 2000s through 2013.

Education spending (Figure 4.6) was not a priority in the periods proceeding 1998. However, Rapid developments in the education system of Saudi Arabia is noticed since the 2000s, and increased steadily in a similar fashion to other expenditure items. The high level of education spending could be also associated with the government-sponsored scholarship program received by qualified students to study abroad. Although this program was in effect in the mid-1970s, it did not receive the same number of students as the subsequent programs of 2005 – 2013.

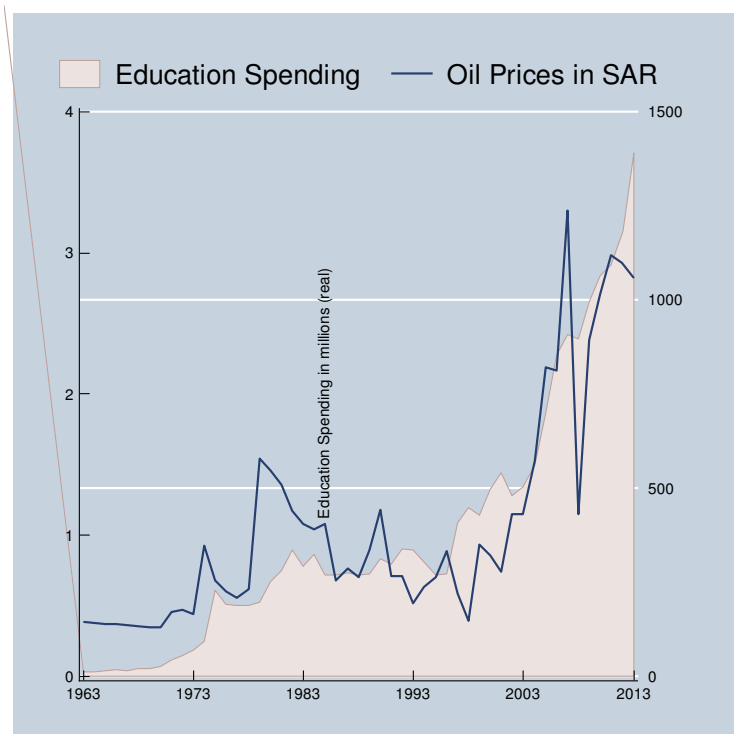

Figure 4.6 Education Expenditures 1963 – 2013

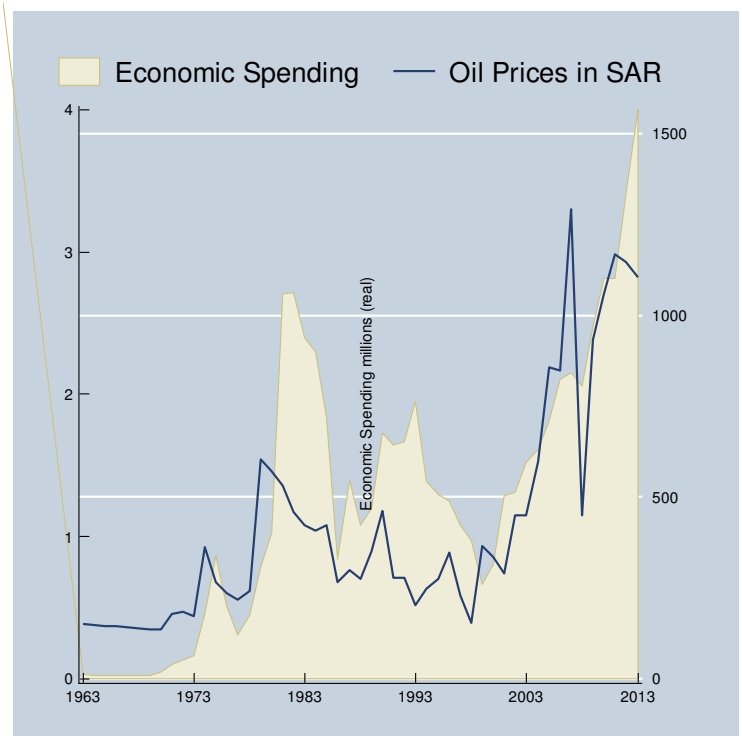

Figure 4.7 Economic Expenditures 1963 – 2013

Economic spending as demonstrated in Figure 4.7 exhibits a direct co-movement with oil prices with a lag of one year. This relationship holds from 1963 through 2000, where economic development has shown a constant increase in its expenditures. Similar to the other sectors, the 2003 – 2008 period exhibits a constant increase in real spending by the government. Health expenditures (Figure 4.8) do not deviate from the previous analysis of defense, education, and economic spending behavior relative to oil prices. Real spending in the heal sector increased in 1973 has maintained a relatively stable mean until 2003.

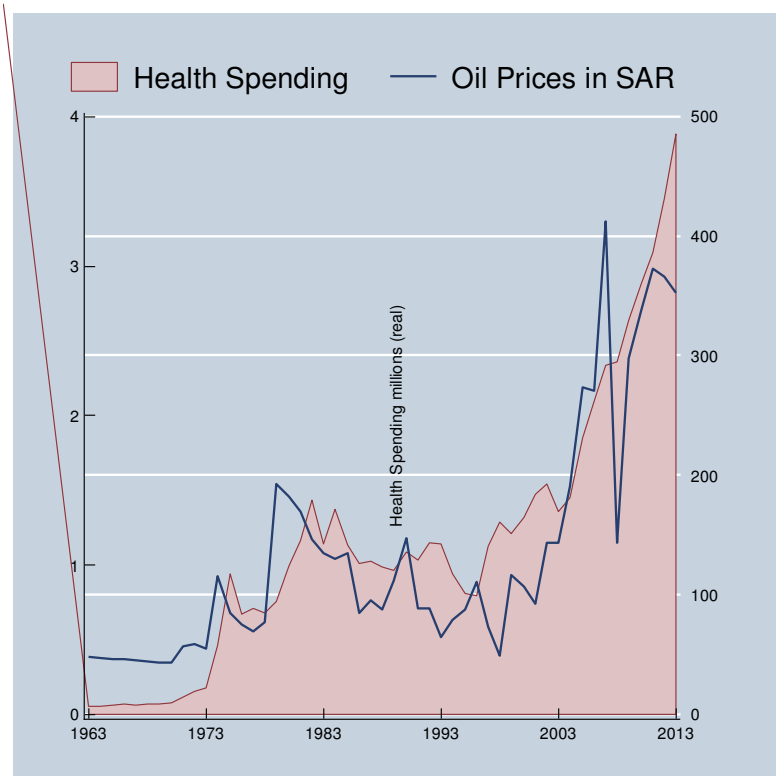

Figure 4.8 Health Expenditures 1963 – 2013

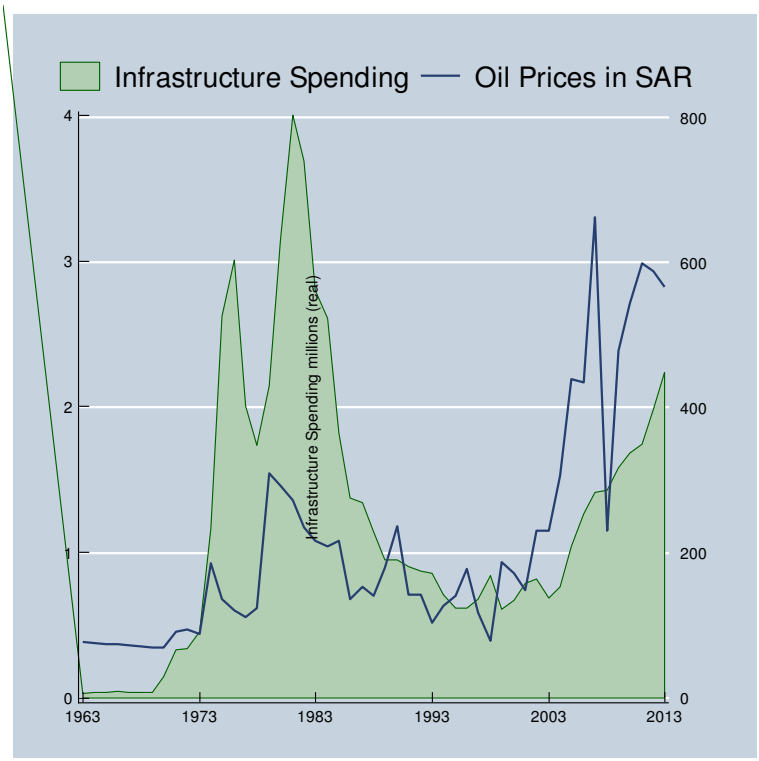

Figure 4.9 Infrastructure Expenditures 1963 – 2013

The policy of King Faisal, King Khalid, and Crown-Prince Fahad during the 1970 – 1982 is well exhibited in Figure 4.9. There is a concentrated focus on infrastructure development. The convex shape of the graph shows less development during the 1980s – early-2000s. This indicates a diversion of funds away from infrastructure to higher priority expenditure items such as defense and military, education, economic development, or health spending. Another explanation could be that the government felt that the infrastructure of Saudi was well-developed to minimize its expenditures during those times. However, infrastructure was no longer able to accommodate the rapid development in other areas of the economy since 2005; as such it has increased through various projects such as metro-line installation, and other related spending.

The graphical representation of the expenditure items and government revenues has shed some light on the possible relationship between them. Although, the conclusions made will be verified through statistical testing and modeling, analyzing the time plots has allowed us to formulate a number of hypotheses. The scatterplot matrix of expenditures with oil prices confirms the high correlation and co-movements of the variables, and provides further evidence that they are cointegrated.

4.4.2 Second Group Variables

As indicated by Table 4.5, the Saudi Arabian equity market as a total of 164 firms as of 2013, in 15 sectors. The insurance sector commands the lead with the total number of firms listed, and total transactions following the 2005 regulation reform[73]. The petrochemicals sector has the highest value of shares traded at roughly 591.97 million SAR, and the second highest number of shares traded. Since it is a sub-industry of oil production, oil prices fluctuations will affect it direct. In turn, through its market capitalization, the petrochemicals sector movement has a significant impact on the TASI.

More than 58% of the value of shares traded is owned by four sectors: petrochemicals, banking and financial services, insurance, and real estate development with 18.5%, 13.6%, 12.8%, and 13.8%, respectively. Most of the 'blue chip' and market leader firms belong to one of the aforementioned sectors. As such, any exogenous shocks that may impact the performance of these sectors will have an adverse impact on the TASI.

[73] Insurance firms dealing in auto, medical, and life insurance, were not allowed to exist in Saudi Arabia, since Sharia-ah Law views their products as a form of gambling. It was not until 2005 that regulation reform mandated all drivers to insure their cars, and then it developed to health and life insurance progressively. Since then, the growth of insurance companies has been the second largest market in the GCC growing 18% between 2008 and 2013. See Iqbal *et al.* (2013).

Interestingly, if we decide to drop the insurance sector – consider it as an outlier due to its rapid growth – we still have a heavily concentrated market in petrochemicals, banking, and real-estate. Total value of shares traded amounts to 45.90% of the total in comparison to having 20.12% of total number of firms. The banks and financial services are directly linked to monetary policy changes and SAIBOR, while the real estate development depends on the availability of credit, and government support-structure in spending. As such we can hypothesize that the equity market is sensitive to changes in the macroeconomic environment.

Table 4.4 The Saudi Arabia Equity Market (2013)

	Value Traded		***Shares Traded***		***Transactions***		***No. Firms***	
Sector	***In real millions (SAR)***	***%***	***In millions***	***%***	***In thousands***	***%***	***Units***	***%***
Banks & Financial Services	SAR 435.44	13.60%	2,570.61	14.90%	585.37	7.50%	11	6.70%
Petrochemical	SAR 591.97	18.50%	2,860.15	16.60%	912.4	11.70%	14	8.50%
Cement	SAR 103.88	3.20%	463.02	2.70%	237.67	3.10%	13	7.90%
Retail	SAR 187.44	5.90%	489.89	2.80%	673.47	8.70%	13	7.90%
Energy & Utilities	SAR 29.16	0.90%	269.84	1.60%	47.76	0.60%	2	1.20%
Agricultural & Food Industries	SAR 159.04	5.00%	667.48	3.90%	490.36	6.30%	16	9.80%
Telecomm. & IT	SAR 248.35	7.80%	2,106.92	12.20%	443.28	5.70%	5	3.00%
Insurance	SAR 410.58	12.80%	1,617.60	9.40%	1,874.66	24.10%	35	21.30%
Multi-Investment	SAR 79.42	2.50%	517.29	3.00%	229.85	3.00%	7	4.30%
Industrial Investment	SAR 191.28	6.00%	685.5	4.00%	468.82	6.00%	14	8.50%
Building & Construction	SAR 188.23	5.90%	842.49	4.90%	655.43	8.40%	16	9.80%
Real Estate Development	SAR 440.90	13.80%	3,726.86	21.60%	762.98	9.80%	8	4.90%
Transport	SAR 71.10	2.20%	298.98	1.70%	186.19	2.40%	4	2.40%
Media & Publishing	SAR 26.53	0.80%	77.86	0.50%	107.86	1.40%	3	1.80%
Hotel & Tourism	SAR 40.35	1.30%	85.23	0.50%	106.44	1.40%	3	1.80%
Total	SAR 3,203.68	100.00%	17,279.73	100.00%	7,782.52	100.00%	164	100.00%

Source: Tadawul Quarterly Report 2014

4.4.2.1 Descriptive Statistics

Table 4.6 reports the summary statistics of the second group of variables. There were 255 observations starting from December 31, 1992 and ending on February 28, 2014. Dummy variables were included based on monthly frequency, and the largest impact was for the 2003 – 2008 energy crises with a mean of 27.8%. The average real narrow money and real broad money supply is 2.79 and 4.83 billion SAR, respectively. The Saudi Arabian to U.S. dollar exchange rate shows little volatility with a standard deviation of 0.007; in comparison, the real effective exchange rate has a standard deviation of 0.1805 riyals, and an average of 0.9902 riyals.

The average TASI value is at 44.23 points, with a maximum of 194.48 and a standard deviation of 34.98 points. Comparing the mean to the standard deviation shows that the TASI is highly volatile as the observed values are further from the mean. The real Saudi Arabian Interbank Offer Rate has an average of 0.351%, and real oil prices in SAR show an average of 1.59/barrel, and a maximum of 4.49 SAR/barrel. The following section may shed some additional light on the relationship between the variables as we graphically analyze them.

Table 4.5: Second Group Variables Summary Statistics (Dec 1992 – Feb 2014) Monthly

Variable	Obs.	Mean	Std. Dev.	Min	Max
Tadawul All Shares Index (1985 = 1000)	255	44.22800	34.98800	11.34000	193.47900
S&P 500	255	5.71400	1.45800	3.00100	8.78200
SAIBOR	255	0.00351	0.00020	0.00004	0.00070
M1 (Narrow Money) billions of SAR	255	2.78700	1.61600	1.21200	6.97600
Real Effective Exchange Rate	255	0.99020	0.18045	0.67700	1.32400
Exchange Rate SAR/USD	255	3.75300	0.00700	3.71000	3.77000
Oil Prices in SAR	255	1.59440	0.97100	0.36806	4.49200
Asian Financial Crisis	255	10.59%	30.83%	0.00	1.00000
Russian Rubble Crisis	255	5.10%	22.04%	0.00	1.00000
Energy Crisis	255	27.84%	44.91%	0.00	1.00000
Asset Bubble	255	14.90%	35.68%	0.00	1.00000
Collapse of 2006	255	4.71%	21.22%	0.00	1.00000
Financial Crisis 2008	255	7.45%	26.31%	0.00	1.00000

Variables have been adjusted by CPI (2005 = 100); while S&P 500 is adjusted with U.S. CPI (2005 = 100)

4.4.2.2 Graphical Analysis

The relationship between oil price movements and the TASI is exhibited in Figure 4.10; the graph shows somewhat of a correlation between the two variables, with the volatility more pronounced in oil prices from 1998 to 2009. However, during the asset price bubble between 2003 and the end of 2005, the TASI had a sharp increase followed by a rapid decline.

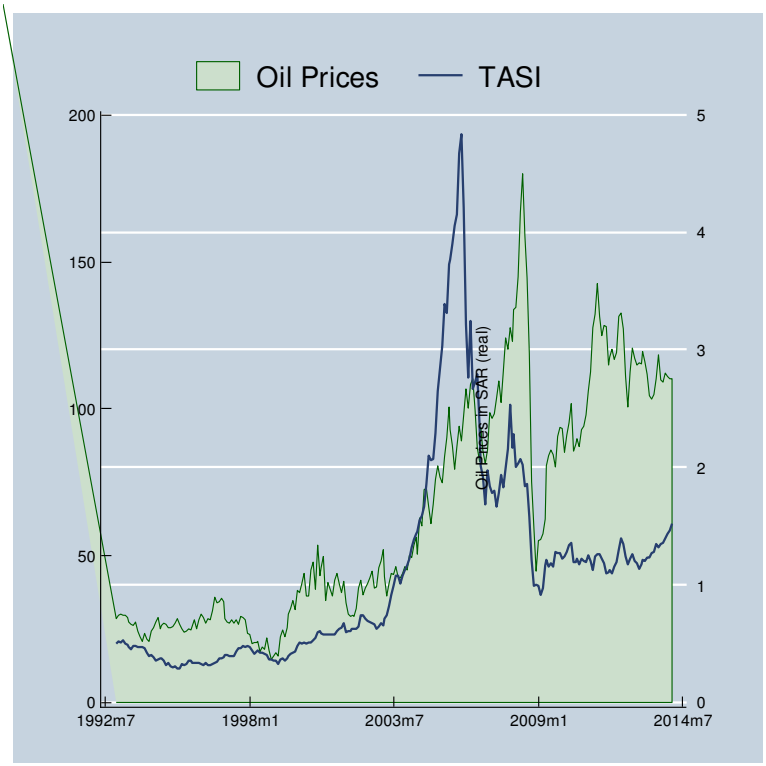

Figure 4.10 TASI and Oil Prices 1992m12 – 2014m2

Not long before the collapse of 2006 ended, and the partial recovery of 2007 took place, oil prices increased in a similar fashion, and declined rapidly in a short amount of time. Both of these are considered anomalies in the market. However, we can note that a decline in oil prices (end of 2006) is followed by a decline in the stock market index, almost instantaneously. We can

trace the declines of oil prices and find them leading the TASI; while the magnitude may differ, the general co-movement is there.

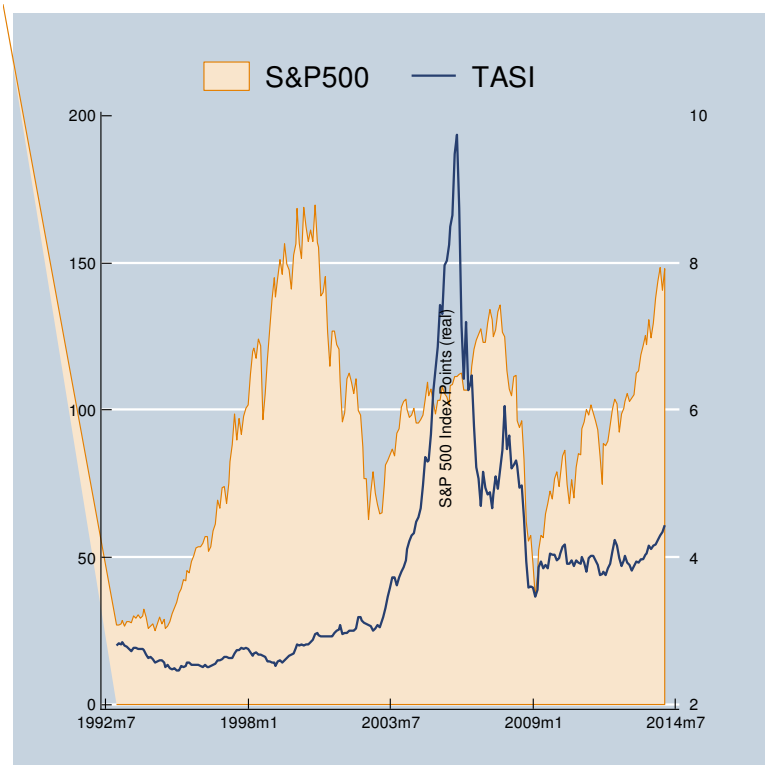

Figure 4.11 TASI and S&P 500 1992m12 – 2014m2

The S&P 500 and the TASI do not share an obvious co-movement, aside from the global shocks affecting all financial markets in 2008, both variables unique random walks (Figure 4.11). The 2003 – 2005 asset bubble shows that it is confined to the Saudi Arabian market as there are no similar increases in the S&P 500. Figure 4.12 confirms that the SAIBOR's rapid decline occurred during the same period that the TASI's price bubble started to form.

At the start of the 2004, the SAIBOR reached an all-time low, just above 1%. Although the monetary policy of Saudi is closely correlated to that of the U.S., interbank lending was pursuing an expansionary strategy by reducing the rate for short-term loans. Banks had an incentive to lend out credit, creating a bubble of investments. The decision to lower the SAIBOR may have created a moral hazard in the market contributing to uninformed mass investments in the market.

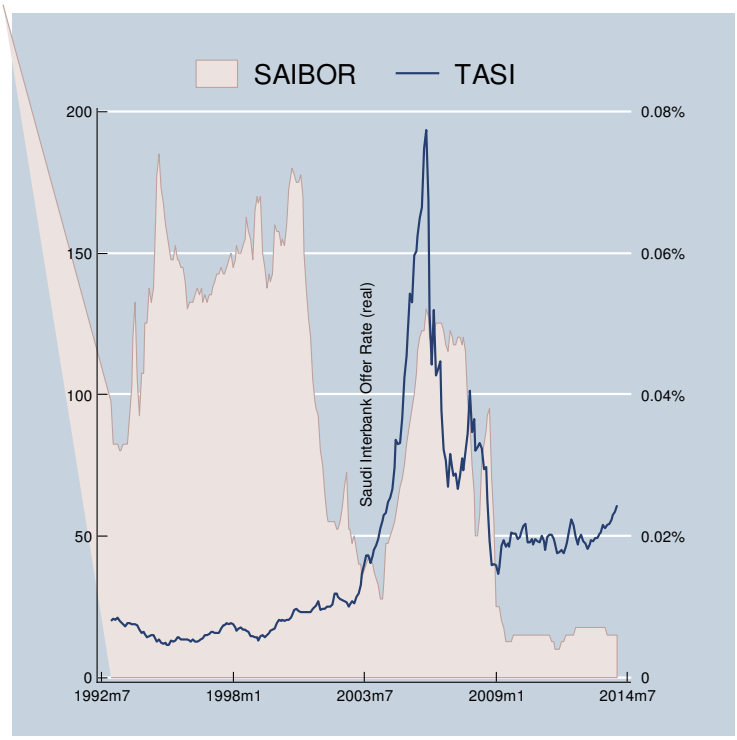

Figure 4.12 TASI and SAIBOR 1992m12 – 2014m2

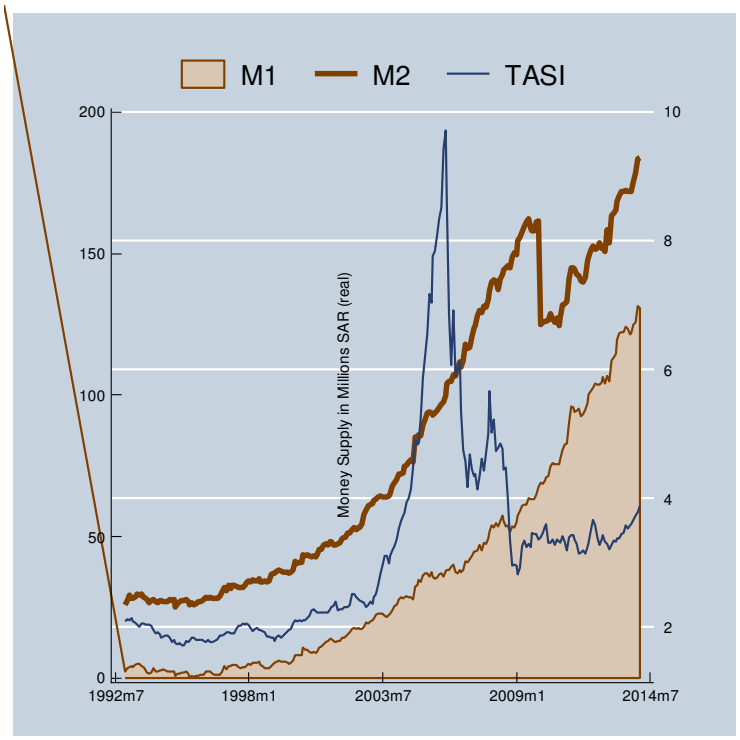

Figure 4.13 TASI, M1 and M2 1992m12 – 2013m2

Before the asset bubble there is co-movement between the money supply and the TASI. However, it seems that the M2 is lagging behind the TASI's drop in 2008. Arguably, the trajectory of both variables does show an upward trend, but it has hard to determine the type of relationship between the TASI, M1, and M2 without further statistical testing. Economic theory tells us that stock prices should increase with money supply and declining interest rates. However, for Saudi Arabia, the case may be where stock prices are actually more sensitive to the SAIBOR decline and other institutional factors, as the asset bubble immediately formed when the SAIBOR reached a year-to-date low in 2003.

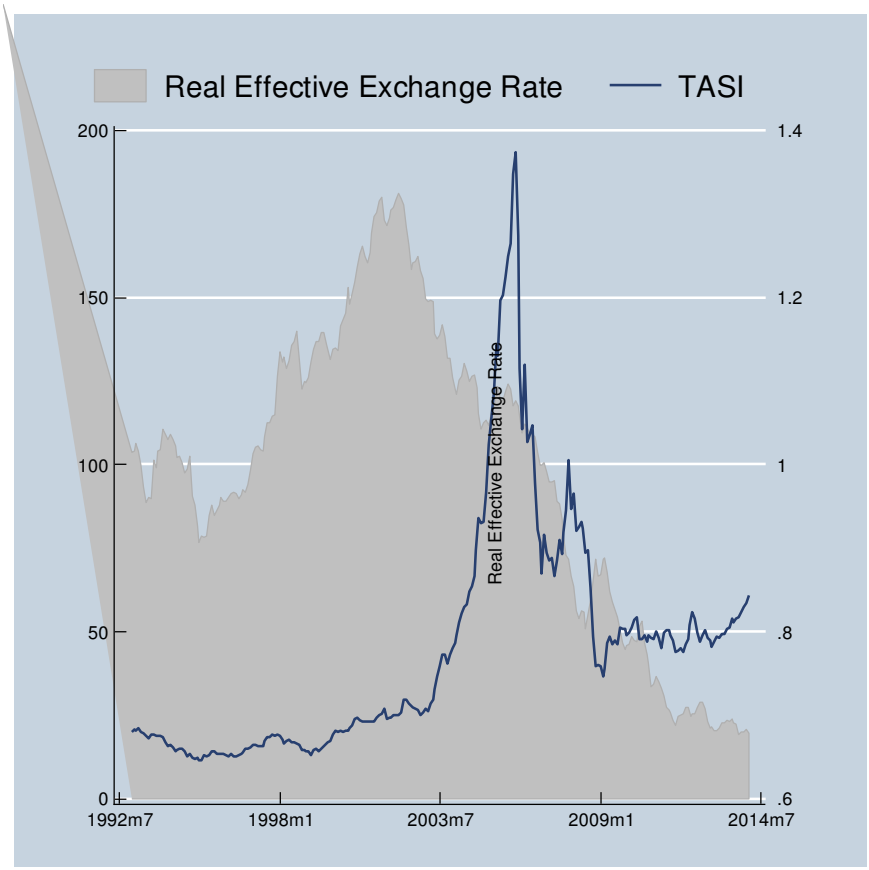

Figure 4.14 TASI, and REER 1992m12 – 2014m2

Figure 4.14 demonstrates the REER[74] started to decline around 2002, and continued to do so until the end of 2005. The depreciating REER could also be a contributing factor to the equity market bubble formation. As investors hold depreciating currency, investments abroad become more expensive, while local equity markets become more attractive. The TASI may share a long-run movement with oil prices, the S&P 500 and the SAIBOR.

[74] The Nominal Effective Exchange Rate is defined as the unadjusted weighted average value of a country's currency relative to all major currencies being traded within an index or pool of currencies (2000 = 100). The weights are assigned by the country and reflect the importance of each currency within the pool, as measured by the balance of trade (IMF, 2006). An NEER greater than 100 indicates that the domestic currency is usually worth more than an imported currency (appreciated against the index); by the same token, a value less than 100 means it is worth less (depreciated). Equivalently, the NEER could be used to estimate the price paid by the consumer for an imported good (higher value NEER means higher imports). The Real Effective Exchange Rate is interpreted in the same way but adjusted by the price level.

4.5 Hypotheses Formulation and Expectations

Based on the graphical analysis of the previous sections, the historical narrative, and the available literature on Saudi Arabia, I am able to formulate a number of hypotheses concerning the two groups of variables. With regards to oil price shocks and real government revenues and expenditures, we should find evidence of fiscal synchronization. However, the line graphs of the variables demonstrated a lag between the movements of revenue sources and expenditure items. To that extent, I suspect that oil revenues could lead expenditures, or have a higher causality magnitude. While still classifying as fiscal synchronization, I hypothesize that the data leans towards favoring the revenue-spend hypothesis for Saudi Arabia.

In analyzing sectoral expenditure items, it seems that defense and military spending should exhibit a starting point for the budget. In other words, budget reallocations from other sectors may be used to cover defense spending. Additionally, infrastructure development could exhibit more sensitivity to shocks in oil prices. Moreover, based on the correlation coefficients between the variables, we might be able to find a number of cointegrating equations between the itemized expenditure items and oil prices. The suitability of the VAR and the VECM methodologies cannot be determined beforehand, as statistical testing would determine the more suitable model based on its post-estimation results. Based on economic theory, we expect that oil price increases should decrease the stock prices in net oil-importing economies; however, in the case of net oil-exporters, we expect that there is an increase in the index due to the higher government revenues born out of an increase in oil production. This is followed by an increase in expenditures, which would increase investors' confidence.

Yet, because oil revenues exhibit a lag, assuming that oil price increases are unexpected, they are slower to adjust than the equity market would. In turn, the impact may only be short-lived and does not affect the real stock prices in the long-run.

I hypothesize that the equity market will exhibit sensitivity to all macroeconomic factors. Specifically, it should increase with increases in oil prices and money supply; while be inversely related to the SAIBOR and the real effective exchange rate. Additionally, the TASI may share a bi-directional impact with the SAIBOR as monetary authorities attempt to control the formation of pricing bubbles. The equity market index should not have enough predictive power on the movement of the real economy. In other words, the variance in the macroeconomic variables is not largely explained by the TASI's volatility.

CHAPTER 5

RESULTS

Based on the tests, models, and tools of analysis specifications, this chapter discusses the empirical results. The chapter is segmented into two sections according to group i.e. first group and second group. Each of these sections will present the econometric findings and results. There are a total of six model specifications. For the first group, the unrestricted VAR and VECM models are applied. In addition the subgroup of Oil revenues, Total Expenditures, and Oil Prices is tested using a VAR model. The second group, testing is also carried out on a VAR and VECM model approach. All of the data is transformed into real logs of their nominal values.

5.1 Oil Price Shocks, Government Revenues and Expenditures

This section presents the results on the first group of variables in an attempt to answer the questions relative to oil price shocks, government revenues and expenditures. First, the graphical analysis of chapter 4 is revisited, but from a statistical testing approach. The variables are tested for non-stationarity through the Dickey Fuller – Generalized Least Squares approach (DFGLS), and the Dickey Fuller unit root test for robustness. Secondly, we estimate the lag selection after achieving stationarity in the variables, relative to the model selection. The third step involves testing for cointegration, followed by the tools of analysis.

5.1.1 Unit Root Testing Results

Time-series data is usually non-stationary, or would exhibit a unit root. This creates a problem for analyzing the results as the mean and variance change over time. If the graphical and unit root testing of the data rejects the null hypothesis of a unit root, then the analysis can be carried out on levels of the data, and no additional adjustments are needed. However, data that exhibits a stochastic movement through time or a trend/seasonality must be adjusted either through taking the first-difference, or de-trending, respectively. To investigate the unit root process in the data of the first group the DFGLS test was performed. The consensus in the econometric literature and empirical evidence indicate that the DFGLS is more reliable and has more power in comparison to other unit root testing methodologies[75].

The null hypothesis (H0) states that the variable exhibits a unit root, or is non-stationary, while the alternative hypothesis asserts that it is stationary and requires no adjustments. If the absolute value of the DFGLS test-statistics is less than the critical value of the significance level (1%, 5%, and 10%), then we fail to reject the null and conclude that data exhibits a unit root; otherwise the alternative is accepted.

Table 5.1 shows the results of the DFGLS unit root tests on the variables of the first group[76]. We fail to reject the null hypothesis on all variables and conclude that the variables exhibit a unit root process. In order to achieve stationarity, we must take the first difference of the variables.

[75] The Dickey-Fuller, and Augmented Dickey Fuller test confirm the results of the DFGLS; however, only DFGLS is reported

[76] The data has been transformed from nominal to real values using CPI (2005 = 100) followed by taking a log transformation.

Given the preliminary data analysis, there are a number of exogenous and endogenous shocks that must be accounted for, which will add more significance to the results of the underlying VAR model. These include: oil production peaks in Germany, Venezuela, U.S. and Canada causing a worldwide increase in oil prices in 1970; the Arab Oil Embargo 1973 – 1974; the oil price shocks of 1980, 1983, 1986, and 1988; the Gulf War of 1991; the Asian Financial Crisis and Russian Rubble Crisis in 1997 and 1998, respectively; and the 2008 financial crisis[77].

Table 5.1 DFGLS Unit Root Test (Mean Stationary): First Group

Lags	**Education**	**Health**	**Defense and Military**	**Infrastructure**	**Economic Development**	**Oil Prices in SAR**
10	0.3320	-0.1160	0.0520	-0.5220	-0.3550	-0.4830
9	0.2790	-0.1540	-0.1580	-0.4820	-0.2540	-0.2000
8	0.4550	0.0260	0.1560	-0.5860	-0.1500	-0.5200
7	0.3650	-0.0180	0.0320	-0.5610	0.1740	-0.4240
6	0.6290	0.1850	0.3930	-0.6850	0.0750	-0.1930
5	0.6950	0.2480	0.5880	-0.6450	0.2080	0.0450
4	0.7490	0.3490	0.4630	-0.7380	0.1140	0.3610
3	1.0100	0.3400	0.5310	-0.3240	0.0820	0.0180
2	1.2010	0.5920	0.5540	0.1390	0.3200	-0.1280
1	1.3740	0.5290	0.8660	-0.3590	0.1720	0.4180
Max lag by SC	10					
Min SC lag	1	1	1	4	1	1
Number of Obs.	40					
	Critical Values					
1%	-2.620					
5%	-1.950					
10%	-1.600					

Note: * 1%; ** 5% and *** 10% significance

[77] The VAR model was executed in numerous variations (results not included) with both level and differenced data to ascertain the significance of the dummy variables. In all the variations of the models, these shocks exhibited a high impact on the variables. Additionally, these variables constituted the largest structural breaks in the timeline of the data.

The lag selection tests recommend the use of four lags based on the LR, FPE, AIC and HQIC criteria, while the SBIC recommends one lag. The selection criteria are based on minimizing the value of each lag selection method. It is common in the empirical literature that the VAR model is examined between the minimum and maximum recommended number of lags; keeping in mind that the data's frequency also plays an important role in deciding the appropriate maximum lag length[78].

Defense and military spending based on the data shows an inelastic expenditure structure; this is supported by the findings of Al-Jarrah (2005), indicating that it has a predetermined percentage of the budget. The remaining expenditure items depend on the expenditures from defense and military, as well as the previous category of spending in a sequential format. Therefore, it is only logical to use the same format for the Cholesky ordering to capture the accurateness of the government's budgetary planning process. In order from the most endogenous to the most exogenous, the variables are set as: defense and military spending, education, economic development, health, infrastructure, and oil prices in SAR.

5.1.2 VAR Results First Group

While the estimates of the individual coefficients in the VAR do not have a straightforward interpretation, the model's validity is judged on its post-estimation test results. However, preliminary goodness of fit estimates indicate that the VAR (4) model is the best specification as it minimized all of the lag selection criteria, and provided acceptable R-square estimates that were significant.

[78] For example, the frequency is linked to the maximum lag i.e. annual data has a recommended maximum lag of one year; quarterly data in is four, monthly data is 12. While this is a guideline it is not a crucial rule to follow as the data's behavior and statistical tests ultimately determine the proper lag length.

The innovations of the VAR system are tested using the LM test for autocorrelation. The null hypothesis states that there is no autocorrelation at the specified lag; conventional approach uses the 95% confidence level as benchmark (or p-values at 5% and less). We failed to reject the null hypothesis, concluding that there is no autocorrelation of errors at the specified lags.

Hamilton (1994) and Lutkepohl (2005) indicate that inference on the VAR models requires the covariance of the variables be stationary. In turn, the expected value of the dependent variable and its variance is finite and independent of time, as well as the covariance of the variables. The stability condition of the VAR model requires that it is invertible and has an infinite order of vector moving-average representation. This allows us to interpret the impulse response functions and forecast-error variance decomposition results.

Technically, as shown in Lutkepohl (2005), if the modulus of each eigenvalue of matrix A is strictly less than one, then the VAR model has satisfied the stability condition. This was exhibited in the VAR (4) model where the inverse roots of the characteristics autoregressive polynomial and the modulus are within the unit circle; thus, the VAR model is stable.

Finally, we need to test the normality of the disturbances' distribution. Each of the VAR equations and all equations jointly, are tested based on skewness, kurtosis, and the Jarque-Bera statistics. The null hypothesis is that the disturbances are normally distributed, and a p-value less than 5% means we reject the null at the 5% level. The results of the normality testing show that we fail to reject the null hypothesis, and conclude that the residuals follow a normal distribution as well as exhibiting a white noise behavior.

5.1.2.1 Impulse Response Function and FEVD

Figure 5.1 presents the IRF and FEVD plots based on the VAR estimation for the First Group. The columns represent the impulse variables, while the rows show the response of these variables to a one standard deviation shock in the impulse variables. The diagonal represents the shock of each variable to itself. All expenditures items, and oil prices, adjust negatively to self-shock. Oil price adjustment shows a direct decrease by the first year, as prices increase oil producers attempt to stabilize the price and meet the demand by increasing supply. On the other hand, if oil price increases were due to supply shocks, then that would also prompt producers to adjust supply levels to stabilize prices in the market.

Most importantly, for our analysis, is to observe how these itemized expenditure items behave when there are oil price shocks. Looking at the last column on the right and starting at the first row, we see the about 7% of the variance in real defense expenditures can be attributed to oil prices. Additionally, a shock to oil prices increases real defense expenditures by 25% in the first year. Gradually, the impact dies out by the third year, and it starts to ascend to reach normal levels by the eighth year.

Surprisingly, about 2.5% of the variance in real education expenditures is attributed to variance in oil prices. Additionally, education spending shows less sensitivity to shocks in oil prices as it increases by roughly 10% at the end of the second year and die out at the third year. Similarly, oil price variance contributed about 4% to the variance of real economic development but with a more sustained impact. It peaks on the 3rd year with an increase of 22% and then decreases to the minimum point by the fourth year.

Oil prices variance contribute about 5.25% of the variance in real expenditures on the health sector. Again, we find a more sustained increase that peaks by the second year in real health expenditures due to oil price shocks, but at a value of less than 20%. Finally, the average variance of real infrastructure spending due to variance of oil prices is estimated at 9.75%, and exhibits a similar movement to oil price shocks as demonstrated by the previous expenditure items.

Table 5.2 Impulse Response Function Summary First Group

		Impulse Variables					
		Defense	Education	Econ. Dev.	Health	Infrastructure	Oil Prices
Response Variables	Defense	☑	☑	☑	☑	☑	☑
	Education	☑	☑	☒	☑	☑	☑
	Econ. Dev.	☑	☑	☑	☑	☑	☑
	Health	☑	☑	☒	☑	☑	☑
	Infrastructure	☑	☑	☒	☑	☑	☑
	Oil Prices	☑	☒	☒	☑	☑	☑

Note: ☑ = Statistically significant where the confidence band is above or below zero; ☒ = no significant movement in response variable from a 1sd shock in the impulse variable

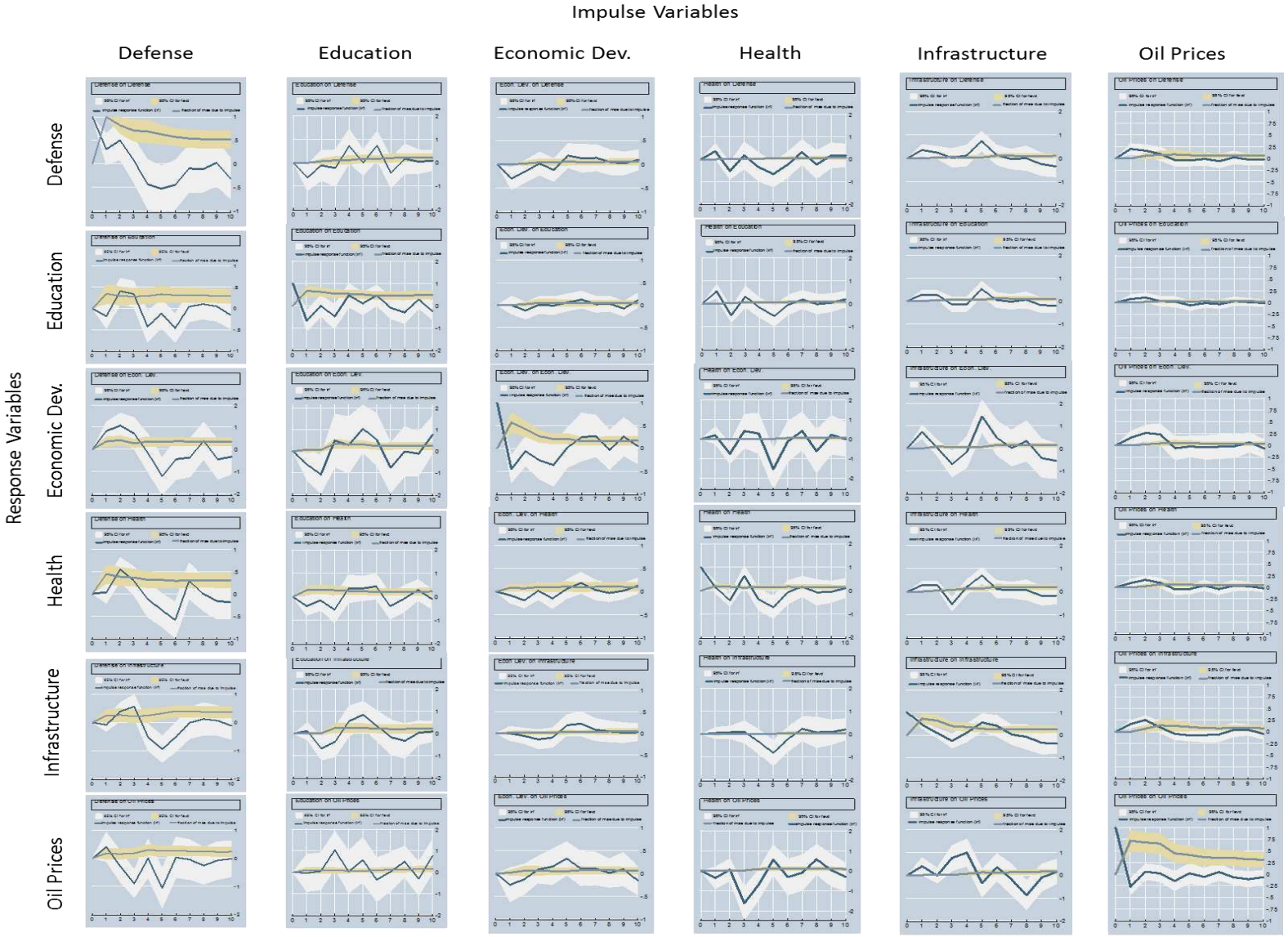

Figure 5.1. Impulse Response Function of Expenditure Items

Table 5.2 provides a brief summary on the statistically significant relationships obtained from the IRF analysis. The impact of a shock to defense expenditures is statistically significant in all expenditure items. Both the increases and decreases of the response variables have confidence bands that are outside the origin. Indicating that defense spending is a primary budget item, and any increases leads to an adjustment in the all sectoral budgets. For oil prices only the decrease by the third period is statistically significant; this proposes that increases in defense expenditures can lead to a decline in oil prices by way of fulfilling higher revenues, but revenues take longer to adjust.

An increase in education spending causes a statistically significant decline in defense and health expenditures in the first year, and then on economic development and infrastructure spending in the second year. There is no significant impact on oil prices. This behavior exhibits that in order to fulfill unexpected increases in education spending, budget cuts in defense and health expenditures occur in the first year, and then the remaining deficit is taken from economic development and infrastructure in the second year. Similarly an increase in economic development expenditures creates a decrease in defense spending in the first year, and then health spending in the second year.

Health expenditures cause a decrease in defense, education, and economic development by the second year; while infrastructure decreases by the fifth year. Additionally, it causes oil prices to decline by the third year in a similar fashion to shocks stemming from defense spending. Infrastructure shocks cause statistically significant increases in all expenditure items by the fifth year. Additionally, there is a significant increase in the first two years for both education and health expenditures; and an increase in the first year for defense and economic development.

Finally, there is a temporary decrease in health expenditures and economic development by the third year. The response of oil prices to shocks in infrastructure spending shows a significant increase in the third and fourth year, and a decrease by the eighth year.

Oil price shocks have a positive and significant impact on all expenditure items in the first and second periods. The shocks usually die out by the third period. In turn, this indicates that there is bidirectional impression between defense, health, and infrastructure spending and oil prices; but a unidirectional impact flowing from oil prices to education and economic development.

Collectively, oil price shocks caused an increase in real expenditure items in a range between 18 – 25%, and a range of FEVD between 2.5% to 9.75%. We also observe that the higher the average FEVD, the longer the impact on increases in real expenditures. Defense and military spending have the highest magnitude in response to oil price increases, while real spending on education exhibits the lowest. The movement confirms the budgetary planning cycle of Saudi Arabia as following a five year economic plan (four years effectively). All the variables reach a minimum point of adjustment by the fourth year.

5.1.3 Cointegration and VECM Results

The Johansen (1990) cointegration test reveals if there are co-movements in the long run between the variables of interest. The null hypothesis is that there are no more than *r* cointegrating relations, which means if we restrict the number of cointegrating equations to be equal to or less than *r* then the remaining *K* – r eigenvalues are zero, where *K* is the number of variables in the model (Johansen, 1990).

One of the drawbacks of determining the number of cointegrating equations (*r*) is that it involves a number of statistical tests[79]. The most widely used is the trace statistic test derived by Johansen (1995). If the trace statistics is less than the 5% critical value, then the corresponding maximum rank indicates the number of cointegration equations. As exhibited in Table 5.3, the test reveals that there are at least two cointegrating equations between the six variables as reported by the trace test statistic.

Table 5.3 Cointegrating Rank First Group

Maximum Rank	Parms	LL	Eigenvalue	Trace Stats	5% Critical Value
0	108	137.66		165.91	102.14
1	120	179.71	0.83928	81.82	76.07
2	130	195.48	0.49634	50.27*	53.12
3	138	207.59	0.40929	26.06	34.91
4	144	212.63	0.19673	15.98	19.96
5	148	217.13	0.1776	6.98	9.42
6	150	220.62	0.14087		

The LM test results for the VECM model shows that we strongly fail to reject the null hypothesis at the specified lags, and conclude that the VECM's residuals exhibit no autocorrelation. In addition, the normality testing of residuals in the VECM model shows that we reject the null hypothesis and conclude that the residuals are not normally distributed. Specifically, infrastructure exhibited high kurtosis, and some skewness (90% level rejection). Finally, the VECM imposes a four unit moduli in the model deeming it as unstable.

[79] Aside from the trace statistics, there is the maximum-eigenvalue statistics, and minimizing the information criteria. The maximum eigenvalue is based on a likelihood ratio test of the null of *r* cointegrating relations against the alternative of *r+1*. The third test follows the lag selection of the underlying VAR, by defining an estimator relative the number of cointegrating ranks that minimizes the information criteria of SBIC, HQIC or AIC. See STATA 13 Software Manual (Stata, 2013).

The first cointegration equation links defense and military spending with all variables except oil prices and education. In other words, it predicts that defense expenditures move positively with economic development and infrastructure, but negatively with health expenditures. The second cointegration equation links education to moving positively with health expenditures, and negatively with infrastructure spending. The coefficients on the short-run adjustment parameters and the long-run cointegrating equations do not exhibit comprehensible or plausible economic relationships.

Primarily, the lack of interpretation is due to the instability of the VECM model. Despite passing the autocorrelation LM test, the model failed the normality testing, specifically exhibiting normal kurtosis. This would indicate that there are large spikes in the cointegration equation. The exogenous shocks or structural breaks coincide with the exogenous variables that were controlled for in the VAR model (Figure 5.2).

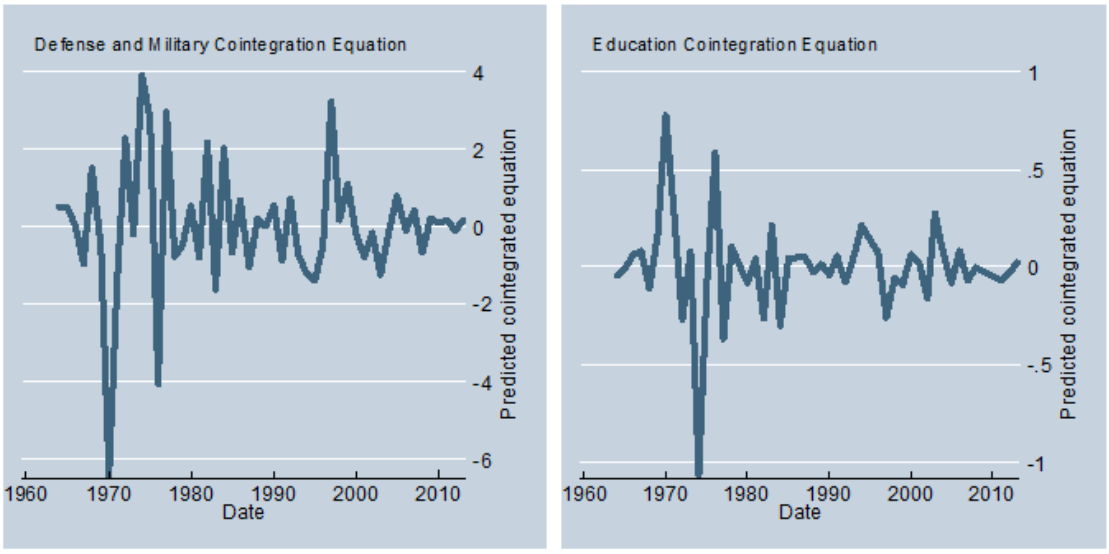

Figure 5.2 Predicted Cointegration Equations First Group

Based on the results of the First Group, the VAR models exhibits unmatched superiority and best fit for the time series. While the Johansen test of cointegration did exhibit comovement in the long run between the variables, the VECM model did not yield reliable results. Mainly, the inability of the VECM to incorporate exogenous variables in the system does not allow it to control structural breaks in the time series[80]. This observation may not be robust, but it would certainly apply in the case of Saudi Arabia's itemized expenditures and oil prices.

The use of unrestricted VAR to model cointegrated variables has been debated in the literature. Farzanegan and Markwardt (2009) showed that the forecasting performance of unrestricted VAR is superior to the VECM when testing variables of the Iranian economy including oil prices.

5.1.4 Sub-Group Analysis

The Sub-Group analysis aggregates real expenditures, and investigates the relationship between oil revenues and oil prices. A number of factors lead to observing hikes in the differenced time series. The data must be tested for unit roots to assess its suitability for modeling. Table 5.4 shows the results of unit root testing assuming a mean stationary behavior for real logs of the data.

There were a number of exogenous and endogenous shocks from the early-1970s and 1980s, through 2013. Oil production peaks in 1970, the Arab Oil Embargo, the Iran-Iraq War, oil price glut of the 1980s, the Asian Financial Crisis and the Russian Rubble Crisis of 1997 and 1998, and the financial crisis of 2008. Since these shocks showed tremendous impact on the first

[80] Arguably, exogenous variables can be included in the VECM system, but in the form of lags. Therefore, the inclusion of dummy variables creates collinearity with its lags, and the model cannot be executed. See STATA software manual (2013).

group, and the inability to control for them has caused instability in the VECM, we must assume that even with aggregation, the variables of the sub-group will still be impacted.

Table 5.4 DFGLS Unit Root Test (Mean Stationary): Sub-Group			
	DFGLS Test Statistics		
	Sub-Group 1		
Lags	**Oil Prices in SAR**	**Oil Revenues**	**Total Expenditures**
10	-0.483	0.068	-0.17
9	-0.2	0.25	-0.208
8	-0.52	0.426	-0.024
7	-0.424	0.632	0.153
6	-0.193	0.461	0.104
5	0.045	0.57	0.228
4	0.361	0.772	0.412
3	0.018	0.528	0.345
2	-0.128	0.72	0.715
1	-0.418	0.368	0.387
Max lag by SC	10		
Min SC	1	1	1
Number of Obs.	40		
	Critical Values		
1%	-2.62		
5%	-1.95		
10%	-1.61		

Note: * 1%; ** 5% and *** 10% significance

5.1.4.1 VAR Results Subgroup

The lag selection criteria of LR, FPE, and AIC recommend the use of four lags; and the HQIC with the SBIC recommend the use of one lag. In consistency to the literature on lag selection criteria conflicts, the VAR model will be tested based on the range from one to four lags. The ordering of the VAR model started with total expenditures, as they are the most endogenous, followed by oil revenues and oil prices all in real log terms.

The LM test of residual autocorrelation shows that the null hypothesis is not rejected for all lags as well as the normality test of the errors. We conclude that the errors are normally distributed and do not exhibit autocorrelation. The VAR model is stable and all roots are within the unit circle, indicating a best fit for the data, and allowing for a valid interpretation of the IRF and FEVD analysis.

5.1.4.1.1 IRF and FEVD Analysis

Figure 5.3 shows total expenditures, oil revenues, and oil prices react in the same manner to self-shock by decreasing within the first period, and gradually adjusting until the shock dies out by the third year. A shock to oil prices increase total expenditures by the first year with an average of 20%, and it would gradually decline to a minimum level by the fourth year.

Oil revenues increase with shocks to oil prices, but with a faster adjustment rate. The peak of the adjustment is reached by the first year, and then it would immediately decline by the second year. Shocks to oil prices are short-lived in oil revenues as they die out by the third year. In addition, the variance imposed on total expenditures from oil price shocks is significantly higher than the variance imposed on oil revenues. This indicates that total expenditures are more sensitive to changes in oil prices. Shocks to oil revenues increase expenditures slightly by the

first year, followed by a decline for two years, and adjusting by the fifth year. An increase in oil revenues has a negative impact on oil prices that are realized by the first year, and readjust by the fourth year, although consistent with market dynamics – increase in supply causes a decrease in price - it is statistically insignificant (Table 5.5). Interestingly, we see that increases in total expenditures and the response of oil prices are similar to the impact exerted by oil revenue shocks on oil prices.

However, it is much more pronounced as oil prices in the latter decrease by 6%, while with total expenditure shocks it decreases by nearly 45%. The behavior of the IRF suggests that there is bi-directional impact between total expenditures and oil prices, and a unidirectional effect flowing from real oil revenues to real expenditures (revenue-spend hypothesis). We could argue that the bi-directional causality exhibited between real oil prices and real total expenditures are in fact due to the direction of impact flowing from oil revenues to expenditures. That is, when considering both real oil revenues and real expenditures as a whole, they may impact oil prices, at least in the short-run.

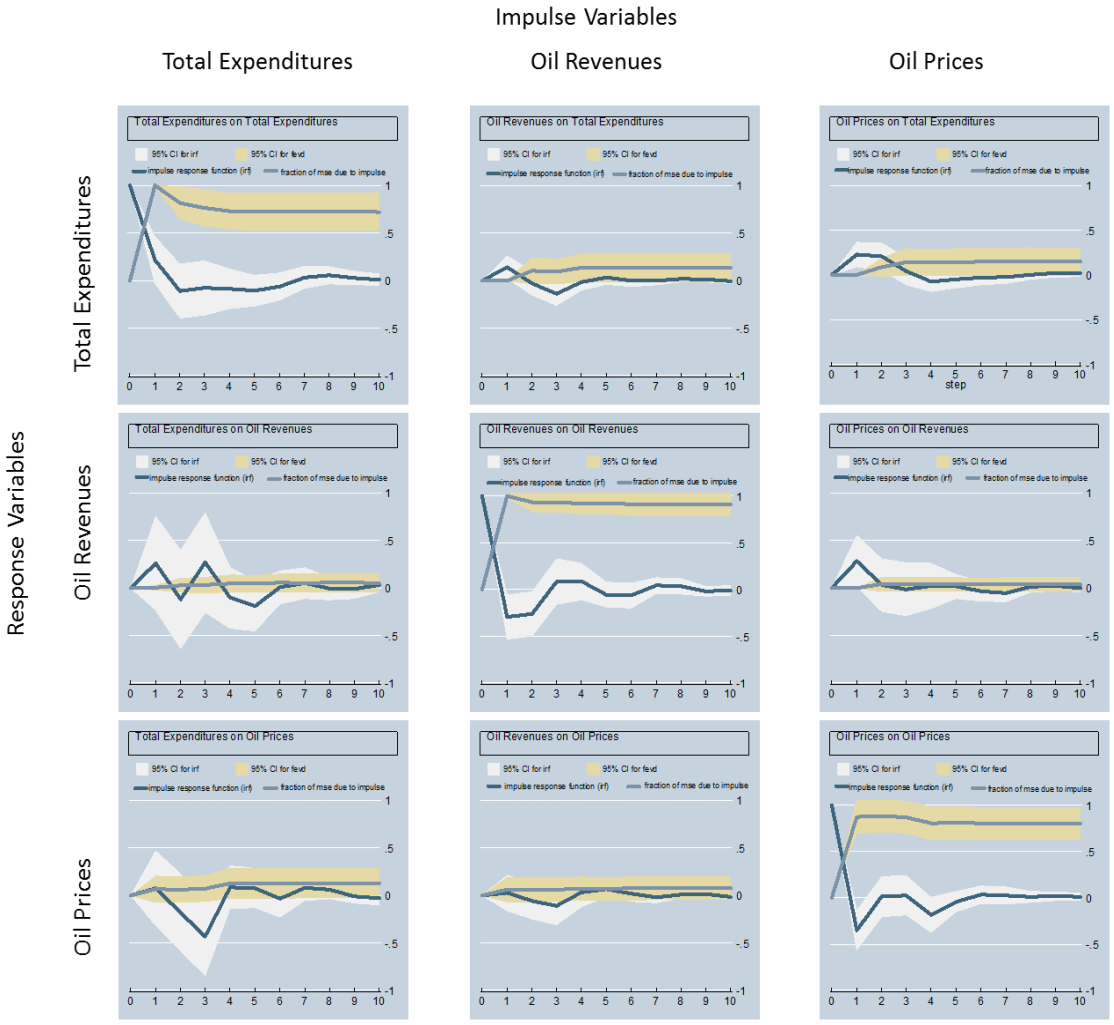

Figure 5.3 IRF of and FEVD Sub-Group VAR

Table 5.5 Impulse Response Function Summary – Sub Group				
Response Variables		Total Expenditures	Oil Revenues	Oil Prices
	Total Expenditures	☑	☑	☑
	Oil Revenues	☒	☑	☑
	Oil Prices	☑	☒	☑

Note: ☑ = Statistically significant where the confidence band is above or below zero; ☒ = no significant movement in response variable from a 1sd shock in the impulse variable

An average of 73% of the variance in total expenditures can be explained by its own movement, while the variance of oil revenues explained by the shock to expenditures averages around 5%. The FEVD reveals that average oil prices variance due to real expenditure shocks is estimated at 12%. Oil revenue shocks explain an average variance of 13%, 91%, and 6.5% on real expenditures, oil revenues, and oil prices, respectively. While oil price shocks on average explain 14.5%, 3.9% and 84% of real expenditures, oil revenues, and oil prices, respectively[81].

5.2 Equity Markets and Macroeconomic Factors

Using the same analysis procedure for section 5.1, we will continue our analysis for the Second Group of variables dealing with the equity markets and macroeconomic factors. The first section will present the unit root testing results, and validate that the data is suitable for analysis. The second section discusses the VAR model results and lag selection, while the third section presents the IRF and FEVD of the VAR. The fourth section presents the results of the cointegration testing and subsequent VECM model, as well as related post-estimation analysis.

5.2.1 Unit Root Testing

Table 5.6 presents the results of the DFGLS unit root testing on the second group of variables. All variables exhibit unit roots at the 5% level. Based on the graphical analysis in chapter 4, the data exhibits a stochastic movement through time; thus, it requires first differencing to become stationary.

[81] The Sub-Group Johansen Cointegration test revealed no cointegration between the variables. In turn, the VECM model cannot be carried out.

Table 5.6 DFGLS Unit Root Testing (Trend Stationary) Second Group									
	DFGLS Test Statistics						**Critical Values**		
Lags	**TASI**	**SAIBOR**	**M1**	**REER**	**OPSAR**	**S&P500**	**1%**	**5%**	**10%**
15	-1.695	-2.163	-0.86	-0.898	-1.907	-1.61			
14	-1.572	-2.247	-0.907	-0.722	-2.086	-1.6			
13	-1.488	-2.002	-0.747	-0.745	-2.109	-1.69			
12	-1.654	-1.908	-0.502	-0.692	-2.509	-1.745			
11	-1.735	-1.896	-0.222	-0.758	***-2.715	-1.594			
10	-1.897	-1.776	-0.083	-0.729	-2.28	-1.57			
9	-1.938	-1.56	0.063	-0.664	-2.14	-1.566			
8	-2.022	-1.573	0.108	-0.671	-2.107	-1.596	-3.48	-2.89	-2.57
7	-1.694	-1.455	0.068	-0.604	-2.272	-1.503			
6	-1.809	-1.525	-0.08	-0.722	***-2.674	-1.413			
5	-1.71	-1.791	-0.216	-0.696	***-2.632	-1.502			
4	-1.668	-1.633	-0.362	-0.628	***-2.698	-1.442			
3	-1.58	-1.641	-0.39	-0.623	***-2.849	-1.356			
2	-1.404	-1.835	-0.414	-0.487	-2.616	-1.223			
1	-1.315	-1.561	-0.307	-0.528	-2.622	-1.277			
Max SC	15								
Min SC	1	2	1	1	1	1			
optimum Lag (Ng-Perron)	8	14	14	15	13	3			
Obs.	239								

99% *; 95% **; 90% ***

5.2.2 VAR Results

In the same approach for the first group of variables we determine the lag selection for the second group, and base our decision by comparing the five selection criteria of LR, FPE, AIC, HQIC, and SBIC. The results of the lag selection with 240 monthly observations show that the FPE and AIC indicate the use of two lags, while the LR indicates a use of 14 lags.

The Cholesky ordering places TASI as the first variable that is affected contemporaneously by the remaining variable shocks. This is followed by SAIBOR, M1, REER, Oil Prices, and finally the S&P 500. Shocks to the S&P 500 will affect all other variables contemporaneously, but is not affected by them.

The VAR model was estimated with 12 maximum lags and three exogenous shocks: the AFC and Russian Rubble Crisis (July 1997 to June of 1998); the collapse of the TASI (February 2006 to August of 2006); and the global Financial Crisis (August 2007 to March 2009). Although we fail to reject the null hypothesis and conclude that there is no autocorrelation in the VAR lags, two equations fail the kurtosis test, and thereby the Jarque-Bera test. The SAIBOR and M1 residuals do not exhibit normal kurtosis. While the null cannot be rejected for skewness, the Jarque-Bera test accounts for both skewness and kurtosis, and therefore we reject the null hypothesis, and conclude that the errors do not exhibit a normal distribution. Yet, the VAR system is stable; coupled with the fact that there was no autocorrelation of errors and the residuals behaving as white noise we are able to deduct meaningful conclusions from the IRF and FEVD analysis.

5.2.2.1 IRF and FEVD

Figure 5.4 shows the response of the TASI to shocks in the macroeconomic environment. Being that it is monthly data, we estimate the horizon for 40 segmented by four month intervals. A self-shock to the TASI causes an immediate decline within the first month, followed by a period of cyclical adjustments, and settlement within 16 months. Exhibited in Table 5.7, we note that all the macroeconomic factors impact the TASI significantly with the exception of the S&P 500. As expected, the TASI declines with increases in SAIBOR by the third month. The TASI increases with money supply in the third and seventh month as predicted by economic theory. An

increase in the real exchange rate causes the TASI to decrease by the fifth month. This inverse relationship is expected as an increase in the real exchange rate means an appreciation of the SAR against the basket of currencies, which lowers the costs of investing abroad. As capital leaves the Saudi equity market, the TASI would temporarily face dampened activity and low demand. Oil price hikes causes an increase in the equity index in the second and eleventh month that is significant.

Figure 5.5 shows how the macroeconomic environment may react to real TASI shocks. As expected, there is no impact on M1, REER, S&P 500. Interestingly, an increase in the TASI causes an increase in oil prices by the fifth month and a decrease by the end of the year; while the SAIBOR would increase by the 10th month, which is expected as the authorities attempt to reduce inflationary pressures in the TASI by pursuing a contractionary monetary policy[82].

On the other hand, the increase and decrease in oil prices is puzzling, especially since it is significant. Yet, when we consider that the same puzzling movement is exhibited in oil prices due to increases in the real exchange rate (an increase in oil prices by the 9th month and decrease by the 16th month) the two relationships might be able to explain the underlying dynamics of this conundrum. Since oil prices are quoted in real SAR, and appreciation in the real exchange rate means an appreciation in the local currency against other currencies in the basket. In turn, it becomes more expensive to purchase oil from Saudi Arabia, and so oil prices in SAR increase. By 12 periods, the oil supply increases as the government attempts to return oil prices to equilibrium, and we note the decline in oil prices with the TASI having a faster adjustment rate than the real exchange rate. While this is a speculation on the type of relationship, its validity is reinforced since oil prices are only affected by the TASI and the REER. There is bidirectional

[82] Only the IRFs of the TASI's impact and the TASI's response to macroeconomic variables shocks is shown. However, Table 5.22 shows the summary of the results.

impact between the TASI, SAIBOR, and Oil Prices; and a unidirectional effect flowing from money supply and the real exchange rate to the TASI. Additionally, we see that there is bidirectional relationship between the S&P 500, SAIBOR, M1, and real exchange rate of Saudi Arabia, which could be capturing the correlation between the monetary policy and financial markets of the U.S. and Saudi Arabia. Conforming to the stated hypotheses in this dissertation, an increase in oil prices causes a decline in net oil-importing financial markets (the S&P 500 declines by the fourth month and the effects die out a year later). Additionally, we note that the real exchange rate affects all variables significantly. About 75% of the TASI's variance can be attributed to self-shock, indicating that the TASI depends on past prices plus a random walk. The remaining FEVD indicates that there is an average of 5% of the TASI's variance attributed to shocks in the macroeconomic environment.

Table 5.7 Impulse Response Function Summary Second Group

		Impulse Variables					
		TASI	SAIBOR	M1	REER	Oil Prices	S&P 500
Response Variables	TASI	☑	☑	☑	☑	☑	☒
	SAIBOR	☑	☑	☑	☑	☑	☑
	M1	☒	☑	☑	☑	☒	☑
	REER	☒	☒	☒	☑	☒	☑
	Oil Prices	☑	☒	☒	☑	☑	☒
	S&P 500	☒	☑	☑	☑	☑	☑

Note: ☑ = Statistically significant where the confidence band is above or below zero; ☒ = no significant movement in response variable from a 1sd shock in the impulse variable

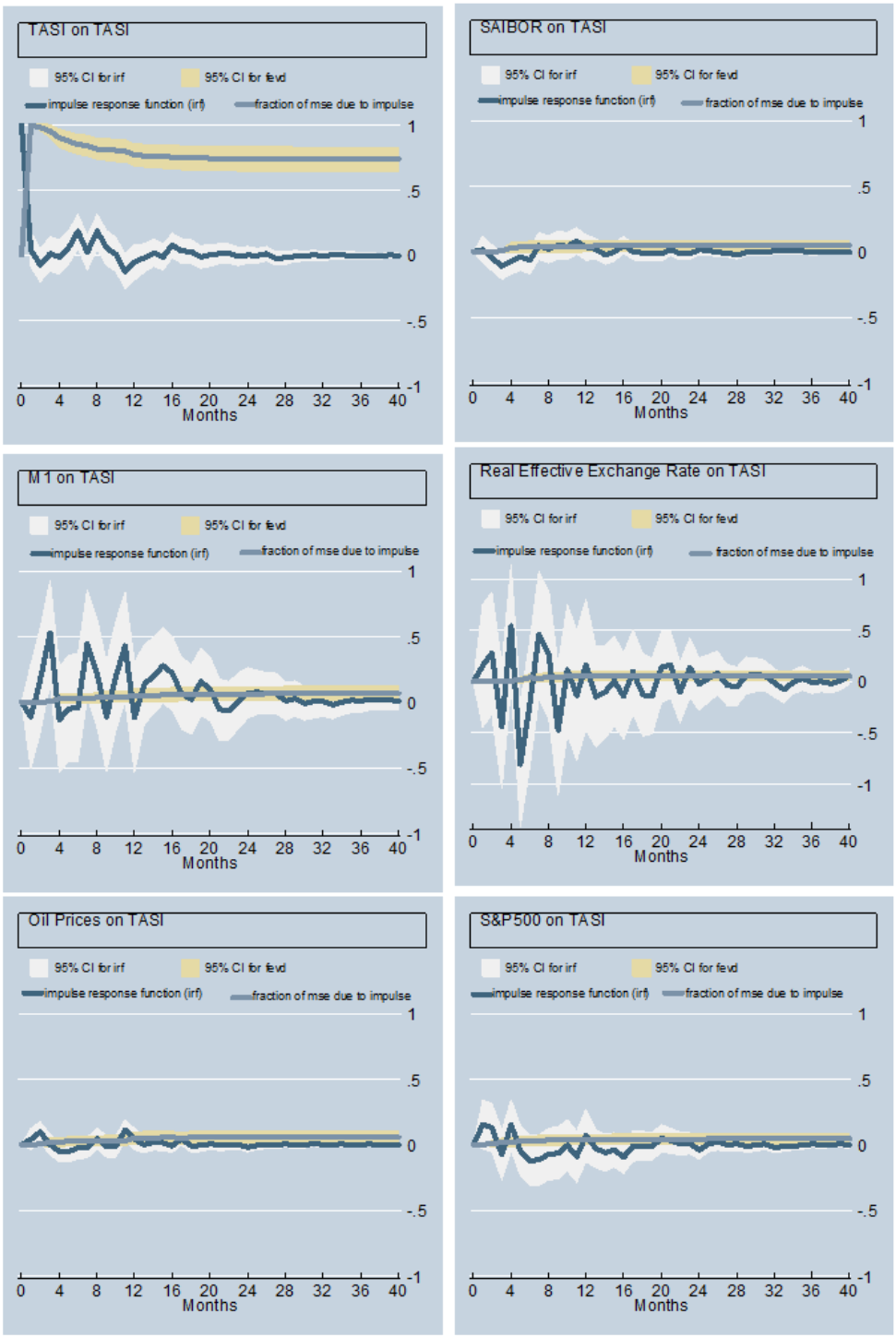

Figure 5.4 TASI's Response to Variable Shocks

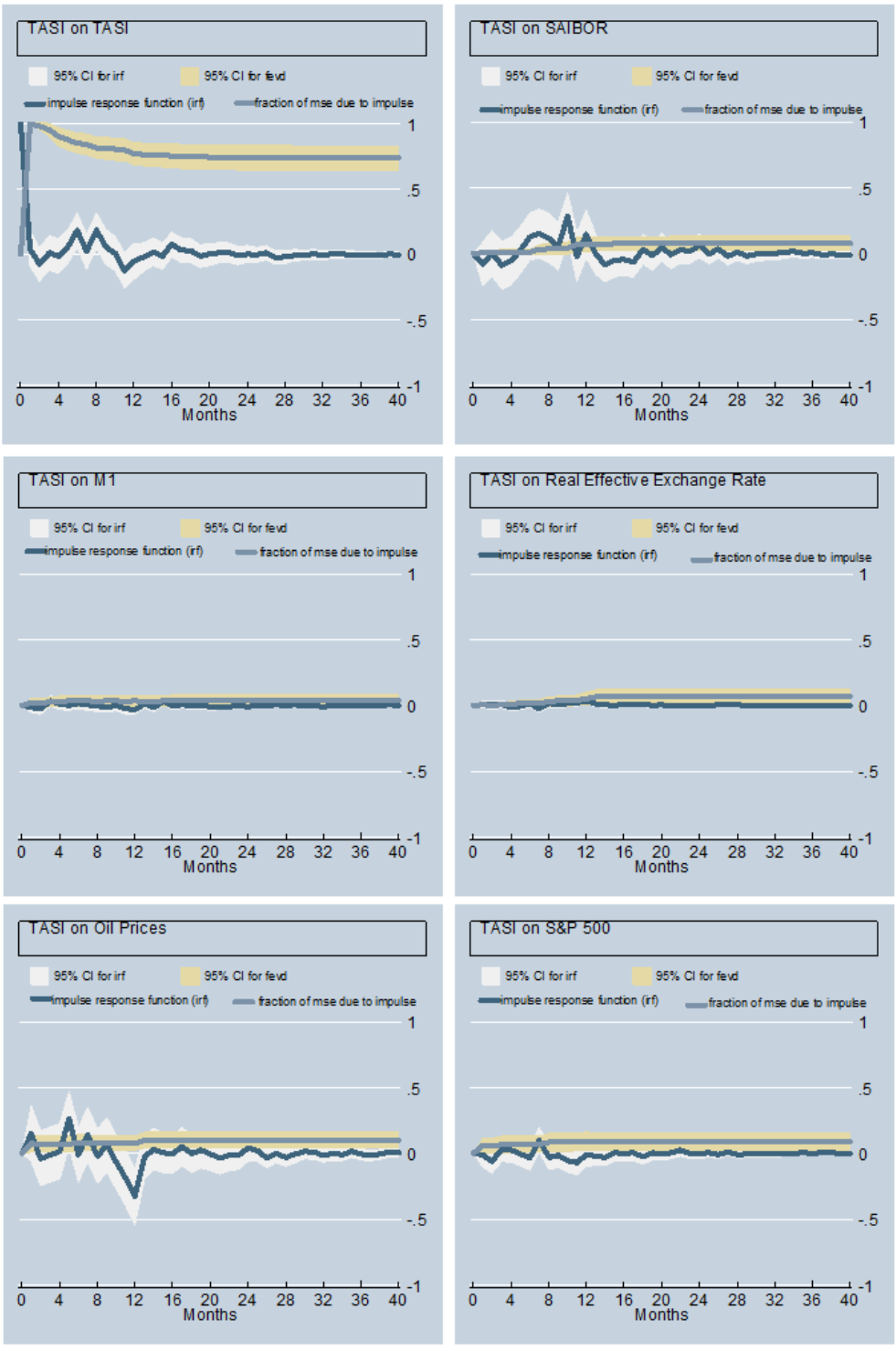

Figure 5.5 Variables' Response to TASI Shocks

5.2.3 Cointegration and VECM

The Johansen test for cointegration shows that the second group has two equations under the assumption of 12 lags in the underlying VAR and a restricted trend in the data levels (Table 5.8). The LM autocorrelation test indicates that we cannot reject the null hypothesis at the 95% level, and conclude that the VECM estimation exhibits no residual autocorrelation for the second group.

Table 5.8 Cointegrating Rank Second Group

Maximum Rank	Parms	LL	Eigenvalue	Trace Stats	5% Critical Value
0	402	2763.16		151.2307	114.90
1	414	2787.68	0.1835	102.1790	87.31
2	424	2809.01	0.1616	59.5178*	62.99
3	432	2821.11	0.0951	35.3266	42.44
4	438	2828.91	0.0624	19.7264	25.32
5	442	2835.64	0.0541	6.2646	12.25
6	444	2838.77	0.0256		

However, we reject the null hypothesis of normality and conclude that the residuals have a non-normal distribution i.e. skewed and exhibits non-normal kurtosis. Most importantly, we are concerned with the stability of the VECM; however, the model exhibits a four unit moduli or roots outside of the unit circle.

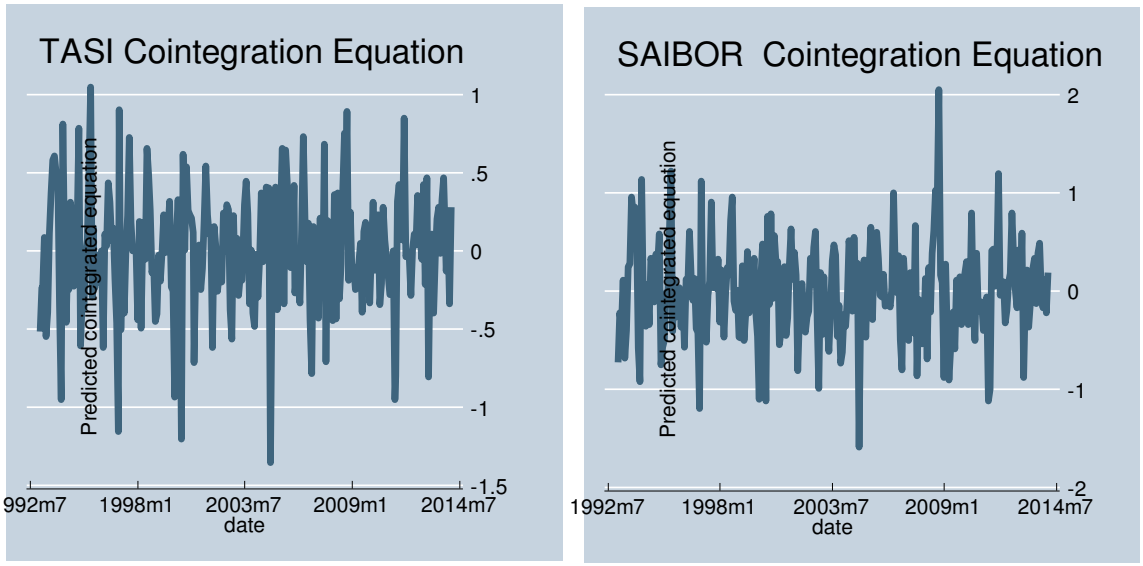

Figure 5.6 Cointegrated Equations of Second Group

Although the VECM estimation shows cointegration equations (Figure 5.6) and residuals that behave like white noise, we are unable to obtain an accurate analysis of the IRF, FEVD, and the long-run behavior of the variables due to instability. The VECM indicated that there were two cointegration equations for the TASI and for the SAIBOR, as theorized from the IRF analysis of the VAR. It did show that the TASI was impacted by the real money supply, real effective exchange rate, and the S&P 500; however, the coefficients were too large to be plausible. The SAIBOR's cointegration equation shows similar impacts and coefficients.

5.3 Addressing Research Questions and Initial Hypotheses

There were four research questions stated in the first chapter for the first group, and four more for the second group. For the oil prices shocks and government expenditures topic we posed the following inquiries:

1. What is the direction of impact between oil revenues and government expenditures?
2. How do the sectoral government expenditures respond to oil price shocks?
3. Which sector of expenditures is most sensitive to oil price shocks? Which is least sensitive?
4. What are the short and long-run dynamics between oil price volatilities and government expenditures?

In answering these questions, I will rely on the VAR results as they presented the best fit for the data. The direction of impact confirms the existence of revenue-spend hypothesis. Additionally, total expenditures and oil prices share a bi-directional relationship; while oil price hikes have a significant impact on both aggregate expenditures and oil revenues alike. Recalling the initial hypotheses on the first topic, it was expected to see revenue-spend hypothesis in action due to the behavior of the time series data. Oil revenue led total expenditures in response to shocks in oil prices. The result is expected since revenues are assumed to adjust faster than expenditures; as the latter requires additional planning, allocation of funds, and significant time spent in strategizing for spending. This is especially true when considering that since the 1970s, Saudi Arabia has followed a five year economic plan aimed at modernizing and developing the state. In the sectoral analysis, oil prices have a significant impact on all expenditure items. By the second period, all sectoral spending would increase, and adjusts by the start of the new economic plan i.e. the end of the fourth year.

Confirming to the initial hypothesis on the sectoral group, we find that defense spending increases causes an increase in all other expenditure items. Additionally, we find that infrastructure is more sensitive to oil price shocks as expected. However, defense and military spending is not the most inelastic sector, but rather education spending is least sensitive to oil price shocks. This finding could be capturing the recent interest in educational programs i.e. establishment of universities in Saudi Arabia and scholarship programs to study abroad.

Finally, we find that there is a bi-directional impact between defense, health, infrastructure, and oil price shocks, while a unidirectional effect flowing from oil prices to education and economic development. This indicates that the government relies on oil revenues to finance large expenditure programs, while using budget re-allocation strategies to cover spending needs of education and economic development. Moreover, it may be evidence of long-term commitment to education and economic development as they exhibit the least sensitivity to oil price shocks. In other words, these two sectors exhibit expenditure smoothing and planning to stay on course, confirming to the policy reforms of King Abdullah sine he was enthroned in 2005.

The Johansen Cointegration test revealed that there are two cointegrating equations in the sectoral group. The VECM results show that the first equation relates defense, health, economic development, and infrastructure spending. The second links education with health and infrastructure only. Since the VECM is unstable, the analysis of these coefficients and their signs is inconclusive.

Based on the scatterplot matrix of the sectoral group, we expected a number of cointegrating equations as the variables were highly correlated. In turn, the VECM should have presented a better fit for the data. However, it seemed unsuitable for this particular data series, which may be related to data-specific attributes such as structural breaks or the inability to include exogenous variables in the VECM. Misspecification of the model can be ruled out since the VAR results produced favorable post-estimation tests and exhibited stability.

The Johansen Cointegration test for the aggregate or Sub-Group variables of oil revenues, total expenditures, and oil prices did not reveal any cointegration equations. Therefore, the VAR estimation is the only reliable source of analysis. However, we would expect that since the sectoral analysis demonstrated cointegrating equations, the aggregate group should have at least exhibited a long-run movement between one or more of the variables. These results could be a confirmation that the unrestricted VAR model is better suited for analyzing data across a large sample period, as it allows the exhibition of the true relationship and behavior of the data.

As for the second topic, Second Group variables, it attempted to investigate the relationship between the national index and macroeconomic variables. Outlining the direction of the research, the results targeted the following research questions:

1. What is the casual relationship between these variables? What is the direction of impact between the TASI and the five economic variables?
2. How does the TASI adjust to shocks from the macroeconomic variables?
3. What is the nature of the volatilities relationship between the TASI and macroeconomic variables?
4. How do innovations in the macroeconomic variables impact the TASI's performance?

The results from the VAR model indicated all variables, with the exception of the S&P 500, impact the TASI's movement. There is a unidirectional impact flowing from M1 and REER to the TASI, while a bi-directional relationship between the TASI, SAIBOR, and Oil prices. However, the impact of the TASI on oil prices may be due to a spurious relationship due to the presence of the real effective exchange rate in the model and quoting the oil prices in Saudi Riyals. Yet, Malik and Hammoudeh (2007) suggested that the Saudi equity market contributes significantly to changes in oil prices, and may be a leading indicator for its movement.

We hypothesized that oil price hikes should increase the TASI since we are analyzing a net oil-exporting economy. Additionally, we expected that the increases in the money supply would yield an increase in investment activity that places upward pressure on the TASI's movement. Noting that the SAIBOR's decline in 2002 caused a fast-pace increase in the TASI, I hypothesized an inverse relationship between the two variables.

The results confirm the initial hypotheses and economic theory. The TASI increases with declines in the SAIBOR and the real effective exchange rate, while increasing with money supply and oil prices. The TASI's shock contributes 75% of its forecasted movement, while each of the remaining macroeconomic factors contributes an average between 3-5% of the variance in the TASI. Increases in the TASI cause an increase in the SAIBOR in ten months, which indicates an attempt to avoid pricing bubbles by the monetary authorities. Most of the impact in the real prices of equity market is short-lived, and has shocks that die out within a year.

While we would rely on the VECM analysis for a long-term analysis, the estimated model for this second group was also unstable. The Johansen Cointegration test indicated two long-run equations for the TASI and the SAIBOR. However, their coefficients were too large to be plausible and showed contradiction to economic theory.

CHAPTER 6

DISCUSSION AND IMPLICATIONS

The findings of this research have several implications that relate to the economy of Saudi Arabia, policy formulation, and contribution to the literature. Primarily, this dissertation contributed to the economic literature on Saudi Arabia by collecting scattered data from both primary and secondary sources. Additionally, the gathering methodology ensures data integrity, and ease of access through a centralized location, which allows access for future research and empirical studies. Moreover, this research has provided a historical narrative relating economic progress to government policies. In comparison, to my knowledge, this is the only dissertation which has simultaneously considered the qualitative and quantitative dimensions of Saudi Arabia to evaluate its economic progress and growth. Although the empirical findings are significant and add to the available literature on Saudi Arabia, they remain a secondary contribution behind the accumulation and collection of the data.

This chapter presents a discussion of the results and compares them to the existing literature on Saudi Arabia. Additionally, it will attempt to rationalize the overlapping and contradictory results. Secondly, it will sum up and translates the empirical findings into policy formation and implications. Finally, it lays out the direction for future research and the conclusion of this empirical study.

6.1 Comparison to the Literature & Discussion

Conforming to the empirical evidence in the literature, the results demonstrate the existence of Wagner's Law in Saudi Arabia. There is an apparent increase in expenditures in the past decade that is coupled with unprecedented economic growth for the Kingdom of Saudi Arabia. The relationship exhibited between revenues and expenditures contradicts the fiscal synchronization hypothesis in Saudi Arabia (Fasano and Wang 2002; Al-Qudair 2005).

One possible explanation for the discrepancy is that the fiscal synchronization relationship is demonstrated via the relationship between oil prices and total expenditures as they share a bi-directional impact. However, when the movement of the data is examined closely, we find that expenditures lag behind revenues or oil price movement by a period of 12 months. Since the VECM estimates were unreliable, we are unable to get an exact short and long-term adjustment measures for these variables.

Another explanation could be that the sample period examined in these studies coincided with periods of simultaneous decision making in revenues and expenditure planning. Said differently, oil price shocks were either expected or had a smaller magnitude of impact that would not prompt rapid production to control prices. The sample period in this dissertation comes across a number of oil price shocks that utilizes oil production as a political instrument i.e. the Arab Oil Embargo, the Iran-Iraq War, and the invasion of Kuwait by Iraq in 1991. Additionally, there are periods where production increases where necessary to control price hikes or satisfy demand quota. All of these facts can translate into a majority of unexpected shocks to oil prices where revenues might increase or decrease within a short-period of time. In turn, expenditures are adjusted accordingly, but lag due to planning processes (Al-Otaibi, 2006).

Additionally, when considering the policies of the current government and current economic measures by the IMF, Saudi Arabia is fixated on the development of education and economic growth via government expenditures. The fact that education and economic development are the least sensitive to oil price shocks resembles the standing policies of King Abdullah on propelling Saudi Arabia to the next economic stage. These finds may not hold true if the data was truncated to 2005, as defense spending had a more inelastic demand for budget allocation as demonstrated by Al-Jarah (2005).

It seems the policies of Saudi Arabia may have started with conservative spending on 'secondary' expenditure items such as health, economic development, and education in the early 1960s and throughout the 1980s relative to infrastructure and defense spending. Although, a focus on human capital and economic development is desirable, infrastructure spending assumes a role of a 'savings account' that covers deficits of other expenditure items.

Without a sound and proper infrastructure in place, economic development and growth would be hindered significantly. Of course, it may be the case where infrastructure expenditure programs overlap with the remaining sectors, and as such it exhibits a larger sensitivity to oil price shocks and budget re-allocation. Yet, the mere fact that it has received the minimal amount of funds for more than three decades may be evidence to its deprioritized status.

During the 1960s and early 1970s, infrastructure spending had reached its highest levels under King Faisal. Reconciling his policies for modernizing the Kingdom, it seems logical that his reforms would focus on building a sound base for future developments. Some infrastructural problems still plague the Kingdom of Saudi Arabia such as poorly constructed public sewage systems, lack of a reliable mailing system, and until recently absence of mass public transportation[83].

Involving the historical narrative of Saudi Arabia allows us to draw conclusions on the overall progress towards economic development. The various monarchs and their policies tend to favor some sectors over others. For example, King Abdulaziz was focused on the unification of the country and establishing a role for Saudi Arabia in the international arena. King Faisal's policies targeted infrastructure development and modernizing the Kingdom through economic planning and adaptation of technology. King Khalid's administration with ample influence by King Fahad focused on the development of education and the control over oil production. King Fahad's period focused on upgrading the defense and military prowess of Saudi Arabia. It was not until King Abdullah's reign that a focus on economic growth and development coupled with a uniform increase in spending was observed.

Additionally, the degree of openness increased substantially in latter period as developments in technology, human capital, research and development allowed Saudi citizens to take full advantage of these spending programs. To synthesize the findings of Joharji and Starr (2010), indeed, the effectiveness of the programs improved due the average citizen's acceptance of change.

[83] Although Saudi Arabia receives little rainfall, the winter and spring seasons' rainfall flood the streets of Riyadh and Jeddah, blocking traffic and creating major delays lasting for more than two weeks. Additionally, there is no physical mailing address for individual houses in Saudi Arabia. Most citizens acquire a post office mailing box in a centralized location. Finally, metro rail transportation systems have only been recently constructed in Saudi Arabia (2006) in heavily populated areas, and are restricted to intercity transport.

Effective development of capital markets also coincided with the policies of King Abdullah. The findings indicate a significant impact of macroeconomic factors on the equity market's performance, which may relate the efficient allocation of resources that foster a dynamic relationship in the economy. However, the results contradict empirical evidence in the literature, while confirming others.

For the Second group of variables, very few studies analyze the Saudi Arabian market and its economy by itself. Results from regional or cross-sectional research are partially applicable for comparison because they would only focus on a single objective or topic. Jouini (2013) and Alshogeathri (2011) present empirical papers that can be applicable as a benchmark for comparison.

In terms of causality, the VAR estimates of the sample period confirm oil price hikes lead to increases in stock prices, but the relationship is not strictly unidirectional as demonstrated by Jouni (2013). Using the results of Alshogeathri (2011)[84] for a direct comparison, his VECM results show that the TASI moves negatively with increases in narrow money supply, the SAIBOR, and the S&P 500, while increasing with broad money supply and oil prices. Additionally, the VECM estimation demonstrates five cointegration equations for the eight variables[85]. However, no evidence is presented on the stability of the VECM model or the normality of errors. Coupled with the use of nominal variables for his analysis, the entire set of conclusions and results drawn is questionable. Moreover, while Alshogeathri (2011) did not find a significant relationship in the VAR model between the TASI and the economic variables, the estimates for the Second Group in this dissertation demonstrate otherwise.

[84] A direction comparison is valid since the objectives and variable selection is similar. However, this dissertation uses six variables instead of eight in Alshogeathri (2011), as well as real variables rather than nominal.

[85] He includes Consumer Price Index, Broad Money Supply and Bank Claims on the Private sector as part of the variable group.

In contradiction to Alshogeathri (2011) the VECM model is inappropriate for analyzing the relationships given that it is unstable, and exhibiting non-normal distribution of errors. The major flaw in his research revolves around the use of nominal variables, and assuming that there are no global spillover effects i.e. disregarding major shocks such as the Asian Financial Crisis and the Russian Rubble Crisis etc.

The results found in this dissertation between the equity market and macroeconomic factors echo the expected relationships drawn from economic theory. An increase in the real money supply causes an increase in the real stock prices as excess funds are used for investments. In addition, an appreciation of the real effective exchange rate allows for capital outflows as investments in foreign markets become cheaper for Saudi Arabia. Finally, being a net oil-exporting economy, there is a positive correlation between the TASI and oil prices.

Similar to equity markets in developing economies, there is an association between the real macroeconomic environment and real stock price returns. While the Saudi Arabian equity market is still young, the increased spending from government programs was able to propel its growth beyond that of its peers. It exhibits a higher liquidity and activity in comparison to neighboring countries. Moreover, it is actively included in economic planning as part of a support system that provides capital for the private sector.

The formation of asset pricing bubbles is expected as the market continued to develop. In light of fast-paced regulation reform, Islamic banking practices, and segregation of roles between underwriting and brokerage houses, the equity market of Saudi Arabia is expected to have a stable role in the development of the economy and minimize the incidence of inflationary bubbles. This is exhibited in the behavior of monetary authorities as the SAIBOR increases to counteract large spikes in the TASI.

The uniqueness of the Saudi equity market stems from the fact that oil revenues constitute a large share of national income. Therefore, it is highly correlated with the overall macroeconomic environment. To that extent, it may be semi-shielded from spillover effects that are caused by negative oil price shocks, or at least temporarily. However, it is still vulnerable to global shocks, especially ones that impact the U.S. monetary policy or the Saudi Riyal exchange rate.

6.2 Conclusion and Further Research

The aim of this research was to investigate the impact imparted by oil price shocks on the Saudi Arabian economy. There were two main topics of discussion. The first is related to oil revenues, government expenditures, and oil prices. These variables were investigated in an aggregate specification, and disaggregated based on the objective of the spending program into five sectors: defense and military, education and human capital development, economic development, health expenditures, and infrastructure development. The second topic researched the relationship between the Tadawul All Shares Index (national equity index) and macroeconomic factors of Saudi Arabia including the SAIBOR, narrow money supply, real effective exchange rates, oil prices, and the S&P 500 U.S equity index.

The results demonstrated that impact flows from oil revenues to total expenditures, or exhibiting revenue-spend hypothesis. Additionally, total expenditures and oil prices share a bi-directional impact, which is reinforced by the historical role of Saudi Arabia as a swing-producer in the oil market and its use of oil production as a political instrument. Education and economic spending program show the least sensitivity to oil price shocks, while infrastructure and defense spending are mostly sensitive to oil price movements. The oil price shocks adjust in the sectoral items by the end of the fourth year, resembling the economic planning process of the Kingdom.

The macroeconomic factors exhibit a statistically significant impact on the TASI, and we are able to confirm economic theory based on the type of relationships estimated between the variables. The TASI and the SAIBOR demonstrate an inverse relationship, while a positive correlation exists between narrow money supply, real effective exchange rate, oil prices, and the TASI. However, the shocks are largely short-lived as they die out within a period of 12 months. Finally, the TASI's variance decomposition reveals that it is 75% dependent on its previous prices, with an average between 3-5% attributed to macroeconomic factors.

The VAR results for both topics demonstrated a better fit than the VECM model, which may be linked to several factors. One explanation on the superiority of the VAR is its ability to accommodate exogenous shocks in the system, which aids in eliminating autocorrelation of errors, and achieves stability in the estimation of the relationships. More importantly, it allows us to draw out plausible conclusions on the variables and their dynamics.

The uniqueness of the Saudi Arabian economy is that it is heavily depended on oil revenues to finance most of its expenditure programs and economic growth, including equity market development. Since 2005, King Abdullah's policies have been directed towards advancement in all economic sectors, and featured large amounts of government expenditures to support such strategies. The historical narrative and policy evaluation of the Saudi monarchs allowed an environmental setting to appear for the empirical evidence. It explained the possible factors behind discrepancies in the literature and previous studies with regards to causality in fiscal policies, growth, and response of such variables in the face of oil price shocks.

A secondary unique aspect of the Saudi Arabian economy is that it is highly correlated with the U.S. monetary policy, which restricts its command over policy instruments such as interest rates. In turn, this status adds complications to the results in the literature as the economy

behaves like a net-oil exporters but may be impacted by net oil-importer-specific shocks, particularly the U.S. The evidence presented show that although Saudi Arabia is in the developing stages, its economic growth progress has demonstrated resilience and a commitment by the government towards a betterment of the socio-economic health status.

There are a number of further research topics that will close the gap in the literature on Saudi Arabia. First, we can attempt a market-directed narrative for oil price movements which aids in assessing the origin of oil price shocks as stemming from demand, supply or terms of trade. This could be achieved by investigating oil market journals, news reports, and other sources to classify the movement in the oil price as due to changes in the demand or supply conditions. Each of these daily movements are coded as exogenous or endogenous shocks, and aggregated. Then, the refined oil price data series is used in investigating the relationships to other macroeconomic factors. Alternatively, a set of different variables could be tested such as GDP, Bank Claims on the Private Sector, and non-oil GDP. Additionally, the role of Islamic banking in either the macroeconomic environment or the TASI could be investigated as part of a specialized research topic.

With the U.S. overtaking Saudi Arabia as the largest oil producer, the same set of variables could be investigated in three to four years, and evaluate the impact on the oil prices, oil revenues, and expenditure programs. Saudi Arabia's wealth accumulation since the 2000s is allowing it to withstand the reduction in oil prices due to an increase in supply. It will be interesting to see if the current U.S. production is sustainable to a point that it would outlast the accumulated wealth of Saudi Arabia.

One important implication of this research is that real expenditures programs, while promoting economic growth, must have a diverse source of revenues. Their sensitivity to oil price shocks shows a higher risk exposure to changes in the oil market such as a change in technology, or the more recently realized the inability to hold the position as the largest producer. Non-oil sector development is making substantial progress, especially when considering that estimated economic growth for Saudi Arabia is projected at 4.5% for 2014 and 2015. However, these programs must find a self-sustaining revenue source that allows for detachment from oil price shocks, and can be used as a significant secondary source of revenues to finance expenditures. Saudi Arabia realizes that diversifying the revenue sources is necessary to maintain high levels of expenditures, and in turn has taken steps towards that end i.e. opening the equity market for foreign investments, investing in nuclear plants and alternative energy research, increasing the number of educational scholarships to advanced economies, and the establishment of centralized financial, research, and academic cities.

For the foreseeable future, Saudi Arabia is on track towards faster economic prosperity spearheaded by King Abdullah and his administration. However, dependence on oil revenues as a source of economic development leave the economy of Saudi Arabia in vulnerable position when facing oil price shocks that stem from demand, supply, or terms of trades.

CHAPTER 7

REFERENCES AND SUPPORTING MATERIAL

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ANNEX 1: SAUDI ARABIA RELATED INFORMATION

Table A1-1: Detailed Objectives of Economic Plans 1970 - 2014

	First and Second	***Third***	***Fourth***	***Fifth ****	***Sixth***	***Seventh***	***Eighth***	***Ninth***
Overall National Objectives	1970 - 1979	1980 – 1984	1985 - 1989	1990 - 1994	1995 - 1999	2000 - 2004	2005 - 2009	2010 - 2014
Safeguard Islamic values in conformity with Sharia	Focus on provision of modern infrastructure, basic government services	Expanding infrastructure, economic resources	Concentration on operation and maintenance	Develop Human resources, health, social services, municipalities and housing	Human resource emphasis as well as social and health	Solving human resource problems	increase number of new entrants to labor market	raise standard of living of citizens
Improve standard and quality of life	Expansion of human resources and beginning of infrastructure growth	Human resources and educational base expansions	Reconstructing the economy to allow more private sector participation	consolidate the gains in infrastructure and social services of the previous two decades	Aiming for balanced budget	Diversify the economy	develop human resources and upgrade efficiency	diversify economic base
Develop human resources, increase productivity, and replace non-Saudis with qualified Saudis	Starting hydrocarbon industries	Hydrocarbon base expansion	Human resource and health expenditure	further economic diversification, expanding the productive base of the economy	Reduction in foreign labor	increasing gas production	enhance national economic competitiveness and integrate into international economies	move towards knowledge-based economy
Realize balanced growth in all regions	Establishment of modern administrative infrastructure	Undertaking regional economic initiatives	Shift from central planning projects approach to program planning approach	encouraging private sector investment in agriculture and light manufacturing	Private sector expansion	consolidating efficiency in production, refining and distribution	enhance private sector participation	strengthen role of private and public sector cooperation
Diversify economic base and reduce dependence on production and exportation of oil					Beginning of partial privatization	reducing state budget deficit	develop science and technology system as base for economy	continue institutional reforms
Provide favorable environment for activities of the private sector to encourage it to play a leading role in development					Reduction of subsidies	increasing Saudization	reduce regional development disparities	develop SME sector
						preparing for globalization, WTO	upgrade human capabilities and remove constraints that impede participation	bolstering human rights
						privatization as strategic option		achieve balance regional development
								promote economic integration with GCC and other powers

* The Fifth year economic plan witnessed large government spending due to the Second Gulf War, and the relocation of Kuwaiti Nationals. As such, budget cuts were required due to constrained resources. Committed funds for civilian programs fell by 30% or $105 billion USD. The majority of the cuts were in government investments in economic enterprises, transportation and communications.

Source: Ministry of Economy and Planning

Table A1-2: Kings of Saudi Arabia and Major Accomplishments

	Abdul-Aziz	***Saud***	***Faisal***	***Khalid***	***Fahad***	***Abdullah***
	Aug 14, 1932 - Nov 9, 1953	***Nov 9, 1953 - Nov 2, 1964***	***Nov 2, 1964 - Mar 25, 1975***	***Mar 25, 1975 - June 13, 1982***	***June 13, 1982 - Aug 1, 2005***	***Aug 1, 2005 - Current***
Major Accomplishments	- Unified the Kingdom - Established preliminary infrastructure (rail way) - Rooted the U.S. Saudi Relationship	- Founded King Saud University - Non neutral foreign policy that may have placed the country at risk - Founded OPEC	- Arab Oil Embargo 1973 - Developed the Media inline of modernizing the country - Developed the educational system especially for females - Managed large windfall profits from oil revenue	- Achieved stability in the Kingdom during the first terrorist attack by Juhayman Al-Otaibi on the Holy Mosque in Makkah - Established the role of the Kingdom at the onset of the First Gulf War between Iran and Iraq	- Developed the education system of Saudi Arabia, infrastructure, during his post as Crown-Prince - Developed the military of Saudi Arabia as a King - Allowed Saudi Arabia to achieve a strong foreign position - Second Gulf War leader	- Economic and financial cities established - Research and development in all fields - Top tier scientific and educational institutions
Oil Industry	- oil discovery in 1938	- discovery of major oil fields that are still operational today	- Increased the Saudi Government ownership in ARAMCO	- Pursued the takeover plan of ARAMCO set by King Faisal	- Saudi Aramco establishment - major oil fields discoveries - Barter system oil for arms	- large oil surpluses in budget accounts were properly managed
Equity Market	- no specific contribution	- no notable contribution	- Set the stage for development through first economic plan	- Continued the work of King Faisal in laying the infrastructure for equity market development	- Equity market formally established in 1985 - foreign banks nationalization	- opened for foreign investors - regulation through the CMA and CML
Economy Related	- shifted revenue dependence from pilgrimage revenue to oil production	- Due to lavish spending habits, Saudi Arabia faced its major economic recession and financial distress	- Set in motion 10 point reform plan to modernize the Kingdom - Installed the first 5 year economic plan in 1970, and the second before his assassination	- implemented the second and third economic plans of the Kingdom - Increased the living standards for the citizens by increasing wages and income	- Opened the market for migrant workers following King Khalid's initiatives - continued the development of economic plans and prudential financial management	- modernizing the economy through supportive development in infrastructure, human capital, and government spending
Monarch Role	Unifier, Leader, Statesman	Generous, Family Man, Ambitious	Modernizer, Strategist, Prudent	Statesman, Democratic, Golden-Age Leader	Cunning politician, Developer, Modernizer	Visionary, well-rounded politician domestic and foreign, Modernizer

Note: This summary is relative to the discussion in the dissertation; the accomplishments of these great leaders could never be captured within a few lines, and is beyond the scope of this dissertation.

ANNEX 2: STOCK MARKET CHRONOLOGY

Table A2-1: Saudi Stock Market Chronology

Year	General changes	Specific Market Behavior	TASI = NCFEI index (1985 = 1000) end of year close
1934	First joint-stock company established. The Arab Automobile Company	The concept of joint-stock approach was only available to the few that were educated. Most of the citizens had little knowledge of how stock markets work	Not calculated/ unavailable
1955	Arabian Cement Company launches its first IPO. This is followed by the privatization of three electric companies owned by the Saudi Government	Capital seekers started to realize that the market may offer the necessary funds. Although Specialized Government Lending institutions were supplying most of the funds to the citizens	Not calculated/ unavailable
1970 – 1980	Informal operations of Saudi Stock Market	Unregulated through unlicensed brokers	Not calculated/ unavailable
1984	Government forms a ministerial committee consisting of SAMA, Ministry of Finance and national economy to regulate and develop the equity market. Intermediation restricted to Saudi Banks only	Unregulated;	Not calculated/ unavailable
1985	Saudi Share Registration Company (SSRC) established by intermediary banks to facilitate central registration and clearing house. NCFEI reaches 691	Weak stock market despite the increase in number of publicly traded company. Market activity registers 9 million shares during 1985-1986	646
1989	Automated clearing and settlement system introduced by SAMA. Electronic Securities Information System (ESIS) introduced in 1990. NCFEI exceeds 1000	The collapse of the US market in 1987 provided a boost to the local equity market. The market increased by 21% in 1987, 14% in 1988 and 22% in 1989 as Saudi investors preferred domestic financial markets	1087
1992	NCFEI closes at 1900; A total of 10 billion SAR raised in the market	Following the shock of the gulf war, and oil price increases, the market rose by 82% in 1991. Volume and value traded increased in an upward trend	1900
1994	NCFEI falls to 1280	Global market shocks, bond market collapse, and declining oil prices hurt investor spirits; the market declined by 34% between 1993-1994	1282
1995	CCFI family of index launched (1995 = 1000)	Increases in oil prices restored investors' confidence	1958
1997	SAIF fund of SAMBA (Saudi American bank) established to facilitate foreign investment in Saudi equity market	Increases in the market by 28% following surges in oil prices until 1998 where the Russian rubble crisis placed downward pressure on oil revenues causing the market to	1398

		drop by 29%	
1999	Equity market participation of foreigners is allowed through local mutual funds	High returns (45%) was realized in the market due to government interest and oil price increases (140%)	2029
2000	The Saudi Electricity Company is established from 10 electric companies operating in Saudi Arabia. SAMA launches the revised ESIS – called Tadawul – on October 6, 2001	Reform process in the market increased investor confidence, total increase 12%	2258
2002	CCFI all shares index reaches an all-time high of 225.57 on May 20th	Continued reform, strong oil prices, development in regulation, accessibility to credit, and ease of transaction execution started to increase investor confidence.	2659
2003	Capital Market Authority Established by Royal Decree on July 2nd, 2003	Speculative activity started to increase due to favorable market conditions – asset price bubble started to form (index doubled in value)	4,437
2005	Increased transparency requirements by the CMA, including punitive and penalty imposition for violators	Credit lines offered by banks such as Murabaha and Mudaraba increased the incidence of speculative activity and margin-trading. The index more than quadrupled in less than 20 months	16,712.60
2006	Surge in joint-stock companies; nominal book value of shares decreased from 50 SAR to 10 SAR to increase liquidity and depth in the market	Stock market bubble reaches its peak and the index at an all-time high	19,502.69 (February 28, 2006)
2008	Separation of investment/brokerage houses from banks due to conflict of interest in 2009 by the CMA	Financial crisis stress on the global economy reaches Saudi Arabia as oil prices decline, and investors begin hoarding.	4,738.14
2013	Increased regulation and monitoring by the CMA; increasing the credibility and accreditation of brokerage houses and brokers/dealers (Chartered Financial Analyst requirement; SAMA certification courses on investment and portfolio management); market to be opened to all foreign investors in 2014 (734 billion SAR estimated value)	The market recovers from previous shocks, but built on fundamental gains and economic activity. Government increased spending and investments in the economy boost the equity market. Coordination between economic growth and equity market development strategies are in sync	8,300.65

Note: Adapted and adjusted from Al-Dukheil (2002)

Table A2-2: Islamic financing services and equivalent commercial banking services

Islamic Banking Term/ Translation	Commercial Bank Service Equivalent	Explanation
Aman-ah (Entrustment/Safety)	(Demand deposits)	Deposits held at the bank for safekeeping purpose. They are guaranteed in capital value and earn no return.
Bay'a mu'ajal (Accelerated Sale)	Pre-delivery, defer payment	The seller can sell a product on the basis of a deferred payment, in installment or in a lump sum. The price of the product is agreed upon between the buyer and the seller at the time of the sale, and cannot include any charges for deferring payment
Bay'a selm (debt-Sale)	Pre-payment, defer delivery	The buyer pays the seller the full negotiated price of a product that the seller promises to deliver at a future date
Al-ejara (Rental)	Lease, lease with option to buy	A party leases a particular product for a specific sum and a specific time period. In the case of a lease purchase, each payment includes a portion that goes towards the final purchase and transfer of ownership of the product
Istisna'a (Creation/ made-to-order)	Deferred payment and delivery	A manufacturer (contractor) agrees to produce (build) and to deliver a certain good (or premise) at a given price on a given date in the future. The price does not have to be paid in advance (in contrast to Bay'a Salam). It may be paid in installments or part may be paid in advance with the balance to be paid later on, based on the preferences of the parties.
Ju'ala (Contracting)	(Service charge)	A party pays another a specified amount of money as a fee for rendering a specific service in accordance with the terms of the contract stipulated between the two parties. This mode usually applies to transactions such as consultations & professional services, fund placements and trust services
Mudaraba (Proprietor Financing)	(Trustee finance contract)	Rabb -ul- mal (capital' s owner) provides the entire capital needed to finance a project while the entrepreneur offers his labor and expertise. Profits are shared between them at a certain fixed ratio, whereas financial losses are exclusively bore by rabb-ul-mal. The liability of the entrepreneur is limited only to his time and effort
Murabaha (profiteering)	(Mark–up financing)	The seller informs the buyer of his cost of acquiring or producing a specified product. The profit margin is then negotiated between them. The total cost is usually paid in installments.
Musharaka (partnership)	(Equity participation)	the bank enters into an equity partnership agreement with one or more partners to jointly finance an investment project. Profits and losses are shared strictly in relation to the respective capital contributions
Qar-th Hasn (Virtue Loan)	Angel investing	These are zero-return loans that the Qur'an encourages Muslims to make to the needy. Banks are allowed to charge borrowers a service fee to cover the administrative expenses of handling the loan. The fee should not be related to the loan amount or maturity
Ka-fala (Bail or Guarantee)	(co-signer, or sponsor)	it is a pledge given to a creditor that the debtor will pay the debt, fine or liability. A third party becomes surety for the payment of the debt if unpaid by the person originally liable

Adapted from Errico and Farrahbaksh (1998) and El-Hawary, Grais, and Iqbal (2004). With translations and revisions made by the researcher.

APPENDIX A: DATA AND VARIABLES

Table A1: Comprehensive Variable List

Variable	Description	Group	Range of Nominal Values	Frequency	Source	Source Type
Oil Prices	Brent Crude Oil Prices in USD and converted to SAR using historical exchange rate records	1,2	1957 - 2013	Annual and Daily	Global Financial Data	Secondary
Oil revenues	Oil Revenues of Saudi Arabia in Millions of SAR	1	1959 - 2013	Annual	Saudi Arabian Monetary Agency Annual Reports	Primary
Other Revenues	Other revenues of Saudi Arabia including: Income tax, customs, general reserve, and others non-oil related (in Millions of SAR)	none	1959 - 2013	Annual	Saudi Arabian Monetary Agency Annual Reports	Primary
Total Revenues	Total revenues of Saudi Arabia in Millions of Sar	none	1959 - 2013	Annual	Saudi Arabian Monetary Agency Annual Reports	Primary
Education Spending	Government Expenditures on Education in Saudi Arabia, or classified as Human Resource Development Sector (in Millions of SAR)	1	1959 - 2013	Annual	Saudi Arabian Monetary Agency Annual Reports	Primary
Health Spending	Government expenditures on health and social development in Saudi Arabia (in Millions of SAR)	1	1959 - 2013	Annual	Saudi Arabian Monetary Agency Annual Reports	Primary
Defense and Security Spending	Defense and Security expenditures in Saudi Arabia; includes various accounts (in Millions of SAR)	1	1959 - 2013	Annual	Saudi Arabian Monetary Agency Annual Reports	Primary
Infrastructure Spending	Infrastructure, transport, communications and municipal services development spending in Saudi Arabia (in Millions of SAR)	1	1959 - 2013	Annual	Saudi Arabian Monetary Agency Annual Reports	Primary
Economic Development Spending	Economic resource development, subsidies, government spending and lending programs (in Millions of SAR)	1	1959 - 2013	Annual	Saudi Arabian Monetary Agency Annual Reports	Primary
Total Expenditures	The total of all government expenditures in Millions of SAR	1	1959 - 2013	Annual	Saudi Arabian Monetary Agency Annual Reports	Primary
Surplus/Deficit	Budget surplus or deficit for each year	none	1959 - 2013	Annual	Saudi Arabian Monetary Agency Annual Reports	Primary
GDP	Gross Domestic product of Saudi Arabia in Millions of SAR	none	1960 - 2013	Annual	Global Financial Data	Secondary
USD to SAR Exchange Rate	Historical track records of the exchange rate	none	1928 - 2013	Monthly	Global Financial Data	Secondary
TASI	Tadawul All Shares index; National equity index of Saudi Arabia	2	February 1985 - February 2014	Monthly and Annual	Saudi Stock Exchange Company; Saudi Arabian Monetary Agency; Global Financial Data	Primary and Secondary
SAIBOR	Saudi Arabian Interbank Offer Rate; proxy for the 90 day - Saudi Interest Rate	2	January 1988 - January 2013	Monthly	Saudi Arabian Monetary Agency; Global Financial Data	Secondary
CPI	2005 = 100; used to obtain real values of all variables in both groups	1,2	January 1962 - February 2014	Monthly and Annual	Saudi Arabian Monetary Agency; Global Financial Data;	Secondary
REER	Real effective exchange rate of Saudi Arabia against a basket of currencies as published by the IMF	2	January 1990 - February 2014	Monthly	Global Financial Data	Secondary
S&P 500	Standard & Poor's 500 index in the US	2	January 1950 - February 2014	Daily and Monthly	Yahoo Finance; Global Financial Data	Secondary
M1	Narrow money supply of Saudi Arabia in Billions	2	January 1990 - February 2014	Monthly	Saudi Arabian Monetary Agency; Global Financial Data	Secondary
Dummy Variables	Various; significance will be determined and included in the results	1, 2	1959 - 2013	Annual	various global reports	N/A
All variables were converted by the CPI to obtain real values, and then converted into logs. The CPI for the U.S. was used to obtain real values for the S&P 500. The availability of the CPI has restricted the sample period to start from 1963 rather than 1959						

Table A2. Size and Liquidity of the Saudi Arabian Equity Market in Nominal						
Date	Market Cap (billions SAR)	Value of Shares traded in billions	GDP in billions	Market Size (Depth) %	Market Liquidity indicator 1	Market liquidity indicator 2
1985	67	0.76	313.941	21.34%	1.13%	0.24%
1986	63	0.83	271.091	23.24%	1.32%	0.31%
1987	73	1.69	275.452	26.50%	2.32%	0.61%
1988	86	2.04	285.146	30.16%	2.37%	0.72%
1989	107	3.36	310.822	34.42%	3.14%	1.08%
1990	97	4.4	391.993	24.75%	4.54%	1.12%
1991	180.9428	8.53	442.037	40.93%	4.71%	1.93%
1992	206.47	13.7	510.459	40.45%	6.64%	2.68%
1993	197.9	17.36	494.907	39.99%	8.77%	3.51%
1994	145.1	24.87	503.055	28.84%	17.14%	4.94%
1995	153.39	23.23	533.504	28.75%	15.14%	4.35%
1996	171.98	25.4	590.748	29.11%	14.77%	4.30%
1997	222.7	62.06	617.902	36.04%	27.87%	10.04%
1998	159.91	51.51	546.648	29.25%	32.21%	9.42%
1999	228.59	56.58	603.589	37.87%	24.75%	9.37%
2000	254.46	65.29	706.657	36.01%	25.66%	9.24%
2001	274.53	83.6	686.296	40.00%	30.45%	12.18%
2002	280.73	133.79	707.067	39.70%	47.66%	18.92%
2003	589.93	596.51	804.648	73.32%	101.12%	74.13%
2004	1148.6	1773.86	970.283	118.38%	154.44%	182.82%
2005	2438.2	4138.7	1230.771	198.10%	169.74%	336.27%
2006	1225.86	5261.85	1411.491	86.85%	429.24%	372.79%
2007	1946.35	2557.71	1558.827	124.86%	131.41%	164.08%
2008	924.53	1962.95	1949.238	47.43%	212.32%	100.70%
2009	1195.51	1264.01	1609.117	74.30%	105.73%	78.55%
2010	1325.39	759.18	1975.543	67.09%	57.28%	38.43%
2011	1270.84	1098.84	2510.65	50.62%	86.47%	43.77%
2012	1400.34	1929.32	2666.436	52.52%	137.78%	72.36%
2013	1752.86	1369.67	2795.15	62.71%	78.14%	49.00%

Table A3: Govt. Specialized Lending Institutions Outstanding Loans (millions of SAR)

Year	ADF	SCSB	PIF	SIDF	REDF	Total
1962	***Established***					
1963	NA					
1964	4.39					
1965	9.93					
1966	13.29					
1967	12					
1968	13.86					
1969	16.13					
1970	16.63					
1971	16.56	***Established***	***Established***			
1972	19.59					
1973	36.3	NA	NA			
1974	145.51			***Established***	***Established***	
1975	269.43			NA	NA	
1976	466	143	3,945.00	2,583.00	4,747.00	11,884.00
1977	821	251	5,508.00	5,628.00	14,952.00	27,160.00
1978	1,204.00	227	8,344.00	11,535.00	20,246.00	41,556.00
1979	1,743.00	177	11,611.00	18,108.00	27,117.00	58,756.00
1980	2,638.00	214	14,878.00	24,238.00	34,064.00	76,032.00
1981	4,670.00	533	22,442.00	29,904.00	39,909.00	97,458.00
1982	6,818.00	594	31,780.00	34,266.00	45,812.00	119,270.00
1983	9,107.00	579	38,035.00	38,059.00	53,350.00	139,130.00
1984	11,457.00	557	42,176.00	42,441.00	59,010.00	155,641.00
1985	12,432.00	563	43,613.00	43,022.00	64,160.00	163,790.00
1986	12,504.00	570	43,637.00	42,927.00	67,269.00	166,907.00
1987	12,238.00	567	42,830.00	42,508.00	68,259.00	166,402.00
1988	11,553.00	570	42,098.00	4,095.00	69,787.00	128,103.00
1989	10,736.00	592	41,950.00	3,849.00	69,946.00	127,073.00
1990	10,020.00	610	38,599.00	3,852.00	69,434.00	122,515.00
1991	9,528.70	599.7	37,486.30	3,891.20	69,733.30	121,239.20
1992	8,828.00	619.8	35,495.90	4,425.90	65,617.30	114,986.90
1993	8,687.10	659.9	31,973.00	5,299.40	66,781.50	113,400.90
1994	8,460.20	659.4	29,721.10	5,928.00	69,009.40	113,778.10
1995	8,143.40	660.1	27,519.90	7,219.50	70,285.60	113,828.50
1996	7,711.60	674.9	25,802.00	8,372.30	70,437.90	112,998.70
1997	7,634.60	709	23,586.50	9,301.10	70,408.20	111,639.40
1998	8,024.00	771	22,352.00	10,223.00	69,888.00	111,258.00
1999	8,195.00	762	21,852.00	10,353.00	69,892.00	111,054.00
2000	8,074.00	777	20,805.00	10,260.00	69,531.00	109,447.00
2001	8,606.60	785.7	21,085.50	9,602.90	69,373.10	109,453.80
2002	9,413.90	819.4	25,566.90	9,279.80	68,711.40	113,791.40
2003	9,501.80	961.8	26,402.40	9,219.50	69,407.50	115,493.00
2004	9,215.60	1,010.00	15,885.10	9,480.90	68,995.80	104,587.40
2005	9,180.20	1,063.20	17,469.26	9,844.90	68,889.00	106,446.56
2006	9,450.90	1,313.40	17,817.69	11,138.47	71,240.90	110,961.36
2007	9,431.70	1,799.12	22,566.79	13,857.00	73,392.73	121,047.34
2008	9,518.40	9,864.00	28,715.63	17,172.26	75,394.30	140,664.59
2009	9,477.10	14,175.47	42,145.93	20,889.50	76,788.10	163,476.10
2010	9,378.40	14,598.90	51,340.20	24,760.00	77,596.80	177,674.30
2011	9,338.80	21,112.20	57,209.40	27,387.60	78,878.50	193,926.50

Source: SAMA annual reports and Ministry of Planning and Economy. Data is in nominal terms.

ADF = Agricultural Development Fund; SCSB = Saudi Credit and Savings Bank; PIF = Public Investment Fund; SIDF= Saudi Industrial Development Fund; REDF = Real Estate Development Fund

APPENDIX B: RAW DATA

Table B1: First Group Variables in Nominal (Millions of SAR except prices)

date	Education	Health	Defense	Infrastructure	Econ. Dev.	Oil Revenues	Other Revenues	Total Revenues	Total Expenditures	Surplus/Deficit	gdp	Oil Prices in USD	SAR to USD exchange	Oil Prices in SAR	cpi
1960	149.00	58.00	397.00	95.00	362.00	540.00	1,180.00	1,720.00	1,061.00	659.00	6,355.00	1.93	4.43	8.54	-
1961	171.00	91.00	512.00	163.00	366.00	564.00	1,521.00	2,085.00	1,303.00	782.00	7,016.00	2.21	4.43	9.78	-
1962	228.00	142.00	644.00	173.00	233.00	674.00	1,691.00	2,365.00	1,420.00	945.00	7,746.00	2.23	4.47	9.96	-
1963	288.00	158.00	808.00	169.00	258.00	721.00	1,965.00	2,686.00	1,681.00	1,005.00	8,674.00	2.23	4.45	9.92	25.82
1964	328.00	179.00	912.00	185.00	243.00	813.00	2,269.00	3,082.00	1,847.00	1,235.00	9,319.00	2.23	4.45	9.92	26.54
1965	395.00	206.00	999.00	215.00	231.00	954.00	3,007.00	3,961.00	2,046.00	1,915.00	10,403.00	2.23	4.45	9.92	26.64
1966	438.00	221.00	1,620.00	242.00	248.00	1,161.00	3,864.00	5,025.00	2,769.00	2,256.00	11,939.00	2.23	4.45	9.92	27.06
1967	418.00	206.00	1,221.00	221.00	218.00	1,127.00	3,810.00	4,937.00	2,284.00	2,653.00	13,143.00	2.23	4.45	9.92	27.63
1968	532.00	248.00	1,494.00	215.00	255.00	1,177.00	4,358.00	5,535.00	2,744.00	2,791.00	14,656.00	2.23	4.45	9.92	28.06
1969	603.00	247.00	1,473.00	209.00	239.00	1,326.00	4,640.00	5,966.00	2,771.00	3,195.00	15,975.00	2.23	4.45	9.92	29.05
1970	747.10	283.10	1,801.10	827.90	504.90	1,573.00	4,807.00	6,380.00	4,164.10	2,215.90	17,398.00	2.23	4.48	9.98	29.10
1971	1,274.70	428.30	2,496.80	2,007.20	1,202.20	2,227.00	8,555.00	10,782.00	7,409.20	3,372.80	28,257.00	3.40	4.08	13.88	30.40
1972	1,720.30	590.80	3,218.50	2,136.70	1,590.10	2,529.00	10,671.00	13,200.00	9,256.40	3,943.60	40,552.00	3.62	4.11	14.87	31.72
1973	2,493.00	815.80	4,647.30	3,368.00	2,303.30	5,336.00	17,474.00	22,810.00	13,627.40	9,182.60	99,316.00	4.60	3.51	16.14	36.95
1974	4,102.90	2,569.80	5,782.10	10,468.40	8,011.80	37,561.00	60,686.00	98,247.00	30,935.00	67,312.00	139,601.00	11.70	3.53	41.35	44.88
1975	13,776.80	7,089.10	12,882.10	31,789.10	20,443.10	21,458.00	89,477.00	110,935.00	85,980.20	24,954.80	164,527.00	11.60	3.51	40.70	60.39
1976	15,194.40	6,665.80	13,881.80	47,983.00	15,873.20	23,002.00	87,933.00	110,935.00	99,598.20	11,336.80	205,056.00	13.56	3.50	47.42	79.45
1977	16,524.30	7,806.30	18,258.90	35,538.60	10,614.70	31,817.00	114,676.00	146,493.00	88,742.80	57,750.20	225,401.00	14.05	3.48	48.95	88.51
1978	16,358.60	7,330.30	19,820.90	30,340.30	15,245.90	27,042.00	102,948.00	129,990.00	89,096.00	40,894.00	249,541.00	16.25	3.32	53.87	87.11
1979	17,465.80	8,359.50	30,114.90	38,144.70	27,348.30	37,403.00	122,597.00	160,000.00	121,433.00	38,566.80	385,807.00	40.50	3.37	136.28	88.72
1980	22,928.40	11,388.90	40,079.90	57,808.40	36,870.00	58,298.00	203,218.00	261,516.00	169,076.00	92,440.40	520,589.00	40.15	3.33	133.50	91.61
1981	26,248.00	13,716.00	82,533.00	75,761.00	99,742.00	34,852.00	255,148.00	290,000.00	298,000.00	(8,000.00)	524,719.00	36.70	3.49	127.98	94.28
1982	31,864.00	17,010.00	92,889.00	70,462.00	101,175.00	69,435.00	243,965.00	313,400.00	313,400.00	-	415,231.00	31.75	3.51	111.36	95.25
1983	27,736.00	13,591.00	75,565.00	53,602.00	89,506.00	164,496.00	60,504.00	225,000.00	260,000.00	(35,000.00)	372,023.00	28.85	3.57	102.99	95.43
1984	30,413.00	16,134.00	79,892.00	49,071.00	84,490.00	164,500.00	49,600.00	214,100.00	260,000.00	(45,900.00)	351,395.00	27.07	3.62	97.89	93.94
1985	24,533.00	12,892.00	63,956.00	33,311.00	65,308.00	154,250.00	45,750.00	200,000.00	200,000.00	-	313,941.00	26.68	3.69	98.34	91.07
1986	23,725.00	11,094.00	60,752.00	24,334.00	29,083.00	87,675.00	43,823.00	131,498.00	148,988.00	(17,490.00)	271,091.00	15.76	3.77	59.40	88.15
1987	23,689.00	11,094.00	54,226.00	23,313.00	47,324.00	74,183.00	32,743.00	106,926.00	159,646.00	(52,720.00)	275,452.00	17.60	3.77	66.30	86.79
1988	23,388.00	10,806.00	50,080.00	20,065.00	36,861.00	73,525.00	31,775.00	105,300.00	141,200.00	(35,900.00)	285,146.00	16.23	3.76	60.98	87.58
1989	24,004.00	10,634.00	47,812.00	16,753.00	41,257.00	84,965.90	36,719.40	121,685.00	140,460.00	(18,774.80)	310,822.00	21.05	3.76	79.09	88.41
1990	28,196.00	12,246.00	61,333.00	17,107.00	60,918.50	98,187.00	42,433.10	140,620.00	179,801.00	(39,180.40)	391,993.00	28.35	3.76	106.56	90.24
1991	28,196.00	12,246.00	61,333.00	17,107.00	60,918.50	113,465.00	49,035.90	162,501.00	179,801.00	(17,299.20)	442,037.00	17.75	3.76	66.70	94.71
1992	31,855.00	13,534.00	57,601.00	16,464.00	61,546.00	117,693.00	33,307.00	151,000.00	181,000.00	(30,000.00)	510,459.00	17.85	3.76	67.07	94.63
1993	32,121.00	13,626.00	61,692.00	16,396.00	73,115.00	121,703.00	47,447.00	169,150.00	196,950.00	(27,800.00)	494,907.00	13.18	3.76	49.53	95.63
1994	29,226.00	11,259.00	53,549.00	13,659.00	52,307.00	86,933.00	33,067.00	120,000.00	160,000.00	(40,000.00)	503,054.00	16.23	3.76	61.00	96.17
1995	26,912.00	10,161.00	49,501.00	12,474.00	50,952.00	101,461.00	33,539.00	135,000.00	150,000.00	(15,000.00)	533,504.00	18.65	3.77	70.29	100.86
1996	27,536.00	10,110.00	50,025.00	12,559.00	49,770.00	99,606.00	31,894.00	131,500.00	150,000.00	(18,500.00)	590,748.00	23.90	3.77	90.07	102.09
1997	41,595.00	14,366.00	67,975.00	13,923.00	43,141.00	129,444.00	34,556.00	164,000.00	181,000.00	(17,000.00)	617,902.00	15.86	3.75	59.48	102.15
1998	45,498.00	16,390.00	78,231.00	17,223.00	38,658.00	136,800.00	41,200.00	178,000.00	196,000.00	(18,000.00)	546,648.00	10.54	3.75	39.53	101.77
1999	42,792.00	15,152.00	68,700.00	12,304.00	26,052.00	75,881.00	45,119.00	121,000.00	165,000.00	(44,000.00)	603,588.00	24.93	3.75	93.49	100.41
2000	49,284.00	16,381.00	74,866.00	13,311.00	31,158.00	117,895.00	39,105.00	157,000.00	185,000.00	(28,000.00)	706,657.00	22.58	3.75	84.68	99.28
2001	53,010.00	18,089.00	78,850.00	15,488.00	49,563.00	169,000.00	46,000.00	215,000.00	215,000.00	-	686,296.00	19.35	3.75	72.56	98.17
2002	47,037.00	18,970.00	69,382.00	16,122.00	50,489.00	97,000.00	60,000.00	157,000.00	202,000.00	(45,000.00)	707,067.00	30.12	3.75	112.95	98.41
2003	49,609.00	16,767.00	70,303.00	13,571.00	58,750.00	110,000.00	60,000.00	170,000.00	209,000.00	(39,000.00)	804,648.00	30.30	3.75	113.63	99.01
2004	55,832.00	17,971.00	78,414.00	15,164.00	62,619.00	145,000.00	55,000.00	200,000.00	230,000.00	(30,000.00)	938,771.00	40.38	3.75	151.45	99.52
2005	69,899.00	23,057.00	95,146.00	20,897.00	71,001.00	220,000.00	60,000.00	280,000.00	280,000.00	-	1,200,000.00	58.34	3.75	218.78	100.00
2006	87,164.00	26,798.00	110,779.00	25,947.00	84,312.00	320,000.00	70,000.00	390,000.00	335,000.00	55,000.00	1,400,000.00	58.96	3.75	221.10	102.21
2007	96,483.00	31,010.00	132,922.00	30,093.00	89,492.00	330,000.00	70,000.00	400,000.00	380,000.00	20,000.00	1,600,000.00	93.68	3.75	351.22	106.47
2008	104,600.00	34,426.00	143,336.00	33,481.00	94,156.00	370,000.00	80,000.00	450,000.00	409,999.00	40,001.00	1,900,000.00	35.82	3.75	134.40	116.98
2009	121,942.00	40,426.00	154,752.00	38,913.00	118,966.00	320,000.00	90,000.00	410,000.00	474,999.00	(64,999.00)	1,600,000.00	77.91	3.75	292.20	122.89
2010	137,440.00	46,600.00	169,667.00	43,628.00	142,665.00	400,000.00	70,000.00	470,000.00	540,000.00	(70,000.00)	2,000,000.00	93.23	3.75	349.61	129.46
2011	148,307.00	52,447.00	181,991.00	47,453.00	149,803.00	468,000.00	72,000.00	540,000.00	580,001.00	(40,001.00)	2,500,000.00	108.09	3.75	405.36	135.91
2012	167,970.00	61,284.00	211,867.00	56,551.00	192,328.00	621,000.00	81,000.00	702,000.00	690,000.00	12,000.00	2,800,000.00	110.80	3.75	415.53	142.05
2013	203,147.00	70,938.00	251,325.00	65,494.00	229,096.00	727,000.00	102,000.00	829,000.00	820,000.00	9,000.00	2,800,000.00	109.95	3.75	412.35	146.20

Table B2: Second Group Variables in Nominal values

year	month	TASI	CPI	Inflation	SAIBOR	M1 in billions SAR	S&P 500	Nominal Effective Exchange Rate	Oil Prices in SAR
1992	12	1888.65	93.83	0.00%	3.65%	123.46	435.71	95.16	67.07
1993	1	1951.2	94.27	0.47%	3.15%	127.74	438.78	95.7	69.44
1993	2	1942.5	94.61	0.37%	3.11%	130.08	443.38	96.98	70.76
1993	3	2004.4	94.88	0.28%	3.10%	132.05	451.67	96.35	70.26
1993	4	1928.9	95.84	1.01%	3.11%	132.35	440.19	95.78	70.83
1993	5	1858.4	95.75	-0.09%	3.08%	134.98	450.19	93.18	69.25
1993	6	1815	95.75	0.00%	3.19%	137.28	450.53	91.42	65.5
1993	7	1730	95.75	0.00%	3.20%	136.53	448.13	91.98	63.32
1993	8	1837	95.57	-0.18%	3.17%	133.81	463.56	91.7	62.87
1993	9	1844.1	95.57	0.00%	3.56%	131.35	458.93	96.07	64.76
1993	10	1797.3	95.49	-0.09%	3.96%	126.77	467.83	95.16	57.99
1993	11	1787.1	95.49	0.00%	4.58%	124.33	461.79	97.05	53.47
1993	12	1793.3	95.57	0.09%	5.05%	121.51	466.45	97.25	49.53
1994	1	1752.26	95.4	-0.18%	4.00%	123.8	481.61	99.48	55.72
1994	2	1631.35	95.75	0.37%	3.58%	130.59	467.14	99.2	51.06
1994	3	1524.8	95.84	0.09%	4.09%	125.2	445.77	98.75	49.79
1994	4	1556.87	95.92	0.09%	4.16%	125.35	450.91	99.41	57.68
1994	5	1470.82	96.01	0.09%	4.78%	127.94	456.5	98.91	60.8
1994	6	1380.13	96.1	0.09%	4.83%	127.58	444.27	98.29	65.57
1994	7	1393.38	95.75	-0.36%	5.23%	128.25	458.26	96.55	69.44
1994	8	1425.15	95.75	0.00%	5.06%	126.39	475.49	96.68	60.24
1994	9	1447.44	95.92	0.18%	5.27%	125.45	462.71	96.07	62.88
1994	10	1378.24	96.19	0.27%	6.29%	126.56	472.35	95.16	64.57
1994	11	1235.4	96.27	0.09%	6.84%	126.24	453.69	95.7	63.7
1994	12	1282.87	96.1	-0.18%	7.07%	125.69	459.27	96.98	61
1995	1	1236.78	100.2	4.27%	6.94%	123.8	470.42	96.35	63.13
1995	2	1201.27	100.72	0.52%	6.71%	127.83	487.39	95.78	64.94
1995	3	1221.63	100.64	-0.09%	6.47%	129.08	500.71	93.18	67.77
1995	4	1143.2	100.81	0.17%	6.38%	130.68	514.71	91.42	71.54
1995	5	1148.57	100.64	-0.17%	6.17%	130.9	533.4	91.98	66.26
1995	6	1298.94	100.46	-0.17%	5.90%	131.13	544.75	91.7	62.49
1995	7	1267.78	100.55	0.09%	5.89%	127.58	562.06	91.87	59.47
1995	8	1321.1	100.37	-0.17%	6.15%	121.66	561.88	94.2	61.06
1995	9	1415.21	100.46	0.09%	5.93%	124.39	584.41	95.59	62.49
1995	10	1423.75	100.9	0.43%	5.94%	123.89	581.5	94.76	62.49
1995	11	1354.26	100.64	-0.26%	5.84%	124.81	605.37	95.04	64.56
1995	12	1367.56	100.64	0.00%	5.82%	125.41	615.93	95.75	70.29

1996	1	1362.3	100.9	0.26%	5.63%	126.35	636.02	96.86	62.68
1996	2	1348.2	101.51	0.61%	5.27%	128.34	640.43	97.05	70.86
1996	3	1313.4	101.68	0.17%	5.39%	128.53	645.5	97.25	76.62
1996	4	1300.2	101.95	0.26%	5.45%	133.49	654.17	97.91	73.49
1996	5	1348.7	101.86	-0.09%	5.37%	133.27	669.12	98.36	68.22
1996	6	1306.3	101.95	0.09%	5.46%	133.16	670.63	98.53	72.66
1996	7	1272.2	101.86	-0.09%	5.61%	130.57	639.95	98.24	71.61
1996	8	1319	102.12	0.26%	5.52%	128.79	651.99	97.85	79.07
1996	9	1358.2	102.21	0.09%	5.57%	128.43	687.33	98.45	91.02
1996	10	1425.5	102.03	-0.17%	5.45%	127.96	705.27	98.99	85.93
1996	11	1508	101.86	-0.17%	5.47%	128.95	757.02	98.4	87.32
1996	12	1531	101.86	0.00%	5.45%	133.11	740.74	99.45	90.07
1997	1	1565.1	101.77	-0.09%	5.51%	142	786.16	101	87.47
1997	2	1656.8	102.03	0.26%	5.47%	137.37	790.82	103.33	73.04
1997	3	1651.9	101.95	-0.09%	5.56%	142.24	757.12	104.05	69.49
1997	4	1628.3	102.3	0.34%	5.77%	142.32	801.34	104.55	68.42
1997	5	1589.9	101.95	-0.34%	5.82%	144.32	848.28	103.74	71.22
1997	6	1611.4	102.12	0.17%	5.84%	144.6	885.14	103.68	68.33
1997	7	1743.2	101.68	-0.43%	5.89%	143.03	954.31	105.02	71.03
1997	8	1868.3	102.12	0.43%	5.81%	140.37	899.47	107.16	67.43
1997	9	1894.7	102.12	0.00%	5.80%	138.88	947.28	107.22	74.83
1997	10	1964.5	101.33	-0.77%	5.84%	139.23	914.62	107.23	72.84
1997	11	1930	101.68	0.34%	6.05%	139.6	955.4	107.71	71.11
1997	12	1957.8	101.42	-0.26%	6.07%	141.29	970.43	112.16	59.48
1998	1	1912.6	102.03	0.60%	5.91%	146.63	980.28	115.81	58.47
1998	2	1811.1	102.03	0.00%	5.98%	144.42	1049.34	114.54	50.74
1998	3	1678	101.42	-0.60%	6.15%	146.99	1101.75	114.5	52.01
1998	4	1784.1	102.3	0.86%	6.13%	148.02	1111.75	113.99	51.72
1998	5	1814.5	101.86	-0.43%	6.07%	147.09	1090.82	114.39	52.62
1998	6	1736.9	101.86	0.00%	6.18%	148.18	1133.84	116.33	44.41
1998	7	1733.4	101.51	-0.34%	6.33%	143.31	1120.67	116.43	47.37
1998	8	1658.4	100.81	-0.69%	6.55%	141	957.28	116.79	45.22
1998	9	1630.1	101.33	0.52%	6.37%	138.28	1017.01	114.06	55.17
1998	10	1494.2	101.33	0.00%	6.24%	137.73	1098.67	110.44	45.01
1998	11	1454.1	100.99	-0.34%	5.99%	138.16	1163.63	110.99	37.17
1998	12	1413.1	100.46	-0.52%	6.65%	140.41	1229.23	110.19	39.53
1999	1	1416.64	100.03	-0.43%	6.76%	143.15	1279.64	110.39	42.52
1999	2	1323.2	100.2	0.17%	6.75%	144.67	1238.33	112.4	39.7
1999	3	1455.23	100.37	0.17%	6.85%	147.25	1286.37	114.25	56.32
1999	4	1484.29	100.03	-0.35%	5.97%	147.37	1335.18	114.67	61.69
1999	5	1420.08	100.11	0.09%	5.76%	146.44	1301.84	114.87	55.32

1999	6	1474.73	99.68	-0.44%	5.53%	146.28	1372.71	115.34	63.65
1999	7	1555.21	99.59	-0.09%	5.67%	145.85	1328.72	115.36	74.89
1999	8	1658.55	99.59	0.00%	5.61%	144.84	1320.41	113.9	79.06
1999	9	1680	99.85	0.26%	5.71%	143.51	1282.71	113.59	86.17
1999	10	1710.73	99.94	0.09%	6.38%	145.37	1362.93	112.48	79.16
1999	11	1896.38	99.68	-0.26%	6.32%	148.28	1388.91	113.43	94.51
1999	12	2028.53	99.85	0.18%	6.32%	156.82	1469.25	113.8	93.49
2000	1	1990.4	100.2	0.35%	6.10%	157.46	1394.46	113.84	101.56
2000	2	2012.66	99.5	-0.70%	6.16%	155.56	1366.42	115.92	108.8
2000	3	1987.57	99.1	-0.40%	6.07%	155.11	1498.58	116.31	89.93
2000	4	2018.47	99	-0.10%	6.31%	166.79	1452.43	116.89	89.22
2000	5	2015.18	98.8	-0.20%	6.81%	162.67	1420.6	119.78	111.16
2000	6	2080.7	98.9	0.10%	7.02%	162.85	1454.6	117.88	118.43
2000	7	2167.96	98.6	-0.30%	7.05%	159.95	1430.83	118.72	94.89
2000	8	2343.52	98.7	0.10%	7.02%	158.46	1517.68	120.18	131.57
2000	9	2369.7	98.6	-0.10%	6.90%	158.93	1436.51	121.92	106.59
2000	10	2315.29	98.5	-0.10%	6.88%	158.03	1429.4	123.32	113.08
2000	11	2274.76	98.3	-0.20%	6.95%	158.47	1314.95	123.95	122.01
2000	12	2258.29	98.3	0.00%	6.72%	165.71	1320.28	122.7	84.67
2001	1	2263.62	98.2	-0.10%	5.94%	166.52	1366.01	121.91	99.72
2001	2	2261.85	98	-0.20%	5.38%	170.53	1239.94	122.82	94.36
2001	3	2256.07	98	0.00%	4.97%	172.83	1160.33	125.07	88.13
2001	4	2265.04	98	0.00%	4.66%	175.49	1249.46	127.01	102.04
2001	5	2352.51	97.8	-0.20%	4.09%	177.57	1255.82	127.29	107.07
2001	6	2439.56	97.8	0.00%	3.81%	178.05	1224.38	128.62	98.3
2001	7	2479.65	97.6	-0.20%	3.73%	174.13	1211.23	128.79	91.32
2001	8	2605.04	97.5	-0.10%	3.62%	173.01	1133.58	125.88	100.47
2001	9	2311.44	97.5	0.00%	3.12%	173.32	1040.94	125.31	82.02
2001	10	2374.69	97.6	0.10%	2.92%	173.61	1059.78	126.39	73.61
2001	11	2360.28	97.5	-0.10%	2.56%	179.64	1139.45	127.19	70.95
2001	12	2430.11	97.7	0.21%	2.27%	179.7	1148.08	127.65	72.56
2002	1	2456.15	97.9	0.21%	2.15%	181.54	1130.2	128.93	71.51
2002	2	2446.82	98	0.10%	2.16%	185.66	1106.73	129.78	77.74
2002	3	2512.26	97.9	-0.10%	2.18%	187.71	1147.39	128.98	95.03
2002	4	2899.69	97.8	-0.10%	2.12%	192.25	1076.92	128.12	101.18
2002	5	2890.3	97.8	0.00%	2.05%	194.99	1067.14	125.62	89.51
2002	6	2762.02	97.6	-0.20%	2.06%	193	989.82	123.19	95
2002	7	2708.31	97.9	0.31%	2.11%	194.6	911.62	120.67	98.55
2002	8	2666.66	98.1	0.20%	2.32%	193.16	916.07	121.77	103.35
2002	9	2654.54	98.2	0.10%	2.64%	193.41	815.28	121.98	109.17
2002	10	2590.52	98.2	0.00%	2.87%	197.67	885.76	122.66	95.66

2002	11	2441.14	98.3	0.10%	2.09%	203.02	936.31	121.05	96.52
2002	12	2518.08	98.4	0.10%	2.08%	202.57	879.82	120.27	112.95
2003	1	2643.97	98.4	0.00%	1.89%	206.32	855.7	117.83	118.38
2003	2	2569.8	98.3	-0.10%	1.93%	206.31	841.15	117.41	127.5
2003	3	2779.1	98.3	0.00%	1.75%	212.27	848.18	117.53	105.19
2003	4	2925.33	98.2	-0.10%	1.59%	215.09	916.92	117.39	88.5
2003	5	3226.71	98.3	0.10%	1.57%	217.26	963.59	113.71	99.68
2003	6	3612.89	98.4	0.10%	1.39%	218.06	974.5	113.21	108.3
2003	7	3907.6	99	0.61%	1.46%	218.24	990.31	114.29	107.55
2003	8	4270.75	98.8	-0.20%	1.59%	215.31	1008.01	115.27	113.92
2003	9	4276.55	99	0.20%	1.70%	214.38	995.97	114.12	105.34
2003	10	4003.92	98.8	-0.20%	1.69%	216.64	1050.71	111.41	104.55
2003	11	4265.79	98.8	0.00%	1.58%	218.54	1058.2	111.36	108.57
2003	12	4437.58	98.8	0.00%	1.45%	223.22	1111.92	109.06	113.62
2004	1	4584.26	98.5	-0.30%	1.39%	229.63	1131.13	107.38	110.74
2004	2	4812.79	98.7	0.20%	1.28%	231.89	1144.94	107.03	123.52
2004	3	5182.59	98.6	-0.10%	1.11%	239.31	1126.21	108.59	121.08
2004	4	5485.46	98.8	0.20%	1.12%	243.27	1107.3	109.25	132.11
2004	5	5662.63	98.7	-0.10%	1.25%	240.9	1120.68	110.54	138.75
2004	6	5712.74	98.6	-0.10%	1.85%	243.13	1140.84	109.63	124.58
2004	7	6160.94	99.2	0.61%	1.86%	246.73	1101.72	109.02	155.52
2004	8	6291.77	99.2	0.00%	1.96%	243.94	1104.24	109.68	149.25
2004	9	6593.76	99	-0.20%	2.08%	244.02	1114.58	109.52	179.1
2004	10	7359.49	99.2	0.20%	2.16%	241.58	1130.2	108.25	180.6
2004	11	8329.7	99.4	0.20%	2.31%	261.64	1173.82	105.36	165.87
2004	12	8206.23	99.4	0.00%	2.46%	263.94	1211.92	103.51	151.45
2005	1	8231.94	99.3	-0.10%	2.65%	270.73	1181.27	104.25	166.91
2005	2	9096.23	99.2	-0.10%	2.80%	267.66	1203.6	104.41	188
2005	3	10499.3	99.2	0.00%	2.99%	277.35	1180.59	103.81	199.58
2005	4	11246.5	99	-0.20%	3.28%	281.29	1156.85	104.98	189.79
2005	5	12019.7	99	0.00%	3.35%	280.58	1191.5	105.65	184.88
2005	6	13454.8	99.2	0.20%	3.52%	275.94	1191.33	107.6	207.61
2005	7	13189	99.5	0.30%	3.81%	283.29	1234.18	108.69	224.15
2005	8	14857.2	99.6	0.10%	4.01%	277.03	1220.33	107.31	250.5
2005	9	15030	99.8	0.20%	4.29%	274	1228.81	107.46	231.49
2005	10	15616.6	100.2	0.40%	4.60%	277	1207.01	108.94	219.29
2005	11	16311.1	100.5	0.30%	4.81%	282.31	1249.48	110.2	199.69
2005	12	16712.6	100.6	0.10%	4.94%	284.57	1248.29	109.69	218.78
2006	1	18820.8	100.8	0.20%	4.94%	281.05	1280.08	107.89	236.96
2006	2	19502.7	100.8	0.00%	5.23%	288.68	1280.66	108.51	224.17
2006	3	17060.3	101.3	0.50%	5.13%	291.9	1294.87	108.33	247.76

2006	4	13043.4	101.4	0.10%	4.89%	292.8	1310.61	107.2	270.61
2006	5	11201.5	101.2	-0.20%	4.77%	297.31	1270.09	104.95	253.34
2006	6	13145.3	101.3	0.10%	4.91%	301.13	1270.2	106.24	274.46
2006	7	10848	101.7	0.40%	5.13%	289.74	1276.66	106.09	280.33
2006	8	11111.9	101.8	0.10%	5.11%	289.21	1303.82	105.48	253.75
2006	9	11410	102.2	0.39%	5.11%	294.12	1335.85	105.8	221.61
2006	10	9717.89	102.8	0.59%	5.12%	292.29	1377.94	106.22	210.49
2006	11	8324.43	103.3	0.49%	5.04%	298.62	1400.63	104.78	241.36
2006	12	7933.29	103.5	0.19%	4.86%	312.94	1418.3	103.4	221.1
2007	1	7041.22	104.4	0.87%	4.82%	313.69	1438.24	104.32	211.97
2007	2	8176.37	103.8	-0.58%	5.10%	316.98	1406.82	104.03	222.72
2007	3	7666.11	104.2	0.39%	5.00%	322.91	1420.86	103.31	256.77
2007	4	7423.58	104.3	0.10%	4.93%	331.35	1482.37	102.13	252.13
2007	5	7492.66	104.2	-0.10%	4.92%	329.84	1530.62	101.99	255.7
2007	6	6969.72	104.4	0.19%	5.04%	333.45	1503.35	102.28	270.85
2007	7	7534.05	105.6	1.15%	5.04%	345.17	1455.27	100.9	288.8
2007	8	8226.97	106.3	0.66%	5.03%	339.3	1473.99	101.22	271.13
2007	9	7833.42	107.2	0.85%	5.10%	354.75	1526.75	100.15	302.75
2007	10	8621.45	108.3	1.03%	5.00%	357.13	1549.38	98.94	336.25
2007	11	9464.4	109.5	1.11%	4.28%	369.95	1481.14	97.53	328.68
2007	12	11176	110.2	0.64%	4.01%	384.11	1468.36	97.64	351.22
2008	1	9675.02	111.7	1.36%	3.40%	399.23	1378.55	96.74	343.32
2008	2	10291.5	112.8	0.99%	2.90%	399.88	1330.63	96.38	377.42
2008	3	9134.99	114.2	1.24%	2.26%	412.48	1322.7	94.16	383.85
2008	4	9367.52	115.2	0.88%	2.30%	409.5	1385.59	93.86	416.71
2008	5	9503.28	115	-0.17%	2.61%	420.21	1400.38	94.78	479.49
2008	6	9352.32	115.5	0.44%	3.56%	430.34	1280	95.03	518.93
2008	7	8633.5	117.3	1.56%	3.85%	428.68	1267.38	94.21	465.37
2008	8	8757.04	117.9	0.51%	4.13%	420.19	1282.83	96.64	425.6
2008	9	7458.5	118.3	0.34%	4.38%	423.32	1166.36	99.01	351.27
2008	10	5800.9	120.1	1.52%	4.59%	418.54	968.75	103.4	225.06
2008	11	4738.14	119.9	-0.17%	3.41%	427.72	896.24	106.27	178.98
2008	12	4802.99	120.1	0.17%	2.65%	426.02	903.25	103.96	134.4
2009	1	4765.92	120.5	0.33%	1.22%	437.65	825.88	104.55	165.71
2009	2	4414.56	120.6	0.08%	1.15%	449.35	735.09	106.97	166.56
2009	3	4703.75	121	0.33%	1.15%	460.19	797.87	107.39	172.99
2009	4	5644.11	121.2	0.17%	0.93%	470.49	872.81	105.56	188.62
2009	5	5893.34	121.3	0.08%	0.84%	472.67	919.14	102.8	243.68
2009	6	5596.46	121.5	0.17%	0.64%	474.31	919.32	101.49	255.41
2009	7	5767.94	122.2	0.58%	0.64%	488.96	987.48	101.03	262.8
2009	8	5660.9	122.7	0.41%	0.65%	489.89	1020.62	100.22	258.83

2009	9	6322.04	123.5	0.65%	0.65%	493.04	1057.08	98.96	246.83
2009	10	6313.08	124.3	0.65%	0.74%	496.1	1036.19	97.68	280.9
2009	11	6355.82	124.7	0.32%	0.77%	506.45	1095.63	97.16	291.63
2009	12	6141.63	125.2	0.40%	0.77%	521.88	1115.1	98	292.2
2010	1	6252.55	125.5	0.24%	0.77%	531.69	1073.87	98.47	267
2010	2	6437.5	126.1	0.48%	0.77%	531.78	1104.49	100.09	286.33
2010	3	6801.01	126.7	0.48%	0.73%	542.01	1169.43	100.05	301.38
2010	4	6907.34	127.1	0.32%	0.73%	549.39	1186.69	100.15	323.21
2010	5	6120.52	127.8	0.55%	0.73%	555.61	1089.41	103	273.53
2010	6	6093.76	128.2	0.31%	0.73%	576.93	1030.71	104.09	281.05
2010	7	6316.69	129.5	1.01%	0.73%	589.13	1101.6	101.73	290.64
2010	8	6106.42	130.2	0.54%	0.72%	589.12	1049.33	100.65	283.13
2010	9	6392.39	130.8	0.46%	0.72%	591.28	1141.2	99.58	302.9
2010	10	6309.92	131.5	0.54%	0.74%	595.17	1183.26	96.54	309.26
2010	11	6318.5	131.9	0.30%	0.75%	609.09	1180.55	97.18	322.61
2010	12	6620.75	132	0.08%	0.75%	625.59	1257.64	98.45	349.61
2011	1	6358.03	132.1	0.08%	0.75%	638.86	1286.12	97.72	371.18
2011	2	5941.63	132.3	0.15%	0.75%	641.04	1327.22	96.93	421.06
2011	3	6562.85	132.7	0.30%	0.75%	685.78	1325.83	95.91	438.52
2011	4	6724.26	133.2	0.38%	0.75%	722.62	1363.61	94.53	474.74
2011	5	6735.98	133.7	0.38%	0.73%	722.48	1345.2	94.47	439.39
2011	6	6576	134.2	0.37%	0.64%	716.63	1320.64	94.3	418.87
2011	7	6445.17	135.8	1.19%	0.60%	727.64	1292.28	94.14	434.75
2011	8	5979.3	136.5	0.52%	0.60%	736.12	1218.89	93.84	436.75
2011	9	6112.37	137.7	0.88%	0.60%	726.46	1131.42	96.19	395.32
2011	10	6224.3	138.4	0.51%	0.70%	735.23	1253.3	96.87	406.65
2011	11	6104.56	138.7	0.22%	0.72%	745.48	1246.96	97.37	417.11
2011	12	6418.13	139	0.22%	0.78%	760.99	1257.6	98.62	405.36
2012	1	6626.04	139.1	0.07%	0.81%	781.5	1312.41	98.74	413.47
2012	2	7226.43	139.5	0.29%	0.85%	790.14	1365.68	97.36	458.37
2012	3	7782.84	139.9	0.29%	0.87%	800.18	1408.47	98.18	462.8
2012	4	7558.47	140.2	0.21%	0.89%	809.61	1397.91	98.27	444.99
2012	5	6975.27	140.5	0.21%	0.92%	809.83	1310.33	99.64	389.5
2012	6	6585.63	140.8	0.21%	0.93%	811.62	1362.16	100.75	353.17
2012	7	6878.19	141.2	0.28%	0.95%	819.71	1379.32	100.96	397.24
2012	8	7139.01	141.7	0.35%	0.95%	833.4	1406.58	100.34	427.24
2012	9	6878.72	142.6	0.64%	0.96%	823.12	1440.67	98.81	417.6
2012	10	6791.04	143.6	0.70%	0.97%	847.21	1412.16	98.36	412.1
2012	11	6533.14	144.1	0.35%	0.98%	837.67	1416.18	98.96	415.65
2012	12	6801.22	144.4	0.21%	0.99%	887.12	1426.19	98.44	415.53
2013	1	7043.55	144.9	0.35%	0.99%	896.76	1498.11	98.63	432.93

2013	2	6998.33	145.13	0.16%	0.99%	905.14	1514.68	99.26	420.38
2013	3	7177.62	145.59	0.32%	0.99%	940.95	1569.19	100.65	406.37
2013	4	7179.8	145.94	0.24%	0.97%	956.51	1597.57	100.7	380.4
2013	5	7404.12	146.06	0.08%	0.97%	960.76	1630.74	101.31	376.28
2013	6	7504.38	146.4	0.23%	0.97%	961.97	1606.28	101.24	384
2013	7	7915.11	146.98	0.40%	0.96%	978.65	1685.73	102.08	404.23
2013	8	7751.32	147.21	0.16%	0.96%	975.19	1632.97	101.65	434.51
2013	9	7964.91	147.44	0.16%	0.95%	964.88	1681.55	101.54	404.08
2013	10	8005.49	148.02	0.39%	0.96%	969.95	1756.54	100.21	402.88
2013	11	8300.65	148.48	0.31%	0.96%	993.15	1805.81	101.06	416.46
2013	12	8535.6	148.71	0.16%	0.96%	1000.45	1848.36	101.08	411.95
2014	1	8704.21	149.06	0.24%	0.96%	1039.98	1782.59	101.79	410.12
2014	2	9058.54	149.18	0.08%	0.95%	1036.49	1859.45	101.15	411.32

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