THE ECONOMETRIC ANALYSIS OF THE UNDERGROUNDE CONOMY IN SELECTED GULF COOPERATION COUNCIL (GCC) COUNTRIES: SAUDI ARABIA, QATAR, THE UNITED ARAB EMIRATES, KUWAIT AND OMAN

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UNIVERSITI UTARA MALAYSIA
June 2016

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Thesis Submitted to the
School of Economics, Finance and Banking,
Universiti Utara Malaysia,
in Fulfillment of the Requirements for the Degree of Doctor of Philosophy

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ABSTRACT

The growing expansion of the underground economic activities has become a serious concern to many countries as it is viewed as a challenge to the economies in the world. Using the currency demand approach model, this study embarks on analyzing the underground economy particularly in the estimation of its size., and its related issues such as illegal money and tax evasion in selected Gulf Cooperation Council (GCC) countries; United Arab Emirate, Kuwait, Oman, Saudi Arabia and Qatar. The analysis in the study is based on time-series quarterly data over the period of 1991:Q1 to 2010:Q4 for the UAE, Kuwait and Oman; and annual data for Saudi Arabia and Qatar over the period of 1980-2010. The analysis of data begins with stationarity test using the recent techniques that account for structural break in addition to the traditional unit root test. It follows by the Gregory and Hansen cointegration test in the presence of structural break for long-run estimates based on currency demand function. Also, the General to Specific (GETS) technique is employed to estimate the short-run dynamic error correction model. The results of data analysis indicate that the estimated size of the underground economy to Gross Domestic Product (GDP) for Saudi, Qatar, UAE, Kuwait and Oman are 62.80%, 17.03%, 10.34%, 24.95% and 32.35% respectively. While, the estimated average size of the illegal money to the money outside banks for Saudi, Qatar, UAE, Kuwait and Oman are 18.18%, 26.70%, 59.68%, 59.51% and 49.78% respectively. The findings also indicate that the rate of tax evasion to the official GDP is estimated at an average of 5.15%, 2.12%, 0.63%, 2.82% and 2.92% for Saudi, Qatar, UAE, Kuwait and Oman respectively. Given the empirical results obtained from the research, the governments of GCC should formulate rules and regulations; and economics policy that are able to curb the growing size of the underground economic activities.

Keywords: Underground economy, illegal money, tax evasion, currency demand function, GCC countries.

ABSTRAK

Peningkatan dalam aktiviti ekonomi bawah tanah telah menjadi satu kebimbangan besar kepada banyak negara kerana ia dilihat sebagai cabaran kepada ekonomi rasmi. Dengan menggunakan pendekatan model permintaan wang, kajian ini membuat anggaran saiz ekonomi bawah tanah, dan isu-isu yang berkaitan seperti wang haram dan pengelakan cukai di dalam beberapa buah negara dalam Majlis Kerjasama Negara-Negara Teluk (GCC) yang dipilh iaitu United Arab Emirate (UAE), Kuwait, Oman, Arab Saudi dan Qatar. Analisis kajian ini adalah berdasarkan data siri masa suku tahunan bagi tempoh 1991: S1 hingga 2010: S4 untuk negara-negara UAE, Kuwait dan Oman; dan data tahunan 1980-2010 bagi negara-negar Arab Saudi dan Qatar. Analisis data dimulai dengan ujian kepegunan. Ujian ini dilakukan dengan menggunakan teknik yang berbeza daripada teknik ujian kepegunan yang biasa kerana ianya mengambil kira wujud perubahan struktur pada data yang digunakan. Ini diikuti dengan ujian kointegrasi jangka panjang dengan menggunakan kaedah ujian kointegrasi Gregory dan Hansen yang mengambil kira perubahan struktur data. Kaedah umum kepada khusus (*general to specific - GETS*) untuk menganggarkan model pembetulan ralat dinamik jangka pendek (*short-run dynamic error correction model*). Hasil daripada analisis data menunjukkan bahawa saiz anggaran ekonomi bawah tanah kepada keluaran negara kasar (KDNK) untuk negara-negara Arab Saudi, Qatar, UAE, Kuwait dan Oman masing-masing adalah 62.8%, 17.03%, 10.34%, 24.95% dan 32.35%. Manakala anggaran saiz purata wang haram kepada wang di luar bank di negara-negara Arab Saudi, Qatar, UAE, Kuwait dan Oman masing-masing adalah 18.18%, 26.70%, 59.68%, 59.51% dan 49.78%. Dapatan kajian juga menunjukkan bahawa kadar pengelakan cukai kepada KDNK rasmi dianggarkan masing-masing pada kadar purata sebanyak 5.15%, 2.12%, 0.63%, 2.82% dan 2.92% bagi negara-negara Arab Saudi, Qatar, UAE, Kuwait dan Oman. Berdasarkan keputusan empirikal yang diperolehi dari kajian ini, kerajaan dalam Majlis Kerjasama Negara-Negara Teluk (GCC) perlu merangka peraturan dan dasar ekonomi yang dapat membendung peningkatan saiz aktiviti ekonomi bawah tanah.

Kata kunci: Ekonomi bawah tanah, wang haram, pengelakan cukai, fungsi permintaan mata wang, Majlis Kerjasama Negara-Negara Teluk (GCC).

ACKNOWLEDGEMENTS

All praise and thanks be to ALLAH (S.W.A), the most Exalted, the most gracious and most merciful who made it possible for me to finish this research.

A Ph.D does not happen successfully without a professional guidance. This credit goes to my supervisor Prof. Dr. Jauhari Dahalan, who insightful comments and suggestions were invaluable to me during this Journey of research. Indeed, he is a knowledgeable, wonderful and expert teacher. I was very lucky to have worked under his supervision. My gratitude goes to the members of the discussion committee, Dr. Nor Azam Abdul Razak, Associate Professor Dr. Sallahuddin Hassan, and Prof. Dr. Fadzlan Sufian for their useful contribution. I wish to express my sincere appreciation to them and to my lecturers at Economics Department, UUM, especially Prof. Dr. K. Kuperan Viswanathan, Prof. Dr. Mohd Zaini bin Abd Karim and Assoc. Prof. Dr. Russayani Binti Isma'il who are always helpful to me.

I would like to extend my deepest gratitude to all those who have directly and indirectly encouraged me to continue my postgraduate, especially academicians of them as Dr. Jalal Faqirah, Dr. Adel AlQadassi, Dr.Sultan Al-Gradi, Dr. Ahmed Abdulhakim Al-Absi, Dr. Mohammed Abulghyth, Dr. Abdulkader H. Al-Kaff, Dr. Wadhah Al-Absi, Dr. Taha H. Rassem, Engr. Mohammed M.Gauhan, Engr. Hassan A. Mahoub, Mr. Mohammed A. Maqbool, Mr. Ali Jauhari, Mr. Abdulrahman AL-Ghadar, Mr. Mohammed M. Hashim ,Mr. Hamzah I., Mr. Yahya Tajaddin, Mr. Zeid Sh. Suheil, Mr. Bandar Hizam, Mr. Ali M. Masrohi, Mr. Malik Abbas, Mr. Abdulhadi H. Ahmed, Mr. Mohammed Y. Thwab, Mr. Ahmed A. Mahoub, Mr. Hamud Z. Ibrahim, Mr. Mohamad Bakhtan and all my classmates in Abbs Community College. A special thank goes to Mr. Ali Naji Al-Salahi and Mr. Fua'ad Hael Saeed for their financial support. I take also this opportunity to thank Om Yazan, Miss. Safyah M. Al-Hamali, Dr. Aisha Thwab, Teacher Miss. Norah Thwab, Teacher Miss. Ghada Abdullah Hashem and Teacher Miss. Reem Bawazeer who encouraged me during my stay in Malaysia. Another name worth mention here is Dr. Mohammed Umar, who's a close friend, always ready to help; I extend my appreciation to him for his unconditional care.

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LIST OF ABBREVIATIONS

Abbreviation	Full Meaning
ADF	Augmented Dickey Fuller
ADCB	Abu Dhabi Commercial Bank
AIC	Akaike Information Criterion
AMF	Arab Monetary Fund
AO	Additive Outlier Model
ARCH	AutoRegressive Conditional Heteroskedasticity
ARIMA	Autoregressive Integrated Moving Average
ARDL	Autoregressive Distributed Lag
ARM	Autoregressive Model
BIC	Bayesian Information Criterion
BTI	Bertelsmann Stiftung's Transformation Index
CDA	Currency Demand Approach
CBK	Commercial Bank of Kuwait
CBQ	Central Bank of Qatar
CPI	Corruption Perception Index
CUSUM	Cumulative Sum of Recursive Residuals
CUSUMSQ	Cumulative Sum of Squares of Recursive Residuals
DW	Durbin-Watson
DOLS	Dynamic Ordinary Least Squares
EBI	Emirates Bank International
ECM	Error Correction Model
ECDM	Emirati Currency Demand Model
ED	Emirati's Dirham
ECT	Error Correction Term
GB	Gulf Bank
GCC	Gulf Cooperation Council
GH	Gregory and Hansen's model
GETS	General to Specific approach
GDP	Gross Domestic Product
GNP	Gross National Product
HRO	Human Rights Organization
HSBC	Hong Kong Shanghai Banking Corporation
IMF	International Monetary Fund
IO1	Innovational Outlier 1 Model
IO2	Innovational Outlier 2 Model
KCB	Kuwaiti Central Bank
KMDM	Kuwaiti money demand model
KD	Kuwaiti Dinar
MIMIC	Multiple Indicators Multiple Causes Model
NBAD	National Bank of Abu Dhabi
NBK	National Bank of Kuwait

Abbreviation	Full Meaning
NCB	National Commercial Bank
OECD	Organization for Economic Cooperation and Development
OLS	Ordinary Least Squares
OMDM	Omani Money Demand Model
OMR	Omani Riyal
OPEC	Organization of the Petroleum Exporting Countries
QCDM	Qatari Currency Demand Model
QMR	Qatari Money Market Interest Rate
QR	Qatari Riyal
SAMA	Saudi Arabian Monetary Agency
SCDM	Saudi Currency Demand Model
SCVAR	Structural Cointegrating Vector Autoregressive VAR
SR	Saudi Riyal
TTC	The t-test Criterion
VAT	Value Added Tax
US	United States
UAE	United Arab Emirates
WTO	World Trade Organization

CHAPTER ONE

INTRODUCTION

1.1 Background of the Study

The issue of underground economic activities has developed a considerable growing interest among economists, academicians and policy-makers worldwide (Buehn & Schneider, 2008; Torgler & Schneider, 2009). The rapidly growing underground economic activities have become a serious problem and a competitor to the official economy of the majority of such economies around the world. Due to the concealed nature of underground economic activities, various methods have to be used to estimate the size of the underground economic activities as no official data is available or can be collected (Schneider & Savasan, 2007).

As mentioned above, it is difficult to obtain an accurate estimation about the real magnitude of the underground economy, whether in developing or developed economies. Nevertheless, Schneider and his researchers conducted various studies on this subject and observed that many studies on the *underground* economy have been mainly conducted in developed countries (Schneider & Enste, 1999; 2000; Schneider, 2002; 2004; 2005; 2006; 2011; Schneider & Klinglmiar, 2004; Feld & Schneider, 2010; Dreher & Schneider, 2010; Schneider, Buehn & Montenegro, 2010; Schneider & Buehn, 2013). Only a few studies have been conducted on the size of underground economies in developing countries (Schneider & Klinglmiar, 2004; Schneider *et al.*, 2010).

The countries of the Gulf Cooperation Council (GCC) are important countries in the global energy market in terms of oil production and exportation (Sturm, Strasky, Adolf & Peschel, 2008)[1]. Additionally, the World Bank in 2012 classified the countries that belong to the GCC as high income-based countries. Nevertheless, studies on the underground economy in these countries are still lacking.

In recent studies on GCC countries, Sturm *et al.* (2008), Shah (2009), Naufal and Termos (2009; 2010), Endo and Afram (2011) and Hertog (2012) explained that the GCC countries are in a unique situation socio-economically due to their strong economic growth and development plans which are a result of an increase in revenues from the oil sector since 1970. This situation has led to a huge immigrant population living in GCC countries, both legally and illegally. In addition, GCC countries do not attract adequate foreign investment due to the strict regulations on the foreigners as investments in the private sector continue to be dominated by royal families. Thus, these socio-economic conditions in the GCC countries have generated conducive environment for underground economic activities to flourish.

In addition, the GCC countries have a poor and weak taxation system, compounded by rampant corruption, thus leading to lower tax revenues in comparison to revenues of oil receipts. Revenue from oil receipt compared to the revenue from tax collection is considered as the only source for the GCC countries to finance their budgets (see for

[1] The countries of the Gulf Cooperation Council (GCC) are Bahrain, Kuwait, Oman, Qatar, Saudi Arabia and the United Arab Emirates (UAE).

example, Harrison, 2010; and Annual Economic Reports of Saudi Arabia, the UAE, Kuwait, Qatar and Oman over the study periods, 1980-2010; 1991-2010).

Indeed, in terms of tax reform policies, the International Monetary Fund (IMF) has recommended that GCC countries implement other kinds of taxes, such as income tax, corporate tax, consumption tax and value added tax so that they do not just depend on oil revenues. But many GCC countries remain wary of levying or increasing tax on taxpayers for political reasons (Harrison, 2010). GCC countries recruit many foreign workers who are needed in the various sectors of the economy. However, the large influx of foreign workers has become a serious problem to the GCC countries (Naufal & Termos, 2010). According to Endo and Afram (2011), in terms of population, the GCC countries form the third largest region in the world after North America and Europe for foreign workers as migrants. The GCC countries have been attracting foreign workers from many countries around the world. Hence, foreign workers in GCC countries represent a large part of the total population. Table 1 shows the size of the non-national population to the total population in GCC countries over the period of 1990–2010.

Table 1.1

Non-national Population in GCC Countries over the Period of 1990–2010

	1990		2000		2005		2010	
Country	Non-National ("000")	Total Population	Non-National ("000")	Total Population	Non-National ("000")	Total Population	Non National ("000")	Total Population
Bahrain	173	495944	246	668239	336	879534	489	1251513
Kuwait	1560	2059774	1283	1906231	1589	296314	2058	2991580
Oman	450	1868055	589	2264163	620	2429510	790	2783000
Qatar	345	476517	453	593693	661	821159	1514	1749713
Saudi	4220	16206078	4976	20144584	6617	24690067	7578	27258387
UAE	1556	1908002	2211	3132104	3413	4875639	6238	8925096
Total	**8305**	23014370	**9758**	28709014	**13236**	35992223	**18667**	44959289

Source: *Author's calculations*

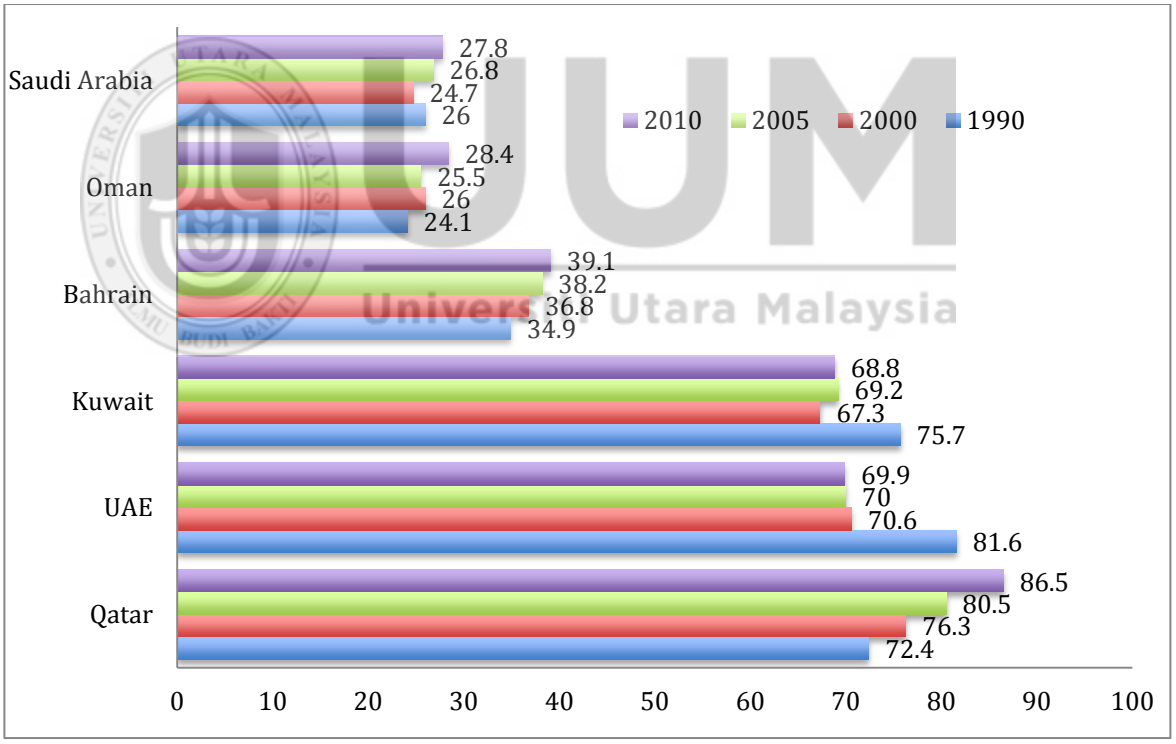

Figure 1.1
Non-national Population as Percentage of Total Population in GCC Countries

Source: Author's calculations

Figure 1.1 showed the demographic distribution of the non-national population as a percentage of total population in GCC countries, over the period of 1990-2010. Nevertheless, the governments of GCC countries have tried to introduce some regulations in order to deal with the issue. However, these regulations are tight, irrational and add to more distortion. In addition, under the new regulations, foreign workers are not allowed to obtain the country's citizenship, there are restrictions for their families to join them and they are not allowed to invest in the country's real estate (Termos, Naufal & Genc, 2013).

Due to the tight restrictions on foreign workers, money obtained by foreigners is remitted to their home countries in large amounts (Naufal & Termos, 2010). Taghavi (2012) showed that the amount of money outflows from the GCC countries to the world's total outflow of money stood at around 12% at the end of 2009. These outflows of money have a negative and positive impact on economic development and macroeconomic variables of the sending and recipient economies respectively.

According to Termos, Naufal and Genc (2013), the outflows of money by foreign workers are considered as leakage in terms of monetary deficit in the GCC economies. The monetary deficit in the economies is so significant that it has led to the annual issuance of new banknotes in GCC countries (see for example Annual Economic Reports of GCC Central Banks in 2010). In this sense, the outflow of money has a negative impact on the sending economy as noticed in the economies of the GCC countries.

Naufal and Termos (2010) said that an impact of the outflow of money by foreign workers in the GCC countries is the increase in the underground economic activities. Generally, due to the service cost imposed for the remittance process, foreign workers prefer to send their money home through a system of individuals (relatives and friends) and unlicensed agents located in the sending and receiving countries (Naufal & Vargas-Silva, 2010)[2]. In other words, due to the tight restrictions imposed on the foreign workers, they resort to illegal channels through which they send their money back home (Naufal & Termos, 2012).

Nonetheless, the economies of the GCC countries are highly dependent on foreign workers as their source of labor (Naithani & Jha, 2009). This persisting situation in the GCC countries has made it a unique case, due to the large outflow of money through illegal channels by the foreign workers who reside legally and illegally[3]. The situation is categorized as one of the activities of the underground economy in the GCC countries (Naufal & Termos, 2010).

Although many economists indicate that several factors influence people to engage in underground economic activities, the tax burden, in particular, is the main factor that can induce people to engage in underground economic activities (see for example, Schneider & Enste, 1999, 2000; Schneider, 2004, 2005; Schneider & Savasan, 2007; Macias &

[2] In the GCC countries, one of the methods for sending money abroad is through unlicensed financial intermediaries and smuggling of luxury commodities, such as cars, which is easier to be transformed into cash.

[3] This is a unique case in the GCC countries. The problem is not only in the magnitude of the outflow of money, but illegal channels through which the money is sent out.

Cazzavillan, 2009; Hernandez, 2009; Buehn & Schneider, 2009; Ene & Stefanescu, 2011; Schneider, 2012).

It seemed that the growing underground economic activities are the result of wrong policies by the governments in most of the GCC countries (Schneider & Enste, 2000). For example, badly executed labor market regulations in the GCC economies can drive foreign workers to participate in underground economic activities (Sturm *et al.*, 2008)[4]. There are no explicit regulations that can ensure the rights of foreigners, despite the reliance of the GCC countries on foreign workers who play an important role in enhancing the economy compared to the local labor force (Naufal & Termos, 2010).

The GCC countries adopt an open door policy to foreigners because of the unavailability of a skilled local labor force (Fasano & Goyal, 2004). This policy, accompanied by tight regulations stipulated on foreigners, has led to distortion in the official employment rate in the labor market. The estimated size of illegal employment in the economies of GCC countries is about 20.2% of the GDP (Angel-Urdinola & Tanabe, 2012). Given the scenario as described above, the main purpose of this study is to estimate the size of the underground economy in selected GCC countries.

In the case of GCC countries, not many studies have been conducted separately in measuring the size and trend of the underground economy. Schneider (2002) and Schneider and Klinglmair (2004), in their study of the underground economies in 110 developing,

[4] Foreigners choose to work in the underground economic activities in order to achieve higher profits as they evade taxes, and they are subject to less red tape in their transactions

transition, and Organization for Economic Cooperation and Development (OECD) countries over the period of 1999-2000, included two GCC countries. They claimed that the average volume of the underground economy in the selected GCC countries, Saudi Arabia and the UAE amounted to about 18.4% and 26.4 %, respectively (in percentage of official GDP).

In another study, Schneider (2004) estimated the size of the underground economies in 145 developing, transition and OECD countries over the period 1999-2000 to 2002-2003 using two methodologies: Currency Demand Approach (CDA) and Multiple Indicators Multiple Causes Model (MIMIC). Based on the CDA, his results showed that the weighted average size of the underground economies (as a percentage of official GDP) in Saudi Arabia, the UAE, Kuwait and Oman were 19.1%, 27.1%, 20.8% and 19.4%, respectively. Schneider *et al.* (2010) estimated the size of the underground economies in 162 developing, transition and OECD countries over the period of 1999-2007 using the same techniques and claimed that the weighted average volume of the underground economies (as a percentage of official GDP) in the GCC countries were 18.1%, 25.9%, 19.4%, 18.4%, 14.4% and 17.9, respectively.

These statistics, however, do not portray the true magnitude of the underground economies in the GCC countries for many reasons. First, in the studies of Schneider and Klinglmair (2004); Schneider (2004; 2006); and Schneider *et al.* (2010), the underground economy was studied in 110, 145 and 162 countries, using one, three and nine years data, respectively. The latest study conducted in 162 countries failed to report the size of the underground economic activities in countries like Qatar, Kuwait, Oman,

Saudi Arabia and the UAE for some years. These studies used cross-sectional time-series data in different categories of development, i.e., developing, transition and OECD countries. The estimates of the underground economy give only a view on the ranking of the magnitude of the underground economies of those countries. Second, the studies do not consider statistical tests that are associated with the currency demand methodology. Therefore, the estimates of the underground economy for the countries in the studies are questionable.

Third, in all those studies on the estimation of the volume of underground economies in Asian countries, Schneider and his co-authors have treated all countries as being at the same level of development. For example, it is not possible to treat the economies of Japan and Singapore as highly developed countries and compare them with others, such as the economies of the GCC countries, even though they are high income countries. In this sense, not all the economies of Asian countries are developed economies.

Finally, these studies used the MIMIC methodology which is mainly calibrated based on the CDA to quantify the volume of the underground economy in those countries of the same groups of economy. According to Breusch (2005b), the MIMIC method is unfit and it is not appropriate for estimating the size of the underground economy. Moreover, because of the distortion in the economic structures for the majority of Asian countries, MIMIC method is also unreliable for estimating the size of the underground economy in the GCC countries.

As in the literature, estimating the size of the underground economy in a country depends on the variables included in the model and the method applied. In this study, the estimation of the magnitude of the underground economies in selected GCC countries is based on the recent Adjusted CDA introduced by Ahumada, Alvaredo & Canavese (2007); and Ahumada, Alvaredo & Canavese (2009). This method overcomes the criticisms and shortcomings that have been known with the standard CDA (for instance, the standard CDA has been criticized by Thomas (1999), Pedersen (2003), Schneider (2006) and Ahumada *et al.* (2007).

The recent development of the CDA method does not depend on equality of velocity of income in both official and underground economies. That is, the estimation results of the underground economy in the selected GCC countries are only correct if the income elasticity is not unity. Consistent with earlier studies, this study uses quarterly and annual data which spanned 1991 to 2010 in the case of the UAE, Kuwait and Oman; and 1980 to 2010 for Saudi Arabia and Qatar. As for time-series data, the stationarity issue is analyzed by employing the recent econometric techniques that take into consideration the presence of structural breaks in testing the unit roots Zivot-Andrews (ZA) (1992); and Pierre Perron (1997) tests, as well as the traditional Augmented Dickey-Fuller (ADF) unit root test of Dickey and Fuller (1979).

The main objective of this study is to shed light on the phenomenon of the underground economy in selected GCC countries by measuring the extent of the underground economic activities through a financial variable (tax burden) in terms of currency in the GCC countries. This study investigates the existence of a long-run relationship between

the growing underground economic activities and its determinants by employing the econometric technique of Gregory and Hansen cointegration test (1996) that includes a structural break in the model.

For short-run relationship, this study utilizes London School of Economics LSE-Hendry method called the General to Specific (GETS) approach as a specific technique to obtain an Error Correction Model (ECM); it then performs multivariate diagnostic tests on the model under estimation as well as testing for the stability of the model.

This study is important as it can provide a better understanding of the magnitude of the underground economy in the selected GCC countries over the period of the study. To the best of the researcher's knowledge, the study is the first one to separately estimate the underground economic activities in selected GCC countries based on tax evasion in these countries. The study seeks to measure the overall underground economic activities compared to the official GDP. From the overall measurement of the underground economy, the study examines the size of the tax evasion as a component of the underground economy. Thus, the study sets a benchmark for future studies on the underground economy in selected GCC countries.

1.2 Problem Statement

The GCC countries are experiencing the growing problem of the underground economic activities as a result of the poor taxation system, distortion in the labor markets and the negative effect of the huge outflow of money by foreign workers and its possible

impacts on the macroeconomic variables (Naufal & Termos, 2010). According to Razgallah (2008) and Schwenken and Heimeshoff (2011), the GCC countries have been attracting foreign workers from all over the world. Because of the strict regulations, the foreign workers in the GCC countries are not allowed to transfer money that exceeds their total salaries received for the period of six months.

This is a unique situation in the GCC counties which is attributed to the fact that foreign workers in the GCC counties may enter legally with valid documentation but later become irregular through overstaying the duration of their valid permit. In addition to illegal entry and overstay, a more subtle irregularity may exist whereby a foreign worker ends up working for an employer other than the one who sponsored him/her.

In fact, the sponsor may not have any job for him. Under this type of pressure a foreign worker may become illegal by running away from his/her sponsor, and then engage to work into illegal activities that may earned him a faster income. With a new income obtained which may exceed, on average his total salaries for the period of six months, it is impossible for him to access legal banking services and to remit his money home for more than his salaries, as he will be accountable for the sources of how he earned that amount of income.

This stringent rule has forced them to resort to illegal means of sending money to their home countries[5]. This includes sending money through their relatives or friends (Naufal & Termos, 2010; Naufal & Vargas-Silva, 2010). The illegal outflows of money from the GCC countries to abroad is predominantly practiced by foreign workers (Al-Asoomi, 2014). By resorting to the relatives or friends channel also, they avoid paying taxes and higher processing fees[6].

In fact, the outflow of money of foreign workers in the GCC countries is a substantial part of the GDP. According to Taghavi (2012), at the end of 2009, the total amount of money outflow of foreign workers was about US$32 billion, transferred out of the GCC countries by 12 million foreign workers. These outflows of money by foreigners working in the Gulf are considered as money leakages to the sending economies. Despite having a financial surplus in their budgets over time, it is observed that the GCC countries have been printing new banknotes annually; which may increase inflationary pressure in the GCC economies[7]. The inflationary pressure in the GCC countries is justified on the grounds that a lot of their currencies are traded underground to other countries of the World. Moreover, the governments of the GCC countries withdraw mutilated notes and print new currencies in exchange. This creates some distortions in money supply into the economies resulting in inflationary pressure. In addition, a part of these currencies may be used to settle illegal transactions in the economies of the GCC countries.

[5] The tight regulations imposed on the foreign workers include: Foreign workers in GCC are not allowed to live with their families, except experts, to own property and have no right for citizenship at all (Shah, 2009; Naufal & Termos, 2010; Naufal & Termos, 2012).

[6] That is normally imposed if using the legal channel.

[7] See the world bank data statistics and the annual reports of central banks in GCC about inflation rates.

As mentioned earlier, the outflow of money by foreign workers has negative impacts on macroeconomic variables in the host countries (McCormick & Wahba, 2000; Ramirez & Sharma, 2009; Naufal, 2011; Termos *et al.*, 2013). In this context, one of the potential impacts of the outflow of money from the GCC countries as remitting countries is increased underground economic activities (Naufal & Termos, 2010).

Taking into account the higher financial services of the cost of sending money, a large amount of money is being transferred from GCC countries to abroad in different ways (Naufal & Vargas-Silva, 2010). Not only that, money laundering which is one of the illegal activities of the underground economy, may have become legalized through the outflows of money executed via official or unofficial channels (Taghavi, 2012).

More specifically, Naufal and Vargas-Silva (2010) in their study on the transfer channels of money from the GCC countries to abroad, argued that the workers send their money home through informal channels, such as the *hawala* system (15%); or via their friends (25%)[8]. The money obtained through illegal activities (illegal transfer of money, drugs, smuggling, gambling, etc.) can be sent abroad through the illegal channels as mentioned above. This includes money laundering which is a component of the underground economic activities (Naufal & Termos, 2010).

[8] The money is transferred illegally through a system of individuals and agents located in the remitting and receiving countries (Naufal & Termos, 2010).

To the knowledge of the researcher, many studies have been conducted to measure the size of the underground economy due to tax evasion in many countries. However, there is no study yet devoted to the economies of the GCC countries separately. Since there is a lack of existing studies on the GCC countries, obtaining a full picture of the underground economy in the GCC countries is difficult. The IMF (2012) in its report on the world economic and financial surveys showed that studies have mainly been conducted in the Middle East and Central Asia on the size of the underground economy in the Caucasus and Central Asia. However, the studies excluded the GCC region.

Studies by Schneider and Klinglmair (2004); Schneider (2004); and Schneider *et al.* (2010) have focused on estimating the magnitude of the underground economy in 110, 145 and 162 countries, using one, three and nine years data, respectively, with different time periods of 1999/2000, 1999/2003 and 1999/2007, under various classifications of development. The first study by Schneider and Klinglmair (2004) chose only two countries of the GCC (Saudi Arabia and the UAE); the second study by Schneider (2004) was conducted with a selection of four countries (Saudi Arabia, the UAE, Kuwait and Oman); and all six GCC countries (Saudi Arabia, Qatar, the UAE, Kuwait, Oman, and Bahrain) were included in the study of Schneider *et al.* (2010).

Considering the latest study, Schneider *et al.* (2010) outlined that the weighted average volumes of the underground economies (as a percentage of official GDP) in the GCC countries (Saudi Arabia, Qatar, the UAE, Kuwait, Oman and Bahrain) are 18.1%, 25.9%, 19.4%, 18.4%, 14.4% and 17.9%, respectively. Furthermore, in all these studies, Schneider and Klinglmair (2004); Schneider (2004); and Schneider *et al.* (2010) also

reported the same results for the same countries, despite the different sample sizes and periods of study. However, Schneider (2004) mentioned that due to the political crises in some countries over the study period, the findings are unreliable.

In addition, these studies do not distinguish the differences in economic environment among those countries, and included them under the same category of Asian developing countries. For example, the study of Schneider and Klinglmair (2004) included the same estimation of the size of the underground economy in Japan under both groups the category of highly developed OECD and also under the category of Asian developing countries. In comparison to others, including them under the same group of Asian developing countries, such as the economies of the GCC countries (although they are classified as high income countries), is not accurate; it must be noted that not all the economies of Asian countries are developed.

Based on the second study of Schneider (2004) the last findings obtained using the MIMIC were mainly based on the available estimations of the CDA. The approach is applied to many countries, such as Australia, Italy, Germany, India, Hungary, Peru, Russia and the United States (Studies of Schneider, Chaudhury & Chatterjee, 2003; Schneider & Bajada, 2003; Schneider & Del'Anno, 2004).

The argument here is that these studies do not take into consideration the weakness of the traditional CDA which assumes equal velocity of money in both economies (underground and formal). The assumption is only correct if the income elasticity of money is unity, which is not the case with the previous studies (Ahumada *et al.*, 2007).

Therefore, the main drawback of all these studies is that the estimated coefficients are biased and unreliable. In the same vein, the estimated values do not represent the actual phenomenon of the underground economy in the GCC countries as they are grouped under the same category of developing countries.

According to Harrison (2010), the GCC countries have introduced various forms of taxation over the last two decades, but their taxation systems are still very weak, particularly, in using policy instruments of administration and collection processes. With the expansion of their economies and growing population, the governments of GCC countries are still facing difficulties in financing their public sector services. The weakness of the taxation policies in the GCC countries has led the IMF to remind the GCC countries from time to time to reduce their expenditures and to implement an effective taxation system as the oil and gas revenues can no longer sustain the social functions of the governments in the GCC countries.

According to Ahmed and Alfaris (2010), not all the GCC countries have oil reserves. Thus, the governments of the GCC countries must develop their taxation systems and be less dependent on oil revenues. The policy-makers have imposed different forms of taxation, such as Value Added Tax, corporate tax on foreign companies, personal income tax, consumption tax and road tax, to name a few. In this sense, the imposition of these various forms of taxation translates into an increase of the tax burden which exerts negative pressure on individuals. This encourages people to evade taxes, then prompting them to engage in illegal activities of the underground economy in GCC countries.

At present, to the best of the researcher's knowledge, no study has been separately conducted on tax evasion in relation to the size of the underground economy of GCC countries. Eichhorn (2006), in his study on tax evasion, claimed that the difficulty in estimating the size of the underground economy is because the underground economy's statistics do not appear directly in the official statistics of the national income accounts of each country. Thus, knowing the true size of the underground economies in the GCC countries is an essential and critical issue, particularly, in the absence of reliable or adequate academic studies about the true magnitude of the underground economic activities in GCC countries.

Additionally, the annual economic reports of the central banks, particularly the annual statistical books and the annual reports of the national income accounts of the GCC countries over the period of 1980-2014, have not included any statistics about the size of the underground economic activities in the economies of the GCC countries[9].

1.3 Research Questions

The estimation of the size of the underground economy of the selected GCC countries ultimately addressed the following main questions of the study:

1. What are the sizes of the underground economy in the selected GCC countries (Saudi Arabia, Qatar, the UAE, Kuwait and Oman)?

[9] These annual reports are available online from the websites of central banks of the GCC countries.

2. What are the rates of illegal money[10] to the money outside the banks in the economies of the selected GCC countries?
3. What is the size of the tax evasion as a component of underground economy in relation to the official GDP in the economies of the selected GCC countries?
4. What are the macroeconomic implications of the underground economy in relation to the official GDP in the selected GCC countries?

1.4 Objectives of the Study

The aim of this study is to investigate the phenomenon of the underground economy in selected GCC countries and its determinants. In line with the economic characteristics of the GCC countries, this study estimates the magnitude of the underground economy, illegal money and tax evasion in the form of excessive uses of currency by both locals and foreign workers living in the GCC countries.

The following are the specific objectives:

1. To estimate the volume of the underground economy in selected GCC countries using the suggested correction of the standard CDA.

2. To compute the magnitude of the illegal money that has not been recorded in the national income accounts statistics of the GCC countries, which is used to perform illegal transactions.

[10] Illegal money is the amount of money that can be held for illegal transactions in the economy (Alexandru, 2013).

3. To quantify the size of tax evasion as an illegal activity of the underground economy in the selected GCC countries.

4. To provide meaningful macroeconomic implications of the underground economy compared to the official economy in those selected economies of the GCC countries.

1.5 Hypotheses of the Study

The purpose of the study is to estimate the volume of the underground economy in selected GCC countries using the recent development of CDA. Some key macroeconomic variables are employed, such as GDP, total non-oil tax revenues, outflow of money, interest rate on deposits and the inflation rate. The main hypotheses of this study are as follows:

1) Null Hypothesis (H_0): Higher economic growth (GDP) does not generate the underground economic activities in the GCC countries.

Alternative Hypothesis (H_1): Higher economic growth (GDP) does generate the underground economic activities in the GCC countries.

The hypothesis is tested as:

H_0: $\beta_j = 0$

H_1: $\beta_j \neq 0$.

where β_j is the coefficient of GDP.

2) Null Hypothesis (H_0): Increase in taxes does not generate the underground economic activities in the GCC countries.

Alternative Hypothesis (H_1): Increase in taxes does generate the underground economic activities in the GCC countries. Therefore, the hypothesis is tested as:

H_0: $\alpha_j = 0$.

H_1: $\alpha_j \neq 0$.

where α_j is the coefficient of taxes.

3) Null Hypothesis (H_0): The excessive expansion of the outflow of money by foreign workers has no impact on increasing the underground economic activities in the economies of the GCC countries.

Alternative Hypothesis (H_1): The excessive expansion of the outflow of money by foreign workers has an impact on increasing the underground economic activities in the economies of the GCC countries.

H_0: $\theta_j = 0$.

H_1: $\theta_j \neq 0$.

where θ_j is the coefficient of the outflow of money.

4) Null Hypothesis (H_0): The reduction of the interest rate on deposits has no impact on stimulating people to work in the activities of the underground economy in the economies of the GCC countries.

Alternative Hypothesis (H_1): The reduction of the interest rate on deposits has an impact on stimulating people to work in the activities of the underground economy in the economies of the GCC countries

H_0: $\delta_j = 0$.

H_1: $\delta_j \neq 0$.

where δ_j is the coefficient of the interest rate on deposits.

5) Null Hypothesis (H_0): A higher inflation rate in the economies of the GCC countries has no impact on generating the underground economic activities.

Alternative Hypothesis (H_1): A higher inflation rate in the economies of the GCC countries has an impact on generating the underground economic activities.

H_0: $\gamma_j = 0$.

H_1: $\gamma_j \neq 0$.

where γ_j is the coefficient of the inflation rate.

1.6 Significance of the Study

A common consensus among economists is that each country has some degree of an underground economy. In case of the GCC countries, although they are considered high income and oil exporting countries, it is essential for policy-makers to quantify the size of the underground economic activities over there, as the oil reserves could no longer settle the social functions of the governments of the GCC. Thus, the importance of the

study stemmed from the desire to create a statistical database about the size of the underground economy in the selected GCC countries. Besides, the study tried to provide an understanding of the implication of the selected macro-economic variables on the underground economy.

The study added to the existing literature on underground economic activities in the selected GCC countries as studies focusing on this issue in these countries are still lacking. The study investigated the key factors that influence people to engage in underground economic activities in the selected GCC countries.

This study could also serve as a guide to policy-makers in formulating their macroeconomic policies in order to clamp negative effects that result from the underground economic activities, such as tax evasion and illegal outflow of money by foreign workers in the GCC countries. This study provided a guide to determine if non-oil revenue taxation and other factors, such as regulatory policies, are appropriate tools to restrict the growth of the underground economy. Weak law enforcement and the existing regulatory policies also encourage the growth of the underground economy in the GCC countries. As a result, this could lead to the loss of revenue for the government due to tax evasion and illegal money transfer abroad. Knowing the extent of tax evasion, illegal money transfer and other illegal economic activities is imperative in order to address the issue of the underground economy.

The contribution of this study is as follows. First, the study added to the existing literature as the issue of the underground economy in the GCC countries per se has not been studied before. Second, the study applied the recent development of the CDFM as a proxy to indirectly estimate the underground economy, which assumed unequal income velocity of money in both economies (formal and underground) as introduced by Ahumada *et al.* (2007; 2009). Third, the study captured the size of the underground economy in the selected economies by employing the recent techniques of a unit root and cointegration tests that give special attention to the issue of structural breaks. Multivariate diagnostic tests that are associated with the model under estimation as well as the stability test were also performed.

More specifically, this study also used the Gregory-Hansen cointegration procedure based on the recent adjusted CDFM as an indirect way to estimate the illegal activities in the economies of the selected GCC countries. The study used Gregory-Hanse cointegration test because the test results of conventional cointegration techniques are biased against the rejection of the null hypotheses as they do not take into consideration the issue of structural break (Gregory & Hansen, 1996). Identifying structural breaks in macroeconomic time-series data is an important issue because the existence of structural breaks in the time-series data analysis can affect the properties of stationarity of the series and distort long-run relationship among the variables in the cointegrating system (Ibrahim, 2009).

Furthermore, this study was carried out using CDFM in selected economies of the GCC countries in the aftermath of the Gulf war and the recent global financial crisis and

investigated whether the function has changed over the study period. Thus, testing for the possibility of structural breaks is worthy of investigation in time-series analysis (Doguwa, Olowofeso, Uyaebo, Adamu & Bada, 2014).

Finally, unlike previous studies that link the positive impact of inflow of money and demand for money as a measurement of the underground economy in the recipient economies[11], this study assumed the negative effects of the outflow of money that is generating the activities of the underground economy in the sending economies, as it is the case of the GCC countries.

1.7 Scope of the Study

This study focused on selected economies of the GCC countries (Saudi Arabia, Qatar, the UAE, Kuwait and Oman) in estimating the size of the underground economies which are unreported in the national income accounts statistics of those economies. The annual time-series data estimates of the underground economy in this study were employed over the period of 1980-2010 for Saudi Arabia and Qatar where, quarterly data were employed over the period of 1991:Q1-2010:Q4 for UAE, Kuwait and Oman. The choice of the annual data for Saudi and Qatar economies is based on the availability of the macroeconomic data in annual form. However, the annual data on some key variables that can affect the CDFM are not available prior to 1990. Therefore, the variables were interpolated into a quarterly data using interpolation techniques proposed in Gandolfo (1981) for UAE, Kuwait and Oman.

[11] See the study of Macias and Cazzavillan (2009), which is conducted on the Mexican economy.

1.8 Organization of the Thesis

The thesis is organized as follows: Chapter One introduced the study. The chapter consisted of the background of the study, problem statement and research questions, hypotheses of the study, objectives of the study, the significance and justification of the study, scope of the study and the organization of the thesis. Chapter Two reviewed a brief overview about the features and characteristics of the GCC economies within some of macroeconomic indicators. Chapter Three introduced conceptual and theoretical framework and empirical literature on the underground economy of the selected countries using the CDA. It presented an evolution of currency demand function model, and concluded with a summary on the literature gaps for the underground economy in the economies of the GCC countries as well as conclusion. Chapter Four described the methodology employed in this study in detail. The chapter also discussed the sources of the data and interpolation method. Chapter Five provided the empirical analysis and discussion of findings. Chapter Six ended the thesis with a summary and general conclusion of the main results, macroeconomic policy implications of the underground economy, recommendations and limitations of the study.

CHAPTER TWO

BRIEF OVERVIEW OF THE GCC ECONOMIES

2.1 Introduction

This chapter started with a brief overview of the GCC economies, taking into account some economic indicators that are very important when looking at the underground economy in the countries. These indicators, such as illicit transfer of money and tax evasion in the GCC countries are considered as the main contributors of the underground economic activities. In other words, this chapter described some of the key indicators from the macroeconomic point of view of the economies of the GCC countries, including the labor market, banking and financial system, foreign worker remittances, taxation system, corruption, unemployment and inflation. The chapter is divided into the following sub-sections.

2.2.1 Labor Markets in the GCC Countries

In general, labor markets in the GCC countries have structural weaknesses in creating new employment opportunities for their national labor force. Specifically, in the private sector, the GCC countries depend mainly on foreign workers, causing the unemployment rate to increase (Sturm *et al.*, 2008; Saif, 2009; Rahman, 2013). More and more attention is being paid to studying this structural distortion in the GCC region. This is because the region is the most attractive for the foreign workers compared to other regions in the world, despite the negative impact of the foreign workforce on the economies of GCC countries (Naufal & Termos, 2010).

Based on the published statistics by Winkler (2010), the percentage of the non-national labor force in the labor markets in the GCC countries registered the highest rate at 92.5% in Qatar in 2008, followed by the UAE at 85%, 80% in Kuwait, 75.8% in Bahrain, Oman at 68%, and Saudi Arabia at 50.1%.

The existence of a huge number of foreign workers in the GCC countries is due to the unavailability of skilled local workforce, inferior perception or outlook of local workforce toward some jobs in the private sector and the availability of cheaper and skilled foreign labor (Saif, 2009).

Due to the increasing rate of unemployment, local workers have resentment toward foreign workers in the GCC countries. Therefore, the governments of GCC countries have tried to re-issue some policies in order to replace foreign workers with local workers. For instance, the governments of the GCC countries have tried to solve the problem of the labor markets by inflating public salaries and concentrating on making all skilled and unskilled jobs in the private sector more attractive to their local workers.

Besides that, the governments have also tried to create a competitive environment in the labor market by legislating better conditions for foreign workers, particularly with continuous attention from international organizations, such as the Human Rights Organization (HRO) to the status of foreign workers in the GCC countries. But the predicament of the governments of GCC countries is that the available cheap labor of

foreign workers encouraged the private sector to increase their demand for foreign workers rather than the locals (Saif, 2009).

According to Shah (2009), despite foreign workers playing a significant role in the development of the economies of the GCC countries, it has become a serious problem and has further distorted the demographic distribution of the population in GCC countries due to the adverse effects of the large number of emigrants on the economies of the GCC countries (See Figure 1.1, chapter 1).

Indeed, the foreign workers entered GCC countries for work after they get permission from a sponsor or under the sponsorship system (*Kafala*). Under this system, foreign workers cannot change their jobs without getting permission from their sponsors. If they do not obtain permission, they have three alternatives. First, they stay with their sponsors as the sponsors hold their passports. Second, they leave the country; this option is not preferred because they might not have enough money, being new entrants to the labor market. Lastly, they work illegally after they get permission to work for themselves in the country based on payment to their sponsors of an amount of money they agreed to (Sturm *et al.*, 2008).

According to Angel-Urdinola and Tanabe (2012), the informal employment in the economies of the GCC countries accounted for about 20.2% of the GDP. Further, illegal immigrants constituted around 10% of the total population in each GCC country (Shah, 2009). This indicated that the contribution of the informal workers (particularly workers who work on their own) to the underground economic activities is greater than their

share to the official employment in the economies of the GCC countries (Angel-Urdinola & Tanabe, 2012). In fact, foreign workers engaged in underground activities in order to obtain quicker profit margins or to evade taxes.

2.2.2 Banking and Financial System

Although the GCC countries are classified as high income countries, the banking and financial sectors remained underdeveloped and dominated by the government and influential families (Olson & Zoubi, 2008; Hertog, 2012). For instance, influential families in Kuwait dominate the main Kuwaiti banks, such as the National Bank of Kuwait (NBK), Commercial Bank of Kuwait (CBK) and Gulf Bank (GB). In Saudi Arabia, the National Commercial Bank (NCB) and Saudi Arabian Monetary Agency (SAMA) are owned by the government. In the UAE, the Emirates Bank International (EBI), the National Bank of Abu Dhabi (NBAD) and Abu Dhabi Commercial Bank (ADCB) are owned by the government. In Qatar, Oman, and Bahrain, most of the banks are owned by the government (El- Quqa, Dash, Bokade, Sarma & Hasan, 2005; Khamis, Al-Hassan & Oulidi, 2010).

The banking and financial sectors played only a limited role in the economic development of the GCC countries. The investment activities of the banking sectors are controlled by the government and influential ruling leaders. Therefore, large financial companies are not listed or classified in the local stock markets in the GCC countries (Hertog, 2012). According to El-Quqa *et al.* (2005) the banking and financial system in

the GCC countries is controlled by influential families; therefore, their investment activities have been unchanged and undeveloped over the last few decades.

Additionally, the banking industry in the GCC countries has been unable to create more investment opportunities. The banking and financial sector does not share information or make disclosures; data on shareholdings are undisclosed and often unavailable to beneficiaries. It has a low business diversification and weak structural reforms, in particular privatization and market liberalization (Sturm *et al.*, 2008).

The stock market in the GCC countries is relatively small compared to international standards; trading conditions and foreign ownership are very limited. It is reliant on interest margins, and the nature of banking activities remained domestic. Although the banking and financial sector in GCC countries can be involved in many activities, it does not have the ability for liquidity creation in the economy (Al-Muharrami, Matthews & Khabari, 2006). In addition, the stock markets in GCC countries are controlled by retail investors. These retail investors imposed licensing restrictions on foreign banks (El-Quqa *et al.*, 2005).

Banks in GCC countries have a strong funding profile, and customers' deposits are the primary source of funding for the economic activities. However, the religious consideration of the depositors disrupted the activities of the banks to some extent; the majority of depositors are reluctant to accept interests on their deposits (Sturm *et al.*, 2008).

According to the Arab Monetary Fund (AMF) in its Unified Arab Economic Report (2008), the GCC economies saw rapid but stable credit growth in the private sector over the period of 2000-2006. The average contribution of the Private Sector Credit Growth to the GDP in the economies of the GCC countries, i.e., Saudi Arabia, Oman, Bahrain, Kuwait, the UAE and Qatar are 30.7%, 35.9%, 49.6%, 54.4%, 53.8% and 30.1%, respectively.

The banking system in the GCC countries has a good capitalization standard and high capital adequacy levels compared to the rest of the world, but it is still underdeveloped (Ayadi & De Groen, 2013). In recent years, the ability of the GCC banks to increase their capital locally has been very weak due to international and national crises, increasing leverage and rapid expansion of credit.

The economies of the GCC countries have enormous oil reserves. Nevertheless, the total capital of top 50 banks operating in the GCC at US$31.5 billion is relatively very small compared to that of the Hong Kong Shanghai Banking Corporation (HSBC) Holdings at US$35 billion (Al-Muharrami *et al*., 2006; Kern, 2012). In other words, the banking system does not have the ability to create or build enormous investment enterprises. As a result, the banking and financial sector of GCC countries are restricted in their investment activities as they are controlled by influential families over there (Ayadi & De Groen, 2013).

As for the domestic liquidity in the GCC countries, it has increased due to the growing government expenditures and financing of the activities of the private sector. The

banking and financial system in the economies of the GCC countries has a strong level of liquidity, as a result of the massive receipts of the higher prices of oil since the 1970s. But, the banking industry has been complacent in trying to attract depositors (El-Quqa *et al.*, 2005).

Indeed, due to the effects of the financial crisis in 2008, the main aim of the policy-makers in GCC countries has been to reduce liquidity risks. However, the banking system remained affected by the financial crisis (Arvai, Callen, Hasanov, Sidahmed, & Sommer, 2013).

The bear-market conditions in the global capital markets have prompted local investors in the economies of the GCC countries to repatriate their finances. This is in order to reduce the effects of outflow remittances as observed by the current account deficits in the balance of payments of the GCC countries[12]. Thus, the available liquidity should be economically invested in profitable investment activities, such as in regional equity and bonds issued by the GCC banks (El-Quqa *et al.*, 2005).

According to Kern (2012), the monetary authorities in the GCC countries should consider implementing structural reforms to develop the banking and financial system; first, by creating a competitive environment among local banks operating in the banking sector; second, encouraging and supporting the local equity markets to expand operations in the banking industry; third, promoting the efficiency of debt capacity of the financial corporations in the system; fourth, developing Islamic banking as a

[12] For example this can be found in the balance of payments of the countries under study.

competitive sector; fifth, providing economic conditions that are appropriate to the banking system to innovate and improve financial instruments; and finally, expanding and deepening investment activities of the private sector. In other words, these reforms confirmed the fact that the banking system in the economies of the GCC countries is not well-developed. With regards to the underground economy, the financial restrictions and regulatory burden imposed on the banking and financial systems in the GCC economies may exert pressure on the financial institutions to work in underground activities as the banking sector is controlled by the royal family; they have the monopoly to grant licences and impose or exempt taxes on the financial firms (El-Quqa *et al.*, 2005; Dabla-Norris, Gradstein & Inchauste, 2008). Since the financial firms have to undertake investment under such tight regulations, it may drive them to engage in underground economic activities.

2.2.3 Foreign Workers' Remittances

In recent years, the issue of outflow of remittances by foreign workers in the GCC countries has drawn the interest of GCC's policy-makers (Saif, 2009). GCC countries are dependent on oil revenues. With higher oil prices in the international markets, investors have increased their investment activities, reflected in the higher rates of economic growth of the GCC countries.

An increase in the volume of investment activities has increased the aggregate demand of the economies of the GCC countries since 1970 (Razgallah, 2008). This increase in the aggregate demand in turn has led to an increase in the demand for foreign labor (whether

skilled or unskilled). This has translated into more income for the foreign workforce and a huge outflow of money through remittances (Naufal & Termos, 2009).

The GCC countries have attracted foreign workers from different regions all over the world. In fact, GCC countries had to recruit foreign workers to help develop their economies and infrastructure. But the huge influx of foreign workers has now become a serious problem for GCC countries (Naufal & Termos, 2010). One of the problems is the huge outflow of money by these foreign workers. The huge outflow of money is a reflection of the massive immigration to the GCC countries.

The annual report of the World Bank Factbook (2011) on migration and remittances stated that Qatar, the UAE and Kuwait had the highest ranks of immigrants at first, third and fourth places of the top 10 immigration countries in the world in 2010, with 86.5%, 70% and 68.8% of their population, respectively. Bahrain, Oman and Saudi Arabia were included under the top 30 immigration countries around the world in 2010, having the ranks of 18th, 27th and 30th places at 39.1%, 28.4% and 27.8% of immigrants of their population, respectively.

The latest estimates of the World Bank indicated that the recorded remittances in the world in 2009 amounted to US$282.5 billion (World Bank Factbook, 2011). The outflow of money from GCC countries was US$ 61.57 billion in 2009. The GCC countries presented various levels of outflow remittance behavior in the world. For example, Oman emerged as the third highest remitting country from the top 10 sender countries in the world in 2009, with US$5.32 billion of remittances.

Kuwait, Bahrain and Saudi Arabia were ranked as the fifth, sixth and seventh in the top 10 sender countries, with US$11.75 billion, US$1.39 billion and US$26.47 billion, respectively (see Table 2.1). In fact, the outflows of money from the economies of the GCC countries illustrated the four major macroeconomic elements of the GCC countries: investment, consumption, imports and exports.

As observed in Table 2.1, the average size of the remittances of the GCC countries in 2009 was about 32% of its aggregate investments. The average remittances of consumption, imports and exports in the GCC countries are 15%, 20% and 14%, respectively. The largest sizes of remittances to total investments are about 77% in Kuwait, 38% in Oman and 28% in Saudi Arabia, while the smallest was 12% in the UAE. The size of remittances for the remaining two countries is 18% of its total investments. The volume of foreign workers in the GCC countries as a percentage of its total population was more than 50% in 2010.

There are several reasons that drive foreigners to remit their money home from the GCC countries. First, because of the excessive regulations and labor laws of the GCC countries, which do not allow foreigners to obtain citizenship in any of the GCC countries. Second, foreign workers are not allowed to own estate in the GCC countries. Finally, the labor laws in the GCC countries do not allow the less-skilled workers to bring their families. Thus, these restrictions forced foreign workers and expatriates to remit their money to their own countries in order to help their families or to be invested in some real estate (Termos, Genc & Naufal, 2012).

Table 2.1

Recorded Remittances from the GCC Countries (2009)

Countries	Remittances USD Billions	Remittances as a Percent of GDP	Population (Million)	Percent of Population as Migrants (*)
Saudi	26.47	6.70%	27.26	27.80%
Kuwait	11.75	10.73%	2.99	68.80%
Bahrain	1.39	6.75%	1.25	39.10%
Oman	5.32	11.53%	2.78	28.40%
Qatar	7.11	7.22%	1.75	86.50%
UAE	9.53	4.22%	8.93	70%
Total	61.57	-	44.96	

Countries	Remittances as a percent of Investment	Remittances as a Percent of Consumption	Remittances as a percent of Imports	Remittances as a Percent of Exports
Saudi	28.20%	17.66%	16.82%	13.62%
Kuwait	77.12%	18.58%	38.29%	19.04%
Bahrain	18.72%	13.22%	11.35%	9.40%
Oman	38.43%	20.02%	26.10%	20.37%
Qatar	18.54%	15.85%	23.12%	15.44%
UAE	12.32%	6.36%	5.42%	5.39%
Mean	32%	15%	20%	14%

Source: *Author's calculations based on Arab Monetary Fund Statistics (2008) and World Bank data, 2013. (*) data is for 2010.*

Based on the World Bank Factbook (2011), the recorded volume of remittances does not reflect the exact size of the total remittances to all the countries in the world; it is believed to be greater than that recorded. As for the GCC countries, Naufal and Termos (2009); and Taghavi (2012) suggested that the remittances that are not sent through financial and other formal institutions (such as Western Union) go unrecorded. Therefore, even the official estimates of the recorded remittances are underestimated in general.

Naufal and Vargas-Silva (2010), in their study on the transfer channels of money in the GCC countries mentioned that foreign workers send their money home using informal channels, through the *hawala* system (15%); or their friends (25%). Naufal and Vargas-Silva concluded that some friends of foreign workers in GCC countries can be *hawala* agents, but they reported their remittances as money sent through their friends.

In fact, Naufal and Termos (2010) argued that GCC economies are unique as their outflows of money constituted a large portion of the GDP. An increase of money transferred through illegal channels has led to an increase in the underground economic activities. Higher financial service cost[13] can also drive foreign workers to send their money home through informal intermediaries, such as their relatives and friends travelling home or through the *hawala* system. Therefore, it is likely that money laundering increases through the increased outflow of money (Naufal & Termos, 2010). Illegal workers have no way to access legal banking services which required that workers should be officially resident in GCC countries and the financial system should be well-developed between the sending and receiving country (De Brauw, Mueller & Woldehanna, 2013). Additionally, even if the worker is officially resident in the country and the transfer service cost is also not so high, informal or formal foreign workers face financial constraints to remit their money home which is less than their salaries.

In addition, the transfer of large amounts of money can lead the owners to be accounted for the sources of how they earned that amount. Thus, it is hard for informal workers to

[13] Globally, studies indicate that the cost of money transfer through illegal channels is cheaper than legal ones (Freund & Spatafora, 2008).

remit their money home through legal channels. The illegal channels are also less costly in comparison to the legal channels (Freund & Spatafora, 2008).

Therefore, workers prefer to send their money home through illegal intermediates, since there is no red tape restriction to send money in this way (Beine, Lodigiani, & Vermeulen, 2012). Thus, outflows of money via informal channels as part of the underground economic activities go undetected by the monetary authorities (Taghavi, 2012).

2.2.4 Taxation System

Over the past few years, policy-makers in the GCC countries have been seeking alternative sources to oil revenues to fund their expenditure. According to Ahmed and Al-Faris (2010) oil revenue is not sustainable. Hence, different kinds of sales taxes and excises have been imposed as alternatives to oil revenue.

The GCC countries have a very simple taxation law and an inefficient tax system dating back to the end of the 1980s. This system mainly relied on high taxes on the foreign companies, fees, tariffs and stamp and custom duties as the principal sources of non-oil tax revenues. Ahmed (2010) suggested that with agreements on free trade, the custom duties will eventually be replaced by the Value Added Tax (VAT). As mentioned earlier, the main alternative of taxes constitutes sales taxes, which include the tax on retail and manufacturers sales. This is may exert pressure on the taxpayers to elude taxes, and then increasing their demand for money in order to settle their transactions.

Under the taxation system of the GCC countries, several forms of taxes at various percentages are imposed. For instance, Saudi Arabia has been imposing corporate income tax on foreigners who are doing business as residents since 1975 at 20%. Withholding tax is also imposed on the payments of expatriates living there. This tax is at different rates ranging between 5% and 20% based on the nature of the payment. The employed capital of nationals is subjected to *zakat* at 2.5%. Gas investment companies are subjected to taxation rates ranging between 30% and 85%, while oil companies are subjected to 85% rate.

Before 2009, Kuwait imposed corporate income tax on foreign companies doing business at tax rates ranging between 0% and 55%. Currently, the tax levied on foreign corporate entities by the tax authorities is 15%. It is also compulsory for companies to retain 5% of the payments to the government authorities in order to settle their tax obligations.

As for Qatar, before 2009, the rate of corporate income tax was up to 35% on foreign entities, and it is obligatory for companies to retain 5% to 7% of payments to the authorities until the foreign companies settled their tax liabilities. After 2009, Qatari authorities levied a flat rate on taxpayers at 10%, based on the levels of income (Qatari Income Tax Law No.21, 2009). In Oman, local companies are subjected to 12% of their income above OMR30, 000, while foreign companies are required to pay above 30%. Oil companies are subjected to 55% tax. Other types of income that are generated from royalties, rental, fees and other activities are subjected to 10%.

The Bahraini taxation system mainly relied on the income of the branches of the foreign banks and oil production companies. The tax authorities in Bahrain levied on oil production companies a flat tax rate of 46% of their net profit. The system imposed on the Bahraini employees a tax rate of 7% in addition to 1% on the expatriates to cover the needs of the old system, the demised and unemployed people. Islamic banks doing business under the Islamic Sharia are compelled to pay 2.5% of its capital as Zakat.

In addition, the Bahraini authority levied 5% for the use of hotels by customers as tax. Indirect taxes take the form of duties, such as import, customs and excise duties (Terterov & Shoult, 2005). In the UAE, each Emirate has its own policy on the imposition of taxes. For example, in Abu Dhabi, tax is imposed on companies operating in any economic activity.

The tax imposed on oil companies relied on agreements between the oil companies and the government by decree of the Emirate, while banks are obliged to pay 20% of their profits (Mezu, 2008). As for corporate income tax, in Abu Dhabi, the taxpayers are forced to pay 50% of their income above AED 5 million, while in the Fujairah emirate, taxation is applied at a flat rate of 50%. The tax imposed on capital is the same as the rate of corporate income, while custom duties are enforced at 5%. The GCC countries planned to implement the VAT as a new reform in their taxation systems in order to establish a stable revenue base (Mezu, 2008).

In fact, tax obligations in GCC countries, particularly in Saudi Arabia since 1975, came from its need to recruit a huge number of foreign workers to develop its economy and infrastructure (Almutairi, 2014).

However, the amount of revenue from various non-oil taxes has created significant distortions and led to restricting foreign direct investment and trade in the GCC countries (Ahmed & Al-Faris, 2010). The sources of non-oil tax revenues in the GCC countries included taxes, custom duties and other non-oil revenues from non-taxes. Table 2.2 provided the growth rates of non-oil revenues to the GCC countries' GDP in terms of percentage over the period of the study.

Table 2.2

The Growth Rates of Non-oil Revenues to the GCC Countries' Gross Domestic Product in Terms of Percentage over the Period of 1990-2010

Year	Saudi	Kuwait	Qatar	Oman	UAE	Bahrain
1990	8.5	5.6	11.3	6.4	5.4	11.2
1991	9	0.9	13.6	6.8	7.1	11.8
1992	7.6	2.6	14.9	7.1	8.4	12.5
1993	7.3	3.9	16.2	7.6	6	11
1994	6.8	5.3	14.2	7.9	6.7	11.5
1995	7.8	3.9	15.8	7.9	7.5	11
1996	7.4	3.8	15.5	8.2	10	10.5
1997	7.5	4.9	14.1	7.5	10.1	11.9
1998	11.5	5.1	20.5	10	11.9	12.7
1999	7.2	5.9	9.8	8.9	8.7	11.6
2000	6.3	3.9	9.9	6.5	8.6	9.4
2001	6.5	7.5	11.3	7.8	5.5	9.1
2002	6.7	5.7	14.8	9.5	4	9.3
2003	7.9	5.7	12.9	10.9	7.2	8.1
2004	6.7	4.2	16.3	9.3	8.2	7.9
2005	5.2	3.3	13.6	8.1	10.3	7.2
2006	5.3	2.8	13	8.2	11	6.6
2007	5.8	3.7	16.3	9	11.1	5.3
2008	5.7	3.5	14.7	7.1	8.1	3.4
2009	5.5	3.4	24.4	8.5	7.1	3.6
2010	4.5	3.8	12.8	6.9	6.1	3.8
Average	**7.1**	**4.3**	**14.6**	**8.1**	**8.1**	**9.1**

Source*: The General Secretariat of the GCC Countries and the Central Banks' annual economic reports of the GCC countries over period of study.*

From Table 2.2, the highest percentage of growth rate of non-oil revenues to the GDP in the GCC countries is in Qatar and Bahrain. It amounted to 14.6% and 9.1% on average over the period of 1990-2010. The average rate was 8.1% in both the UAE and Oman, followed by an average rate of 7.1% in Saudi Arabia. Kuwait had a lower percentage rate of 4.3%. It is observed that the average percentage rate of non-oil revenues is less than 15%, except Qatar, where the average rate was around 20% in 1998 and remained on a high level over the later period of the study.

There is a consensus among researchers that taxation is costly to owners of business firms in the private sector (Cesaroni, 2014). Thus, it is the main driving force for individuals to work in underground economic activities. Most previous studies have stated that taxation and the underground economy move together - when the tax burden increases, illegal activities of the underground economy also increase to avoid the high tax compliance costs (Fugazza & Jacques, 2004; Choi & Thum, 2005; Gillman & Kejak, 2006).

In the case of GCC countries, the underground economic activities may be due to the unfair taxes and labor market restrictions. Businesses only remain in the official economy to obtain benefits from the public services provided by governments (Choi & Thum, 2005). A taxpayer's decision to evade taxes is due to excessive regulations, corruption and inequality of the tax burden levied by authorities. Additionally, the firms' resentment of the governments may push them to engage in illegal activities as the governments do not support the infrastructure services that can facilitate the marketing of their products in the official economy.

2.2.5 Corruption

Over the past two decades, the problem of corruption has attracted much interest among officials all over the word. Each country has its own level of corruption, and the countries of the GCC are not without exception. According to Al-Bassam (2011), Saudi Arabia, as the largest country in the gulf region, has serious problems of corruption; it scored 3.5 of 10 in 2008 in terms of the Corruption Perception Index (CPI), which is measured on a scale from zero (highly corrupt) to 10 (highly clean) (Transparency International Berlin, 2008).

The widespread corruption in Saudi's society is due to the violations of the rule of law where influential members of the royal family, businesses and ministries or religious *ulama* are above the law. A strong reason for the existence of high levels of corruption in Saudi Arabia is that the rulers have absolute control over the law. Further, the members of the royal family hold senior administrative positions in the government without any competencies or qualifications to do so, in a way that can create resentment of people and drive up the corruption level (Al-Bassam, 2011).

Nevertheless, there are appeals and attempts to implement reforms in the administrative and political system. Saudi Arabia has established a commission of anti-corruption for supporting the government's efforts to fight corruption (Ahmed, 2012). However, it was a just a propaganda of King Abdullah and failed. The failure to implement major reforms in the country is because some of the powerful members are against the reforms (Al-Bassam, 2011).

In Kuwait, the CPI was 4.1 out of 10 in 2009; and 4.5 of 10 in 2010. Globally, Kuwait was ranked 54th out of 180 countries and the second in the gulf region with 4.6 of 10 points in 2011. Manifestations of corruption are notable through the generated oil revenues, whereas the sources of income are limited (AL-Hussaini, AL-Mutairi, & Thuwaini, 2013).

According to Bertelsmann Stiftung's Transformation Index BTI (2012) in its report on Kuwait, the royal and merchant families dominated the main economic activities in the country; in addition, nepotism and favoritism are also prevalent. Thus, the administrative decisions by members of the royal family are often arbitrary and can lead to increased corruption.

In Qatar, corruption is less, compared to the other Gulf countries for a number of reasons. First, in Qatar, people looked at corruption as a crime and offense. Second, the higher salary of employees played a useful role in reducing corruption, whereby the mainstream Qatari labor force is employed by the public sector. Finally, the country's laws do not allow officials to use their official posts for their own benefits (Bertelsmann Stiftung BTI, 2014).

In Oman, the CPI of Transparency International was 5.5 of 10 in 2009; and 5.3 of 10 in 2010 (Buckley & Rynhart, 2011). Corruption is a serious problem in Oman, especially among top officials (Bertelsmann Stiftung BTI, 2014). According to Buckley and Rynhart (2011), in the Sultanate of Oman, the powerful families dominated the

commercial sector and the Sultan's family had the power to control the system in the country.

For example, some members of the royal family are engaged in businesses through contracts with the public sector. According to Bertelsmann Stiftung BTI (2012), "Four of Oman's largest business groups are dominated by the Minister or *Diwan* of the Royal Court, the Minister of Tourism and two special advisers to the Sultan, either personally or through their close relatives (brothers and children)''.

This uneven distribution of power led to the creation of several levels of corruption in the Sultanate. Some serious cases of corruption recently led to the dismissal of several senior officials. The ability of the Omani government to fight corruption is very limited compared to Qatar and the UAE (Buckley & Rynhart, 2011).

Based on the reports of Transparency International Bangladesh (2009); and Transparency International Berlin (2010), CPI in the UAE was 6.5 of 10 and 6.3 of 10 in 2009 and 2010, respectively. There is a concentration of power in the hands of the royal family and the rulers of the UAE have absolute power to make decisions. Further, the participation of members of the ruling family in all senior government positions and the domination of other institutions are indicative of widespread corruption in the UAE (Bertelsmann Stiftung BTI, 2012). Although the government of the UAE has instituted anti-corruption laws, the implementation is ineffective because senior officials are reluctant to disclose their finances.

In Bahrain, the CPA was 4.9 of 10 in 2009 and 5.1 of 10 in 2010 (Transparency International Bangladesh, 2009; Transparency International Berlin, 2010). Despite the existence of anti-corruption laws, high levels of corruption existed among the senior officials; they took over lands or public funds through corrupt means. Besides, the governments offered license impunity for influential members of the royal family or people who are close to them (Bertelsmann Stiftung BTI, 2012).

The interaction between corruption and the underground economy occurred when the members of the royal family practice indirectly the same activity of the owners of business firms. In this situation, the owners of business firms have the option of working in the underground economy to avoid tax or excessive regulations imposed by the authority (Choi, & Thum, 2005). Hence, a higher level of corruption in GCC countries is one of the major reasons that induce individuals to participate in underground economic activities.

2.2.6 Unemployment

In the recent two decades, the issue of unemployment became the biggest problem of policy-makers in the GCC countries (Al-Qudsi, 2006; Forstenlechner & Rutledge, 2010). The rate of unemployment varies from one country to another in the Gulf region. For instance, the estimated rates of unemployment in Saudi Arabia were 6.05% in 2005 and 10% in 2010.

In Kuwait, the rates were 1.67% in 2005 and 2.1% in 2010. In the UAE, the unemployment rates were 2.5% in 2005 and 4.3% in 2010. The unemployment rates of Oman were 7.5% in 2005 and 15% in 2010. The unemployment rates of Bahrain and Qatar in 2005 were 3.4% and 2%, while in 2010, they were 3.8% and 2.3%, respectively (Permanent Population Committee, 2008; Annual Economic Reports of GCC Banks, 2010).

The problem of unemployment is increasing over time in the GCC countries for many reasons. First, the output of the education system of the GCC countries does not meet the needs of the public or private sector, besides an ineffective policy toward the restriction of massive immigration (Shediac & Samman, 2010).

Second, the domination of foreign workers in the labor markets irrespective of public or private sector. For example, in Saudi Arabia, two-thirds of the total workforce was foreigners and more than 88% of foreign workers were working in the private sector (Forstenlechner & Rutledge, 2010; Alanezi, 2012). Third, the reluctance of the national labor force to work in professions that require physical effort. Finally, the cheap wages of skilled foreign expatriates compared to the local workforce which make business owners prefer foreign workers; besides, they are willing to work in any environmental condition (Al-Qudsi, 2006). Nevertheless, the GCC countries have tried to create new job opportunities through economic diversification programs to increase employment opportunities for local workers. However, their efforts to solve the unemployment issue have not been very fruitful.

Indeed, the unemployment problem is mainly caused by the reliance of the GCC economies on the huge number of foreign workers who accept lower wages, more skillful and can adapt better; therefore, it is very difficult for the GCC countries to replace them with the national workforce (Shediac & Samman, 2010). In other words, although the GCC governments have adopted some processes of localization to reduce the extent of unemployment, the efforts will be ineffective if working conditions in the private sector are not enhanced simultaneously (Mashood, Verhoeven, & Chansarkar, 2009).

It is argued that the unemployment problem and the expansion of informal activities are two faces of the same coin in the developing countries (Charlot, Malherbet & Terra, 2015). The problem of unemployment in GCC countries can drive workers into underground economic activities. The manifestation is reflected within the expanded informal economic activities such as illegal workers in the labor markets of the GCC countries which relied on the foreign workers[14].

The unemployment problem in the region was also attributed to three causes: demographic, economic and socio-cultural (Gulf Investment Cooperation, 2012). Demographically, more than 50% of the national population in 2008 comprised foreign workers (Winckler, 2010; Naufal & Termos, 2010). Economically, unemployment is associated with informal employment of foreigners in the private sector. The national workers do not want to work in the private sector due to the low pay, particularly the

[14] According to Shah (2009) the manifestations of the informality in the GCC countries are attributed to unemployment problem and tight restriction stem from visa trading, over staying, trafficking and smuggling.

more educated workers who look for more suitable job opportunities in the public sector. Finally, the socio-cultural' perspective of nationals of the GCC countries looked beyond the nature of available jobs in the private sector. Thus, a huge number of unemployed workers and a lack of suitable jobs in the public sector may induce the local workers to engage in illegal activities besides illegal foreign workers.

2.2.7 Inflation Rate

In recent years, the rising inflation rates in the GCC countries have attracted the attention of economists (Hasan & Alogeel, 2008). According to Ziaei (2013) inflation in the GCC countries has increased since 2002 and has reduced the purchasing power of consumers. The rates of inflation in all GCC countries in 2008 were 10% in Saudi Arabia; 3.5% in Bahrain; 10.6% in Kuwait; 12.5% in Oman; 15.1% in Qatar; and 12.3% in the UAE (Saidi, Scacciavillani & Prasad, 2009). Table 2.3 illustrated the inflation rates from 2002 to 2010 in the GCC countries.

Table 2.3

Inflation Rates in the GCC Countries (2002-2010)

Year	Saudi	Kuwait	Qatar	Oman	UAE	Bahrain
2002	0.2	0.9	0.2	-0.3	2.9	-0.5
2003	0.6	1.1	2.3	0.3	3.1	1.7
2004	0.3	1.3	6.8	0.9	5.1	2.4
2005	0.7	4.2	8.8	1.9	7.1	2.6
2006	2.2	3.1	11.8	3.2	11.3	2.01
2007	4.1	5.5	13.8	5.9	11.1	3.3
2008	9.9	10.6	15.1	12.5	12.3	3.5
2009	5.06	3.95	-4.87	3.54	1.56	2.79
2010	5.35	4.01	-2.43	3.26	0.88	1.97

Source*: World Bank and Annual Reports of the Central Banks of the GCC countries in 2010*

As observed in Table 2.3, the inflation rates in GCC countries ranged from an average rate of 2002 to higher level of 2006 at the end of the period under review. For example, the inflation in Saudi Arabia has been less than 1% since 2002 until 2005 and it increased from 2006 to 2010. Kandil and Morsy (2011) stated that the average rate of inflation in all the countries of GCC was 11.5% in 2008, which was greater than the average rate of 6.3% in 2007. The rate decreased in 2009 because of the impact of the global financial crisis. The rates of inflation increased again in 2010 (Altowaijri, 2011). In line with the literature, there are several causes of inflation in the GCC countries. For instance, the sources of inflation in the economies of Saudi Arabia and Kuwait were attributed to some local and foreign factors, including an increase in the domestic demand, demand and supply of money, supply shocks, increase in the oil prices and the decrease of the dollar price as most GCC countries pegged their currencies to the US dollar.

Therefore, the inflation rates in GCC countries were affected by fluctuations in the prices in the global market. Moreover, an increase in the prices of imported goods is one of the sources of inflation in GCC countries (Hasan & Alogeel, 2008; Altowaijri, 2011).

Kandil and Morsy (2011) found that the main source affecting inflation in the GCC countries is the oil revenue. Sturm *et al.* (2008) and Termos *et al.* (2013) suggested that the main causes of inflation in the GCC countries were the money supply through issuance of new banknotes, the prices of imported commodities, economic growth and the higher prices of oil in the global markets. Besides that, in Qatar, Oman and the UAE, the higher levels of wages in the private sector and the general prices were the main drivers of the inflationary rate.

In the literature, the high inflation rate exerted pressure on individuals to engage in black market trade (Ercolani, 2000). In case of an increase in inflation, the firms spent their money faster at current prices rather than holding it at the future prices as money loses its purchasing power. With the turnover of investors in the underground economic activities, the demand for their products led to increase in the underground output relative to the official sector. Hence, inflation increased tax evasion since their new products are not accounted and taxed (Ahiabu, 2006). Indeed, inflation had its cost on the evaders as they can avoid taxation by resorting into underground economic activities. However, they cannot elude the inflation tax, since, evaders demand cash to perform transactions (Ercolani, 2000).

2.2 Conclusion

This chapter presented some of the key macroeconomic indicators that have led to the emergence of the underground economic activities in GCC countries. It may help in deeping the understanding of the nature of the underground economic activities in the countries of interest. This aspect has not been studied in the economies of the GCC countries. From a macroeconomic perspective, however, these few pointers could be considered as indication for the emergence of the underground economy phenomenon in the GCC economies.

CHAPTER THREE

LITERATURE REVIEW

3.1 Introduction

Currently, there is renewed attention globally in the measurement and analysis of the underground economy phenomenon using the CDA. This chapter is devoted to provide a conceptual and theoretical framework on the phenomenon of the underground economy. The chapter reviewed the extant literature on the magnitude of the underground economic activities in some countries that have used the CDA. It also summarized an overview of the CDA evolution, as well as the gaps in the literature as follows:

3.2 Conceptual and Theoretical Framework of the Underground Economy

To date, there is no consensus among authors about how the underground economy is defined (Schneider & Hametner, 2014). Each definition looks upon underground economic activities from one perspective and ignores the other. Thus, definition of the underground economy is still an unresolved issue among economists. This can be observed from several names for the underground economy such as unrecorded economy, shadow economy, second economy, cash economy, unobserved economy, hidden economy, irregular economy, black economy, dual economy, illegal economy, informal economy, unofficial economy, parallel economy, etc.

In the existing literature, the term used for the underground economy depends on the objective and the methodology used in estimating the size of the phenomenon

(Asamiew, 2010; Asante, 2012). For example, the definition of the underground economy based on the classification of transactions from the monetary and non-monetary prospective has been noted in the literature, as shown in Table 3.1.

Table 3.1

Classification of the Underground Economic Activities

Type of activity	Monetary transactions		Nonmonetary transactions	
Illegal activities	Trade with stolen goods, drug dealing and manufacturing, prostitution, gambling, smuggling, fraud, and so forth.		Barter of drugs, stolen goods, smuggling, and so forth. Produce or growing drugs for own use. Theft for own use.	
	Tax evasion	Tax avoidance	Tax evasion	Tax avoidance
Legal activities	Unreported income from self-employment; wages, salaries, and assets from unreported work related to legal services and goods.	Employee discounts, fringe benefits.	Barter of legal services and goods.	All do-it-yourself work and neighbor help.

Source: taken from Asiedu and Stengos (2014).

Table 3.1 outlines that the activities of the underground economy consist of the non-disclosed income to the authorities, which are mainly generated from the goods and services produced in the formal economy, either from monetary transactions or trade by barter.

In line with the theoretical works, the concept of the underground economic activities refers to the legal or illegal activities which are related to tax evasion and not reported in

the statistics of the national income accounts of the GCC countries. Based on Drummond, Ethier, Fourgere, Girard, and Rudin, (1994), Tedds (2004), Hernandez (2009) and Asamiew (2010), "underground economic activities are all the economic activities (whether legal or illegal, market and non-market) that add value to the Gross Domestic Product (GDP) but are not reported to tax authorities and not observed in the statistics of the national income accounts".

This study considered activities included as underground economy as the illegal economic activities, the unmeasured portion of the formal activities and all other economic activities that are measured but go unrecorded. At the same time, the study agreed with the statement that it is not necessary that the underground economy only consists of illegal economic activities; many legal activities can also be part of the underground economy. For example, a teacher who is teaching outside his/her official classes may be contributing to the underground economy if his/her income is not reported to tax authorities (Greenidge, Holder & Mayers, 2009).

Generally, the main theories of the underground economy indicate several factors that influence people to engage in underground economic activities. They list tax burden, the social security contributions, corruption, budget deficit, increase in inflation and interest rates, unemployment, the weakness and complexity of the tax system, poor public sector services, excessive government regulations, higher cost of remittance from remitting country to receiving country and the attitude of taxpayers towards the government (for example, Torgler & Schneider, 2009; Feld & Schneider, 2010; Schneider, 2012; Schneider & Buehn, 2013; Schneider, & Hametner, 2014).

With respect to factors that may contribute to the existence of the underground economy, the tax burden in particular, is still the main factor that can induce people to contribute to underground economic activities (see for example, Schneider & Enste, 1999, 2000; Schneider, 2004, 2005; Schneider & Savasan, 2007; Macias & Cazzavillan, 2009; Hernandez, 2009; Buehn & Schneider, 2009; Ene & Stefanescu, 2011; Schneider, 2012), since taxes affect labor-leisure choices, and also motivate labor supply into the underground economy.

Some of the empirical results of the impact of the tax burden on the underground economy is provided in the studies of Schneider (1994, 2000, 2005) and Johnson, Kaufmann and Zoido-Lobatón (1998); they all found statistically significant proof for the effect of taxation on the underground economy. Since, the underground economic activities in most cases involve the evasion of taxes. In spite of the negative impact of the underground economy on the macroeconomic policy variables of the official economy, the growth of the underground economic activities are connected to its positive effects on employment opportunities and the distribution of income.

It is recognized among the economists that the underground economy has its development from the changes in the macroeconomic fiscal and monetary policy variables. Thus, the methodology used for quantifying the size of the underground economy in each country depends on the socio-economic characteristics of the certain country. The measurements of the underground economic activities become different by countries. The methods are classified into three major categories, namely: the model

approach, direct method and indirect method (see for example, Fethi *et al*., 2006; Dell'Anno and Halicioglu, 2010).

The model approach is based on statistical theory which attributed the size of the underground economy as a latent variable though some causes were linked to some indicators. A widely used method of this type is the Multiple Indicators Multiple Causes Model (MIMIC) which is a special Structural Equation Modeling method (Dell'Anno, 2007; Barbosa, Pereira & Brandão, 2013).

The direct method estimated the volume of the underground economy through survey questionnaire and auditing of taxation that are conducted by the tax authorities using samples of the economy or of a certain sector. The reliability of these surveys depends on the answers given by the respondents. The problem is that the individuals involved in underground activities will not want to be identified by government authorities. As such, the answers given in response to the questions would be invalid. Thus, this method is neither easy nor preferred for measuring the underground economic activities (Hernandez, 2009).

Finally, the indirect method measured the magnitude of the underground economic activities based on macroeconomic variables data. There are three categories of the indirect method: monetary approach, physical input approach that assumes the consumption of electricity compared to GDP is the good indictor on the underground activities and the approach that looks for discrepancies between macroeconomic variables data that are used based on national accounts. For example, the discrepancies

between income and expenditure in the economy (Dell'Anno & Halicioglu, 2010). In this context, the CDFM of an indirect monetary approach is the most popular method in the literatures to estimate the volume of the activities of the underground economy (Asante, 2012; AnaMaria *et al*., 2009; Pickhardt, & Sarda, 2006). Besides, it is an appropriate technique to the conditions of the emerging economies to evaluate the size of the underground economy in terms of currency.

3.3 Selected Review of Previous Studies

According to Embaye (2007) previous studies have ignored the estimation of the underground economy phenomenon in developing countries. Furthermore, the estimation of the underground economic activities in the developing countries using direct methods is very hard. This is attributed to the nature of informal activities. Thus, the CDA is a widely used method to estimate the underground economic activities in developing countries, such as the GCC countries. It may help to understand the picture of the size of the underground economic activities, such as tax evasion and the massive outflow of money through remittances by foreign workers in the GCC countries.

It is observed that over the last six decades, many studies have covered the underground economy phenomenon; however, these studies have not used specific methods, or a particular illegal activity. These studies have focused on the factors that contribute to the emergence of the underground economic activities. This subsection introduced a critical review of the literature on the underground economy for some countries that have applied the CDA to quantify the volume of the underground economic activities to the

size of its official GDP. The variables employed to estimate the underground economy in relation to the formal economy in those countries are considered.

A common consensus among economists is that the CDA is the most and widely used as a measurement to quantify the volume of the underground economic activities (See studies of Chipeta, 2002; Schneider, 2002; Schneider & Bajada, 2003; Fethi, Fethi and Katircioglu, 2006; Chiumya, 2007; Georgiou, 2007; Greenidge *et al.*, 2009; AnaMaria *et al.*, 2009; Asaminew, 2010; Arby, Malik & Hanif, 2010; Asante, 2012; AnaMaria, 2013; Agbi, 2014; Berger, Pickhardt, Pitsoulis, Prinz, & Sardà, 2014). According to Hernandez (2009), the first attempt to investigate the factors that can drive people to hold a proportion of their income in the form of cash was proposed by Cagan (1958) in the United States (US) over the period of 1875 -1955. The factors were opportunity cost of holding money, real income per capita, the size of retail trade, the extent of travel per capita, the degree of urbanization and the tax rates on the transactions.

Through these factors, Cagan tried to explain the behavior of individuals in their demand for currency of the money supply over the period. Cagan suggested that all the factors contribute to the holding of cash by individuals, but he stressed that the higher tax rate on the transactions was the main factor that stimulates people to increase their currency use in order to hide taxable transactions. In his model, the currency demand for money was regressed on the expected real income per capita, interest rate on deposits and the tax rate on income.

From his study, Cagan also suggested that the increase of currency demand was attributed to black market activities in the US during the period of the Second World War. Besides, the black market drove individuals to evade taxes. He reported that the size of the underground economy was estimated to be US$21 billion and US$25 billion in 1945 and 1950, respectively, equal to 50% to 60% of the total unincorporated business income. Despite pioneer efforts shown by Cagan in investigating the determinants of currency demand, particularly the relationship between income tax rates and currency demand, Cagan did not report anything about the diagnostic statistic tests associated with his underlying model.

Following this, many studies have been conducted on the US economy. For instance, Gutmann (1977) estimated the volume of the underground economy in the US over the period of 1937-1976 based on four fundamental assumptions. First, the massive regulations and higher rates of tax are the main reasons that can drive people to underground economic activities. Second, cash is only used as a medium to perform transactions in the underground economy, and the excessive use of money is an indication of the expansion of the underground activities, including tax evasion. Third, there is a benchmark to calculate the size of the underground economy even if the underground economy does not exist; since its volume is established based on the ratio of currency to demand deposits. Finally, the money velocity of income is assumed to be the same in both economies, formal and informal economy; computing the volume of the underground economy is obtained by multiplying the velocity of money with the value of illegal money (Ahmed & Ahmed, 1995).

Isolating the impact of the government regulations and increased rates of tax Gutmann (1977) showed that the increase in demand rate of deposits are directly the result of the extra amount of cash used in the underground economy. Gutmann calculated the extent of the underground economy based on a benchmark for the period from 1937 to 1941 and introduced a disturbing estimate of the underground economy of about US$ 200 billion. The study finally quantified the amount of cash to demand deposits for 1976.

Gutmann (1977) hypothesized that knowing the magnitude of demand deposits in its actual values is required for the estimation process. He then estimated the excessive cash as extra currency associated with the underground economic activities by taking the difference between the benchmark and the ratio of currency to demand deposits for 1976. Thus, Gutmann obtained the estimate of the size of the underground economy by excessive money multiplied by the ratio of formal Gross National Product (GNP) to legal money.

Feige (1979) criticized Gutmann's first assumption. He argued that the first assumption of Gutmann is not real and it is contestable, where a lot of illegal currency is remitted abroad and is then returned to the country by creation of loans by economic agents. Therefore, creation of loans for individuals can drive the demand deposits and has an impact on both the numerator and denominator of the money rate to the demand deposits ratio. Besides, illegal transactions can be settled by cheques (Feige, 1979).

The criticism of the second assumption is that the tax rates were not high to be intensive compared to unrecorded income. Feige (1979) also criticized Gutmann's third

assumption; since the ratio of currency to demand deposits fluctuated over time due to regulations and changes in the rate of taxes. Finally, the criticism of the fourth assumption is that Feige (1979) did not agree that the money velocity of income is the same in both economies; Feige was of the view that the velocity in the informal economy is much more integrated than in the legal economy. It must be noted that Gutmann (1977) explained his method to estimate the volume of the underground economy in the US over the period of his study without consideration of any statistical procedures and the effectiveness of the fluctuation of prices. Gutmann was only interested in investigating the relationship between the demand ratio of currency and demand deposits over the period of his study.

Other studies have been conducted by Tanzi (1980; 1982; 1983) for the US economy. Tanzi (1980; 1983) introduced an econometric model of currency demand function based on the earlier work of Cagan (1958). The basic idea of Tanzi was to establish a link between the demand ratios of money in relation to increased rates of the tax burden, and employed it to derive new estimates of the volume of the underground economy in the US.

Tanzi's method was based on two assumptions: first, the existence of the underground economic activities is attributed to the high tax burden; and second, increased use of money is mainly due to conformity to illegal transactions or storing wealth. In his model, Tanzi used the demand rate of currency to the money supply as the dependent variable. The independent variables were the ratio of personal income tax to disposable income net of transfers, top-bracket statutory tax rate, the rate of weighted average tax on interest

income, wages and salaries in personal income, interest rate on time deposits, real income per capita that is measured as permanent and as actual income and one-lagged dependent variable. Based on Tanzi's model, it is observed that the currency demand function is applied as a measurement to quantify the underground economy as it linked the changes in the tax level to changes in the demand ratio of money. Tanzi's model was tested for the period of 1929-1976, but Tanzi reported the estimation of the underground economy and tax evasion in the US for the period of 1970 to 1978. In addition, the Durbin-Watson (DW) test with the inclusion of one-lagged dependent variable and R-squared criterion are not the best to measure or examine the capability of the model, (Austriou & Hall, 2007). Thus, the estimated figures of the underground economy may be debatable.

Schneider (2002, 2005); Schneider and Klinglmair (2004a, 2004b); and Schneider (2004c) estimated the volume of the underground economy in 110 and 145 developing, transition and OECD countries using different methodologies over two different periods. The main methodology employed was the CDA with its determinants as developed by Tanzi (1980, 1983). The dependent variable was the ratio of currency in circulation to the money supply regressed on its explanatory variables, such as the weighted average of tax rates, wages and salaries as a proportion of national income, interest rate on savings and the per capita income. Schneider with his co-author concluded that over the period of 1999-2000 in 110 countries, the average size of the underground economy as a percentage of Gross National Income (GNI) was 41% in the developing countries; 38% in transition countries; and 18% in the OECD countries. Over the period of 1999-2003 in 145 countries, the average size of the underground economy was at 39.1% in the

developing countries; 40.1% in transition countries; 16.3% in the OECD countries; and 21.8% in three communist countries. The observation is that since they applied the traditional CDA, they assumed that the money velocity of income is the same in both economies (shadow and formal). In addition, they reported the final estimate of the underground economy in all those countries individually and as groups. Schneider with his co-author did not report the estimation of currency demand function; thus, their estimates may be disputed. Pickhardt and Pons (2006) estimated the underground economy in Germany applying the CDA for the period of 1980-2001. In their model, the currency demand was the dependent variable. The explanatory variables were GDP, consumer price index as a measure of the inflation rate, interest rate, tax rate and two dummies for German republic and the establishment of the euro system.

In their estimates, they assumed that the underground economy is zero in the base year and the money velocity of income in the underground economy differed from that in the formal economy. They formulated that the extent of the underground economy is a function of tax rate and official GDP. The estimated coefficients were statistically significant. The size of the underground economy steadily increased from 9.41% of the GDP in 1980 to 15.61% in 2001. It is noticed that they did not report any statistical tests that can investigate the relationship between the underlying variables included in the long-run estimation. In addition, the sample size of 22 observations is small; thus, it is not good for the analysis of the phenomenon of the underground economy compared to the bigger size of the German economy.

Based on this view, it is obvious that the size of the underground economy is much bigger in developing and transitional countries compared to others. Thus, this study focuses more on the available literature on a country basis in developing and transition countries. For example, Ahmed and Ahmed (1995) and Ahmed and Hussain (2008) applied CDA to estimate the underground economy and tax evasion in Pakistan using the same variables. They used currency in circulation to money supply as a dependent variable, while the explanatory variables were the ratio of total tax revenues to GDP, interest rate on time deposits and a dummy variable as a proxy for tax reforms over different periods of 1960 -1990 and 1960-2003.

In Ahmed and Ahmed (1995), the dummy of the tax reforms was given a value of '1' for the period of 1960-1971, and for the period of 1997-2003 in Ahmed and Hussain (2008). In their studies, the estimated coefficients were statistically significant at the 5% level. For instance, Ahmed and Ahmed (1995) found that the size of the underground economy in Pakistan was one-third of the GDP; while the size of the tax evasion was between Rs 40 billion to Rs 45 billion over the period of 1989-90.

Ahmed and Hussain (2008) found that the underground economy fluctuated over the period. For example, the size was at a declining level of 30% from 1960 to 1964; varied between 60% and 70% from 1965 to 1975; and declined again by 56% from 1980 to 1986; 39% in 1988; and 28% in 1993. The main note here is that both of the studies neglected including the GDP as a significant variable that can affect the currency demand function. In addition, they did not report the statistics that can measure the fitness of the currency demand model as a measurement of the underground economy.

Furthermore, a higher R-squared may exhibit misleading or spurious inference on the relationship between the explanatory and dependent variables (Austriou & Hall, 2007). In both studies, the issue of stationarity and cointegration was not considered by the authors; in fact, the determination of the order of included variables through stationarity analysis and an investigation of the long-run relationship between the dependent variable and its explanatory variables are needed in terms of time-series data analysis.

Employing Tanzi's method with some modification, Aslam (1998); Yasmin and Rauf (2004); and Kemal (2007) estimated the size of the underground economy and tax evasion in Pakistan in different periods of 1960-1998, 1974-2002 and 1974-2005, respectively. In their studies, Aslam (1998) used the independent variables, such as the total tax revenue, interest rate on time deposits, the growth rate of the real GDP and dummy variable of the changes in the monetary policy taking the value of '1' for the period of 1990-1998; while the dependent variable was currency in circulation and a foreign currency account.

In Yasmin and Rauf (2004), the dependent variable was the ratio of currency in circulation to the money supply, while, the independent variables were the total tax revenue, the growth rate of the real GDP, interest rate on time deposits, banking services, GDP at current prices and the lagged currency in circulation to the money supply. In Kemal (2007), the dependent variable was similar to the variable in Aslam (1998), while the independent variables were total tax revenue, GDP at current prices, the growth rate of the real GDP, banking services, inflation rate and a dummy taking the value of '1' for

the period of 1990-2005, the lagged currency in circulation and a foreign currency account to money supply.

Aslam (1998); and Yasmin and Rauf (2004) used similar independent variables, such as total tax revenues, interest rate on time deposits and the ratio of economic growth. Kemal (2007) used currency in circulation plus foreign currency account as the dependent variable. Yasmin and Rauf (2004) and Kemal (2007) were similar in their use of the dependent variable in terms of using the lagged dependent variable as independent variable and also total tax revenues. Kemal (2007) differed from Aslam (1998); and Yasmin and Rauf (2004) in using the ratio of inflation as independent variable. In all these studies, the estimated coefficients were statistically significant except the variable of growth rate in Yasmin and Rauf (2004).

In Aslam (1998), the estimates indicated the large size of the underground economy in Pakistan, where it was 29 % of the GDP in 1960 and increased to 43% of the GDP in 1998. In 1976, it decreased to its lowest level of 27% of the GDP, and amounted to its highest level of 52.6% and 53% of the GDP in 1981 and 1991, respectively. On the other hand, the total value of the tax evasion was 84% of the budget deficit over the period. In Yasmin and Rauf (2004), the size of the underground economy fluctuated between 15.22% in 1974 and 30.7% of the GDP in 1995. It was at its highest level of 43% of the GDP in 1997, and it declined to 32% in 2002.

On the other hand, the size of tax evasion gradually increased from Rs 1,562 million in 1974 to reach RS 152 billion in 2002. The size was at 40% in 1974 to 11% of the GDP in

2002. In Kemal (2007), the size of the underground economy was 22.4% of the GDP in 1974. It increased to 34.7% of the GDP in 1984, but it declined to 27.3% in 1991. However, it increased rapidly between 1991 and 1998 to its highest level of 57.1% in 1998 but declined to 40.7% of the GDP in 1999. In 2003, it increased to 51% and then declined to 44.3% in 2005. The size of tax evasion was 2.38% of the GDP in 1974 and it increased to 4.83% in 1982 and 5.2 % in 1987 but declined to 3.29 % in 1991. However, it increased rapidly to its highest level of 7.2% in 1998 but dropped to 5.13% in 1999. In 2003 it increased to 6.78% and declined to 5.48% in 2005.

The comment is that Aslam in his estimate looked at the velocity of money as the same in both formal and underground economies. The dummy variable was included to provide the impact of the structural reforms in Pakistan. Nevertheless, Aslam did not provide any statistical tests, such as the analysis of stationarity in the presence of a structural break for the estimated variables or the tests that can investigate the long-run relationship in terms of cointegration. In addition, Yasmin and Rauf (2004); and Kemal (2007) did not report any statistical procedure that accompanied their underlying models. Thus, their estimates of the underground economy and tax evasion are questionable. Besides, the test of DW is not appropriate for investigating the autocorrelation as they included a lagged dependent variable as an independent variable in their models (Patterson, 2000; Asteriou & Hall, 2007).

Hernandez (2009) estimated the volume of the underground economy in Peru by applying the recently adjusted CDA for the period of 1979-2005. Hernandez used the total currency in real terms as a dependent variable, and the independent variables were

total revenues of taxes to GDP, real GDP, interest rate on deposits and the inflation rate. All the estimated coefficients were statistically significant. The results indicated that the volume of the underground economy fluctuated over the period between 44% and 50% of the GDP. In his estimate of the size of the underground economy, Hernandez took into account the issue of unequal money velocity of income. Besides, he considered the stationarity analysis of the tested variables and the long-run interaction among the major variables that can drive people to increase their demand for money through the econometric technique of cointegration (Johansen's cointegration test). But, it is observed that the sample size of the study period is not sufficient for a good analysis in terms of time-series data.

Marcias and Cazzavillan (2009) quantified the magnitude of the underground economy in Mexico using the recent CDA for the period of 1970-2006. In their model, the currency in circulation normalized by GDP was the dependent variable, while the explanatory variables were the total tax revenues also normalized by GDP, the real GDP, the average nominal interest rate and the received remittances normalized by GDP. Macias and Cazzavillan found that all the estimated coefficients were statistically significant. In their estimate, they used the unit root test and the econometric method of Johansen's cointegration analysis. In addition, they applied the suggested correction of the CDA on inequality of money velocity of income, introduced by Ahumada *et al.* (2007). Marcias and Cazzavillan's estimation indicated that the underground economy reached its highest level of two-third of GDP in the late 1980s and remained in a stable rate of one-third of GDP from 1990 to the end of the period.

Schneider and Hametner (2007) estimated the size of the underground economy in Colombia by employing Tanzi's method of the CDA for the period of 1976-2002. They used the currency demand per capita as the dependent variable. The explanatory variables were the real GDP per capita, interest rate on deposits, the cumulative value of cash dispensers, overall taxation on income and consumption, unemployment rate and real expenditure as a percentage of GDP. The estimated coefficients were statistically significant except the coefficients of interest rate, the cumulative value of cash dispensers and real expenditure. Schneider and Hametner found that the size of the underground economy fluctuated from 20% to 50% over the period of 1970-1990, and increased to reach more than 50% over the period of 1995-2002.

In their estimates, they did not take any interest to apply the advanced methods that can deal with a small sample size as in time-series data. Additionally, they confirmed the estimation using Autoregressive Integrated Moving Average (ARIMA) based on the currency demand model and mentioned the justification of using ARIMA, but they did not consider the analysis of stationarity test that should be associated with this model (Gujarati, 2004).

Faal (2003) estimated the volume of the underground economy and tax evasion in Guyana using an econometric model of the CDA for the period of 1964-2000. In his model, the real currency demand was the dependent variable and the tax on income and imports, disposable income, interest rate, the inflation rate and financial innovation were independent variables. Faal considered the tests of unit root and used the technique of

Autoregressive Distributed Lag (ARDL) model to investigate the long-run relationship between currency demand and its determinants.

He found the estimated coefficients were statistically significant and the size of the underground economy fluctuated over time. It was about 27% in 1970 and 55% of the GDP in 1975. From 1980-1988, the size rapidly increased to reach 89% of GDP. The largest size of the underground economy was at 101% of the GDP in 1989. The size also fluctuated between 66% -73% of the GDP during 1989-1991, and it declined to its average level at 47% over the period of 1991-2000. The volume of the tax evasion in Guyana was at 7% per year of the GDP over the period of his study.

It must be noted that Faal (2003) in his estimate of the underground economy adopted the traditional CDA since the highest volume as reported by Faal in 1989 reflects the impact of money velocity of income as the same in both economies. So, it is not logical that the size of the underground economy exceeds the volume of the legal economy in that year compared to other years over the period. Besides, he did not take into account the changes in the import prices on currency demand.

Greenidge *et al.* (2009) estimated the size of the underground economy in Barbados using the traditional CDA for the period of 1972-2007. They used the real currency per capita as the dependent variable and the independent variables were the rate of taxes on income to the GDP, real disposable income and interest rate. In their estimation, they considered the unit root test and investigated the long-run relationship between the

currency demand and its determinants by employing the technique of General-to-Specific (GETS) introduced by Krolzig and Hendry (2001).

However, they ignored the issue of the structural break, which is attributed to the global political events or exogenous shocks. They found that the estimated coefficients were statistically significant. The volume of the underground economy in Barbados steadily increased over time from 29.6% in 1973 to 38% of the GDP in 2007.

Maurin, Sookram and Watson (2006) estimated the volume of the underground economy in Trinidad and Tobago using the traditional CDA for the period of 1973–1999. In their model, the currency demand in terms of real balances was the dependent variable, while the independent variables were the GDP, the tax variable, interest rate and the inflation rate. By applying the Structural Cointegrating Vector Autoregressive (SCVAR) model based on currency demand introduced by Garratt, Kevin, Pesaran, and Shin (2003), they found that the estimated coefficients were highly significant.

The underground economy in Trinidad and Tobago increased from 14% of the GDP at the beginning of the period to its highest level at 36% of the GDP in 1980. Then, it declined to around 20% of the GDP in 1982-1999. A note here is that they did not take into consideration the impact of exogenous shocks of the oil prices during 1973.

AnaMaria *et al.* (2009) quantified the volume of the underground economy in Romania using the recent CDA for the period of 1998:Q1- 2008: Q4. They used currency demand as a dependent variable, while the explanatory variables were taxes, GDP, wages and

interest rate. They used unit root test and investigated the long-run relationship between the demand for money and its determinants applying the Johansen's cointegration test. They found that the variables were cointegrated over time, and the estimated coefficients were highly significant.

In their estimates, AnaMaria and her colleagues applied the suggested correction of the currency approach as introduced by Ahumada *et al.* (2007) to adjust the estimation of the underground economy in Romania. The size of the underground economy was at its highest level of 38% of the GDP during the second quarter of 1999 and remained stable at 27% of the GDP over the period from the first quarter of 1998 to the last quarter of 2008.

It is noticed that the sample size is too small, i.e., 44 observations in terms of quarterly data. It is not accurate to investigate the long-run relationship between the currency demand and its explanatory variables with the application of Johansen's cointegration test with a sample size less than 50 observations. Johansen's cointegration test works well if the sample size is sufficiently large (Chen & Chihying, 2005). In addition, AnaMaria and colleagues did not confirm the behavior of the currency demand function in the stability test.

Fethi *et al.* (2006) estimated the volume of the underground economy and tax evasion in Cyprus applying Tanzi's method for the period of 1960-2003. In their model, the ratio of currency demand to the money supply in terms of real balances was the dependent variable. The independent variables were the taxes on income, the total salaries and

wages as a percentage of the GNP, interest rate on savings, the inflation rate measured by the consumer price index and real income per capita.

They applied the Ordinary Least Squares (OLS) to estimate their model and found that the estimated coefficients were highly statistically significant. Fethi and his co-authors found that the volume of the underground economy in Cyprus as a percentage of the GDP varied between 3.9 % and 16.1% of the GDP, while the average ratio of tax evasion was at 31% of the GDP over the study period.

The comment here is that the sample size of their study is more than 44 observations in terms of yearly data. The assumptions of the standard OLS are no longer valid which distort the best linear unbiased estimators over time. Thus, it is not capable of good analysis and the estimation will be biased (Verbeek, 2004). Furthermore, as the authors used time-series data, they neither consider the issue of stationarity analysis for the variables included in the model under estimation nor the issue of a cointegration test over time in the system. In other words, they did not report any statistics relevant to the long-run relationship. Besides, in their estimates, they assumed the equality of the money velocity of income in both economies. Thus, their estimation is not correctly adjusted as suggested by Ahumada *et al.* (2007; 2008; 2009).

Yoke-Kee, Chin-Yoong and Habibullah (2007) quantified the size of the underground economy in Malaysia using the standard CDA over the period 1970-2005. The dependent variable was the currency demand deflated by the consumer price index, while the explanatory variables were the real GDP, interest rate, the tax burden measured by the

average value of the total tax revenues and two dummy variables: one as a measure of the fiscal regime; and the other as a measure of the impact of the Asian financial crisis. Taking into account the unit root tests and employing Johansen's cointegration test to investigate the long-run relationship, they found that the currency demand and its explanatory variables were cointegrated over time. The estimated coefficients were highly significant, except the variable of the interest rate.

Yoke-Kee *et al.* (2007) found that the volume of the underground economy in Malaysia ranged between 27% and 48% of the GDP. Based on their study, the three variables included in the model of the Malaysian currency demand function do not have explanatory power on money demand in the Malaysian economy. Yoke-Kee *et al.* also ignored the report of diagnostic tests that should accompany the underlying model, for instance, serial correlation, heteroscedasticity and misspecification functional form. In their study, they did not mention how they calculated the estimation of the underground economy.

Haque (2013) estimated the size of the underground economy in Bangladesh using the CDA over the period of 1973-2010. In his model, the currency demand to the money supply was the dependent variable, while the independent variables were the tax ratio to the GDP, the inflation rate, number of bank branches and a dummy to capture the impact of the structural break in the economy. Haque used the stationarity analysis and applied Johansen's cointegration test to investigate the long-run relationship between currency demand and its determinants.

He found that the estimated variables were statistically significant, except the inflation rate and the dummy variable. Haque reported that the size of the underground economy in Bangladesh has rapidly increased over the study period. It was 7% of the GDP in 1973 and 62.75% of the GDP in 2010. The note here is that the estimation was established on the assumption that money velocity of income is the same in both economies (illegal and legal). Moreover, he did not take into account the impact of the other major variables on the demand for money, such as the volume of the GDP and interest rate.

Although Haque took into account the impact of the structural break using a dummy variable included in his model, he did not investigate the long-run relationship using the recent techniques of cointegration in the presence of a structural break. Additionally, it is observed that the reported diagnostic tests are not correct. Thus, the estimated result is questionable.

Dell'Anno and Halicioglu (2010) estimated the size of the underground economy in Turkey by applying the traditional CDA for the period of 1987-2007. The demand for money in terms of real balance was the dependent variable. It was regressed on the tax burden on business, GDP, interest rate and exchange rate. In their model, the long-run relationship between currency demand and its determinants was investigated by applying the ARDL technique of the cointegration test. In their estimates, the chosen model was based on the adjusted R-squared compared to other criteria. The estimated coefficients were statistically significant, except the exchange rate.

The size of the underground economy ranged between 10.7% and 18.9% of the GDP over the study period. Dell'Anno and Halicioglu did not take into account the impact of fluctuation of the global prices on the economy. Besides, they captured estimates of the underground economy based on the assumption of equality of the money velocity of income in both economies (informal and formal); that is incorrect as has been proven by Ahumada *et al.* (2007).

Dell'Anno and Halicioglu suggested that in their model, the included variables in logarithmic form eliminated the impact of the structural breaks on the estimation process, but in econometric research, transforming variables into logarithmic form is not enough to solve the problem of structural breaks.

Nikopour (2003) estimated the volume of the underground economy in Iran using the CDA for the period of 1961-2001. In his estimated model, the ratio of the currency in circulation to total private bank deposits was regressed on the income per capita, inflation rate, the ratio of urban population to the rural population, private consumption expenditure per capita, direct taxes, import taxes, social insurance burden, the ratio of public expenditure to the GDP, free exchange rate and a dummy variable for the impact of the Iranian revolution in 1979.

The model was in logarithmic form, and the long-run relationship between currency demand in the Iranian economy and its determinants was investigated through the (ARDL) technique. Nikopour found that the estimated coefficients were statistically

significant, except the inflation rate variable. The average size of the underground economy was at 27.76% of the GDP over the study period.

In his estimate, Nikopour calculated the size of the underground economy based on the assumption that the money velocity of income is the same in both economies. He suggested that the diagnostic tests are statistically an indication of a desirable estimation, but he did not report any relevant statistics. Additionally, Nikopour did not consider the impact of any economic events that happened over the study period. These include the effectiveness of global fluctuation on the oil prices in the international energy market and other internal reforms, such as the change in the tax law during 1969 in the Iranian economy (Zangeneh, 2007).

Alkhdour (2011) estimated the magnitude of the underground economy and tax evasion in Jordan using the conventional CDA during the period of 1976-2010. In his model, the real currency in circulation per capita was the dependent variable, while the independent variables were the tax revenues on sales to the GDP, the ratio of income tax to the GDP, the tax rate on imports (custom duties revenues to the imports), the weighted average of interest rates on savings, the number of Islamic banks measured as one thousand per person, and a dummy variable for the depreciation of the Jordanian dinar in 1988, taking the value of '1" in the years of 1988-2010 and '0' otherwise.

In his model, the variables were tested by the conventional ADF test and the test indicated that the variables have a unit root. Alkhdour converted the variables included in his model into first difference to investigate the long-run relationship between the

currency demand and its explanatory variables. He found that the estimated variables were statistically significant, except the variable of the number of Islamic banks.

The average size of the underground economy in Jordan was around 14.7 % of the GDP over the study period. It increased from 6.1% of GDP in 1976 to 22.1 % of the GDP in 2010, while the average volume of the tax evasion over the period was about 8.4% of the total government revenue. Despite the importance of the research as the only separate study in the Arab countries, the assumption of the OLS method is no longer stable or valid over time. Hence, it is biased in estimating the model taking into consideration the sample size properties as time-series data. The author did not report any statistics in investigating whether the variables were cointegrated or not.

In addition, Alkhdour computed the size of the underground economy based on the assumption of equality of the money velocity of income as the same. Moreover, he included three types of taxes in his model as explanatory variables. Therefore, the note here is that if he aimed to quantify the extent of the underground economy in the whole Jordanian economy, it is logical to include all the types of taxes in the model as one source of the total tax revenue, unless the objective of his study was to quantify the size of the underground economy in terms of a comparative study among the economic sectors. Finally, Alkhdour ignored the basic variables that can drive people to demand for money in the whole economy, such as inflation, interest rate on deposits and the growth rate of GDP.

In African countries, Ariyo and Bekoe (2012) quantified the magnitude of the underground economy and tax evasion in Nigeria using CDA based on Tanzi (1983), over the period of 1975-2010.

The currency demand was the dependent variable, regressed on the tax revenues to GDP, GDP per capita, the final expenditure of the household to the GDP, interest rate, the inflation rate, education level of individuals and the urbanization level of cities. In their model, the variables were tested for unit root and investigated for the long-run relationship between the currency demand in Nigeria and its explanatory variables through the Engle-Granger two-step procedure of the cointegration test. Ariyo and Bekoe applied the GETS technique to capture the final version of a dynamic Error Correction Model (ECM). In their estimation, they found that the estimated variables were highly significant, and the average size of the underground economy and the tax evasion ranged between 42.54% and 79.32%, 2.09% and 6.75% of the GDP.

The most important note here is that Ariyo and Bekoe applied the Engle-Granger two-step procedure of the cointegration test and the estimated coefficients are statistically significant. They reported the diagnostic tests of the final version of the ECM, but it is noticed that their model has a problem of serial correlation. They also assumed the money velocity of income in the underground economy is the same as that in the legal economy; therefore, the final result of the volume of the underground economy is questionable.

Asante (2012) quantified the volume of the underground economy and tax evasion by employing the CDA in Ghana for the period of 1990-2010. The model was in a log linear form, and the currency demand was regressed on the GDP, the inflation rate, nominal interest rate and taxation. The variables included in the model were tested for a unit root. In terms of small sample size time-series data, Stock-Watson's Dynamic Ordinary Least Squares (DOLS) method was applied to investigate the long-run relationship between currency demand in Ghana and its explanatory variables.

The estimation showed that the variables were cointegrated over time. Asante found that the extent of the underground economy has increased from 36% of the GDP at the beginning of the study period to 44% in the end, while the average size was about 48% of the GDP. Its highest level was at 72% of the GDP in 2004. Moreover, the size of tax evasion was at 4% of the GDP in 1990 to 6% of the GDP in 2010. The high volume of the underground economy was 10.6%, 15.8 % and 14.4% of the GDP in 2003, 2004 and 2005, respectively.

The note here is that Asante suggested that the analysis of stationarity indicated that the tested variables have a unit root, but he did not report any result about the stages of the analysis. Moreover, the calculation of the underground economy is not on the basis of the equality of the money velocity of income. In addition, the result of the average size of the underground economy in Ghana is somewhat bigger than that reported by Schnieder *et al.* (2010).

It is observed that the sample size is small, but Asante justified that he used the DOLS method to investigate the long-run relationship between currency demand and its determinants to overcome the problem of small sample size, and the DOLS has the same asymptotic properties as Johansen's technique. He did not report the result of a unit root and the small sample size of 21. Johansen's technique deals with a large sample size or full information. So, in terms of time-series data analysis, it would have been better for Asante to apply the recent technique rather than DOLS, such as the ARDL that can deal econometrically with small sample size and does not require an analysis of stationarity.

Chiumya (2007) estimated the volume of the underground economy in Malawi as a developing country using the CDA for the period of 1965-2000. In his model, the currency demand to the money supply was regressed on the GDP, the rates of consumption tax, import tax and income tax, interest rate and inflation rate. Chiumya adjusted the variables included in his model to be in the first difference and the second lagged dependent variable.

He justified that this was done for two reasons: first, to eliminate the potential serial correlation in the disturbance terms; and second, he also assumed that the method of the conventional OLS was applied to investigate the long-run relationship between currency demand and its determinants in their level form in terms of lags and two-lagged dependent variable. Chiumya reported that the average size of the underground economy in Malawi was around 12.3%, 23.1% and 18% of the GDP, respectively, over the period from 1967 to 1979, 1980 to 1989 and 1990 to 2000.

It is observed that Chiumya did not mention any statistical procedure about a unit root. He only mentioned that the OLS is capable of investigating the long-run relationship between a dependent variable and its explanatory variables, but the assumptions of the standard OLS no longer have stability or validity over time. Further, the estimated coefficients were not statistically significant, except the variables of the inflation rate and the first and second lagged dependent variables. Besides, the included variables of inflation and interest rate were in logarithmic form. In this context, the major variable of taxes was insignificant and the inflation and interest rates were not included in its ratios. Hence, the estimated result is not accurate and therefore, doubtful.

Asaminew (2010) estimated the size of the underground economy and tax evasion in Ethiopia using a conventional CDA over the period of 1971-2008. In his model, the demand for money was regressed on the GDP in its nominal value, taxes, lending interest rate, the inflation rate measured by the consumer price index and dummy taking the value of '1' in 1990, as a measure to exhibit the impact of the financial liberalization in the economy. The variables were in logarithmic form, tested for a unit root and the long-run relationship over the system was investigated applying the Engle and Granger two-step procedure.

The result indicated that the variables have a unit root and cointegrated over time, and the estimated coefficients were statistically significant. The average size of the underground economy in Ethiopia was about 40%, 35% and 27.8% of the GDP, respectively, for the period from 1971 to 1991, 1992 to 2000 and 2001 to 2008. The tax evasion was higher at its average rate of 10.4% of the GDP over the study period. The

note here is that Asaminew included the variables of lending interest rate and inflation in a logarithmic form without any justification.

Moreover, the computation of the size of the underground economy was undertaken on the assumption that the money velocity of income is the same in both economies (recorded and underground). The main observation is that the coefficient of the variable of taxes is not statistically significant. Therefore, the findings are questionable. In addition, he did not consider the impact of exogenous shocks on the economy over the period and the accurate estimation of the underground economy, since the financial liberalization is not an event that only happened during the study period.

Makochekanwa (2013) estimated the volume of the underground economy in Zimbabwe using the CDA for the period of 1980 - 2009. In his model, the currency holdings with non-public banks was regressed on the real income, the average tax rate, nominal interest rate, the private final consumption expenditure to the GDP, exchange rate in the black market and the time trend. The variables included in the model were tested for a unit root and the model was estimated using the conventional OLS.

The analysis for stationarity indicated that all the variables were non-stationary, except the variable of the exchange rate in the black market. The volume of the underground economy had increased from 8.1% of the GDP in 1980 to 52% in 2009. The largest size was at 70% of the GDP in 2008.

It is observed that Makochekanwa (2013) had estimated all variables in his model with different order of integration, and did not report any statistical procedure about the sample size. He also did not consider investigating the long-run relationship between variables in the overall system in terms of cointegration theory, even though the R-squared was approximated to unity.

By using the OLS method, the estimates of the result would be spurious as the OLS is not the best linear unbiased estimator over time (Verbeek, 2004). Additionally, Makochekanwa calculated the size of the underground economy in Zimbabwe based on the assumption outlined in Tanzi's method that the money velocity of income is the same in both economies. Hence, the estimated result is not accurate and questionable.

Saunders and Loots (2005) estimated the magnitude of the underground economy in South Africa using an Autoregressive model - AR (1), based on the CDA for the period of 1966-2002. In their model, the currency in circulation (banknotes and coins) to the money supply was regressed on the government tax revenues to the GDP, the final consumption expenditure, real income per capita, nominal interest rate, the general index of government intervention and the variable of a time trend. Saunders and Loots mentioned that the included variables were tested for a unit root and the test was used as an indicator for the determination of the order of integration.

They estimated their model in terms of AR based on the South African's currency demand function by applying least squared regression as one way to remove the impact of serial correlation problem in the estimation process. The estimated coefficients were

statistically significant, except the variable of the final consumption expenditure and the real income per capita. The adjusted R-squared was used as a criterion to test a good fit of the AR (1) underlying model. Saunders and Loots reported the two diagnostic tests of Ramsey and Heteroscedasticity.

They found that the size of the underground economy in South Africa declined from 12% of the GDP at the beginning of the study period to about 7.7% of the GDP in 1993. Then, the size was a slight increase as a percentage of the GDP. It is noticed that Saunders and Loots (2005) did not report the analysis results of stationarity for the variables tested. In terms of time- series data, testing for cointegration between the dependent variable and its explanatory variables is needed, but Saunders and Loots did not consider this issue.

They only used the standard OLS to estimate the underlying model, but it is known that the OLS estimator is no longer stable or valid over time (Verbeek, 2004). Further, in terms of time-series data analysis, the higher R-squared is not a good measure to explain the capability of the model; where it may exhibit misleading or spurious inference on the relationship between the explanatory and dependent variables (Austriou & Hall, 2007). Saunders and Loots (2005) made an unacceptable methodological error that the coefficient of government tax revenue had a negative sign, despite their suggestion that all the coefficients of the independent variables had its expected signs.

The most important note here is that the positive and significant coefficient values on tax variables are needed to quantify the volume of the underground economy using a monetary approach, such as the CDA. For example, with a negative sign of the tax

revenues coefficient, the predicted currency demand without tax will be larger than the predicted values of the currency demand with tax, which leads to the magnitude of the underground economy being less than zero, which is not acceptable in an empirical real world. In addition, the method of estimating the size of the underground economy was based on the assumption that the money velocity of income is the same in both economies (recorded and unrecorded). Hence, the estimated result of the underground economy is questionable. Based on the review of the literature, Table 3.2 summarized the magnitude of the underground economy and tax evasion as a percentage of official GDP for some of the developed, transition and developing countries that have applied the CDA methodology.

Table 3.2

Summarizes the Volume of the Underground Economy and Tax Evasion as a Percentage of Official GDP for Some Countries that Applied CDA Methodology

Authors	Country and Study period	A measurable Model		Significant	Size of the (UE) as % of GDP	Size of the (TE) as % of GDP
		Dependent Variable	Independent Variables			
Cagan (1958)	USA (1875-1955)	Currency to money supply	- Real income per capita - Tax rate on income - Interest rate on deposits	Sign. Sign. Sign.	From 50 % in 1945 to 60 % in 1950 of the total unincorporated business income.	From $ 21 billion in 1945 to $25 billion in 1950 of unreported business income.
Tanzi (1980;1983)	USA (1929-1976)	Currency to money supply	- Tax rate of personal income to disposable income net of transfers. - Top-bracket statutory tax rate. - Rate of weighted average tax on interest income. - Wages and salaries in personal income. - Interest rate on time deposits. - Real income per capita.	Unreported Unreported Unreported Unreported Unreported Unreported	From 3.7% in 1970 to 4.17% in 1978.	From 3.34 billion in 1970 to 7.54 billion in 1978.

Schneider (2002;2005), Schneider & Klinglmair (2004a,2004b) and Schneider (2004c)	In 110 and 145 developing, transition and OECD countries (1999-2000; 1999-2003).	Currency in circulation to money supply	- Weighted average of tax rates. - Wages and salaries to national income. - Interest rate on savings. - Income per capita.	Unreported Unreported Unreported Unreported	Over the two study periods, the average was at 41% and 39.1% in the developing, 38% and 40% of transition and 18% and 16.3% in the OECD and 21.8% in three communist countries.	Not taken in the analysis
Pickhardt and Pons (2006)	Germany (1980-2001)	Currency demand	- The GDP. - Inflation rate. - Interest rate. - Tax rate. - Dummy for the German unity. - Dummy for establishing of the euro system.	Sign. Sign. Sign. Sign. Sign. Sign.	The size has steadily increased from 9.41% of the GDP in 1980 to 15.61% of the GDP in 2001.	Not taken in the analysis
Ahmed and Ahmed (1995)	Pakistan (1960-1990)	Currency in circulation to money supply	- The ratio of total tax revenues to GDP. - Interest rate on time deposits. - Dummy variable as a proxy of tax reforms taking 1 from 1960-1971.	Sign. Sign. Sign.	The size was amounted at one third of the GDP.	The size was between Rs 40 billion to Rs 45 billion over the period of 1989-90.
Ahmed and Hussain (2008)	Pakistan (1960-2003)	Currency in circulation to money supply	- The ratio of total tax revenues to GDP. - Interest rate on time deposits. - Dummy variable as a proxy of tax reforms taking 1 from 1997-2003.	Sign. Sign. Sign.	It was fluctuated over the period, declined at the level of 30% from 1960 to 1964, fluctuated between 60% to 70% from 1965 to 1975, declined again by 56% from 1980 to 1986, 39% in 1988 and 28% in 1993 and stable afterward at is ratio.	The size was between Rs 722 million (4% of the GDP) in 1960 to Rs 1053 million (2.2% of the GDP) in 2003.

Aslam (1998)	Pakistan (1960-1998)	Currency in circulation plus a foreign currency account.	- Total tax revenue. - Interest rate on time deposits. - The growth rate of the real GDP. - Dummy variable taking the value of 1 for the period of 1990-1998.	Sign. Sign. Sign. Sign.	It was at 29 % of GDP in 1960 and increased to 43% of GDP in 1998. In 1976 it was at the lowest level of 27% of the GDP, and was at its highest level of 52.6% and 53% in 1981 and 1991.	The total value of the tax evasion was at 84% of the budget deficit over the period.
Yasmin and Rauf (2004)	Pakistan (1974-2002)	Currency in circulation to money supply.	- Total tax revenue. - The growth rate of the real GDP. - Interest rate on time deposits. - Banking services. - GDP at current prices. - The lagged dependent variable.	Sign. Insign. Sign. Sign. Sign. Sign.	The size was fluctuated between 15.22% in 1974 to 30.7% of the GDP in 1995. It was at it's the highest level of 43% of the GDP in 1997 and it declined to 32% in 2002.	The size was at 40% in 1974 to 11% of the GDP in 2002.
Kemal (2007)	Pakistan (1974-2005)	Currency in circulation plus foreign currency account	- Total tax revenue. - GDP at current prices. - The growth rate of real GDP. - Banking services. - Inflation rate. - Dummy taking the value of 1 for the period of 1990-2005. - Lagged dependent variable.	Sign. Sign. Sign. Sign. Sign. Sign. Sign.	The size was 22.4 % of the GDP in 1974 and increased to about 44.3% of GDP in 2005.	The size of tax evasion was 2.38 % of the GDP in 1974 and 5.48% of GDP in 2005.
Hernandez (2009)	Peru (1979-2005)	Total real currency	- Total tax revenues to GDP. - Real GDP. - Interest rate on deposits. - Inflation rate.	Sign. Sign. Sign. Sign.	The size was fluctuated over the period between 44% to 50 % of the GDP.	Not taken in the analysis

Schneider and Hametner (2007)	Colombia (1976-2002)	Currency demand per capita	- Real GDP per capita. - Interest rate on deposits. - Cumulative value of cash dispensers. - Overall taxation on income and consumption. - Unemployment rate. - Real expenditures as a percentage of GDP.	Sign. Insign Insign. Sign. Sign. Insign.	The size was fluctuated from 20 % to 50% over the period of 1970-1990, and increased to reach more than 50% over the period of 1995-2002.	Not taken in the analysis
Marcias (2008)	Mexico (1970-2006)	Currency in circulation normalized to GDP	- Total tax revenues normalized by GDP. - The real GDP. - The average of nominal interest rate. - Received remittances normalized by GDP.	Sign. Sign. Sign. Sign.	It was reached at its highest level of two third of GDP in the late of1980 and remained in a stable rate at one third of GDP since 1990 to the end of the period.	Not taken in the analysis
Faal (2003)	Guyana (1964-2000)	Currency demand in terms of real	- The income's taxes and imports. - Disposable income. - Interest rate. - Inflation rate. - The financial innovation.	Sign. Sign. Sign. Sign. Sign.	It was about 27% in 1970 and 55% of the GDP in 1975. From 1980-1988, the size was rapidly increased to reach at 89%. It declined at its average level at 47% over the period of 1991-2000.	The size of tax evasion was at 7% per year of the GDP over the period.
AnaMaria,Ion and Catlain (2009)	Romania(1998:1-2008:4	Currency demand	- The taxes. - GDP. - Wages. - Interest rate.	Sign. Sign. Sign. Sign.	It was at its highest level of 38% of the GDP in the 2nd quarter of 1999 and remained stable at 27% of the GDP over the period of 1998:Q1 to 2008:Q4.	Not taken in the analysis

Maurin, Sookram and Watson (2006)	Trinidad and Tobago (1973-1999)	Currency demand in terms of real	- The GDP. - The tax variable. - Interest rate. - The inflation rate.	Sign. Sign. Sign. Sign.	It was increased from 14% of GDP in the beginning of the period and rose at its highest level at 36% of the GDP in 1980. Afterward, it was declined to around 20% of the GDP since 1982-1999.	Not taken in the analysis
Greenidge, Holder and Mayers (2009)	Barbados (1972-2007)	Real currency per capita	- The rate of taxes on income to the GDP. - Real disposable income. - Interest rate.	Sign. Sign. Sign.	The size has steadily increased over time from 29.6% in 1973 to 38% of the GDP in 2007.	Not taken in the analysis
Fethi, Fethi and Katircioglu (2006)	Cypirot (1960-2003)	Real currency demand to money supply	- The taxes on income. - The total salaries and wages as a percentage of the GNP. - Interest rate on savings. - Inflation rate measured by CPI. - Real income per capita.	Sign. Sign. Sign. Sign. Sign.	The size was varied between 3.9 % and 16.1% of the GDP over the study period.	The average ratio of tax evasion was at 31% of the GDP over the period.
Yoke-Kee, Chin-Yoong and Habibullah (2007)	Malaysia (1970-2005)	Currency demand deflated by the CPI	- Real GDP. - Interest rate. - Tax burden measured by the average value of the total tax revenues. - Dummy one as a measurement of the fiscal regime. - Second dummy as a measurement of the impact of the Asian financial crisis.	Sign. Insign. Sign. Sign. Sign.	The size was ranged between 27% to 48% of the GDP over the period.	Not taken in the analysis

Haque (2010)	Bangladesh (1973-2010)	Currency demand to money supply	- Tax ratio to the GDP. - Inflation rate. - Number of bank branches. - Dummy to capture the impact of the structural break in the economy.	Sign. Insign. Sign. Sign.	It has rapidly increased over the study period. It was at 7% of the GDP in 1973 and at 62.75% of the GDP in 2010.	Not taken in the analysis
Dell'Anno and Halicioglu (2010)	Turkey (1987-2007)	Money demand in term of real	- Tax burden on business. - GDP. - Interest rate. - Exchange rate.	Sign. Sign. Sign. Insign.	The size was ranged between 10.7% to 18.9% of the GDP over the study period.	Not taken in the analysis
Nikopour (2003)	Iran (1961-2001)	Currency in circulation to total private bank deposits	- Income per capita. - Inflation rate. - Ratio of urban population to rural population. - Private consumption expenditure per capita. - Direct taxes. - Import taxes. - Social insurance burden. - Ratio of public expenditure to the GDP. - Free exchange rate. - Dummy variable for the impact of the Iranian revolution in 1979.	Sign. Insign. Sign. Sign. Sign. Sign. Sign. Sign. Sign. Sign.	The size was at its average of 27.76% of the GDP over the study period.	Not taken in the analysis
Alkhdour (2011)	Jordan (1976-2010)	Real currency in circulation per capita	- Tax revenues on sales to the GDP. - The ratio of income tax to the GDP. - The tax rate on imports. - The weighted average of	Sign. Sign. Sign.	The size was around 14.7 % of the GDP over the study period.	The average volume of the tax evasion

			interest rates on saving. - A number of Islamic banks measured as one thousands of person. - Dummy variable for the depreciation of the Jordanian dinar in 1988, taking value of one in the years of 1988-2010.	Sign. Insign. Sign.	It was increased from 6.1% of GDP, in 1976 to 22.1 % of the GDP in 2010.	over the period was at about 8.4% of the total government revenues.
Ariyo and Bekoe (2012)	Nigeria (1975-2010)	Currency demand	- Tax revenues to GDP. - GDP per capita. - The final expenditure of the household to the GDP. - Interest rate. - Inflation rate. - Educational level of individuals. - The urbanization level of cities.	Sign. Sign. Sign. Sign. Sign. Sign. Sign.	The size was ranged between 42.54% – 79.32% of the GDP over the period.	The size was ranged between at 2.09% – 6.75% of the GDP.
Asante (2012)	Ghana(1990-2010)	Currency demand	- GDP. - Inflation rate. - Nominal interest rate. - Taxation.	Sign. Insign. Insign. Sign.	It has increased from 36% of the GDP in the beginning of the study period to 44% in the end. While, the average size was about 48% of the GDP and its highest level was at 72% of the GDP in 2004.	The size was at 4% of the GDP in 1990 to 6% of the GDP in 2010.
Chiumya (2007)	Malawi (1965-2000)	Currency demand to money supply	- GDP. - The rates of consumption tax. - Import tax and income tax.	Insign. Insign. Insign.	The average size was around 12.3%, 23.1% and 18% of the GDP respectively, over the	Not taken in the analysis

			-	Interest rate.	Insign.	period from 1967 to 1979, 1980 to 1989 and 1990 to 2000.	
			-	Inflation rate.	Sign.		
			-	First and second lagged dependent variable.	Sign.		
Asaminew (2010)	Ethiopia(1971-2008)	Currency demand	-	Nominal GDP.	Sign.	The size was about 40%, 35% and 27.8% of the GDP respectively, for the period from 1971 to 1991, 1992 to 2000 and 2001 to 2008.	The size was higher at its average rate of 10.4% of the GDP over the study period.
			-	Taxes.	Sign.		
			-	Lending interest rate.	Sign.		
			-	Inflation rate measured by CPI.	Sign.		
			-	Dummy taking the value of one since 1990, to measure an impact of the financial liberalization in the economy.	Sign.		
Makochekanwa (2013)	Zimbabwe (1980-2009)	Currency holdings with non-bank public	-	Real income.	Unreported	The volume had increased from 8.1% of the GDP in 1980 to 52% in 2009. The highest size was at 70% of the GDP in 2008.	Not taken in the analysis
			-	The average tax rate.	Unreported		
			-	Nominal interest rate.	Unreported		
			-	The private final consumption expenditure to the GDP.	Unreported		
			-	Exchange rate in the black market.	Unreported		
			-	The time trend.	Unreported		
Saunders and Loots (2005)	South Africa(1966-2002)	Currency in circulation to money supply	-	Total tax revenues to the GDP.	Sign.	The size was declined from 12% of the GDP in the beginning of the study period to about 7.7% of the GDP in 1993. Afterward, the size was a slight increased as a percentage of the GDP.	Not taken in the analysis
			-	The final consumption expenditure.	Insign.		
			-	Real income per capita.	Sign.		
			-	Nominal interest rate.	Sign.		
			-	The general index of government intervention.	Sign.		
			-	Variable of time trend.	Sign.		

Source: Author's compilation based on previous literature.

3.4 An Overview of Currency Demand Approach Evolution

The CDA, as a proxy to estimate the magnitude of the underground economy, is based on the assumption that money in terms of cash is used to perform the transactions that individuals like to keep concealed from authorities (Ahmed & Hussain, 2008). Illegal transactions executed using cash are hard to trace as they leave no observable tracks (Agbi, 2014). Other assets are documented in financial institutions and then their uses are registered in such a way that transactions performed with them can be easily traced. Therefore, an excessive use of cash is an indication of an increase in the size of underground activities in the economy.

If the amount of cash used to undertake illegal transactions can be estimated, then this amount could be multiplied by the income elasticity of money to obtain a measure of the volume of the underground economy (Ahumada *et al.*, 2007).

A pioneering attempt to apply the CDA was Cagan (1958), who linked increased demand for money and the tax burden (as the main cause of the underground economy) for the US over the period of 1875 -1955. Then, Gutmann (1977) used the same approach to estimate the size of the underground economy in the US over the period of 1937-1976 based on four fundamental assumptions (Fethi *et al.*, 2006). First, the tight regulations and higher rates of tax burden levied by the government are the main causes that can drive economic agents to underground economic activities. Second, only cash is used as a medium to perform the concealed transactions in the underground economy, and the huge use of cash is an indication of the expansion of the underground economic

activities and tax evasion. Third, there is a benchmark to calculate the magnitude of the underground economy even if the underground economy does not exist; since its volume is established based on the ratio of currency to demand deposits. Finally, the income elasticity of money (money velocity of income) is assumed to be the same in both economies - official and underground economy. Then, calculating the volume of the underground economy is obtained by multiplying the velocity of money with the value of illegal money that can be used to perform illegal activities (Ahmed & Ahmed, 1995; Ahmed and Hussain, 2008).

The note on Gutmann (1977) is that he applied the same approach of Cagan (1958) but without any statistical procedures which makes the estimation results questionable. Cagan's approach was employed by Tanzi (1980; 1983) for the US economy. Tanzi (1980; 1983) introduced an econometric model of currency demand function based on the earlier work of Cagan (1958). The basic idea of Tanzi was to establish a link between the demand ratios of money in relation to increased rates of the tax burden, and employ it to obtain new estimates of the volume of the underground economy for the US (Dell'Anno & Halicioglu, 2010).

Ferwerda, Deleanu, and Unger (2010) stated that Tanzi (1983) proposed his basic regression model for the currency demand and concentrated on the possible conventional causes or normal causes that can raise tax burden and other causes that lead economic agents to work in the underground economy. In his model, the main factors included were the ratio of cash holdings to current and deposit accounts, a

weighted average tax rate, a proportion of wages and salaries to the national income, the interest paid on savings deposits and the per capita income (Fethi *et al.*, 2006; Ferwerda *et al.*, 2010). The calculation of the volume and development of the underground economy can be calculated in the first stage by taking the difference between the development of estimated figures of currency with taxation variable equals to zero and the development of actual currency with infinite taxation variable in order to capture estimation of extra amount of money that can be held by agents to perform their transaction in the underground economy (Dell'Anno & Halicioglu, 2010).

In the second stage, they assumed that the income velocity of currency is the same in the underground economy and legal economy. Then, the volume of the underground economy can be computed and compared to the official GDP.

The CDA is the most commonly employed method. It has been applied to measure the magnitude of the underground economy in many countries in the world, such as the US, Tanzania, Italy, New Zealand, Spain, Mexico, South Africa, Peru, Pakistan, Ghana, Ethiopia, Romania, Canada, Turkey, Colombia, etc.

Despite the widespread use of CDA, it has been criticized in some aspects (Schneider & Hametner, 2007; 2014). First, not all transactions in the underground economy are settled in cash. Hence, the total size of the underground economy (including transactions in terms of barter) may be larger than the one previously estimated (Schneider, 2006; Schneider & Buehn, 2013). Second, the authors considered only the

financial variables, such as tax burden, as a main cause of the underground economy (Schneider & Savasan, 2007; Schneider & Hametner, 2014). Other variables, such as the tight regulations, taxpayers' behavior toward the authority, and so on, are ignored, which also may contribute to the underground economy. Due to the fact that reliable data for the majority of countries is lacking, these overlooked variables may have influence in generating and increasing the activities of the underground economy.

Third, studies that have been conducted using the CDA to measure the extent of the underground economy have been undertaken on the assumption that the velocity of money has the same value in both economies[15]. As introduced by Ahumada *et al.* (2007), the assumption is only appropriate if the income elasticity of money is one which is not the case with the previous studies. Therefore, the estimation of the underground economy should be corrected as suggested by Ahumada *et al.* (2007: 2009).

Finally, the method assumes that there are no illegal activities of the underground economy in the base year of the study period. This assumption is open to criticism: when the assumption is relaxed, the size of the underground economy has to be adjusted, and then it might be larger than the volume reported (Schneider & Buehn, 2013).

[15] See for example studies of Faal (2003); Nikopour (2003); Saunders and Loots (2005); Fethi *et al.*, 2006; Ahmed and Hussain (2008); Haque (2010); Asaminew (2010); Dell'Anno and Halicioglu (2010); Ariyo and Bekoe (2012) and Makochekanwa (2013).

3.5 Gaps in the Literature

In spite the existence of the literature on the phenomenon of the underground economy for several countries in the World, studies on the underground economy in the GCC countries have not yet been separately devoted. This study comes to fill the following gaps:

First, the existing studies may or may not provide the actual magnitude of the underground economy in the GCC countries as mentioned above. Therefore, this study could help to better explain the underground economy in the GCC countries. Second, it is attributed to the lack of valuable statistics on the real size of the underground economy in the GCC countries. Thus, this study is the first attempt to estimate the volume of the underground economy due to tax evasion and the expansion of illegal activities in selected economies of the GCC countries.

Third, this study looked into the substantial money leakage that is associated with the large outflow of money through remittances by foreign workers living in the GCC countries, which may generate the illegal activities of the underground economy. Thus, it is compulsory to estimate the volume of the underground economy over there. Fourth, in line with the recent studies on the underground economy, this study is conducted using the recent adjusted CDFM, taking into consideration the difference in the velocity of money in both economies (underground and formal economy). The adjusted CDFM is a proxy to estimate the volume of the underground economy, which included some key macroeconomic variables that may influence people to participate in the

underground economic activities, namely GDP, total non-oil tax revenues, the outflow of money remitted by foreign workers, the rate of interest on deposits and the inflation rate.

Fifth, the majority of the previous studies on the underground economy have been conducted using the traditional CDFM, which assumes the equality of the income velocity of money in both economies formal and informal. This study tried to indirectly quantify the extent of the underground economy in those selected economies of the GCC countries by employing the recent technique of a cointegration test that give special attention to the issue of structural breaks based on the recent form of the CDFM.

Finally, because of the negative impact of the underground economic activities on economic development and planning of the GCC countries, it is imperative to estimate the volume of the underground activities for the officials to revise their current economic policies (fiscal and monetary in particular), in order to minimize the negative impacts of the underground economy on the macroeconomic policy variables of the country's formal economy.

3.6 Conclusion

This chapter started with an explanation of the conceptual and theoretical framework of the underground economy phenomenon. It was followed by introducing a critical review of some of the empirical studies that have been carried out using the standard CDFM as a proxy to estimate the underground economy in some countries around the world. This

is associated with a summary of the relevant literature review in Table 3.2. Afterward, the chapter showed the evolution of the CDFM approach. Finally, the chapter presented the gaps in the literature on the underground economy studies.

CHAPTER FOUR

RESEARCH METHODOLOGY

4.1 Introduction

This chapter described the methodology and data used for the study. It included the statistical tests that were performed on the underlying model of the CDA. In the literature, the approach applied for estimating the volume of the underground economy in each country depends on the characteristics of the individual country. Thus, the measurements of the underground economic activities vary by countries. The methods are divided into three major categories, namely: the model approach, direct method and indirect method (see for example, Fethi *et al.*, 2006; Dell'Anno and Halicioglu, 2010).

Under the indirect monetary approach, the CDA is one of the popular measurements to estimate the volume of the underground economic activities. In this context, the recent form of CDA was applied in this study as a proxy to estimate the volume of the underground economy in selected GCC countries.

It is a common fact that most macroeconomic series contain unit roots and also structural breaks. In this study, the univariate unit root tests, such as Zivot and Andrews (1992); and Pierre Perron (1997) in the presence of one structural break were applied to investigate the order of stationarity of the variables. The CDA was examined for the long-run relationships using Gregory and Hansen's cointegration test (1996) in the presence of a structural break.

For estimation of the short-run ECM model, the General to Specific (GETS) technique of Krolzig and Hendry (2001,2005) as explained in Rao, Singh and Kumar (2010) was used based on the choice of cointegrating equation with one period lagged residuals. This was followed by diagnostic tests and the estimation of model stability. Finally, the size of the underground economy, illegal currency and tax evasion in the selected economies of GCC countries was measured.

4.2 Model Specification of Currency Demand Approach

The main focus of this study was to estimate the volume of underground economic activities in the selected GCC countries, namely, Saudi Arabia, Qatar, the UAE, Kuwait, and Oman. The estimation also included the amount of tax evasion in the form of currency in circulation and the excessive use of hard currency or cash by foreign workers in the selected GCC countries when remitting money to their home countries.

In this study, the CDA model was used to estimate the size of the underground economy. Two basic assumptions under the CDA are: first, a behavioral assumption which assumed that the illegal transactions of the underground economy are undertaken in the form of cash to avoid being detected by the authorities (Alexandru , 2013). Thus, an excessive use of cash may contribute to an increase in the volume of underground activities in the overall economy, and vice versa (Fethi *et al.*, 2006; Pickhardt & Pons, 2006).

Second, an observational assumption which assumed that there are number of discernible variables which drive economic agents to prefer the use of cash to carry out underground activities. Indeed, the underground economic activities were due to the overly regulated or tight policies implemented (such as massive regulations and increase in tax rates) that create a negative reaction among taxpayers towards the government (Hernandez, 2009). Nevertheless, several criticisms have been made of the CDA (see for example, Giles, 1999; Schneider, 2004; Ahamuda *et al.*, 2007). Part of this criticism has been considered by recent works (see for example, studies of Ahumada *et al.*, 2007, 2008, 2009; Macias & Cazzavillan, 2009; AnaMaria, Ion & Catalin, 2009; Asante, 2012).

Under the indirect method, the CDA is the most widely applied method for estimating the volume of the underground economy (Pickhardt & Pons, 2006; AnaMaria *et al.*, 2009; Asante, 2012). Besides, it is an appropriate technique for the conditions of the emerging economies to evaluate the estimation of the underground economy in terms of currency, as they are not well-developed.

Following the recent empirical studies, the study employed the recent CDA model of Ahumada *et al.* (2009) and Hernandez (2009), where the coefficient of income elasticity for money in the long-run is not equal to one. In this study, the currency demand model was expressed as follows:

$$M1_t = \alpha_0 TR_t^{\beta 1} G_t^{\beta 2} Rem_t^{\beta 3} exp^{(\gamma_i h_t)} \quad (1)$$

where $M1_t$ is the currency in circulation plus demand deposits at time *t* as the dependent variable[16], TR_t is total non-oil tax revenues of each selected GCC country at time *t*, G_t is the nominal GDP at time *t*, Rem_t is outflow of money remitted by foreign workers to their home countries at time *t*, h_t represents the opportunity cost of holding money, i.e., $h_t = (i_t + \pi_t)$, where i_t is the interest rate on deposits over a period *t*, and π_t is the inflation rate at time *t*, α_0 is a constant and ε_t is the error term.

By taking natural logarithms of both sides of (1) and substituting for h_t, the estimable model of currency demand function as (1) was transformed into a linear form:

$$lnM1_t = \alpha_0 + \beta_1 lnTR_t + \beta_2 lnG_t + \beta_3 lnRem_t + \gamma_1 i_t + \gamma_2 \pi_t + \varepsilon_t \quad (2)$$

All variables are in nominal terms, and the expected signs for the parameters of the explanatory variables in the equation (2) were as follows:

β_1 , β_2 and $\beta_3 > 0, \gamma_1, \gamma_2 < 0$.

Based on the theoretical literature of the CDA, the hypothesized relationship between total non-oil tax revenues and demand for currency is positive. Previous studies have shown that higher rate of taxation is considered as the main motivation for economic agents to avoid taxes through underground activities (Dell'Anno & Halicioglu, 2010;

[16] M1 is used as a suitable measure of excessive use of cash in the underground economy due to the fact that transactions that are carried out using cash in the underground activities are anonymous, and therefore difficult to trace compared to other financial assets. In this sense, an excessive use for currency could denote an increase of the underground economic activities (Buhen & Schneider, 2008; Alexandru, 2013). M1 included the current demand deposit accounts which are as liquid as cash (Alexandru, 2013). Thus, using the demand deposits account with currency in circulation is due to the fact that the demand deposits account is only the most monetary instrument to cash that can be immediately used for trading in the underground economy.

Haque, 2013). Therefore, an estimation of tax elasticity of money demand mirrored the cash holdings used to carry out unobserved transactions (Asaminew, 2010).

Unlike cash transactions which leave no tracks and are difficult to trace, other financial instruments of payments, such as checks are easy to identify as they were recorded in the financial institutions (AnaMaria, 2013). In other words, taxation is a sensitive financial factor that induced individuals to engage in the underground economy (Makochekanwa, 2013). An increase in tax rate increased the burden on taxpayers that leads agents to participate in underground economic activities in order to evade tax by using cash rather than other instruments of payment.

Indeed, tax evasion, as one of the illegal activities of the underground economic activities in the GCC economies, was associated with informal employment in the small and medium business enterprises in the private sector. The owners of these business enterprises tend to evade taxes in order to obtain greater profits as their transactions in the underground economy were subject to less red tape or less official procedures. This reflected the fact that the productivity of informal workers in the GCC's private sectors is higher compared to the cost of using them[17]. Consequently, the share of illegal workers' productivity in GCC countries constituted one-fifth of their GDP (Angel-Urdinola & Tanabe, 2012). In more specific terms, the underground economies of the GCC countries were specific situation where the owners of the business firms are mandated to purchase a license from corrupt officials to start doing investments in the

[17] The cost of using foreign workers (in terms of productivity) in GCC remained low compared to that of local workers. This situation has led the owners of enterprises to participate in the illegal employment of foreign workers in order to evade taxes and tight labor regulations and then, to obtain greater profits.

official economy (Choi & Thum, 2005). Therefore, the business firms have no benefits to continue doing businesses with high tax costs attached to them in the official economy due to corruption and poor public services provided by the government.

In this situation, an imposition of extra tax burden as additional costs led the economic agents to engage in tax evasion activities by using cash rather than checks. This led to an increase in the demand for money over its supply (Schneider, 2002; Braithwaite, 2002; Dell'Anno, 2003; Alanon & Gomez-Antonio, 2005; Saunders, 2005; Georgiou, 2007; Ahmed & Hussain, 2008; Buhen & Schneider, 2008; AnaMaria *et al.*, 2009).

In the survey of literature, the estimation of the underground economy varied with the inclusion of tax variable. In fact, different types of taxes have been used in the previous studies based on the CDA as a measurement of the underground economy (see for example, Thomas, 1999; Faal, 2003; Nikopour, 2003; Fethi *et al.*, 2006; Chiumya, 2007; Dell'Anno & Halicioglu, 2010; Ferwerda *et al.*, 2010; Arby *et al.*, 2010; Makochekanwa, 2013). However, some studies have used total tax revenues in the economy instead (see for example, Aslam, 1998; Albu, Daianu & Pavelescu, 2002; Saunders, 2005; Kemal, 2007; Ahmed & Hussain, 2008; Perazzi, Merli & Paredes, 2010). In this study, the principal sources of non-oil tax revenues are mainly from the high taxes on the foreign companies that operate in the non-oil sectors, employed capital of nationals that pay for zakat, royalties, rental, fees, license, tariffs and stamp and custom duties as well as other economic activities that generate profits.

In this context, the focus of this study was to capture the accurate estimation of the underground economy and the overall tax evasion in the selected GCC countries. This is included the different sources of taxation, excluding the tax on gas and oil companies, as a proxy for the financial variable that motivated agents to participate in the underground economic activities. This is because the oil revenues were the main source for GCC countries to fund the social functions of their governments. Therefore, it is very hard for companies working in the oil sector to avoid the payment of their tax obligations, even if the government increases the tax burden rate on those companies because of the fact that the production activity of the oil sector is monitored by the government. Therefore, the tax burden imposed on oil companies in the GCC countries may not have an impact on the generation of underground economic activities, since the companies have no way to evade taxes.

Based on the literature, the hypothesized sign between GDP that is associated with rapid economic growth in the economies of GCC and the demand for currency is positive (Macias & Cazzavillan, 2009; AnaMaria *et al.*, 2009). In fact, the demand for money is attributed to expansion of the economic activities that is captured by GDP in terms of nominal value (Asaminew, 2010). As is the case in many developing countries, a big portion of the economic activity in GCC countries took place in the underground economy (Dabla-Norris *et al.*, 2006).

The justification to include the variable of GDP is due to its impact on the increase in the money demand in the economy. The growing overall economy stimulated

production of new outputs with taxes attached to the new good and services produced. The higher tax bracket rate on the new output produced resulted in an increase in economic agents participating in the underground economic activities, thus leading to the increase in their demand for currency.

On the contrary, there are very few studies that have found a negative link between an increase in GDP levels and the demand for currency in terms of their relationship with underground economic activities (for instance, Loayza, 1996). The results of such studies however, were not accepted in general, since the interaction between expansion of economic activities and demand for currency is always positive (Buehn & Schneider, 2008b).

Moreover, the hypothesized sign of the expected effect of the outflow of money from remittances and currency demand function of the selected GCC countries was also positive. In fact, increasing underground economic activities in the GCC countries is attributed to the increase in the outflow of money from remittances by foreign workers living in these countries (Naufal & Termos, 2010). The view above is reflected by huge migration of foreign workers in the GCC countries (see Table 1.1, Chapter 1).

In addition, the outflow of money can contribute to underground economic activities directly because of the weakness of the banking system of these countries. For instance, the money sent to home countries by foreign workers, either through licensed or unlicensed financial institutions, is not monitored by systems, such as the *Hawala*

system of tracking the location of sending and receiving countries[18]. Therefore, money laundering and trafficking may be remitted and legalized within the channel of outflow of money (Freund & Spatafora, 2008; Naufal & Termos, 2010).

In this sense, the outflow of money due to remittances created a number of negative impacts on economic development and the economic system of the remitting countries. The outflow of money from the economy in the form of cash created substantial leakages of liquidity, and resulted in the increase in money demand. In terms of the balance of payments, the GCC economies ware suffering from a sustained deficit in their accounts of net current transfers, which were attributed to the higher outflow due to remittances made by foreign workers in these countries (Sturm *et al.*, 2008). The outflow of money in GCC countries made up a large portion of the GDP (Termos, Genc & Naufal, 2012).

According to Naufal and Termos (2009), the effect of the outflow of money due to remittances on the macroeconomic variables stemmed from the distortions in the economic policies in all the economies in GCC countries. The growing size of the outflow increased the downward pressure on public expenditure of the government through the multiplier effect on investment, productivity and competition among firms. This led to the distortion of price levels, increased level of poverty and distortion of exchange rate policies as GCC countries peg their currencies to the US dollar (Naufal &

[18] Due to the higher operating cost in providing financial services.

Termos, 2009; Taghavi, 2012). Thus, the spending of the GCC countries should be higher than the money outflows.

Furthermore, the outflow of money due to remittances had a negative impact on the money supply through the continuous outflow of domestic currencies of the GCC countries to other countries as the currency was accepted in other countries, particularly in the home countries of the foreign workers. Accordingly, the reason to include the outflow of money by foreign workers as an explanatory variable was that the outflow of money via remittances from GCC countries were linked directly to the underground activities through a ‘‘smurfing system’’, i.e., the remitted amounts of money were converted into smaller packages in order to avoid the higher cost of transfer service or to avoid having to report and pay taxes if they are in large amounts of money (Bowers, 2009; Macias & Cazzavillan, 2009). Another reason was due to the negative impact of the outflow of money through huge remittances that are associated with large immigrant workers in the GCC countries (see Figure1.1, Chapter 1, Endo & Afram, 2011).

Previous studies have shown that higher interest rates on deposits were expected to have a negative effect on the demand for currency in the GCC countries (see for example, Tanzi, 1982; Castellucci & Bovi,1999; Albu *et al.*, 2002; Chipeta, 2002; Yasmin, Rauf, 2004; Schneider & Hametner, 2007; Gulzar, Junaid & Haider, 2010). Interest rate on deposits is considered as the opportunity cost of holding cash[19]. Thus, it can be

[19] As the case in the previous studies that have been conducted on the underground economy, including the variable of the interest rate on the deposits, it is due to its impact either in positive or negative direction on the currency demand function. This study followed the same process.

increased or decreased (Cagan, 1958). The higher rate of interest on deposits increased the opportunity cost of holding cash; people would be motivated to invest in the form of deposits rather than holding money in cash, thereby reducing currency demand for liquidity (Hemachandra, 2009).

On the contrary, a lower rate of interest on deposits decreased the opportunity cost of holding money; where people will convert their deposits to cash rather than hold it in the form of deposits, thus increasing their demand for currency. In other words, a decrease in interest rates will increase credit available to the underground economy due to substitution of cash in the organized economy, since there is loss for individuals to keep money in the form of deposits (Hemachandra, 2009). In fact, the financial sector in the developing economies, such as the economies of the GCC countries, is still at the developing stage. Therefore, the sign of the rate of interest on the deposits in relation to currency demand may not reflect the real opportunity cost of holding money (Abd Karim & Guan, 2004; Hertog, 2012).

For inflation rate, the expected sign on currency demand was negative. The reason was that inflation rate is illustrated as tax on money used. Higher rate of inflation led to an increase of seigniorage in the economy. With inflation, money will lose its true value as the demand for cash will be reduced, since people will spend their money faster at current prices rather than hold it for the future at higher prices (Ahiabu, 2006). In contrast, a lower rate of inflation leads to an increase in demand for cash, since the true

value of money will be increased and people will prefer to spend rather than to save their money.

In relation to the underground economy and in case of higher rate of inflation, the economic agents will divert to the underground markets, whereas the overcrowding of buyers in an organized market is less. Thus, the turnover of goods and services in the underground markets increased and as a result, the underground economic activities increase relative to the formal sector (Ahiabu, 2006).

In fact, the inflation rates have been increasing at an average rate in the GCC countries over the period of this study. It has risen sharply since 2004 to around 10% in Qatar, Saudi Arabia and the UAE, in particular. The main factors that simulated inflation in GCC economies were the growing domestic demand associated with the rapid demand for money, rapid expansion of economic activities and the growing demand for imports (Sturm *et al.*, 2008).

The reason to include the inflation rate as an explanatory variable in the model was to jointly account for the opportunity cost of holding money as explained, taking into consideration the average rates of inflation in GCC countries during the period of study. Thus, inflation rate tended to have a lasting impact on currency demand. This study focused on the estimation of currency demand function in both the long-run and short-run relationships. The process of the estimation required the application of the recent techniques of time-series data analysis that considered the existence of structural change

in the data. The variables considered in this study are first tested with the traditional unit root test and with the recent unit root test in the presence of structural breaks.

4.3 Unit Root Test and Structural Break Issue

The issue of structural break has received much attention from researchers in the past and recent studies. It was one of the statistical problems that accompanied the time-series data, particularly macroeconomic data series. The existence of a structural break was attributed to the dynamic path of the economic system (Pasinetti, 1981). An occurrence of structural change stemmed from unexpected changes in a macroeconomic time-series data, political and economic events such as crises, policy change and regime shifts (Valadkhani, Layton & Pahlavani, 2005).

The idea of unit root tests came from the fact that estimating the standard regression models using the method of Ordinary Least Square (OLS) relied on the proposition that the means and variances of the included variables remained unchanged over time. Variables whose means and variances change over time are non-stationary or have a unit root problem (Gregory & Hansen, 1996). Thus, employing non-stationary variables in regression analysis using the OLS method leads to biased inferences and implausible results.

Almost all macroeconomic variables have a unit root or non-stationarity in nature. The process of analysis of the study began with the stationarity test on all the variables included in the model of estimation. The unit root tests of the variables were a

precondition to the investigation of the cointegration relationship. However, for cointegration test based on ARDL, the unit root test to predetermine the integration level of the variables involved is not necessary as long as they are either I(0) or I(1) (Akinlo, 2006).

Accordingly, the literature on testing for a unit root helped to capture some characteristics of the series under investigation, whether or not the series has a unit root. According to Glynn, Perera and Verma (2007), in case of series that has no unit root (stationary), the series waved around a constant long-run mean, and it has a finite variance that is uncorrelated to time. On the other hand, in case of a series with a unit root (non-stationary), the series does not fluctuate around the long-run deterministic mean and its variance is time-dependent.

The conventional Augmented Dickey-Fuller (ADF) (1979) test is the widely used method to test for unit roots in macroeconomic time-series data. Perron (1989) stated that the conventional ADF test lost its power in the presence of structural breaks (Gregory & Hansen, 1996). In this sense, the ADF test has no evidence of the rejection of a null hypothesis when the alternative hypothesis is true and the time break-point is ignored (Fort & Lee, 2006). Thus, the importance of this study is in its application of unit root test methods that took into consideration the presence of a structural break.

In this study, several unit root tests, namely Zivot and Andrews (1992); and Perron (1997) tests were employed. These two tests were conducted together with the

conventional ADF unit root test in order to capture strong inferences about the statistical properties of the variables in the CDA model of the selected GCC countries.

4.3.1 Unit Root Test without Structural Break: ADF Test (1979)

The study began with testing the existence of unit root for each variable in the model under estimation using the traditional ADF test of Dickey and Fuller (1979). Under the ADF test, the null hypothesis is that the variable is associated with unit root; β=0, against the alternative hypothesis that the series is stationary; β <0.

The test enabled us to investigate how many degrees of transformation should the series be differenced in order to achieve stationarity, i.e., the order of integration (*d*). If the series is I (0) process, *d*=0, it is said that the series has no unit root or it is stationary at level with an integration order of zero. If the series is I (1) process, *d*=1, it is said that the series has a unit root or non-stationarity with an integration of order one process. Thus, the series should be stationary at first difference. There are three different models to examine the properties of stationarity of the variables in the ADF test. The test is based on a set of models: with constant only, with intercept and time trend; and without intercept and time trend. The models of ADF test are formulated as follows:

ADF test equation with intercept: $\Delta X_t = a + \beta X_{t-1} + \sum_{i=1}^{k} \delta \Delta X_{t-i} + \varepsilon_t$ (3)

ADF test equation with trend and intercept: $\Delta X_t = a + \gamma t + \beta X_{t-1} + \sum_{i=1}^{k} \delta \Delta X_{t-i} + \varepsilon_t$ (4)

ADF test equation with no intercept and trend: $\Delta X_t = \beta X_{t-1} + \sum_{i=1}^{k} \delta \Delta X_{t-i} + \varepsilon_t$ (5)

where Δ is the difference operator, x_t is the tested variable, *t* is the time trend variable, *k* is the number of lags and ε is disturbance term. The term Δx_{t-i} is the lagged first differences to fit serial correlation in the residuals and *i* is the number of augmentation which is included in the ADF test (Bashier & Dahlan, 2011).

The rule is that if the *t*-statistic is less than its critical value, then the null hypothesis of the unit root, $\beta = 0$ cannot be rejected and we conclude that the variable is non-stationary. However, if the *t*-statistic is greater than its critical value, the null hypothesis of non-stationary can be rejected since the alternative hypothesis, $\beta < 0$ is accepted and we conclude that the variable is stationary (Hwang, 2002).

The number of optimal lag length or *m* will be chosen automatically based on Bayesian Information Criterion (BIC) of Schwartz (1989) and Akaike Information Criterion (AIC) (Akaike 1979). Gregory, Nason and Watt (1996); and Gregory and Hansen (1996) claimed that the usual ADF test has spurious findings in the presence of the structural break, and its power about the properties of a series reduced sharply. To overcome the spurious conclusions of the ADF test, this study adopted the unit root tests in the presence of structural break, such as Zivot- Andrews' (1992); and Perron (1997) root tests[20].

[20] The econometric software, Eviews version 8.1 package was used to perform the ADF tests of the Augmented Dicky-Fuller test (1979), Zivot- Andrews' (1992) and Perron's (1997) tests.

4.4 Unit Root Test with one Structural Break

4.4.1 Zivot-Andrews' Unit Root Test with One Structural Break

As mentioned earlier, testing for a unit root in time-series models has been a precondition for investigating the long-run relationship of variables through cointegration methods. Zivot-Andrews' (1992) unit root test is one of the widely acclaimed unit root tests that took into consideration the presence of structural break in the series.

Zivot-Andrews' (1992) unit root test allowed for only one time break in each tested variable; where the time break-point is endogenously estimated at unknown point as it occurred at time *t*. Therefore, Zivot-Andrews'(1992) unit root test was employed to test for the unit root in each variable that has been included in the CDA of the selected GCC countries. The test consisted of three models as follows:

Model **(A)**: the change in the level shift or intercept of series at unknown time break-point T_b:

$$\Delta Y_t = \hat{\mu}^A + \hat{\theta}^A DU_t + \hat{\beta}^A t + \hat{d}^A D(T_b)_t + \hat{\alpha}^A Y_{t-1} + \sum_{i=1}^{k} C_i{}^A \Delta Y_{t-i} + \hat{e}_t \qquad (6)$$

Model (**B**): the change in the slope of series in the trend function occurring at unknown time break-point T_b:

$$\Delta Y_t = \hat{\mu}^B + \hat{\beta}^B t + \hat{\gamma}^B DT_t^* + \hat{\alpha}^B Y_{t-1} + \sum_{i=1}^{k} C_i{}^B \Delta Y_{t-i} + \hat{e}_t \qquad (7)$$

Model (C): the change in the level shift and in the slope of series with trend occurring at unknown time break-point T_b:

$$\Delta Y_t = \hat{\mu}^C + \hat{\theta}^C DU_t + \hat{\beta}^C t + \hat{\gamma}^C D\mathrm{T}_t^* + \hat{d}^C D\left(T_b\right)_t + \hat{\alpha}^C Y_{t-1} + \sum_{i=1}^{k} C_i{}^C \Delta Y_{t-i} + \hat{e}_t \quad (8)$$

where DU_t in Equations 6 and 8 is a dummy variable for level shift at each time a break occurred, while DT_t^* in both Equations 7 and 8 is a dummy variable representing change that occurred in the trend. The dummy of DU_t =1 if $t > T_b$, or 0 if $t \leq T_b$, while the dummy of DT_t^* = $t - T_b$ if $t > T_b$, or 0 if $t \leq T_b$., whereas T_b is the date at which structural break took place, while the dummy of $D\left(T_b\right)_t$ = 1 if T_b+1 or 0 otherwise.

The guideline for choosing the date of a structural break is by choosing the minimum value of the *t*-statistic for testing the null hypothesis that $\hat{\alpha}$ = (α −1) =1, for all the models. If the *t*-statistic is less than its critical value at all levels of significance, it implied that the included variable has a unit root or is non-stationary with one structural break-point. If the *t*-statistic is greater than its critical value, it implied that the variable under test has no unit root with one break point or stationarity with one break, since rejection of null hypothesis does not mean rejection of a unit root itself, but implied rejection of unit root without a break (Lee & Strazicich, 2003).

The critical values are provided by Zivot and Andrews (1992), while the optimal number of lag length is based on the AIC. However, Zivot-Andrews' unit root test has spurious conclusion on the properties of the tested variable as it does not include the break date point under the null. Thus, it is not completed compared to the recent tests of the unit root (Silvia, & Iqbal, 2011). To cover the shortcoming of the prior test, this study also employed the unit root test of Perron (1997).

4.4.2 Perron's Unit Root Test with One Structural Break

As mentioned above, the recent methods for the testing of unit root emanated from the drawback of the conventional unit root tests (such as ADF test) that ignored the structural or time break-points in macroeconomic time-series data. Perron's (1989) unit root test is based on the traditional models of ADF unit root test that incorporated a dummy variable for one known time break. Perron (1989) assumed that the occurrence of time break is determined as an exogenous point, and it is chosen independently based on the data.

Perron's (1989) unit root test comprised three models that included the break-point under both the null and alternative hypotheses. The first Model (A) exhibited a one-time break in the level or intercept of tested series of the trend function of the series. The second Model (B) referred to the changing growth model which exhibited one time break in the slope of a series with trend without any change in the intercept. The third Model (C) allowed for change effects for one time break in the intercept and slope of a series simultaneously.

According to Patterson (2000), the three models were formulated in its null and alternative hypotheses as follows:

The null hypothesis of Model (**A**): the change in the intercept of series is:

$$Y_t = \mu + \delta_1 DVTB_t + Y_{t-1} + \varepsilon_t \quad (9)$$

where $DVTB_t$ is a pure impulse dummy, which took the value 1 in only one period and 0 elsewhere, $DVTB_t$=1 if t= T_b+1, and $DVTB_t$=0 if $t \neq T_b$+1. Where T_b is the time at which change occurred in the trend function of the series.

The alternative hypothesis of Model (**A**): the trend is stationary with one time break in the intercept of series is given as:

$$Y_t = \mu + \beta t + \delta_1 DVU_t + \varepsilon_t \qquad (9.1)$$

In this sense, the null hypothesis of the series has a unit root with one-time break in its intercept at T_b+1, while the alternative hypothesis of the series is trend stationary with a change in the intercept to $\mu+\delta_1$.

The null hypothesis of Model (**B**): the change in the slope of series is:

$$Y_t = \mu + \beta t + \delta_2 DVU_t + Y_{t-1} + \varepsilon_t \qquad (10)$$

where DVU_t is the growth dummy variable, DVU_t=0 if $t \leq T_b$, and DVU_t=1 if $t > T_b$.

The alternative hypothesis of Model (**B**): the trend is stationary, with one-time break in the slope of series as:

$$Y_t = \mu + \beta t + \delta_2 DVT_t{}^* + \varepsilon_t \qquad (10.1)$$

where DVT_t^* is the dummy variable of the trend slope, DVT_t^*=0 if if $t \leq T_b$, and DVT_t^*= $t-T_b$ if $t > T_b$.

The null hypothesis is that the series has a unit root with one-time break in its slope at the time, T_b+1, while the alternative hypothesis is that the series is stationary in trend with a change in the slope $\beta+\delta_2$.

The null hypothesis of Model (**C**): is change in the intercept and in the slope of the series:

$$Y_t = \mu + \delta_1 DVTB_t + \delta_2 DVU_t + Y_{t-1} + \varepsilon_t \quad (11)$$

The coefficients of δ_1 and δ_2 in Equation 11 are dummies for the effects of intercept and slope on μ, respectively. The difference between these two dummies is that the effect of $DVTB_t$ in time T_b+1 is to increase Y_t by δ_1 from T_b+1 onwards; the effect of the change is not attributed to change of δ_1 in the innovation ε_1 , while the effect of dummy variable of DVU_t is 0 before T_b and 1 thereafter.

The alternative hypothesis of Model (**C**): is the change in the intercept and in the slope of the series as below:

$$Y_t = \mu + \beta t + \delta_2 DVU_t + \delta_3 DVT_t^* + \varepsilon_t \quad (11.1)$$

where, DVT_t =0 if if $t \leq T_b$, and $DVT_t^* = t - T_b$ if $t > T_b$.

Since for the null hypothesis, the series has a unit root with one-time break in its level and slope at the time T_b+1, while for the alternative hypothesis, the series is trend stationarity with a change in the intercept and in the slope to $\mu + \beta + (\delta_2+\delta_3)$, the break-

point is chosen based on the minimum *t*-statistic for all the possible time break-points that are computed for unit root test.

In fact, Perron (1997) has shown that Perron's (1989) unit root test is biased toward the chosen time break-point exogenously; the selection of the break-points is uncorrelated with data. Perron (1997) extended his original unit root test with the presence of structural break through two different models, one with unknown time break, which is endogenously determined.

Unlike the former unit root test of Perron (1989); Perron's 1997 test is to test a null hypothesis of series with unit root against the alternative hypothesis with one-time break only. In other words, Perron (1997) proposed both the time trend, *t* and DT_b, the time break at which time change occurred in two forms: Innovational Outlier 1 (IO1) and Innovational Outlier 2 (IO2) models and the third model is called the Additive Outlier (AO) model. These models of Perron's (1997) test were formulated as follows:

Model (IO1) demonstrated a gradual change only in the intercept of a series in the trend function at time T_b as:

$$Y_t = \mu + \theta DU_t + \beta t + \delta D(T_b)_t + \alpha Y_{t-1} + \sum_{i=1}^{k} c_i \Delta Y_{t-i} + e_t \qquad (12)$$

Model (IO2) exhibited the change in both the intercept and the slope of a series in trend function at time T_b as:

$$Y_t = \mu + \theta DU_t + \beta t + \gamma DT_t + \delta D(T_b)_t + \alpha Y_{t-1} + \sum_{i=1}^{k} c_i \Delta Y_{t-i} + e_t \qquad (13)$$

where Y_t is the tested series, T_b is the date of time break, k is truncation lag parameter and it is also treated as unknown, and DU_t = 1 if $t > T_b$, 0 otherwise, $D(T_b)_t$ =1 if $t = T_b+1$, and 0 otherwise and the last term DT_t=1 if ($t > T_b$), t = 1, 2,…T. The third form of Perron's (1997) unit root test is AO model, which represented the sudden and rapid change that occurred in the trend function of the series. This form was conducted using a two-step procedure. First, the series was de-trended as follows:

$$Y_t = \mu + \beta t + \gamma DT_t^* + Y_t \quad (14)$$

where $DT_t^*=1(t- T_b)$ if $t > T_b$, 0 otherwise. Second, the test is then executed using the t-statistic for the null hypothesis, α = 1 in the following regression:

$$Y_t^* = \alpha Y_{t-1}^* + \sum_{i=1}^{k} c_i \Delta Y_{t-i}^* + e_t \quad (15)$$

In this test, the time break is treated as endogenous (unknown point). There are two ways for choosing the time break as suggested in Perron's (1997) unit root test. First, a time break-point is chosen based on the minimum value of the t-statistic for testing the null hypothesis of a unit root computed for all possible time break-points with estimated slope coefficient of γ=0, and α= 1 for the model (IO2) - the change in both the intercept and the slope.

The second is the value with most negative sequentially, with α=1 or θ=0 for model (IO1); the change in the intercept (Verma, 2007). For the time break-point for (AO), the change occurred in the slope only if the trend function of the series is selected at the minimum value of the t-statistic for testing the null hypothesis of α=1(Marashdeh &

Shrestha, 2008). This study employed Zivot-Andrews's (1992) unit root test and Perron's (1997) unit root test with one structural break.

The next stage after analyzing the stationarity properties of the variables in the currency demand function is to test the cointegration long-run relationship between the demand for currency and its determinants that have significant influence in the growth of the underground economic activities in the selected GCC countries. Gregory and Hansen's (1996) cointegration test with the presence of a structural break has been employed in this study.

4.5 Gregory and Hansen's Cointegration Test with a Structural Break

Gregory and Hansen's (1996) cointegration test was applied to investigate the long-run relationship between currency demand function and its determinants in the presence of a possible structural break (Singh & Pandey, 2009; Banafea, 2014). The test is an extension of Engle-Granger's (1987) cointegration test and it is a residual-based approach to test the null hypothesis of no cointegration against the alternative hypothesis of cointegration with one unknown structural break (Gregory & Hansen, 1996; Harvie & Pahlavani, 2006; Kumer, Webber & Fargher, 2013).

The most important contribution of Gregory and Hansen's (1996) cointegration test is that it allowed for I(1) variable over the whole system at one unknown time break-point (Omotor, 2011). The determination of a potential unknown break-point is endogenously estimated. Gregory and Hansen (1996a) mentioned that the standard ADF lost its power

to conclude that there is no long-run relationship, in case of non-rejection of the null hypothesis of no cointegration if the cointegrating system is mainly cointegrated with a one potential time break change.

According to Gregory and Hansen (1996), "*the standard tests for cointegration are not appropriate, since they presume that the cointegrating system is time-invariate under the alternative hypothesis"*. Thus, testing for cointegration based on the conventional tests is biased toward non-rejection of the null hypothesis and may produce a spurious inference of a cointegration relationship (Harvie & Pahlavani, 2006).

Gregory and Hansen (1996a) presented three models that allowed for testing the null over alternative hypotheses, taking into account the existence of structural break in the cointegrating long-run relationship, since the time break-point is unknown:

Model (1): the possible structural change in the level shift unknown time break-point, T_b as:

$$Y_t = \mu_1 + \mu_2 DU_{tk} + \alpha_1 X_t + e_t \quad (16)$$

Model (2): the possible change in the level shift with the trend at unknown time break-point, T_b as:

$$Y_t = \mu_1 + \mu_2 DU_{tk} + \mu_3 t + \alpha_1 X_t + e_t \quad (17)$$

Model (3): the possible change in the regime shift or full break where both the level shift and the slope coefficients change at unknown time break-point, T_b as:

$$Y_t = \mu_1 + \mu_2 DU_{tk} + \alpha_1 X_t + \alpha_2 X_t DU_{tk} + e_t \quad (18)$$

where Y_t, is the dependent variable of the cointegrating system, X_t is independent variable, t is a time trend. μ_1 represents the intercept before the level change, while μ_2 denotes the change in the intercept at a time break. α_1 represents the cointegrating slope coefficients before time break occurs, while α_2 denotes the change in the slope coefficients of the cointegrating system after time break occurs, t is time subscript and e is an error term.

In all these three models, DU_{tk} =1 if $t > k$ and DU_{tk}= 0 if if $t \leq k$, where k is the time break- point at which break occurred. The time break dates are achieved by an estimation of the cointegrating systems for all possible break dates; the time break date is chosen at a value that minimized the *t*-statistic or at which absolute value of the test *t*-statistic is at its maximum compared to its critical values provided by Gregory and Hansen (1996) using Monte Carlo experiments.

The number of optimal lag length was chosen automatically based on the criteria of BIC, AIC and t-test criterion (TTC)[21]. The three models above in Equations 16, 17 and 18 were extended to test cointegration relations for all the variables that are included in the CDA of the selected GCC countries. The new models can be expressed as follows:

[21] The econometric software, RATS version 8.1 package was used to perform Gregory and Hansen's (1996) cointegration test.

Model (1): cointegration equation with level shift dummy as:

$$lnM1_t = \mu_1 + \mu_2 DU_{tk} + \alpha_1 ln(TR)_t + \alpha_2 lnG_t + \alpha_3 lnRem_t + \alpha_4 i_t + \alpha_5 \pi_t + \varepsilon_t \quad (19)$$

Model (2): cointegration equation with level shift dummy and trend as:

$$lnM1_t = \mu_1 + \mu_2 DU_{tk} + \mu_1 t + \alpha_1 ln(TR)_t + \alpha_2 lnG_t + \alpha_3 lnRem_t + \alpha_4 i_t + \alpha_5 \pi_t + \varepsilon_t \quad (20)$$

Model (3): cointegration equation with regime shift dummy (full break) where both the level shift and the slope coefficients are changed as:

$$\begin{aligned} lnM1_t = {} & \mu_1 + \mu_2 DU_{tk} + \alpha_1 ln(TR)_t + \alpha_{11} ln(TR)_t DU_{tk} + \alpha_2 lnG_t + \alpha_{22} lnG_t DU_{tk} + \alpha_3 lnRem_t + \\ & \alpha_{33} lnRem_t DU_{tk} + \alpha_4 i_t + \alpha_{44} i_t DU_{tk} + \alpha_5 \pi_t + \alpha_{55} \pi_t DU_{tk} + \varepsilon_t \end{aligned} \quad (21)$$

To capture the estimates of the best model with structural break in the long run period, this study proceeded to estimate all the three cointegrating Equations, 19, 20 and 21 applying Engle-Granger technique, as extended by Gregory-Hansen (1996). Choosing the best model to investigate the cointegrating long-run relationships between currency demand and its determinants was based on the model that is a more consistent with the theory, significant and passes the diagnostic tests. The test proceeded with the estimation of one period lag of ECM, using the residuals obtained from the estimated cointegration equations with respect to the above models. The residuals were tested for its stationarity in level as suggested by Engle-Granger (1987). This was in order to gather a robust conclusion from the cointegrating relationship.

4.6 Short-Run Estimation

In this study, the dynamic short-run ECM was built based on the LSE-Hendry method called GETS as explained in Rao, Singh and Kumar (2010). To do this, the currency demand function in its first adjustment in Equation 2 was transformed into the following form:

$$\Delta lnM1_t = -\lambda[lnM1_t - (\alpha_0 + \beta_1 \ln TR_t + \beta_2 \ln G_t + \beta_3 \ln \mathrm{Re}\, m_t + \gamma_1 i_t + \gamma_2 \pi_t)] \quad (22)$$

where λ presents an adjustment coefficient of ECM. It should be negative, less than one and significant. This is due to the fact that the demand for currency can fluctuate in the current time period as a result of the changes in its determinants, where the independent variables that may interpret the behavior of currency demand can also change in the current and past time periods. Thus, Equation 22 is re-written in a more general and accurate specification as in Equation 23:

$$\begin{aligned}\Delta lnM1_t = \alpha - \lambda[lnM1_t - (\alpha_0 + \beta_1 \ln TR_t + \beta_2 \ln G_t + \beta_3 \ln \mathrm{Re}\, m_t + \gamma_1 i_t + \gamma_2 \pi_t)] \\ + \sum_{i=1}^{n} \phi_i \Delta \ln TR_{t-j} + \sum_{i=1}^{n} \delta_i \Delta \ln G_{t-j} + \sum_{i=1}^{n} \theta_i \Delta \ln \mathrm{Re}\, m_{t-j} + \sum_{i=1}^{n} \psi_i \Delta i_{t-j} \\ + \sum_{i=1}^{n} \varphi_i \Delta \pi_{t-j} + \sum_{i=1}^{n} \gamma_i \Delta \ln M1_{t-j}\end{aligned} \quad (23)$$

where Δ is the difference operator, while the term of $\Delta\, lnM1_{t-j}$ describes the changes in the lagged dependent variable, and α is the intercept. The term of the ECM is the difference between the actual and estimated currency demand at time $t-1$, which is included in Equation 23 in order to introduce a most capable fit of general dynamic specification of the adjustment process. In line with this technique, Equation 23 was estimated using OLS and the insignificant lagged variables were discarded till the last

fitted version of the adjustment model of the short-run dynamic error correction was obtained.

In essence, the short-run ECM was obtained based on an estimation of Equation 23. Hence, the dependent variable of currency demand was regressed on its lags, its own determinants with their current and lagged terms and the one period lagged residuals that were obtained from the cointegrating equation as determined by Gergory and Hansen's (1996) methodology (see Singh & Pandey, 2009; Omotor, 2011; Dritsakis, 2012; Kumar & Webber, 2013; Kumar *et al.*, 2013).

The final version of short-run dynamic ECM was tested for serial correlation, normality, functional form misspecification, and heteroscedasticity of the residuals. Finally, the stability test of currency demand function using Cumulative Sum of Recursive Residuals (CUSUM) and Cumulative Sum of Squares of Recursive Residuals (CUSUMSQ) tests as introduced by Brown, Dublin and Evans (1975) were conducted[22].

4.7 Estimation of the Underground Economy

The beginning point of estimating the volume of the underground economy in the selected GCC countries relied on the choice of the correct model of the long-run relationship of cointegrating equations based on Gregory and Hansen's (1996) method. Additionally, the choice of a correct model is one that is consistent with economic theory and is significant.

[22] The econometric software, Eviews version 8.1 package was used to perform dynamic ECM based on the GETS technique of Hendry (2001,2005) as in Rao, Singh and Kumar (2010) and the diagnostic and stability tests of the model.

In line with previous empirical studies, for accurate estimates of the underground economy, the values for the coefficient of tax elasticity and income elasticity should be positive and significant. For instance, if the coefficient of tax elasticity is negative, then the predicted value of the currency demand function without tax ($\ln\widehat{M1}_{t\ *_{wT}}$) will become greater than with tax ($\ln\widehat{M1}_{t\ *_{T}}$), which makes the size of the underground economy less than zero. This does not make any sense in the real world situation.

If the coefficient of tax elasticity is insignificant, then the difference (the value of illegal money, which is a first stage to estimate underground economy) between the predicted value of the currency demand function without tax ($\ln\widehat{M1}_{t\ *_{wT}}$), and the predicted value of the currency demand function with tax ($\ln\widehat{M1}_{t\ *_{T}}$) will not be statistically significant (Hassan & Suk-Yu, 2010). The same analysis will be only conducted in the case where the coefficient of income elasticity is negative.

The study proceeded to estimate the volume of the underground economy in the selected GCC countries following recent studies that used the recent CDA. Following Ahumada *et al.* (2007); Ahmed and Hussain (2008) and Macias and Cazzavillan (2010) the analysis of the underground economy in the selected GCC countries followed the typical path.

For each quarter or year over the period of the study, the predicted values of the currency demand function were first derived with the tax revenues variable ($\ln\widehat{M1}_{t\ *_{T}}$)

and then secondly, the predicted values of the currency demand function were derived without tax revenues variable ($\ln\widehat{M1}_{t\ *_{wT}}$). The difference between these two predicted values was multiplied by the actual total value of money supply *M2* or by the actual total value of money in circulation, plus demand deposits accounts *M1* over the period of study to give the level of illegal currency.

As a matter of fact, in the existing empirical literature, the calculation process of illegal money has been computed in two different ways. First, the computation of the total value of illegal currency was based on the difference between the predicted value of currency demand function with tax variable and without tax variable multiplied by money supply *M2* or money in circulation plus demand deposits accounts *M1*. Second, the process of computing the total value of illegal currency depended only on the difference between the predicted value of currency demand function with tax variable and without tax variable.

This study applied the above mentioned two procedures for computing the total value of illegal currency. The most essential part of the study is that if either the first or the second procedure was applied, both procedures were subjected to the conditions suggested by Ahumada *et al.* (2007) in estimating the volume of the underground economy.

In this case, the illegal money to demand currency ratio for each quarter or year is formulated as follows:

Illegal money $(IM1)_t = \left[(\ln \hat{M}1_t *_T) - (\ln \hat{M}1_t *_{wT}) \right] * M2_t$ (24)

Or following the first procedure where,

Illegal money $(IM1)_t = \left[(\ln \hat{M}1_t *_T) - (\ln \hat{M}1_t *_{wT}) \right] * M1_t$ (25)

In the second procedure,

Illegal money $(IM1)_t = \left[(\ln \hat{M}1_t *_T) - (\ln \hat{M}1_t *_{wT}) \right]$ (26)

Assuming the total money in the economy can either be used for legal or illegal transactions over the whole economy. Therefore, the true legal money in the economy was computed by taking the difference between total money supply and illegal money, or between the total money outside banks and illegal money. Mathematically, this can be expressed as follows:

Legal money $(LM1)_t = \left[M2_t - (I\hat{M}1_t) \right]$, or $(LM1)_t = \left[M1_t - (I\hat{M}1_t) \right]$ (27)

According to Ahumada *et al.* (2007), based on the CDA in estimating the underground economy, the velocity of income elasticity of money demand is an empirical issue and its calculation reflects the transactions over all the economies in both formal and informal settings. Thus, the values of the velocity must be known prior to the estimation of the underground economy (Macias & Cazzavillan, 2009). The velocity of money in the economies of GCC countries is mathematically expressed as:

$$VelocityofMoney = \frac{GDP_t}{\mathrm{M1} - (\mathrm{IM1}_t)} \quad (28)$$

Equation 26 was used to capture an estimation of the underground economy, whereas the size of the underground economy in the selected economies of GCC over the period of 1991-2010 in quarterly data in the case of the UAE, Kuwait and Oman; or over the period of 1980-2010 in yearly data for Saudi Arabia and Qatar was obtained by multiplying illegal money by the velocity of money as follows:

The underground economy $(UE)_t = IM_t * V$ (29)

The study assumed that the coefficient value of GDP_t (Income elasticity of money demand) is different from 1. So, in this study, the estimation of predicted values of the underground economy was corrected using the suggested method by Ahumada *et al.* (2007). This is shown below as follows:

$$\frac{UndergroundEconomy_t}{Official\,GDP_t} = \left(\frac{Illegal\,Currency_t}{Legal\,Currency_t}\right)^{\frac{1}{\beta}} = \left(\frac{UndergroundEconomy_t}{OfficialGDP_t}\right)^{\frac{1}{\beta}} \quad (30)$$

Equation 30 corrected the estimation of the underground economy when the coefficient of income elasticity is not equal to one which has been the case in this study; Ahumada *et al.* (2007) proved that it is wrong to assume the equality of the velocity of money using currency demand function in estimating the underground economy under the hypothesis that the coefficient of income elasticity is equal to one[23].

Meanwhile, the predicted values of the total tax evasion in the selected economies of the GCC countries (for each year or quarter over the period of this study) were obtained by

[23] See Appendix A : an aggregation framework for a suggested correction in estimating the underground economy.

multiplying the estimates of the underground economy by the ratio of the total non-oil tax revenue to the GDP. This can be expressed as follows:

$$TaxEvasion(TE) = \left(UE_t\right) * \left(\frac{TotalTax\,\mathrm{Re}venue_t}{GDP_t} \right) \tag{31}$$

4.8 Sources of Data and Interpolation Process

The analysis of this study was based on time-series data of five selected economies of the GCC countries (Saudi Arabia, Qatar, the UAE, Kuwait, and Oman). The data for Saudi on money outside banks (M1), GDP and inflation rates were collected from the World Bank Data (2014). The total non-oil tax revenues and the outflow of money abroad were collected from the General Secretary of GCC countries, while, interest rate on deposits was collected from the annual reports of Saudi Arabia Monetary Agency (SAMA) for the period of 1980-2011.

The data for Qatar on money outside banks (M1), GDP, the outflow of money, inflation rate and interest rate on deposits were collected from the annual economic reports of the Central Bank of Qatar. The total non-oil tax revenues data was collected from the General Secretary of GCC countries. The data for UAE on money outside banks (M1), GDP and inflation rates were collected from the World Bank Data (2014). The total non-oil tax revenues and the outflow of money abroad were collected from the General Secretary of GCC countries, while, interest rate on deposits was collected from the annual economic reports of the Central Bank of UAE. The data for Kuwait on money outside banks (M1), GDP, the outflow of money abroad, inflation rates and interest rate

on deposits were collected from the Central Bank of Kuwait over the period of 1990-2011. While, the total non-oil tax revenues data was collected from the General Secretary of GCC countries. The data used for Oman on money outside banks (M1), GDP and inflation rates were collected from the World Bank Data (2014). The total non-oil tax revenues and the outflow of money abroad were collected from the General Secretary of GCC countries, while, interest rate on deposits was collected from Economic Statistics published by the Central Bank of Oman.

Due to the unavailability of quarterly data of macroeconomic variables in those selected economies in GCC countries, the Gandolfo (1981) interpolation method and the method that has been reported in Hernandez (2009) were used to derive quarterly series from the annual data. The formulae to compute the quarterly series were provided by Galdolfo (1981) as follows:

$$1^{st}\ \text{Quarter: } Y_t = 0.0546875Y_{t-1} + 0.234375Y_t - 0.0390625Y_{t+1} \quad (1)$$

$$2^{nd}\ \text{Quarter: } Y_t = 0.0078125Y_{t-1} + 0.265625Y_t - 0.0234375Y_{t+1} \quad (2)$$

$$3^{rd}\ \text{Quarter: } Y_t = -0.0234375Y_{t-1} + 0.265625Y_t + 0.0078125Y_{t+1} \quad (3)$$

$$4^{th}\ \text{Quarter: } Y_t = -0.0390625Y_{t-1} + 0.234375Y_t + 0.0546875Y_{t+1} \quad (4)$$

where Y_{t-1} is the last year, Y_t is the current year to be interpolated and Y_{t+1} is the next year. For instance, to compute the first quarter series for total tax revenues, one may substitute the values of the annual total non-oil tax revenues for Y_{t-1}, Y_t and Y_{t+1} in (1). A similar technique have been used to obtain the series for the second, third and fourth quarters. The annual data from 1990 to 2011 were interpolated into quarterly data

spanning 1991:Q1 to 2010:Q4 in this study. Another technique to derive quarterly series from annual data was reported in Hernandez (2009) as follows:

$$i_t = (1+X_t)^{\frac{N}{4}} - 1 \cdot \qquad (32)$$

where i_t is the derived quarterly series, X_t is the annual series and *N* is the order of the derived quarter relative to a series in annual terms, N=1, 2, 3 and 4.

4.9 Conclusion

This chapter started with a concise overview of the measurements that have been used in the previous empirical studies to estimate the underground economy. The chapter focused on explanations of model specification in detail, taking into account the selected variables. As the analysis of this study is conducted using time-series data, the chapter outlined the recent techniques of unit root tests that were applied to test the properties of the series included in the presence of one structural break, such as unit root tests of Zivot-Andrews (1992); and Perron (1997), in addition to short presentation of the conventional tests for unit root.

Furthermore, the chapter proceeded to describe the methodology of Gergory and Hansen‘s (1996) cointegration test in terms of long-run estimates based on model specification of currency demand function. Besides, the description of the GETS technique of Krolzig and Hendry (2001, 2005) as in Rao, Singh and Kumar (2010), which was employed to estimate the short-run dynamic ECM with consideration of the diagnostic tests and stability test were performed to examine the robustness of the

model. Then, the chapter explained the methodology used to estimate the underground economy, illegal money that can be used to settle the illegal transactions and the tax evasion as the main objectives of this study. Finally, the chapter presented the methods for the interpolation of data in order to derive new quarterly data from annual series.

CHAPTER FIVE

EMPIRICAL RESULTS AND FINDINGS

5.1 Introduction

This chapter started with the presentation and discussion on the stationarity of the variables included in the model under estimation, for each of the sampled countries over the study period. To this end, the traditional ADF test has been performed along with the unit root tests of Zivot-Andrews (1992) and Pierre Perron (1997). Since, the later unit root tests are exclusive to the issue of the structural breaks in a comparison to the classical ADF test. The intention was to capture a strong inference about the properties of a tested series in order to overcome the spurious conclusions in the case of the ignorance of the structural break. At this stage, the optimal lag selection is automatically based on the frequency of the data.

The results of the traditional and recent unit root tests were reported for each country individually. As the stationarity analysis is a precondition for investigating the long run relationship among the variables in the system under consideration, the Gregory-Hansen cointegration test was conducted based on three models: dummy level shift, dummy level shift with trend and full break or regime shift. The findings of the long run relationship were provided in respect to the selected countries in the sample. The best models that have been selected were the most consistent with the economic theory and the most statistically significant.

Next, the study also analyzed the estimation of the short run dynamic ECM using the technique of GETS of Krolzig and Hendry (2001, 2005). At this stage, the diagnostic tests and stability test were performed in order to capture a goodness fit of the preferred model. Afterward, the analysis of the study proceeded with the estimation of the underground economy, illegal currency and the tax evasion for the countries in the sample. The arrangement of the analysis for the selected countries started with the economy of Saudi, Qatar, UAE, Kuwait, and Oman. Therefore, the arrangement and analysis have been done based on the relative size and the available data (regarding the frequency of data, whether it is yearly or quarterly) of each economy.

5. 2 Saudi Arabia's Empirical Results

5.2.1 Unit Root Test Results

The empirical analysis started with Saudi Arabia because it had the largest economy in the region of GCC, and the availability of its annual data (Alkhathlan, 2013). The procedures employed for examining the stationarity of the tested series were the traditional Augmented Dickey-Fuller (ADF), Zivot-Andrews (1992) and Perron's unit root tests. The later techniques were employed to take account of the existence of structural break.

Starting from the unit root test of ADF as reported in Table 5.2.1, the results indicated that the tested variables were I(1) process (integrated of order one) or non-stationary in its level at 5% significance level[24] except the variable of interest rate, which was stationary

[24] The test for all the series was conducted with intercept and trend, and the optimal lag selection is automatically selected by Schwarz Information Criterion in Eviews.

in its level or I(0) process at the 5% level of significance. Since the null hypotheses of the unit root for the tested series were not rejected except for the null hypotheses of the unit root for the tested series of interest rate on deposits which was rejected. While the variables were integrated of order one or I(1) process at 5% significance level except for the outflow of money variable which became stationary at 10%. The results concluded that the tested variables share the same properties of the stationarity analysis as I(1) process. The conclusion here may provide a spurious conclusion, because the consideration of the structural break is discounted (Gregory *et al.*, 1996).

Considering the weakness of the former test of the ADF unit root test, Zivot and Andrews (1992) proposed a unit root test in the presence of structural break to take care of the shortcomings of the traditional unit root test. Setting for the maximum order at k=1 to each tested variable; the results of Zivot-Andrews unit root test in the level and the first difference were presented in Table 5.2.2[25]. From the results, all tested variables were non-stationary in level at the 5% significance level under both intercept and intercept with trend models since, the null hypothesis of non-stationary were not rejected. However, the examined variables were stationary in their first difference or integrated of I(1) process at the 5% level of significance, excluding for the variable of interest rate on deposits which was stationary at the 10% significance level.

It is shown that all the variables have a unit root in their level and stationary in their first difference with one break point. But the variables differed in the break points in regards

[25] The Zivot-Andrews's (1992) unit root test was conducted with the intercept and both the intercept and trend.

to the same type of models of the test. The final conclusion on the tested variables may have a bias, which may arise from the estimation procedure in case of the variation of critical values in Zivot-Andrews's (1992) unit root test (Glynn *et al.*, 2007).

Perron's unit root test (1997) was employed in order to confirm that the statioarity analysis of the examined variables using Zivot-Andrews's (1992) unit root test is robust (Valadkhani *et al.*, 2005). Perron's unit root test provided a valuable inference for analyzing the unit root on a certain variable in the case of the occurrence of the structural break. Furthermore, it introduced the break whether the occurrence of the break point is attributed to a certain event or other factors (Glynn *et al.*, 2007). The study set the maximum order equals to one (k=1) for each variable. The results of Perron's unit root test in the level and the first difference were presented in Table 5.2.3[26].

It is shown that the tested variables were non-stationary in their level at the 5% significance level, taking into account the type of models as it was reported in Table 5.2.3. However, the examined variables have no unit root in their first difference or integrated of I(1) process at the 5% level of significance, except the variable of interest rate on deposits which has no unit root at the 10% significance level, since, the null hypothesis for all tested series were rejected. The results outlined that both the tests of Zivot-Andrews's (1992) unit root and Perron's unit root test (1997) confirmed each

[26] The Perron's (1997) unit root test was conducted with the intercept, trend and both the intercept and trend.

other in analyzing the stationarity of the variables in the existence of the structural break.

Based on both the tests, the time break points for the year 1986 coincided with the oil price crash (Banafea, 2014). The break dates of 1987 and 1988 corresponded to the economic policy of the Saudi government that has been aimed to cover the public budget deficit, due to the decline in the oil revenues during that period (Looney, 1992). The time break points of 1990 and 1991 reconciled with the event of the First Gulf War and its impact on the Saudi economy (Khadria, 2010; Hvidt, 2013). Since, the Saudi economy has a largest budget deficit, which led the government to reduce its expenditure during that period (Ghali, 1997).

The time break points for the year 1992-1995 coincided with the slump in the oil revenues as a result of the reduction in oil prices in the global market. This fall was followed by a reduction in the government expenditures (Alshahrani & Alsadiq, 2014). The time break point of 2000 corresponded to an adoption of the economic reform through the Seventh Economic Development Plan which has been targeted to enhance and restructure the Saudi economy. The Saudi government was concentrated to prepare the economy for Globalization, Privatization, to be a member in the World Trade Organization and to enhance the implementation of the *Saudization* System as a strategic

option (Ramady, 2010)[27]. The break point for the year 2001 coincided with the event of the September 11 attacks (Banafea, 2014).

The time break point of 2003 matched with the rapid surge in economic growth, which reflected the hike of the oil revenues (Cevik & Teksoz, 2013). Lastly, the break date of 2005 coincided with the event that the Saudi economy has officially joined the World Trade Organization (WTO) (Banafea, 2014).

5.2.2 Gregory - Hanesn Cointegration Test Results

To investigate the long run relationship between currency demand function and its determinants over the study period while taking the possible presence of a structural break into consideration. The test of Gregory and Hansen's (1996) cointegration was applied (Kumer *et al.*, 2013). The Gregory and Hansen cointegration test results were represented in Table 5.2.4. The results showed that the test-statistics of ADF were significant at the 5% level of significance in the models of GH-2: Eq.20, SA and the model of GH-3: Eq.21, SA respectively. The null hypotheses of no cointegration in the models of the GH-2, and GH-3, with a structural break point were rejected. Thus, the results concluded that the models of Saudi money demand in GH-2 and GH-3 have a long run relationship with its explanatory variables over the study period. However, the results indicated that the model of money demand in GH-1: Eq.19, SA was statistically insignificant, which failed to reject the null of no cointegration with a structural time

[27] The Saudization System is the policy that has been implemented by the Saudi government via the ministry of Labor in order to increase the share of Saudi workforce (Saudi women and youth) in the private sector (Sadi, 2013).

break. Therefore, there was no sufficient evidence for a long run relationship between money demand and its determinants in the GH-1 model.

The estimations of Gregory-Hansen cointegration tests were plotted in Figures 5.2.1, 5.2.2 and 5.2.3, and the time break points reflected some of the events that have occurred and had its impact on the economy. For instance, the break date point of 1985 coincided with the reduction in the oil revenues, which led to an increase in the public budget deficit of the country (Alkhathlan, 2013). However, the break date of 2005 matched with the occasion that the economy of Saudi Arabia had become a member of the WTO and the break point of 1997 referred to the East Asian economic crises (Banafea, 2014).

5.2.3 Long Run Estimates of Saudi Money Demand Model

To investigate the long run relationship between the money demand and its explanatory variables in the predictable currency demand model with structural break in the Saudi economy, this study proceeded to estimate all the three cointegrating Equations, 19, 20 and 21 applying Engle-Granger technique, as extended by Gregory-Hansen (1996). The results of the estimation were provided in Table 5.2.4. From the results, the model of GH-1 was not applicable, since it failed to reject its null of no cointegration. The model of GH-3 with regime shift was not acceptable since the sign of income elasticity was negative, which makes no sense for the money demand function as indirect method to estimate underground economy.

The results showed that the model of GH-2 had strong statistical evidence as a measurement of the currency demand proxy to obtain estimates of the underground economy in the Saudi

economy. The statistics of the selected model were presented in Table 5.2.5, and reported in Equation 33:

$$\ln M1_t = 9.16 + 0.16DU_{tk} + 0.02t + 0.19\ln(TR)_t^{**} + 0.03\ln G_t - 0.06\ln \mathrm{Re}\, m_t - 0.02i_t^{**} + 0.1\pi_t \quad (33)$$

Note: (*) 1%, (**) 5% and (***) 10% level of significance.

The GH-2 model was applicable due to the following reasons. The underlying interested variable in the model, the financial variable of non-oil tax revenue had its expected sign, and consistent with an economic theory. The coefficient of the variable was statistically significant at 5% level. It was observed that the variable of non-oil tax revenue had a statistical effect on the money demand model of the Saudi economy. The long-run period estimation indicated that a 1% increase in tax burden, the demand for money by taxpayers will increase by 0.19%. Additionally, the results signified that the variables, the dummy and trend had significant impact on the money demand model of the Saudi economy. Also, the results indicated that the interest rate on deposits has its negative sign in line with economic theory and statistically significant at the 5% level. For every 1% decrease in the interest rate on deposits, the demand for money is expected to increase by 2%.

On the other hand, the results displayed that the variable of GDP had its expected positive sign, and statistically insignificant effect on the money demand. Indeed, the GDP variable was used as a scale variable that reflected the extent of the transactions of the economic activity. In the case of Saudi, it is insignificant in relation to money demand because of the fact that Saudi economy's GDP heavily relied on the production

of crude oil, which contributed more than half of the country's output and had no integration with other sectors in the economy (Fadil, 1985; Albassam, 2015).

According to Basher and Fachin (2014) the decisions on the size of the production of crude oil are not influenced by monetary creation. Therefore, the liquidity of the private sector was not affected. In regards to this fact, it is likely that the money demand in the Saudi economy was not affected by the total GDP, which constituted the income of oil production. But it may be affected by the non-oil GDP. The coefficient of the outflow of money by foreign workers had a negative sign and statistically insignificant effect on the money demand. The unanticipated insignificance of the money outflows on the money demand in the Saudi economy may be attributed to the fact that the investment and consumption activities are relying on the foreign workers who are staying in the country. With a tight regulation imposed on the foreigners, foreign workers in the Saudi economy send billions of dollars to their home countries[28]. These amounts of money sent to abroad were not used for the investment or consumption in the economy of Saudi Arabia. In recognition of this truth, the money demand in the Saudi economy may not be influenced by the outflow of money (Alkhathlan, 2013).

The finding also indicated that the variable of inflation rate was statistically insignificant. It has no influence on the money demand of the Saudi economy, and then did not support the economic theory. The unexpected relationship of inflation related to the money demand could be attributed to the fact that the Saudi monetary authority had

[28] The Saudi economy had more than 9.5 million of the foreign workers, who constituted more than 31percent of its total population. In 2009, the Saudi economy was the second biggest source of money outflow ($26.0 billion), after the US economy (Alkhathlan, 2013).

adopted a preventative monetary policy that kept the inflation rate at its moderate level (AL-Towaijri & Al-Qudair, 2006)[29]. The result here may arise from the fact that the main objective of the Saudi monetary authority has been the price stability (Alshebel & Al-Hassan, 2001). This consequence reflected that the consumer price index in the Saudi economy had its advantage of stability on average over time (Saudi Arabian Monetary Agency, 2010). Thus, the money demand of the Saudi economy was not influenced by inflation rate.

Considering the cointegrating equation result of the Gregory-Hansen model 2; dummy level shift with trend, the study continued to capture the estimation of the dynamic short run of the error correction model (ECM) as presented in sub-section 5.2.4.

5.2.4 Short Run Estimation of Saudi Money Demand Model

Estimating the short run ECM required the inclusion of residuals obtained from the Gregory-Hansen cointegrating equation of model 2, in its one lagged period. The residuals have to be examined for its stationary at order zero or I(0) process. The ADF test coincided with its null hypothesis of a unit root in the residuals against the alternative hypothesis that residuals are stationary. The finding was reported in Table 5.2.6. The result revealed that the ADF test statistic was at its maximum absolute value of 4.29. It was statistically greater than its critical value of 3.57 at the 5% level of significance. The test result indicated that the null hypothesis can be rejected since the residuals were

[29] The inflation rates of the Saudi economy were at its moderate level since 1980-2003. From 2003 up to 2010, it fluctuated due to some external factors that push it to increase (Altowaijri, 2011; Saudi Arabian Monetary Agency, 2014).

stationary in level. The result further supported that the Saudi money demand model has a long run relationship with its determinants.

Moving to estimate the dynamic adjustment of the error correction model (ECM), the method of General to Specific (GETS) was applied to this end. The dependent variable of currency demand, $\Delta lnM1_t$ was regressed on its lags, its own explanatory determinants with their current and lagged terms ($\Delta\, lnTR_t$, $\Delta ln\, G_t$, $\Delta lnRem_t$, Δi_t and $\Delta\pi_t$), and with the inclusion of the one period lagged residuals that were obtained from the cointegrating equation GH-2 in Gergory and Hansen's (1996) estimation (Kumar *et al.*, 2013).

The method dealt with an application of maximum two periods lags, and the lagged variables were subject to the deletion tests till the last parsimonious fitted version of the adjustment model of error correction (ECM) was obtained. Moreover, the last version of the model was also subject to the diagnostic and stability tests. The finding of the short run error correction model was reported in Table 5.2.7, while the results of the diagnostic tests were demonstrated in panel B, the lower part of the Table.

From the estimates of the parsimonious model of the short run dynamic ECM, the estimated coefficients of the variables of the money outflows and the one lagged period of the dependent variable (money demand) were statistically significant at the 5% level and have a positive effect on the money demand. The coefficient of the variable of the GDP was statistically significant at the 10% level and has a positive impact on the

money demand. Contrary to the theory, the coefficient of the variable of total non-oil tax revenues had a negative sign in the short run at the 10 % level of significance. The coefficient of the variable of inflation was statistically significant at the 10% level and had a positive impact on the money demand. The coefficient of interest rate was statistically not significant. From the results, the coefficient of the lagged variable of the error correction term (ECT) had its negative sign and significant at the 5% level of significance. The coefficient mirrored the speed of amendment between the two periods: long run and short run, and indicated that 51% of disequilibrium in the prior period would be amended in the current period. It confirmed the idea that the variables under attention were moving together over time or cointegrated.

The adjusted R-squared suggested that 51% of the variation in the Saudi money demand model was explained by its determinants. In addition, the statistic value of the Durbin-Watson test (DW-statistic = 1.89) showed that the estimated model has no problem of serial correlation or heteroscedasticty in the disturbances.

As can be seen from the diagnostic tests associated with the estimates of (ECM) in the lower part, panel B of Table 5.2.7, the test statistic value (0.46) of the Breusch- Godfrey of Lagrange Multiplier (LM) for serial correlation, with two degrees of freedom was less than its critical value of 5.99 and statistically insignificant at the 5% level. Since the p-value was greater than its 5% level of the significance, the test concluded that the residuals of the estimated parsimonious model were not serially correlated. The Ramsey's RESET test distributed as Chi Square χ^2 was applied for testing the functional

form specification with three degrees of freedom[30]. The value of the RESET statistic of 6.67 was less than its critical value of 7.82 and statistically not significant at the 5 % level. The test revealed that the estimated model was free from specification error. The Jarque-Bera test of normality for residuals was also applied with two degrees of freedom. It was indicated that the value of the JB- test statistic stood at 0.23 less than its critical value of 5.99 and not significant at the 5% level. Thus, the result ended with the conclusion that the residuals of the estimated model were normally distributed.

The AutoRegressive Conditional Heteroskedasticity (ARCH) test was applied to test for heteroscedasticity with only one degree of freedom and it was distributed as Chi Squaresχ^2. From the result, the value of the ARCH statistic of 1.35 was less than its critical value of 3.84 and statistically not significant at the 5% level. Therefore, the conclusion was that the disturbances were homoscedastic, i.e., there was no evidence of heteroscedasticity on the estimated short run model.

As for the stability test, the cumulative sum of recursive residuals and the cumulative sum of squares of recursive residuals of Brown *et al.* (1975) were used to investigate the stability of the estimated parameters in the selected model of GH-2. It was well-run recursively, plotted against the break points and based on the first set of *n* observations. If the plot of CUSUM statistic is found within 5% level of significance, the estimated coefficients are stable over time. The same analysis applied to the CUSUMSQ that is

[30] The null hypothesis of the test with one or two degrees of freedom was rejected at the 5% level of significance.

depended on the squared recursive residuals. Graphical presentations of these two tests were provided in Figure 5.2.4 and 5.2.5.

From the result, the plot of CUSUM statistic for *ln*(M1) did not cross its critical value lines, and hence, the study concluded that the Saudi money demand model was stable over time. In the same vein, the plot of CUSUMSQ statistic did not cross its critical value lines as well, and thus, the result indicated stability in the Saudi currency demand model, *ln*(M1), i.e., the estimated parameters were stable over the period of the study. The stability of the Saudi currency demand model may offer signal on the capability of the monetary policy in the Saudi economy as it was the main target of the government, since the Third Economic Development Plan (Looney, 1986). Therefore, the Saudi Arabian Monetary Agency (SAMA) should continue to use its monetary instruments for the implementation of its economic monetary policy.

5.2.5 Analysis of the Underground Economy in Saudi

Based on the estimated GH currency demand model-2, Table 5.2.8 offered the estimates of the size of the underground economy, illegal money and tax evasion in the Saudi economy over the period of 1980-2010. The outcomes provided that the underground economy in the Saudi economy grew from about R.S 351,213 billion in 1980 to R.S 942,506 billion in 2010. As a percentage of GDP, the average size of the underground economy constituted 62.80% of the official GDP over the study's period. The size was 64.25% of the official GDP in 1980 and 57.82% of the official GDP in 2010.

It was approximated into two-third of the official GDP at the beginning of the study period and greater than the average size, as reported by Schnieder *et al.* (2010) and Elgin and Oztunali (2012). From the results, the underground economy was at its highest size in 2008, while its trend has been steadily moving with the official GDP since the year of 1980 to the end of 2010. The development of the underground economy in the Saudi economy was bigger compared to some other Asian and African developing countries such as Bangladesh, Malaysia, Morocco, Guyana, Tanzania, Nigeria, Malawi, and Ethiopia.

The result confirmed that the underground economic activities move in line with the official activities of the GDP in the Saudi economy. The results of the underground economy to the official economy in the Saudi economy were demonstrated in Figure 5.2.6. The volume of the underground economy in the Saudi economy may reflect irregular economic activities that have been made by staying immigrants or those who overstayed and other economic agents in the country[31]. The size may be attributed to the expansion of the money laundering activities and narcotics trade in the Saudi economy (AL-Asmari, 2014).

In other words, it became a consequence of the reaction among the several factors that can stimulate the owners of the Small and Medium-sized enterprises, recruitment companies of foreign workers and foreign workers to work in the underground

[31] The foreign workers in the private sector of the Saudi economy constituted more than 9.5 million of the total population (Alkhathlan, 2013).

economic activities[32]. Thus, it may come to be a medium to elude unfair taxes and labor market restrictions in order to accomplish a faster income.

However, the results displayed that the size of illegal money in the Saudi economy grew from about R.S 10,877 billion in 1980 to about R.S109, 415 billion in 2010. As a percentage of money in circulation outside banks (M1), the level of the illegal money in the Saudi economy has been steadily growing since 1980 (18.45%) till the end of 2010 (17.48%). The average size of the illegal money to the money outside the banks has reached about 18.18% over the study period. The result of the illegal money and legal to the total amount of money outside the bank in the Saudi economy has been illustrated in Figure 5.2.7. These amounts of illegal money may come to mirror the volume of hidden and illicit transactions settled by cash, and leave no trace to be tracked by the authorities. Such as avoiding from paying taxes, the accomplishment of the money laundering process, illegal transfers, Drug trafficking, the other criminal activities involving the use of money (AL-Asmari, 2014).

For the tax evasion, the size and growth of the tax evasion in the Saudi economy amounted to about R.S 18,501 billion in 1980 to R.S 41,256 billion in 2010. It has reached, on average 5.15% of the official GDP over the period. The highest level of the tax evasion compared to the official GDP was estimated to be about R.S 70,660 billion in 2008. The rate of the tax evasion to the official GDP has been fluctuating over the study period. It was 3.38% of the official GDP in 1980 and 2.53% of the official GDP

[32] For example, corruption, tight labor regulations and increasing for the costs of tax were the kay factors that push agents to move into illegal activities.

in 2010. The high rates of tax evasion compared to the official GDP have fluctuated from 7.53% in 1982 to 7.91% in 1990. Afterward, the rates have declined downward, except for the year of 1998, since the rate was 7.21%. The result of tax evasion to the official GDP has been plotted in Figure 5.2.8.

On the other hand, the outcomes showed that the tax evasion concludes an important part of the non-oil tax revenues in the Saudi economy. As a percentage of the total non-oil tax revenues, the growth rate of tax evasion was estimated at 64.25% in 1980 to about 57.82% at the end of the period. The average growth rate was 62.80% over the study period. The outcome suggested that tax evasion practices in the Saudi economy were concentrated among the Small and Medium-sized enterprises as it was the case in the GCC countries. The result has been plotted in Figure 5.2.9.

An increase of tax evasion in the Saudi economy may be attributed to the increased growth rate of the tax burden in the economy. Since, the average rate of non-oil revenues as percentage of the gross domestic product in Saudi which reflected the tax burden amounted to 8.09% over the study period. The average rate was around 10.15% during the eighties, while the higher average rate was about 13.9%, 12% and 12.1% in 1983, 1994, and 1985 respectively. Afterward, the rate was ranked between 9%-5.4% over the later period of study. Nevertheless, the decrease in the level of the tax burden rate compared to the eighties period, but the rate was relatively larger in relation to the gross national product of the Saudi economy. The outcome on the magnitude of tax evasion as a significant portion of the underground economy in the Saudi economy could be a result of

wrong fiscal policies and cost labor regulation policies which led to losses in the revenues of the authority.

As a percentage of the underground economy, the average rate of the tax evasion of the underground economy was estimated at 8.13% over the study period. It was estimated at 5.27% in 1980 to about 4.38% in 2010. The trend had its upward direction during the period of 1982-1990. In the later period of study, the trend was decreasing, but at its steady state level. The result was plotted in Figure 5.2.10.

The result here supported the fact that tax burden was the main driving factor for agents to engage into underground economic activities. However, the result indicated that the tax evasion was a component of the illegal activities of the underground economy in the Saudi economy, since the underground economy comprises different illegal activities.

5.3 Qatar's Empirical Results

5.3.1 Unit Root Test Results

The study continued to analyse the results of the Qatari economy because it has been ranked among the highest income countries in the global economy (World Bank, 2015). Additionally, the annual macroeconomic data of the country were accessible. The study began with the analysis of the unit root test of the variables included in the model using the traditional Augmented Dickey Fuller unit root test (ADF), and the unit root tests of Zivot-Andrews (1992) and Perron (1997).

The results of the ADF unit root test were reported in Table 5.3.1[33]. The results indicated that the null hypothesis of non-stationarity was not rejected at 5% level of significance for all variables in level, except the variable of inflation which was stationary at 5% level of significance. But the variables became stationary in their first difference at 5% significant level, while inflation variable was integrated with first order at the 10 percent level.

A common criticism toward the conventional ADF test is that it has a spurious judgment in the case of the unknown structural break, when it occurred in reality (Gregory *et al.*, 1996). Thus, the test power about the properties of a series reduced sharply and may incorrectly introduce a questionable interpretation (Harvie & Pahlavani, 2006). To get rid of the spurious conclusions of ADF test, Zivot- Andrews (1992) unit root test and Perron unit root test (1997) in the presence of structural break were applied. With the optimal lag selection of k = 1 to each examined variable, the results of Zivot-Andrews unit root test were presented in Table 5.3.2.[34].

The results indicated that the null hypothesis of non-stationary was not rejected. Thus, all variables are non-stationary at 5% significance level under intercept, trend and intercept and trend models, except the variable of money outflow, which was non-stationarity at 10% level of significance. However, the variables under investigation

[33] The test for all the series was conducted with constant and trend, and the optimal lag selection was automatically selected by Schwarz Information Criterion in Eviews.
[34] The Zivot-Andrews's (1992) unit root test was conducted with the intercept, trend only, and both the intercept and trend.

were integrated of order one or I(1) process at 5% significance level in the first difference.

From the results, the variables differed in the break date. The final inference on the tested variables may have bias, which may be attributed to the estimation procedure in case of the variation of critical values in Zivot-Andrews's (1992) unit root test (Glynn *et al.*, 2007). Perron's unit root test (1997) was conducted here to confirm that the stationarity analysis of the examined variables using Zivot-Andrews's (1992) unit root test remained unaffected (Valadkhani *et al.*, 2005).

Setting the maximum order at $k = 1$, the results of Perron's unit root test in the level and first difference were presented in Table 5.3.3.[35]. The outcomes revealed that the tested variables were non-stationary at 5% of significance level, taking into account the type of models estimated since, the null hypothesis of non-stationary was not rejected. However, the examined variables were integrated of I(1) process at the 5% level of significance, except the variable of inflation rate, which was integrated of I(1) process at 10% significance level. The results showed that both the tests of Zivot-Andrews's (1992) unit root and Perron's unit root test (1997) proved each other in analyzing the stationarity in the occurrence of the structural break point.

From both unit root tests, time break points coincided with the event of the September 11 attacks for the year 2001. Based on Annual Economic Report of CBQ, 2000, 2002, 2003,

[35] The Perron's (1997) unit root test was conducted with the intercept, trend and both the intercept and trend.

2004, 1991, 1993, 1999, and 2005, the break point of 1999 and 2000 coincided with an increase in the Qatari gross domestic product as a result of an increase of the oil and gas production. The break point of 2002 corresponded to a new indirect monetary strategy-market oriented- titled "the Qatari Money Market Interest Rate" (QMR). The policy was adopted as an instrument to affect the return on deposits and develop the banking system within credit facilities.

The break date point of 2003 mirrored the robust growth of the GDP in Qatar which may be attributed to the increase in both oil prices in the global energy market and the produced quantities of oil and gas in the local economy. In 2004, the global economy had a year of the fastest recovery compared to the previous 25 years. It was favorable to the economy of Qatar as the demand for oil raised up in the global energy market, and led to additional receipts for the Qatari economy. The time break point of 1991 referred to the negative impacts of the Gulf war on the Qatari economy. While the break date of 1993 corresponded with the decline in oil prices in the global market and its impact on the Qatari economy.

The time break point of 1998 coincided with the negative impacts of the global slump on the Qatari economy. Finally, the break date of 2005 reflected the growth of the real GDP in Qatar, but at a slower pace than that of 2004. The results of the unit root tests were valuable in confirming the cointegration tests of the currency demand of M1 and its determinants.

5.3.2 Gregory - Hansen Cointegration Test Results

The empirical findings of Gregory and Hansen cointegration test were reported in Table 5.3.4. The results showed that the *t*-statistics of ADF were significant at the 5% level of significance in the models of GH-2: Eq.20, QTR and GH-3: Eq.21, QTR. Therefore, the null of no cointegration in the models GH-2, and GH-3, with a structural break point of money demand was rejected. This implied that money demand in GH-2 and GH-3 exhibited long run relationship with its explanatory variables. For the model of money demand in GH-1: Eq.19, QTR, the result was statistically insignificant. Therefore, the null hypothesis of no cointegration with structural time break was not rejected. This implied that there was no long run relationship between money demand and its determinants in the GH-1 model.

The break date point of 2000 coincided with the robust economic growth in the Qatari economy. The rapid growth led to more revenues as the oil prices in the global energy market soared dramatically in the year 2000 compared to 1990 (Annual Economic Report of CBQ, 2000). The plots of the estimated findings of Gregory-Hansen cointegration tests were presented in Figures 5.3.1, 5.3.2 and 5.3.3.

5.3.3 Long Run Estimates of Qatari Money Demand Model

To capture estimates for the best predicted model with structural break in the long run period, this study proceeded to estimate all the three cointegrating Equations, 19, 20 and 21 applying Gregory-Hansen, which was mainly an extension of Engle-Granger technique. Estimated results of the long run were in Table 5.3.5. The empirical findings

indicated that the GH-1 model was not under attention, because it failed to reject the null hypothesis of no cointegration. The model of GH-3 with regime shift was not acceptable since the expected sign of GDP variable was negative, which make no sense of the money demand function as indirect method to estimate underground economy.

The results provided that the model of GH-2 had strong statistical evidence as a measurement of the currency demand proxy to capture estimates of the underground economy in the Qatari economy. The statistics of the selected model were presented in Table 5.3.5, and reported in Equation 34:

$$lnM1_t = -4.59 + 0.32DU_{tk}^{**} - 0.01t^{**} + 0.27ln(TR)_t^{**} + 0.20lnG_t^{**} + 1.01lnRem_t^{**} - 0.02i_t^{**} + 0.6\pi_t^{***} \quad (34)$$

Note: (*) 1%, (**) 5% and (***) 10% level of significance.

From the results, the GH-2 model was favorable due to the following points. The model has its expected signs, and consistent with an economic theory. The coefficients of the variables included were statistically significant at the 5% level, while that of inflation was statistically significant at the 10 percent level. It is shown that the dummy variable had a significant impact on the money demand function while the trend term had a negative effect. The income elasticity of money had an important effect on the money demand in the economy of Qatar. A one percentage increase in income increases the demand for money by about 0.20% in the economy.

It is cleared that the financial variable of non-oil tax revenue had a statistical effect on the currency demand function in the Qatari economy. The coefficient was statistically significant at the 5% level and had its expected sign. A 1% increase in tax burden increases the demand for money by taxpayers by about 0.27%. In fact, this result proved that a rise in money demand in the Qatari economy was a consequence of the evasion of tax payment. As for the coefficient of the variable of outflow of money, it was statistically significant at the 5 % level. An increase in the outflow of money to abroad by 1% increases the demand for money by 1.01% in the economy. The coefficient of interest rate on deposits was negative in line with economic theory and statistically significant at 5% level of significance. A reduction in the interest rate on deposits by 1 unit increases the money demand by about 2%.

Finally, the coefficient of inflation variable was statistically significant at the 10% level, and had unexpected sign. The result indicated that an increase in the inflation rate by 1 unit increases demand for money by 60%. The positive relationship between inflation rate and money demand may reflect the expansion of monetary policy that has been undertaken by the Qatari authority over the study period. With a higher rate of inflation, the economic agents will turn away to the underground markets, whereas the overcrowding of buyers in an organized market is less. Thus, the turnover of goods and services in the underground markets increased as a result the underground economic activities relative to the formal economy (Ahiabu, 2006). Thus, agents demanded more money in order to generate a new output in the underground economy than to work in the official economy.

Based on the results of cointegrating equation of the Gregory-Hansen model 2 (dummy level shift with trend). In the next stage, the study proceeded to test the stationarity in the residuals of GH-2 and used it to capture estimation of dynamic short run error correction model (ECM).

5.3.4 Short Run Estimation of the Qatari Money Demand Model

Based on the cointegration analysis, the residuals obtained from the Gregory-Hansen cointegrating equation of model 2 have been tested for its stationarity at order zero or I(0) process. The test corresponded to its null hypothesis of a unit root in the residuals against the alternative hypothesis that residuals were stationary. The result of the residuals test was reported in Table 5.3.6. From the result, the test statistic of ADF was at its maximum absolute value of 4.52, which was greater than its critical value of 3.57. It is statistically significant at the 5% level. The result indicated that the null hypothesis can be rejected since the residuals were stationary in level. The conclusion is that there was a long run relationship among the variables under estimation.

To estimate the dynamic adjustment of the error correction model (ECM), the method of General to Specific (GETS) was applied. To do this, the dependent variable of currency demand $\Delta lnM1t$, was regressed on its lags, its own explanatory determinants with their current and lagged terms ($\Delta lnTRt$, $\Delta ln\ Gt$, $\Delta lnRemt$, Δit and $\Delta \pi t$), and the one period lagged residual that was obtained from the cointegrating equation GH-2 in Gergory and Hansen's (1996) estimation (see Singh & Pandey, 2012; Rao & Kumar, 2009). With an application of maximum three lags periods, the current and lagged variables were subjected to the deletion tests till the last parsimonious fitted version of the adjustment model of error

correction (ECM) was achieved. Moreover, the last form of the ECM model was also subjected to the diagnostic tests. The results of the short run estimates were reported in Table 5.3.7, while the results of the diagnostic tests were provided in the lower part of the Table.

The results indicated that the coefficients of the variables in the ECM were statistically significant at the 5% level of significance, excluding the coefficient of the total non-oil tax revenue which was statistically significant at the 10% level. The coefficients of the outflow of money and interest rate on deposits were statistically not significant. From the results, the coefficient of the lagged variable of the error correction term had a negative sign and significant. The coefficient of error term represented the percentage (about 60%) of disequilibrium in the GH-2 model of currency demand in the Qatari economy. The disequilibrium was compensated by dynamic adjustment of the short run error term in each year. The adjustment of the error term inhibited the explanatory variable of the money demand moving away from each other. This interpreted that the excessive use of money was pursued in the next period through a reduction in the money balances, which economic agents would like to save in the economy.

The adjusted R-squared showed that roughly 20% of the variation in money demand in the Qatari economy was explained by its explanatory variables. In addition, the statistic value of the Durbin-Watson test (DW-statistic = 2.5) showed that there is no evidence of serial correlation or heteroscedastic disturbances in the estimated model. Additionally, the results indicated that the dynamic ECM had no problem with all statistical diagnostic tests. Lastly, testing for the stability in the model of money demand may provide an

indication about the capability of the monetary policy in the Qatari economy. The tests of CUSUM and CUSUMSQ proposed in Brown *et al.* (1975) were used to investigate the stability of the estimated parameters in the model of GH-2.

It was well-run recursively, was plotted against the break points and based on the first set of *n* observations. If the plot of CUSUM statistic is maintained within the 5% level of significance, the estimated coefficients were stable over time. The same analysis applied to the CUSUMSQ that was depended on the squared recursive residuals. Graphical presentations of these two tests were provided in Figures 5.3.4 and 5.3.5. From the result, the plot of CUSUM statistic for ln(M1) did not cross its critical value lines, and hence, the study concluded that the model of money demand in Qatar was stable over time. In the same vein, the plot of CUSUMSQ statistic did not cross its critical value lines, excluding the point of 2001. The result indicated stability in the currency demand model ln(M1), i.e., the estimated parameters were approximately stable over the period of the study. It can be concluded that the money demand function ln(M1) of the Qatari economy was an appropriate monetary instrument in terms of formulating monetary policy.

5.3.5 Analysis of the Underground Economy in Qatar

Based on the estimated GH-2 model, Table 5.3.8 provided estimates of the size of the underground economy in Qatar over the period of 1980-2010. The results introduced that the underground economy in the Qatari economy grew from about R.Q4, 839 billion in 1980 to R.Q71, 908 billion in 2010. As a percentage of GDP, the average size of the underground economy constituted 17.03% of the official GDP over the study's

period. It was 16.90% of the official GDP in 1980 and 15.51% of the official GDP in 2010. As can be shown in Table 4.3.8, the average size of the underground economy in Qatar was greater than the average size reported in Schnieder *et al.* (2010).

From the results, the magnitude of the underground economy as a percentage of the official GDP had been steadily increasing since 1980 to the end of 2010, excluding the year 1998s. This is because the average was at its peak point of 18.14% of the official GDP. The statistics of Table 5.3.8 indicated that the underground economy in the Qatari economy has increased significantly since 1980. The development of the trend for the underground economy in Qatar was less compared to some other Asian and African developing countries such as Bangladesh, Malaysia, Morocco, Guyana, Tanzania, Malawi, and Ethiopia. However, the rank of the underground economy in the Qatari economy itself was relatively bigger than its official economy.

The result also indicated that the size of the underground economy in Qatar reflected the informal employment of the foreign workers in the economy as a result of tight regulations levied. Qatar had the largest number of immigrants, which constituted about 72.4%, 76.3%, 80.5% and 81.6% of the total population over the period of 1990, 2000, 2005 and 2010 respectively. The foreigners engaged in illegal job to meet the payment of their sponsors, an amount of money they agreed, after they have been given permission to work in the country (Sturm *et al.*, 2008). This was the scenario in order to obtain a faster profit. The result of the underground economy to the official economy in Qatar has been demonstrated in Figure 5.3.6.

However, the results showed that the size of illegal money in Qatar grew from about R.Q 594 million in 1980 to about R.Q23, 276 billion in 2010. The level of the illegal money as a percentage of money in circulation outside banks (M1) in the Qatari economy has been steadily growing since 1980 (26.11%) till the end of 2010 (26.57%). The average size of the illegal money to the money outside the banks has reached about 26. 70% over the study period. The result of the illegal money and legal to the total amount of money outside the bank in Qatar has been shown in Table 5.3.8 and illustrated in Figure 5.3.7.

This finding provided that the underground economy in Qatar was brought about by the huge outflow of money to abroad illegally due to the distortion in the economic policies. In addition, an increase in the underground economic activities was attributed to the fact that illegal workers have no way to access legal banking services, which required that workers in most cases should be a resident of the country officially. However, even if the workers were resident officially, formal or informal workers have a limited financial constrain to remit (less than their salaries) their money home (De Brauw *et al.*, 2013). Since the owners have to account for the sources of large amounts of money owned, much money went unrecorded through informal channels. In addition, there was no red tape restriction to sending money in illegal ways and the cost of sending such money was less than that in the formal ways (Freund & Spatafora, 2008; Beine *et al.*, 2012).

To that extent, the size and growth of the tax evasion in the Qatari economy amounted to about R.Q 190 million in 1980 to R.Q 9,163 billion in 2010. It has been growing

steadily since 1980 from 0.66% to 1.98% in the end of 2010, excluding the years of 1998 and 2009. The rate of the tax evasion as a percentage of the official GDP, on average, was estimated at 2.12% over the study period. The higher rates of tax evasion compared to the official GDP reached 3.71% in 1998 and 3.93% in 2009. The level of tax evasion as a percentage of GDP was soaring rapidly since 1998. The higher level of tax evasion compared to the official GDP was estimated at R.Q 7.556, 9.657, 13.967 and 9.163 billion respectively in the last four years of the study period. The result of tax evasion to the official GDP was illustrated in Figure 5.3.8.

On the other hand, the results indicated that the tax evasion constituted a significant portion of the non-oil tax revenues in the Qatari economy. The rate of tax evasion as a percentage of total non-oil tax revenues was estimated at 16.90% in 1980 and about 15.50% in 2010. The average growth rate was 17.03% over the study period. The result suggested that tax evasion practiced in the Qatari economy were concentrated among the Small and Medium-sized enterprises. The result has been shown in Figure 5.3.9.

The results showed that an increase in tax evasion in the Qatari economy was attributed to the higher growth rate of the tax burden in the economy, since the average rate of non-oil revenues as a percentage of the gross domestic product in Qatar which reflects the tax burden amounted to 13.11% over the study period. The higher average rate was around 20% in 1998 and remained at the highest level over the later period of study.

The result on the size of tax evasion as a component of the underground economy in the Qatari economy could be a result of wrong fiscal policy, which led to losses in the revenues of the government. The increased tax burden was more costly to owners of business firms in the private sector (Dabla-Norris *et al.*, 2008). In fact, this result confirmed that taxation and underground economy move together over time, as shown in Figure 5.3.10. However, the average rate of the tax evasion of the underground economy was estimated at 0.12% over the study period.

The result suggested that tax evasion was a component of illegal activities of the underground economy in the Qatari economy, but it is much less than that estimated in the Saudi economy. This may be due to the relative size of the Saudi economy compared to other economies in the region. Besides, it may attribute to the fact that the taxation policy framework in the Qatari economy did not allow the economic agents to evade taxes. Therefore, the underground economy involved different illegal activities in Qatar.

5.4 United Arab Emirates's Empirical Results

5.4.1 Unit Root Test Results

The analysis progressed to study the UAE economy because it has the second largest economy in the region of GCC countries. As for the unit root tests, the analysis started with the ADF unit root test, as reported in Table 5.4.1[36]. From the results, all the tested variables have a unit root in their level, but the variables became stationary in their first

[36] The test for all the series was conducted with constant and trend, and the optimal lag selection was automatically selected by Schwarz Information Criterion in Eviews.

difference. The analysis continued to address a spurious inference of the traditional ADF unit root test attributed to the ignorance of the structural break, which may exist in real (Gregory *et al.*, 1996). For this purpose, Zivot- Andrews (1992) unit root test was used to investigate the order of integration of the variables.

Setting the optimal order at k = 4 to each variable, the results of Zivot-Andrews unit root test in level and first difference were presented in Table 5.4.2[37]. The results indicated that the null hypothesis of non-stationarity was not rejected. Thus, all variables were non-stationary in level at the 5% significance level. However, the results revealed that the variables under investigation were integrated of order one or I(1) process at 5% significance level. Because of the bias in Zivot-Andrews unit root test as a result of different critical values and estimation process, Perron's unit root test (1997) was applied to support the stationary analysis results of the tested variables using Zivot-Andrews's (1992) unit root test remained stable (Valadkhani *et al.*, 2005).

With the optimal order of k = 4 for each variable, Perron's unit root test results in the level and the first difference were presented in Table 5.4.3[38]. Taking into account the type of models, the results showed that the variables were non-stationary at 5% significance level. However, the examined variables were integrated of I(1) process and became stationary after taking their first difference at the 5% level of significance, since the hypothesis of null for all tested series was rejected.

[37] The Zivot-Andrews's (1992) unit root test was conducted with the trend and both the intercept and trend.

[38] The Perron's (1992) unit root test was conducted with the trend and both the intercept and trend.

The results concluded that both the tests of Zivot-Andrews's unit root and Perron's unit root test supported each other with regard to the order of integration of underlying variables. The Zivot-Andrews and Perron time break points of 1999:Q2, 2000:Q1 2000:Q2 and 2000:Q3 coincided with the rising oil revenue as a result of increasing oil prices in the global market (Annual Economic Reports of the Ministry of Emirati Economy, 1999; 2000).

However, the time break point of 2001 coincided with the impact of the event of the September 11 attacks on the growth of the UAE economy. The break points of 2005:Q3, 2006: Q1, 2006: Q2, 2006: Q4, 2007: Q1 and 2007:Q3 corresponded to the impact of the surge in the oil prices on the economic growth of the UAE economy, and an increasing rate of inflation. Also, the break point of 2008:Q1 coincided with the impact of the global financial crisis (Annual Economic Report of the Ministry of Emirati Economy, 2008).

5.4.2 Gregory - Hansen Cointegration Test Results

The empirical results of Gregory and Hansen cointegration test were presented in Table 5.4.4. The results showed that the *t*-statistics of ADF are significant at the 5% level in the three models of GH-1:Eq.19, UAE, GH-2:Eq.20, UAE and GH-3: Eq.21, UAE respectively. Therefore, the null hypothesis of no cointegration in the models GH-1, GH-2, and GH-3, with a structural break point of money demand was rejected. This implied that money demand in GH-1, GH-2 and GH-3 had a long run relationship with its explanatory variables.

The break date point of 2006:Q1coincided with the effect of the increased oil prices in the global market which affected the public budget of the UAE government. This accelerated growth of the UAE economy. However, the break point of 1996:Q3 corresponded to the effect of the reduction in the prices of imports from abroad, as the UAE economy pegged its currency to the US Dollar.

It was also as a result of increase in the purchasing power of the US Dollar against other currencies for some of the European countries, which made the imported goods to be cheaper for the local consumers. The break point of 2000:Q3 coincided with the economic diversification policy implemented by the government in order to develop the whole sectors in the economy. The plots of the estimated results of Gregory-Hansen cointegration tests were presented in Figures 5.4.1, 5.4.2 and 5.4.3.

5.4.3 Long Run Estimates of Emirati Money Demand Model

To obtain the estimates of the best predicted model with structural break in the long run period, this study proceeded to estimate all the three cointegrating Equations, 19, 20 and 21 as reported in Table 5.4.5. From the results, the null of no cointegration of all the three cointegrating equations was rejected. The results indicated that there was a long run relationship between the currency demand function of the UAE economy and its explanatory variables. However, the two models of GH-2 with trend and GH-3 with regime shift were not acceptable. This is because, the expected sign of income elasticity and non-oil tax revenues in both models were negative, which make no sense of the money demand function's estimates as a proxy to estimate underground economy in the

UAE economy. In this context, the estimates of the underground economy were negative, which is irrational. Based on the results, the GH-1 model was the best model to capture estimates of the underground economy in the UAE. The statistics of the selected model were in Table 5.4.5, and displayed in Equation 35:

$$lnM1_t = -14.9 - 0.01DU_{tk} + 0.06ln(TR)_t *** + 1.28lnG_t ** + 1.06lnRem_t ** - 0.09i_t ** - 0.1\pi_t \quad \ldots\ldots\ldots\ldots\ldots\ldots (35)$$

Note: (*) 1%, (**) 5% and (***) 10% level of significance.

The model is preferred due to the following explanations. The model holds its expected signs, and consistent with an economic theory of the money demand. The coefficients of variables included were statistically significant at the 5% level, except the non-oil tax revenues variable which was statistically significant at 10% significance level. However, the variable of inflation had its negative sign, but it was not significant. The variable had no effect on the money demand model of the UAE economy[39].

The findings showed that the level shift dummy variable had no effect on the money demand function. It was clear that the coefficient of non-oil tax revenue variable possessed its positive sign and had its effect on the currency demand function in the UAE economy. This confirmed the hypothesis that an increase in the tax burden rate on the taxpayers led to increase in the demand for money. The variables of the outflow of money to abroad, the GDP and the interest rate on deposits have a strong explanatory

[39] With regards to Keynesian theory, inflation mirrored that much money chasing limit goods. In the case of Emirati economy, the demand for money may not be affected by the inflation, due to the fact that the purchasing behaviour of Emirati individuals constituted one - fifth of the total population, therefore, they did not exert any inflationary pressures on the money growth that can push the general level of prices upward. According to Darrat and Al-Yousif (2003), the inflation in the economy of the UAE was imported, as the Emirati economy had pegged its Dirham to the U.S. dollar. Thus, inflation had its sources from an external channel.

power on the money demand model in the UAE economy. Despite that the variable of non-oil tax revenue had its correlation to the money demand; it also showed a weak power in explaining the actual relationship with the money demand in the economy of the UAE compared to other variables.

From the results, an increase in income level by 1% increased the demand for money by 1.28%. Also, if there is an increase in tax burden by 1%, agents tend to increase their uses of money by 6%. A 1% increase in outflow of money to abroad increased money demand by 1.06%. A 1 point decrease in the interest rate on the deposits increased the demand for money by 9%.

Refer to the results of Gregory-Hansen model 1 (dummy level shift). The study moved to test the stationarity in the residuals of GH-1 in order to capture estimation of dynamic short run error correction model (ECM).

5.4.4 Short Run Estimation of the Emirati Money Demand Model

From the result of Gregory-Hansen cointegration model 1, the residuals obtained must be tested for its stationarity. This was to investigate the order of integration of the residuals as suggested in Engle-Granger (1987). The test coincided with its null hypothesis of a unit root in the residuals against the alternative hypothesis that residuals are stationary. The result was presented in Table 5.4.6.

It was shown that the maximum absolute value of the ADF test statistic was 4.52, which was greater than its critical value of 3.57. It was statistically significant at the 5% level. The result showed that the null hypothesis was rejected, since the residuals were stationary in level. This implied that there was a long run relationship among the variables under investigation. The result indicated that an estimation of the dynamic adjustment of the error correction model (ECM) must be obtained. To this end, the method of General to Specific (GETS) was applied.

The dependent variable of money demand $\Delta lnM1_t$, was regressed on its lags, its own explanatory variables with their current and lagged terms ($\Delta lnTR_t$, $\Delta ln\ G_t$, $\Delta lnRem_t$, Δi_t and $\Delta \pi_t$), and the one period lagged residual that was obtained from an estimation of the Gregory and Hansen model1 as in the cointegrating Equation 19 of Gregory and Hansen's (1996) estimation (see Singh & Pandey, 2012; Rao & Kumar, 2009). With an application of four period's lags, the current and lagged variables were subjected to the deletion tests till the last parsimonious fitted version of the adjustment model of the error correction model (ECM) was obtained. In addition, the last version of the ECM model was subject to the diagnostic tests. The results of the short run estimates were reported in Table 5.4.7, while the results of the diagnostic tests were provided in the lower part of the Table.

Based on the results, the coefficients of the current and lagged variables in the ECM were statistically significant at the 5% level, excluding the coefficient of the outflow of money. The coefficient of the lagged error correction term possessed its negative sign and significant at the 5% level. The coefficient denoted the percentage (about 16%) of

disequilibrium in the Gregory-Hansen Model 1 of the currency demand in the Emirati economy.

The disequilibrium was compensated by dynamic adjustment of the short run error term in each quarter. The adjustment of the error correction term inhibited the explanatory variable of the money demand moving away from each other. This suggested that the excessive use of money was followed in the next period through a drop in the money balances, which economic agents would tend to save in the economy. The adjusted R-squared indicated that roughly 54% of the variation in money demand in the Emirati economy was explained by its determinants. In addition, the statistic value of the Durbin-Watson test (DW-statistic = 2.1) confirmed the absence of serial correlation or heteroscedastic disturbances in the estimated model.

Additionally, the results indicated that the dynamic ECM passed its statistical diagnostic tests, except for the normality test. Lastly, investigating the stability in the Emirati money demand model produced a sign about the capability of the monetary policy. For this purpose, the tests of CUSUM and CUSUMSQ proposed in Brown *et al.* (1975) were conducted to examine the stability of the estimated parameters in the model of GH-1. The estimated coefficients were plotted against the break points and based on the first set of *n* observations. The plots of CUSUM and CUSUMSQ were presented in Figures 5.4.4 and 5.4.5.

As can be observed from Figure 5.4.4, the plot of CUSUM statistics of money demand was within its critical bounds at 5% level of significance. It showed the stability of the currency demand model. However, the plot of the CUSUMSQ statistics crossed its critical lines. From Figure 5.4.5, the plot indicated that the money demand model in the economy of the UAE deviated from within the critical lines. The result showed that the occurrence of instability started from the beginning of 1997:Q1 to 2006:Q1. It is likely that the instability of the UAE money demand function was transitory. The instability during the period of 1997:Q1could be attributed to the impact of the Asian economic crisis and the decline in the global oil prices. During the pre-2006:Q1, the rate of inflation had gone up as a result of reliance of the economy on imports from abroad. The global inflation had its pressure on the economy of the UAE through the exchange rate channel, as the local currency was pegged to the US Dollar[40]. For an effective monetary policy in the economy of the UAE, it was necessary for the government to give more consideration to the use of the money demand M1 in case of unexpected instability.

5.4.5 Analysis of the Underground Economy in UAE

From the estimated result of the GH-1 model, the estimates of the size of the underground economy in the UAE over the period of 1991:Q1-2010:Q4 were reported in Table 5.4.8. The results indicated that the size of the underground economy grew from about Dirham UAE 10,053 billion in 1991:Q1 to Dirham UAE 26,169 billion in 2010:Q4. As a percentage of the official GDP, the size of the underground economy

[40] Due to the reduction of the Emirati Dirham against the US Dollar(The Annual Economic Report of the Ministry of Emirati Economy, 2006).

was on average 10.34%. It was 10.03% of the official GDP in 1991:Q1 and 10.94% of the official GDP in 2010:Q4.

As can be observed in Table 5.4.8, the average size of the underground economy in the UAE was less than the average size reported by Schnieder *et al.* (2010). It was also less than some other Asian and African developing countries such as Malaysia, Bangladesh, Morocco, Malawi, Guyana, Tanzania, and Ethiopia. The difference in the size of the underground economy from that reported by Schnieder *et al.* (2010) may be attributed to the method used, variables included and the study period. The size of the underground economy, which was hard to track itself, is a benchmark to the policy makers to address their economic policies in such a way to restrict individuals from indulging in illegal activities.

It appeared that the practices of illegal activities were constructed mainly among the foreign workers, and arised as a result of the absence of the human rights toward foreign workers. For instance, the demand policy for foreign workers must be associated with the social rights that should be granted to foreign workers in the labor market of the country, as foreign workers constituted more than 91% of the total labor force in 2007. This could help to deter foreign workers living in the UAE from engaging in illegal activities.

Also, the results indicated that the magnitude of the underground economy as a percentage of the official GDP had steadily increased since the first quarter of 1991 to

the last quarter of 2010, except the four quarters of 2007. The average size was at its peak point of 11.46% of the official GDP, while, the lowest size, on average, at both the first and second quarters of the 1993 was 9.60%.

From the results, the trend for the size of the underground economy in the UAE had also increased significantly and constantly since the first quarter of 1991. Also, the results of the estimable size of the underground economy may mirror the tight regulations that have been imposed on the foreigners living in the country. An expansion of the underground economy distorted the economic policies, particularly the fiscal and monetary policies, and hindered the economic planning process. Thus, the policy makers have to revise their policies in order to restrict the expansion. The size of the underground economy to the official economy in the UAE has been illustrated in Figure 5.4.6.

However, the findings showed that the magnitude of the illegal money in UAE grew from Dirham UAE 1,788 billion in the first quarter of 1991 to Dirham UAE 37,062 billion in the end of 2010. The highest level of the illegal money began from 2006:Q1 onward. In terms of percentage, the extent of the illegal money to money in circulation outside banks (M1) in the Emirati economy had constantly increased since 1991:Q1 (58.56%) till the first quarter of 2006 (61.91%). Afterward, it had persisted to increase at a moderate level and on average reached 61.92%. However, it was estimated, on average, at 59.68% over the study period.

The result indicated that the expansion of illegal money to the total money outside banks may reflect the growing need of individuals to use currency in terms of cash in the economy. This is to avoid the payment of tax burden, hide their illegal transactions such as buying drugs or send money to their home countries[41]. Since, the use of money did not leave traces for the authority to track. In addition, the cash payments remained a preferred instrument for foreign workers (particularly foreign workers who were doing business themselves, staying illegally or overstaying) to transfer money abroad. Figure 5.4.7 illustrated the size of illegal and legal money to the total money outside banks in the country.

The size of the tax evasion amounted to Dirham UAE 577 million in the beginning of 1991 and Dirham UAE 1,908 billion in the end of 2010. The rate of tax evasion to the non-oil tax revenues reached on average 10.34% over the study period. However, the rate of the tax evasion to the official GDP remained on average at its lowest level (0.63%). The highest magnitude of the tax evasion started from the first quarter of 2006 to the fourth quarter of 2008. It was estimated at Dirham UAE 2,315 billion and Dirham UAE 2,387 billion respectively. Afterward, the trend of the size tends to be downward. Figure 5.4.8 displayed the size of the tax evasion to the official GDP in the UAE over the study period.

[41]As it was the case in the GCC countries, foreign workers had no way to access legal banking services due to the formal workers had limited financial constrain to remit (less than their salaries) their money home (De Brauw *et al.,* 2013). In addition, there was no red tape restriction to sending money in illegal ways and the cost of sending such money was less than that in the formal ways (Freund & Spatafora, 2008; Beine *et al.*, 2012). Therefore, much money went undocumented through informal channels.

It was observed that the size of the tax evasion constituted a significant portion of the non-oil tax revenues into the economy of the UAE. As in percentage, the average growth rate of the tax evasion constituted 10.34% of the total non-oil revenues over the study period. The rate was estimated at 10.03 % in the first quarter of 1991 to 10.94% in the fourth quarter of 2010. The result showed that the tax evasion as a component of the underground economy had its influence on the tax revenues. Nevertheless, the non-oil tax revenues did not represent the main source of funding for the public budget of the Emirati economy compared to the tax revenues levied on the oil companies. Thus, the government should revise its fiscal policy taking into account the size of tax evasion.

As the non-oil tax revenues came predominantly from the custom duties and the tax revenues, the results suggested that the tax evasion practices in the Emirati economy may be concentrated among the importers of retailers and wholesalers. This was along with the tax evasion practices of the owners of the recruitment agencies of foreign workers that have propagation in the country. The size of the tax evasion to the non-oil tax revenues has been illustrated in Figure 5.4.9.

The results indicated that the size of the tax evasion in the Emirati economy may be attributed to the tax burden imposed on the agents, which was costly to them, and then motivated them to evade taxes. The average rate of non-oil tax revenues as a percentage of GDP in the UAE revealed the tax burden amounted to 5.95% over the study period. The highest rate, 8.16% in 2005 continued to increase and varied between 9.80% and

7.16%. However, the tax evasion as a percentage of underground economy constituted, on average 5.95% over the period.

The most important part of this analysis is that the ratio of the tax evasion to the non-oil tax revenues was equal to the ratio of the underground economy to the GDP. This result confirmed that the tax evasion was only a component of the underground economic activities, and, they move together over time. This has been illustrated in Figure 5.4.10.

5.5 Kuwait's Empirical Results

5.5.1 Unit Root Test Results

The study focused on the Kuwaiti economy because it possessed the third largest economy in the Gulf region after Saudi and UAE (Annual Economic Report of Kuwaiti National Bank, 2007). From the results of the unit root tests reported in Table 5.5.1, there existed the sign that all the tested variables were not stationary at the 5% level of significance, and they became I(1) at the 5% level after taking the first difference. This result may be false because the traditional ADF unit root test ignored the issue of structural break. To correct the weakness of the prior test, the analysis moved to use Zivot-Andrews's (1992) unit root test in the presence of structural break.

Setting the maximum lag selection at k = 4 for each examined variable; the results of Zivot-Andrews unit root test were presented in Table 5.5.2[42]. The results indicated that the null hypotheses of existed unit root for all tested variables were not rejected. Thus,

[42] The Zivot-Andrews's (1992) unit root test was conducted with the trend only, and both the intercept and trend.

the variables were non-stationary at the 5% significance level. However, the results also suggested that the variables were I(1) at the 5% significance level after taking the first difference, since the hypothesis of null for all tested series were rejected.

Due to the fact that Zivot-Andrews unit root test has its spurious conclusion on the properties of the tested variable, as it is not complete compared to the recent tests of a unit root (Silvia, & Iqbal, 2011)[43]. In this text, Perron's unit root test (1997) was applied to enhance the stationarity results of the underlying variables using Zivot Andrews's (1992) unit root test. Furthermore, the earlier reported results remained unchanged.

Setting the optimal lag selection at k = 4 for each variable, Perron's unit root test results in the level and first difference were presented in Table 5.5.3[44]. Taking into account the type of models employed, the results showed that the variables were I(1) at the 5% of significance level, since the null of non-stationary were not rejected at level. However, the null hypotheses were rejected after converting the series into first difference. The results concluded that both the tests of Zivot-Andrews's unit root and Perron's unit root test enhanced each other in regards to the investigation of the order of integration of the underlying variables in the existence of structural break.

The Zivot-Andrews and Perron time break points of 1994:Q2, 1994:Q3 coincided with the new monetary policy of the Central Bank of Kuwait (CBK) that was implemented to enhance the performance of the financial system and to maintain the monetary stability

[43]Because the test did not include the structural break in its null hypothesis, as it was the case in Perron's unit root test (1997).

[44] The Perron's (1992) unit root test is conducted with the trend and both the intercept and trend.

in the economy. The key instrument of the CBK's policy in the 1994 year was depended on an increase for the discount rate and the interest rate on saving by 1.5%, and 0.25%, respectively (Annual Economic Report of the Kuwaiti Central Bank, 1995).

The break date point of 1997:Q1, 1997:Q2 and 1997:Q3 corresponded to the impact of the decline in the global oil prices on the Kuwaiti economy due to the Asian Financial Crisis (Annual Economic Report of the Kuwaiti Central Bank, 1997). The time break points of 2001:Q2 and 2001:Q4 mirrored the reduction in the productive activity of the Kuwaiti economy due to the Organization of the Petroleum Exporting Countries' decisions (OPEC) which restricted the production of oil during that year (Annual Economic Report of the Kuwaiti Central Bank, 2001). The time break point of 2002:Q4 reflected the contribution of the most non-oil sectors in achieving a positive growth to the Kuwaiti GDP compared to the productive activity of oil sector during that year (Annual Economic Report of the Kuwaiti Central Bank, 2002).

The break date point of 2004:Q2 coincided with the accelerated growth of the Kuwaiti economy due to the rapid rise in the global oil prices compared to the previous year (Annual Economic Report of the Kuwaiti Central Bank, 2004). The break date points of 2006:Q1 and 2006:Q4 corresponded to the monetary policy that has been aimed to possess the purchasing power of the Kuwaiti Dinar at stable condition, and to drop the imported inflationary pressures on the economy (Annual Economic Report of the Kuwaiti Central Bank, 2006).

The break date of 2007:Q1 and 2007:Q4 coincided with the CBK's decision to re-peg the Kuwaiti Dinar to the US dollar (Annual Economic Report of the Kuwaiti Central Bank, 2007). Finally, the break date point of 2008:Q1 reflected the effect of the global financial and economic crisis on the Kuwaiti economy (Annual Economic Report of the Kuwaiti Central Bank, 2008). After obtaining the condition that the included variables were I(1), testing for the cointegration relationship among the variables became compulsory.

5.5.2 Gregory - Hansen Cointegration Test Results

Applying for Gregory and Hansen cointegration test to investigate the long run relationships, as presented in Table 5.5.4. The results indicated that the *t*-statistics of ADF were significant at the 5% level in the two models of GH-1: Eq.19, KUW, and GH-3: Eq.21, KUW, since the null of no cointegration in the models GH-1, and GH-3, with a structural break point of money demand was rejected. This implied that money demand in GH-1 and GH-3 had a long run relationship with its explanatory variables. However, the results showed that the *t*-statistics of ADF were insignificant at 5% level in the model of GH-2: Eq.20, KUW. Therefore, the model failed to establish cointegration at 5% significance level.

From the results, the break date point of 2004:Q3 coincided with an accelerated growth of the Kuwaiti economy due to the growing oil revenues as the oil prices in the global energy market increased compared to the previous year (Annual Economic Report of the Kuwaiti Central Bank, 2004). The break point of 2007:Q1 corresponded to the new

monetary policy of the KCB toward the decision to re-peg its currency to the US dollar. The KCB reset the levels of domestic interest rate on the Kuwaiti dinar in line with the movements of interest rates on the underlying global currencies.

On the other hand, it decreased the discount rate by 1 percentage point (from 6.25% to 5.75%). Additionally, the KCB granted approval to some investment banks in the Gulf region to open a branch in the country. These new reform policies of the KCB were concentrated to modernize and develop its financial system (Annual Economic Report of the Kuwaiti Central Bank, 2007). The investigated results of Gregory-Hansen cointegration tests were plotted in Figures 5.5.1, 5.5.2 and 5.5.3.

5.5.3 Long Run Estimates of Kuwaiti Money Demand Model

To capture the estimates of the best model with structural break in the long run period, the study proceeded to estimate all the three cointegrating Equations, 19, 20 and 21, as reported in Table 5.5.5. From the results, the null of no cointegration of the two cointegrating equations of GH-1(Dummy level shift) and GH-3 (with regime shift) were rejected. The results indicated that there was a long run relationship between the currency demand function of the Kuwaiti economy and its explanatory variables in these two models.

However, the model of GH-2 (Dummy level shift with the trend) was not favorable. Because, the model failed to reject its null of no cointegration, thus, it had no long run relationship. In the same vein, the model of GH-3 was not under attention. Because, all

the key explanatory variables were insignificant, then it make no sense of the money demand function's estimates as a proxy to estimate underground economy in the Kuwaiti economy.

Based on the results, the GH-1 model was the best model estimated for the Kuwaiti underground economy. The statistics of this model were reported in Table 5.5.5, and displayed in Equation 36:

$$lnM1_t = 4.18 + 0.19DU_{tk}** + 0.07ln(TR)_t** + 0.68lnG_t** - 0.29lnRem_t** - 0.21i_t** + 0.06\pi_t** \quad (36)$$

Note: (*) 1%, (**) 5% and (***) 10% level of significance.

The model was the most preferred due to the following explanations. The variables included in the model have their expected signs, while, the variable of inflation entered the model with a positive sign. It was consistent with an economic theory of the money demand, and all the coefficients of the variables included were statistically significant at the 5% significance level.

From the results, the level shift dummy variable had a positive impact on the Kuwaiti money demand function. The results showed that the coefficient of non-oil tax revenue variable held its positive sign and had its impact on the Kuwaiti currency demand function. This supported the hypothesis that an increase in the tax burden rate on the taxpayers leads to increase in their uses of money in the economy. The variables of the GDP, the outflow of money to abroad, and the interest rate on deposits had a strong explanatory power on the money demand in the Kuwaiti economy.

The results indicated that an increase in tax burden by 1%, agents tend to increase their uses of money by 7%. A 1% increase in income level increased the demand for money by 0.68%. The estimates also provided that money demand decreased by 0.29% for every 1% increase in outflow of money to abroad. A one point decrease in the interest rate on the deposits increased the demand for money by 21%. Finally, despite the coefficient of inflation variable was statistically significant at the 5% level, it held positive sign and affected the demand for money. The result indicated that money demand increased by 6% for every 1 point increase in the inflation rate.

Despite the fact that inflation rate was statistically significant and affected the money demand in the Kuwaiti economy, the relationship did not operate in line with economic theory of money demand. The positive relationship between inflation rate and the money demand may be attributed to the fact that with continuous inflation rate in the economy, agents resorted to work in the underground economic activities than to work in the official economy in order to offset the effect of the inflation tax (Ahiabu, 2006). This led to increase in their demand for money to fund a new investment, as the demand for money introduced an easier option for those trying to hide their underground activities.

To capture estimates of dynamic short run error correction model (ECM), the analysis of the study progressed to test the stationarity of the residuals of GH-1 in respect of the outcomes of Gregory-Hansen model 1 (dummy level shift).

5.5.4 Short Run Estimation of the Kuwaiti Money Demand Model

For the short run estimates, it was compulsory to test the stationarity of the residuals that was obtained from the cointegrating equation of Gregory-Hansen model 1. This was to investigate the order of integration of the residuals as suggested by Engle-Granger (1987). The test dealt with the null hypothesis of a unit root in the residuals against the alternative hypothesis that residuals were stationary. The result has been presented in Table 5.5.6.

From the outcome, the maximum absolute value of the ADF test statistic was 3.54, which was statistically larger than its critical value of 2.89 and significant at 5% level. The result showed that the residuals were stationary in level, since, its null was rejected. This confirmed the evidence that the Kuwaiti money demand model had a long run relationship with its explanatory variables under investigation. It indicated that an estimation of the short run dynamic of the error correction model (ECM) must be acquired. To this end, the method of General to Specific (GETS) was applied. The dependent variable of money demand $\Delta lnM1_t$, was regressed on its lags, its own independent variables with their current and lagged terms ($\Delta lnTR_t$,$\Delta ln\, G_t$,$\Delta lnRem_t$, Δi_t and $\Delta \pi_t$), and the one period lagged residual that was obtained from an estimation of the Gregory and Hansen cointegration model 1 (see Singh & Pandey, 2012; Rao & Kumar, 2009).

With an application of four period's lags, the lagged variables were subjected to the eliminating tests till the last parsimonious fitted version of the adjustment model of the

error correction term (ECM) was obtained. The results of the short run estimates were reported in Table 5.5.7, along with its diagnostic tests, as presented in panel B of the lower part of the Table. From the results, the coefficients of the current and lagged independent variables in the ECM were statistically significant at the 5% level, excluding the coefficient of the interest rate on deposits, which was significant at the 10% level.

The results showed that the coefficient of the lagged error correction term had its negative sign and statistically significant at the 10% level. The coefficient of the ECM confirmed that 0.03% of disequilibrium in the previous period was adjusted in the current period. The adjusted R-squared suggested that roughly 60% of the variation in money demand in the Kuwaiti economy can be explained by its determinants. In addition, the statistic value of the Durbin-Watson test (DW-statistic = 1.82) confirmed that the estimated model was approximately free from the serial correlation or heteroscedastic disturbances. Also, the results showed that the dynamic ECM had no problem with all statistical diagnostic tests in the residuals.

For the stability test of the Kuwaiti currency demand model, the CUSUM and CUSUMSQ tests of Brown *et al.* (1975) were applied. The tests were conducted on the residuals of the short run dynamics error-correction model (ECM). The tests were well-run recursively, plotted against the break points and based on the first set of n observations. If the plot of CUSUM statistic does not cross the boundaries of its two critical lines within the 5% level of significance, then it can be an evidence that the estimated coefficients are stable over time. The same analysis is applied to the

CUSUMSQ that is depended on the squared recursive residuals. Graphical plots of these two tests were provided in Figure 5.5.4 and 5.5.5.

From the result, the plot of CUSUM statistic for ln(M1) lies outside its critical value lines, and hence, the study indicated that the Kuwaiti money demand model was not stable. In the same vein, the plot of CUSUMSQ statistic also crossed its critical value lines, and thus, the result indicated instability in the Kuwaiti currency demand model ln(M1). From Figure 5.5.4 and Figure 5.5.5, the plots of CUSUM and CUSUMSQ indicated that the Kuwaiti currency demand model had faced some instability during the 2003 year, and the fourth quarter of 1997 to the end of 2000.

The instability of the Kuwaiti currency demand model may be attributed to the fluctuations in the interest rate on the KD deposits and discount rate that had been taken as instruments to control the credit creation by the monetary authority (Annual Economic Report of the Kuwaiti Central Bank, 1997; 1998; 1999; 2000; 2003). A policy implication for the Kuwaiti central bank was that in executing its monetary policy, the bank should pay attention to the equilibrium between demand and money supply.

5.5.5 Analysis of the Underground Economy in Kuwait

From the empirical result of the GH-1 model, the estimates of the underground economy in the Kuwaiti economy over the period of 1991:Q1-2010:Q4 were displayed in Table 5.5.8. The outcomes showed that the size of the underground economy grew

from about Dinar Kuwaiti 151,827 million in 1991:Q1 to Dinar Kuwaiti 2,584 billion in 2010:Q4. The results indicated that the size of the underground economy had increased its contribution in the Kuwaiti's economy over the study period. It constituted a significant portion of its official GDP. As a percentage of the official GDP, the size of the underground economy was on average 24.95%. It was 19.07% of the official GDP in 1991:Q1 and 26.30% of the official GDP in 2010:Q4.

As can be seen in Table 5.5.8, the average size of the underground economy in the Kuwaiti's economy was fairly higher than the average size reported by Schnieder *et al.* (2010) and Elgin and Oztunali (2012). The difference in the size of the underground economy from that reported by Schnieder *et al.* (2010) or Elgin and Oztunali (2012) may be attributed to the method used, variables included and the study period. The size of the underground economy itself constituted a significant portion to the official GDP in Kuwait. It is a benchmark to the policy makers to address their economic policies in such a way to restrict individuals from indulging in illegal activities.

As it is the case in other GCC countries, the underground economy mirrored different sorts of illegal activities in the Kuwaiti's economy, which were concentrated mainly among the local individuals and foreign workers, since the foreigners constituted more than 70% of the total population in Kuwait over the study period. The growing size of the underground economy may come from the characteristics of the socio-economic environment of the Kuwaiti society. It may be attributed to the increased rates of

unemployment among the Kuwaiti youth[45], the tight regulations that had been imposed on the foreigners working in the country, and the absence of human rights toward foreign workers (Shah, 2013)[46]. In fact, the expansion of the narcotics trade in the Kuwait society has been the most important manifestation of the underground economic activities. Because the unemployment problem and too much money available to youth, the narcotics's traffickers exploited them to resort into drugs (Leghari, 2006)[47].

From the results, the trend of the size of the underground economy became upward. The largest size of the underground economy for 2005, 2006 and 2007 was determined to be 27.33% of the official GDP. An expansion of the underground economy distorted the economic policies, particularly the fiscal and monetary policies and labor market policies. Remaining the size at its current level may hinder the planning process and the economic development. Thus, the authorities have to revise their policies in order to restrict the expansion of illegal activities. The size of the underground economy to the official economy in the Kuwaiti economy was demonstrated in Figure 5.5.6.

However, the outcomes revealed that the extent of the illegal money in the economy of Kuwait grew from Kuwaiti Dinar (KD) 183,492 million in the first quarter of 1991 to Kuwaiti Dinar (KD) 996,096 million in the end of 2010. In terms of percentage, the average size of the illegal money to the money outside the banks reached about 59.51%

[45] The unemployment rates among the youth in the Kuwaiti economy increased from 8.41% in 1991 to 12% in 2010.

[46] For example, the acceptance for foreigners to bring their families relied on their salaries, which must be above USD900. Furthermore, working foreign women usually have no rights to sponsor the migration of their husband (Shah, 2013).

[47] Kuwait's per capita income rate, on average, reached up to $20,000 per year over the study (World Bank Data, 2015).

over the study period. The size had steadily increased from 52.50% in 1991:Q1 to 62.21% in the end of 2010. The result indicated that the excessive use of money may reflect the true need of individuals to settle their illegal transactions in terms of cash in the economy. This is to hide their illegal transactions such as buying drugs or send money to their home countries, as the foreign workers living in the country had no way to access legal banking services because they had a limited financial constrain to remit their money home, since the use of money hand by hand did not leave traces for the authority to track.

Furthermore, the use of money in terms of cash remained a favored instrument for foreign workers (particularly foreigners who are doing themselves business, staying illegally or overstaying) to settle their payments or to send money abroad as the Kuwaiti currency was internationally acceptable. Figure 5.5.7 showed the size of illegal and legal money to the total money outside banks in Kuwait.

On the other hand, the magnitude of the tax evasion estimated as Kuwaiti Dinar (KD) 6,143 million in the first quarter of 1991 and Kuwaiti Dinar (KD) 202,830 million in the end of 2010. The rate of the tax evasion to the official GDP estimated on average at 2.83% over the study period. The size had been highly growing since the first quarter of 1998 until the end of 2003. Afterward, the size declined until it was ranked between 3.96% and 2.06%. Figure 5.5.8 showed the size of the tax evasion to the official GDP in the economy of Kuwait over the study period.

It had been shown that the extent of the tax evasion constituted an important portion of the non-oil tax revenues into the economy of Kuwait. In terms of percentage, the average rate of the tax evasion to the total non-oil tax revenues was 24.95% over the study period. The rate was estimated at 19.06 % in the first quarter of 1991 to 26.30% in the last quarter of 2010. The result provided that the tax evasion as a part of the underground economy had its impact on the tax revenues. Nevertheless, the non-oil tax revenues did not represent the main source of funding the public budget of the Kuwaiti economy. The results suggested that the tax evasion practices in the Kuwaiti economy may be concentrated among those owners of the Small and Medium-sized enterprises in the private sector. The size of the tax evasion to the non-oil tax revenues had been illustrated in Figure 5.5.9.

The result on the size of the tax evasion in the country may come to support the fact that the tax burden, which reflected the behavior of individuals, had always costly to them, and then motivated agents to evade taxes. As in percentage, the average rate of non-oil tax revenues of the GDP in the economy of Kuwait, which revealed the tax burden, amounted to 4.3% over the study period. The higher rate of the tax burden started from 5% in 1997 to 5.7% in 2003. Afterward, the rate declined and fluctuated between 3.3% and 4.2%. However, the results revealed that the tax evasion as a percentage of the underground economy constituted, on average 11.01% over the period.

The analysis summarized that the ratio of the tax evasion to the non-oil tax revenues was equivalent the ratio of the underground economy to the GDP. This result confirmed

the fact that the tax evasion was only a component of the underground economic activities, nevertheless, they move together over time. The size of the tax evasion to the extent of the underground economy had been shown in Figure 5.5.10.

5.6 Oman

5.6.1 Unit Root Test Results

Finally, the analysis concentrated on the estimation of the underground economy within its determinants in the Omani economy, starting with the stationarity analysis of the variables, using the traditional ADF unit root test, as reported in Table 5.6.1[48]. The results indicated that all the variables were I(1) at the 5% level after taking the first difference, except the variable of non-oil tax revenues which was stationary at I(1) process at the 10% level. However, ignoring the issue of structural break in the estimation process of the unit root of variable may introduce bias and false inference on the properties of the series. Zivot and Andrews (1992) unit root test was applied to cover the drawback of the traditional ADF test of unit root in the presence of structural break.

Setting the maximum lag selection at k = 4 for each tested variable; the results of Zivot-Andrews unit root test were presented in Table 5.6.2[49]. Concerning the type of models, the results showed that all the variables were I(1) at the 5% significance level, except the variable of interest rate on deposits, which is stationary at the 10% significance

[48] The test for all the series was conducted with constant and trend, and the optimal lag selection is automatically selected by Schwarz Information Criterion in Eviews.
[49] The Zivot-Andrews's (1992) unit root test was conducted with the intercept, trend only, and both the intercept and trend.

level. The final conclusion had been confirmed using Perron's unit root test (1997) to cover the existed bias of Zivot-Andrews unit root test, since it did not consider including the structural break under the null hypothesis (Silvia, & Iqbal, 2011). From the results of Perron's unit root test, displayed in Table 5.6.3[50], it is shown that the inferences on the properties of the included variables using both unit root tests were identical.

The Zivot-Andrews and Perron time break points of 1996:Q2 corresponded with the implementation of the fifth-five development plan that has been taken by the Omani government in order to develop and modernize the economy. The strategy was aimed at enhancing the investment and the exportation within the implementation of the privatization policy as a new strategy (Looney, 2009). The break point of 2000:Q1, 2000:Q2 and 2000:Q3 coincided with the decision of the Omani government to liberalize its investment law that aimed to attract foreign capital. Besides, Oman had officially joined WTO (Gani, 2015). The break points of 2001:Q2, 2002:Q2 and 2002:Q3 coincided with the decline in receipts of the oil revenues, which were a result of the drop in the oil production (Annual Economic Report of Omani Central Bank, 2002; 2003; Looney, 2004). The break point of 2005:Q1 corresponded to the increase of inflation rate due to the prices of imported food (Annual Economic Report of Omani Central Bank, 2007).

The break point of 2006:Q4 referred to the robust growth in the economy of Oman, since the accelerated economic growth had its strong impact on the whole

[50] The Perron's (1997) unit root test was conducted with the trend and both the intercept and trend.

macroeconomic indicators (Annual Economic Report of Omani Central Bank, 2006). The break date points of 2007:Q1, 2007:Q2, 2007:Q3 and 2007:Q4 corresponded to the impact of the surge in inflation which was a result of the strong economic growth in the economy of Oman. Growth was driven mainly by the accelerated growth in the activities of the non-oil sectors and had led the prices to increase (Annual Economic Report of Omani Central Bank, 2007; Gani, 2015). Since the stationarity analysis of the variables included indicated that the variables were I(1), thus, investigating the cointegration relationship among the tested variables became a mandatory issue.

5.6.2 Gregory - Hansen Cointegration Test Results

In time series data analysis, examining the long run relationship between the variables included in the system was required. To this end, Gregory-Hansen cointegration test was applied. The empirical findings of the estimates of the Gregory and Hansen cointegration test were presented in Table 5.6.4. The results showed that the *t*-statistics of ADF were significant at the 5% level for all the three models of GH-1: Eq.19, OMN, GH-2: Eq.20, OMN and GH-3: Eq.21, OMN. Since, the null of no cointegration in the models GH-1, GH-2, and GH-3, with a structural break point of money demand were rejected. This concluded that Omani money demand in GH-1, GH-2, and GH-3 had a long run relationship with its determinants.

The break date point of 2007:Q4 reflected the effect of high inflation, which was a result of the robust economic growth of the Omani economy. Since, the growth was driven predominantly by the accelerated growth in the investments in the non-oil sectors

and its strong contribution to GDP (Annual Economic Report of Omani Central Bank, 2007; Gani, 2015). The break point of 2001:Q1 corresponded to the decline in the oil production, since the Omani government was concentrated to boost the diversification, particularly in the private sector, while, the break date point of 1997:Q1 coincided with the surge in the oil production in the Sultanate of Oman (Looney, 2004). The results of Gregory-Hansen cointegration tests were plotted in Figures 5.6.1, 5.6.2 and 5.6.3.

5.6.3 Long Run Estimates of Omani Money Demand Model

Investigating the long run relationship between the Omani money demand and its explanatory powers, taking into account the structural break issue was required in order to capture the long run estimates. For this purpose, Gregory-Hansen cointegration technique was used to estimate all the three cointegrating Equations, 19, 20 and 21, as reported in Table 5.6.5. From the results, the null of no cointegration of all the three cointegrating equations of GH-1 (Dummy level shift), the model of GH-2 (Dummy level shift with the trend) and the model of GH-3 (with regime shift) were rejected. Thus, the results indicated that there existed a long run relationship between the currency demand function of the Omani economy and its explanatory determinants.

The results provided that, the model of GH-2 (Dummy level shift with the trend) and the model of GH-3 (with regime shift) were not acceptable. Because, both the models failed to possess their expected signs for all the important explanatory variables, particularly, the variable of the income elasticity of money and the financial variable, the estimated

results had no sense for the Omani money demand function as a proxy to calculate the underground economy in the economy of Oman.

Based on the results, the GH-1 model was the best selected model to estimate the underground economy in the economy of Oman. This was because the coefficients had their expected signs, and were statistically significant at the 5% level of significance. It was also consistent with an economic theory of the money demand. The statistics of this model were reported in Table 5.6.5, and displayed in Equation 37:

$$lnM1_t = -1.90 + 0.09DU_{tk}** + 0.50ln(TR)_t** + 0.33lnG_t** + 0.39lnRem_t** - 0.05i_t** - 0.05\pi_t** \quad (37)$$

Note: (*) 1%, (**) 5% and (***) 10% level of significance.

From the findings, the variable of dummy level shift had a positive impact on the Omani money demand model. The results indicated that the variable's coefficient of non-oil tax revenue possessed its positive sign and had its influence on the Omani currency demand model. This supported the hypothesis that an increase in the tax burden rate exerted pressure on the economic agents to increase their uses of money in the economy. The variables of the GDP, the outflow of money to abroad, the interest rate on deposits, and inflation rate had a strong explanatory power in interpreting the Omani money demand model.

From the results, for every 1% increase in the tax burden, economic agents increased their uses of money by 0.50%. A one percent increase in income level increased the demand for money by 0.33%. For every 1% increase in the outflow of money to abroad,

the demand for money increased by 0.39%. Also, the demand for money increased by 5% for every 1 point decrease in the interest rate on the deposits. Finally, for every 1 point decrease in the inflation rate over all the economy, the demand for money increased by 5%.

Concerning the result of Gregory-Hansen model 1 (dummy level shift), the next stage of the analysis moved to test the stationarity in the residuals that were captured from the cointegrating equation of the GH-1 model. This was in order to obtain estimates of dynamic short run error correction model (ECM).

5.6.4 Short Run Estimation of the Omani Money Demand Model

To obtain estimates of the short run error correction model, testing for the stationarity of the residuals were achieved from the cointegrating equation of Gregory-Hansen model 1 was mandatory. This investigated the order of integration of the residuals as suggested by Engle-Granger (1987). The test introduced that the residuals had unit root against the alternative hypothesis that residuals were stationary. The result was presented in Table 5.6.6.

Based on the results, the maximum absolute value of the ADF test statistic was 3.13, which was statistically larger than its critical value of 2.90, at the 5% level of significance. The test failed to accept the null hypothesis that residuals were non-stationary, thus, result implied that the residuals were stationary in its level. This confirmed the evidence that the Omani money demand model had a long run

relationship with its determinants. The conclusion showed that an estimation of the short run dynamic of the error correction model (ECM) must be conducted. To this end, the method of General to Specific (GETS) was used.

The dependent variable of money demand $\Delta lnM1_t$, was regressed on its lags, its own independent variables with their current and lagged terms ($\Delta lnTR_t$,$\Delta ln\ G_t$,$\Delta lnRem_t$, Δi_t and $\Delta\pi_t$), and the one period lagged residual that was captured from an estimation of the Gregory and Hansen cointegrating model 1 (see Singh & Pandey, 2012; Rao & Kumar, 2009).

Setting maximum lags, k = 4 the lagged variables were subject to the deletion test till the last parsimonious fitted form of the adjustment model of the error correction term (ECM) was achieved. The last finding of the short run estimates was reported in Table 5.6.7, along with its diagnostic tests, as presented in the lower part of the Table. The result indicated that the coefficients of the current and lagged independent variables in the ECM were statistically significant at the 5% level, excluding the coefficient of the lagged income variable, which was statistically significant at the 10% level.

The results provided that the coefficient of the lagged error correction term had its negative sign and statistically significant at the 5% level. The coefficient of the ECM confirmed that 0.12% of disequilibrium in the previous period was amended in the current period. The adjusted R-squared suggested that roughly 98% of the variation in the Omani money demand model was interpreted by its determinants. In addition, the

statistic value of the Durbin-Watson test (DW-statistic = 1.76) proved that the estimated model was basically free from the serial correlation or heteroscedastic disturbances. Also, the results showed that the dynamic ECM had no problem with all statistical diagnostic tests in the residuals, except the normality.

Checking for the stability of the Omani money demand model, the CUSUM and CUSUMSQ tests of Brown *et al.* (1975) were applied. The tests were conducted on the residuals of the short run dynamics error-correction model (ECM). The tests were well-run recursively, plotted against the break points and based on the first set of n observations. If the plot of CUSUM statistic does not cross the boundaries of its two critical lines within the 5% level of significance, then it can be taken as evidence that the estimated coefficients are stable over time. The same analysis was applied to the CUSUMSQ that was depended on the squared recursive residuals. The graphical plots of these two tests were shown in Figure 5.6.4 and 5.6.5.

From the plots, it was observed that the CUSUM statistic for ln(M1) lies within its critical value lines, and hence, the study indicated that the Omani money demand model was stable. However, the plot of CUSUMSQ statistic crossed somewhat its critical value lines, and thus, the result indicated some instability in the Omani money demand model ln(M1). From Figure 5.6.4 and Figure 5.6.5, the plots of CUSUMSQ indicated that the Omani money demand model had experienced some instability during the period of 1997:Q3-1999:Q2, which may be attributed to the influence of the Asian

Financial Crisis on the economy of Oman (Annual Economic Report of the Central Bank of Oman, 1997; 1998; 1999).

5.6.5 Analysis of the Underground Economy in Oman

To estimate the size of the underground economy in the economy of Oman under the period of this study, the GH-1 model was used for this purpose, and the empirical estimates results were displayed in Table 5.6.8. The results provided that the size of the underground economy in the economy of Oman grew from about Riyal Omani 351,772 million in 1991:Q1 to Riyal Omani 1,803 billion in 2010:Q4. As a percentage of the official GDP, the size was, on average 32.35%. It was 32.55% of the official GDP in 1991:Q1 and 29.95% of the official GDP in the last quarter of 2010. The results indicated that the magnitude of the underground economy as a percentage of the official GDP steadily increased since the first quarter of 1991 to the end of 2010, excluding the years 1998s and 1999, respectively. Where, the average size was at its peak point of 33.31% of the official GDP. From the results as it was shown in Table 5.6.8, the average size of the underground economy in the Omani economy was greater than the average size reported by Schnieder *et al.* (2010) and Elgin and Oztunali (2012).

The statistics of Table 5.6.8 indicated that the underground economy in the economy of Oman had gone up significantly since 1991. The development of the trend for the underground economy in Oman was somewhat different and less than some other Asian and African developing countries such as Nepal, Pakistan, the Philippines, Bangladesh, Morocco, Ghana, Madagascar, Tanzania, Malawi, Chad, Niger, Uganda and Ethiopia.

The difference in the size may be attributed to the environmental circumstances, methodology, variables used, and the time of the study period.

However, the rank of the underground economy in Oman itself was relatively bigger and constituted a significant portion of its official economy. As was the case in the GCC countries, the size of the underground economy in Oman may reflect the expansion of illegal employment of foreign workers in the economy. For example, foreign workers constituted 28.4% of the total population in Oman in 2010 (World Bank Data, 2013). The estimable size also reflected the participation of illegal work of the unemployed people in the activities of the underground economy, whereas, the Omani economy had the highest rate of unemployment over the study period (Gulf Investment Cooperation, 2012). The estimable size may come from the practices of illegal activities that were concentrated mainly among the smugglers and visa traders in the country.

In addition, it was a result of illegal activities such as the increased use of drugs among the Omani people, particularly, the national youth, since Oman compared to other GCC countries had become a large market for illegal drugs (Robins, 2014). The result indicated that the size of the underground economy could be a crucial point to the policy makers to restrict its extent through a revision of the prevailing regulation and support for anti-corruption. Figure 5.6.6 illustrated the size of the underground economy to the official economy in the economy of Oman.

The extent of illegal money in the economy of Oman grew from OR 30,974 million in the first quarter of 1991 to OR 505,488 million in the last quarter of 2010. In terms of percentage, the average size of illegal money to the money outside the banks reached about 49.78% over the study period. The size had fluctuated between 49.42% and 50% from the period of 1991:Q1 to the end of 2006. Afterwards, the size had declined. The outcome indicated that the excessive use of money reflected the need of agents to settle their hidden transactions in terms of cash in the economy. This was to hide their informal transactions, such as buying drugs or sending money to their home countries, as foreign workers living in the country have no way to access legal banking services because they had financial limitations to remit their money home. Thus, individuals tend to increase their use of cash due to the fact that the use of cash passing from hand-to-hand did not leave traces for the authority to track (Dell'Anno & Halicioglu, 2010).

It was observed that the estimated volume of illegal money reached half of the total money outside the banks. The size reflected the increasing use of money by individuals (national and foreigners) to cover the illegal activities that contributed to the growth of the underground economy in Oman. Since, the contribution rate of foreigners of the total population in Oman composed, on average, about 26%, and 67% of the labor force over the study period (Winckler, 2010; Endo & Afram, 2011; World Bank data, 2013).

In addition, the large magnitude of illegal money may also arise from the tight regulations imposed on the agents in the labor market, which in turn exerted pressure on foreign workers, in particular to increase their demand and illegal use for money.

Furthermore, the size had its manifestation via the practices of corruption and nepotism prevailing in the country, which was tough to track. Figure 5.6.7 illustrated the size of illegal and legal money to the total money outside banks in Oman.

The amounts of tax evasion estimated to RO 26,277 million in the first quarter of 1991 and RO 129,068 million at the end of 2010. The rate of tax evasion to the non-oil tax revenues reached, on average, 32.35% over the study period. The rate grew steadily since the first quarter of 1991 from 2.43% to 2.14% at the end of 2010, excluding the years between 1998 and 2007, since, it went upwards. However, the rate of the tax evasion to the official GDP estimated, on average at 2.92%. The highest magnitude of tax evasion started from the first quarter of 1998 to the fourth quarter of 2007, since the highest rate of its size to the official GDP was estimated on average, at 3.15%. Afterwards, the rate went downwards. Figure 5.6.8 showed the size of tax evasion to the official GDP in the economy of Oman over the study period.

The results indicated that the size of tax evasion constituted a significant part of the GDP and non-oil tax revenues in the economy of Oman. As a component of the underground economy, it had an effect on the total tax revenue and other macroeconomic variables. The results suggested that the tax evasion practices in the economy of Oman may be concentrated among the owners of the business firms in the private sector, as well as, the owners of the recruitment companies of foreign workers that existed in the country. The result on the size of tax evasion to the total non-oil tax revenues has been shown in Figure 5.6.9. The results also provided that the size of the

tax evasion in the economy of Oman may be attributed to the excessive regulations, spread corruption among senior officials and tax burden imposed on the agents. The rate of the tax burden had started to increase since the first quarter of 1991 until the end of 2010. It reached, on average, 8.1% of the GDP over the study period, which was costly to them, and motivated them to evade taxes.

In other words, the size reflected the fact that the business firms had resentment towards the government since the government did not support the infrastructure services that can facilitate the marketing of their products in the official economy. Keeping to this situation and an inequality of the tax burden levied by authority may drive them to involve in illegal activities in order to elude taxes. The analysis concluded that the ratio of the tax evasion to the non-oil tax revenues was equal to the ratio of the underground economy to the GDP.

In this respect, the tax evasion was only a component of the underground economic activities; nevertheless, they move together over time. It was estimated, on average as 9.01% of the underground economy over the study period. The size of the tax evasion to the underground economy was shown in Figure 5.6.10.

5.7 Conclusion

The empirical findings of the analysis showed that all the variables included in the currency demand model of the sample countries were stationary at first difference. The results provided that there were long run relationship between the currency demand

model and its determinants. Besides, the currency demand models of the sample countries had been affected by its important determinants, such as the main financial variable of interest; non-oil tax revenues. The best models were consistent with the theory and statistically significant. The long run estimated models were employed to obtain estimates of the underground economy in the sample countries. The estimates of the underground economy in the sample countries were very interesting.

CHAPTER SIX

SUMMARY AND GENERAL CONCLUSION

6.1 Summary

In this study, the main objective was to estimate the size of the underground economy in the selected GCC countries (Saudi Arabia, Qatar, the UAE, Kuwait and Oman). The other objectives aimed at estimating the illegal currency, which is the amount of money used for illegal transactions in the economy. Moreover, the study estimated the amount of tax evasion, in terms of currency, based on the level of the underground economy over the official economy at individual country level.

The analysis was conducted on the sample countries at individual country level using time-series data that covered the period of 1980-2010 for Saudi Arabia and Qatar; while due to unavailability of sufficient annual data, the analysis covered the period of 1991:Q1-2010:Q4 for the UAE, Kuwait and Oman. The disaggregation procedure of Gandolfo (1981) was applied to interpolate the available annual data into quarterly series.

The present research made important contributions to the Gulf region. For instance, it contributed to the existing literature by providing an estimate of the size of the underground economy in the selected GCC countries. With respect to the sampled countries, the findings may provide a benchmark to the decision-makers to revise their economic policies and lower the current magnitude of the underground economy. This

study also offered the macroeconomic policy implications for the underground economy. Finally, the recommendations and limitations were also expounded.

For future work, the study recommended that researchers should consider other financial and monetary variables that can induce people to engage in underground economic activities. Unlike previous studies, this study is the first one that adopted Gregory-Hansen's Cointegration (1996) approach based on the CDA Methodology as a proxy to estimate the magnitude of the underground economy. The Gregory-Hansen Cointegration (1996) approach in the presence of structural break was found to be an appropriate technique for a robust analysis in the case of GCC countries.

Methodologically, the CDA Model based on the cointegration technique of Gregory and Hansen was adopted for the macroeconomic variables of GDP, the total non-oil tax revenues, the outflow of money that was remitted by the foreign workers to their home countries, the interest rate on deposits and inflation rate. For each individual country of GCC in the sample, it was applied indirectly to obtain estimates of the underground economy.

Generally, the analysis was the same for each selected GCC country, but the outcomes were not similar. The analysis results of the underground economy were valuable. The estimation process was carried out by selecting the most appropriate model based on theory and most statistically significant. First, starting with the analysis of the Saudi Arabian economy, the second model of Gregory-Hansen was the best. The results

revealed that the underlying variable of interest, which was the financial variable of non-oil tax revenue, had a positive impact on the Saudi Currency Demand Model (SCDM); while the variable of interest rate on deposits had a negative impact on the SCDM and was statistically significant.

However, other variables did not affect the SCDM. For instance, the GDP variable was statistically not significant (even at 10% level of significance), but it had a positive sign. This finding was in line with the study of Basher and Fachin (2014), where they stated that the SCDM was not influenced by the total GDP, but it may be affected by the non-oil GDP sectors.

The outflow of money by foreign workers had a negative sign and statistically not significant on the SCDM. The unexpected non-significance of the money outflows on the SCDM was due to the fact that the investment and consumption activities relied on the local citizens and foreign workers who were staying in the country[51]. With tight regulations levied on the foreigners, they send billions of dollars to their home countries. The amounts of money sent abroad were not used for investment or consumption in the economy of Saudi Arabia. Thus, the SCDM in the Saudi economy may not be affected by the outflow of money (Al-khathlan, 2013).

[51]The foreign workers constituted 52% of the populations living in GCC countries (Djajic, & Mesnard, 2015). The Saudi economy had more than 9.5 million foreign workers, who constituted more than 31% of its total population. In 2009, the Saudi economy was the second biggest source of money outflow ($26.0 billion), after the US economy (Al-khathlan, 2013).

Contrary to the theory, the inflation rate had a positive sign and statistically not significant. It had no impact on the SCDM of the Saudi economy. The result concurred with the study of Al-Towaijri and Al-Qudair (2006); and the annual economic report of the SAMA (2014). They argued that the SCDM of the Saudi economy was not influenced by inflation rate because the Saudi monetary authority adopted a preventative monetary policy that kept the inflation rate at a moderate and stable level.

Concerning this model, the results showed that the average size of the underground economy constituted 62.80% of the official GDP over the study period. However, the average size of the illegal money to the money outside banks was about 18.18%. In terms of tax evasion, the rate to the official GDP fluctuated and reached on average, 5.15% over the period. It was 3.38% of the official GDP in 1980; and 2.53% in 2010. The high rates of tax evasion compared to the official GDP fluctuated from 7.53% in 1982 to 7.91% in 1990. Then, the rates declined, except for the year of 1998, where the rate was 7.21%.

As a percentage of the total non-oil tax revenues, the average growth rate of tax evasion was estimated at 62.80% over the study period. However, as a percentage of the underground economy, the average rate of tax evasion was estimated at 8.13% over the study period. Also, the results confirmed that the average rate of the underground economy to the official GDP was equivalent to the average rate of tax evasion to the total non-oil tax revenues. The results indicated that the volume of the underground economy in Saudi Arabia may reflect irregular economic activities undertaken by

staying immigrants or those who overstayed their visas and other economic agents in the country. The size may be attributed to the expansion of the money laundering activities and narcotics trade in the Saudi economy (AL-Asmari, 2014). Besides, it may become a medium to elude unfair taxes and as a result of the labor market restrictions, which pressurized the agents to earn additional income faster by doing business in the underground economy.

Lastly, the findings concluded that the demand for money in the Saudi economy may also be attributed to other variables that motivated people to increase their use of money, and the estimable size of the underground economy in the CDA varied with respect to that variable.

As for Qatar, the same stages of analysis were conducted using the best selected model of the Qatari Currency Demand Model (QCDM). However, the results on the underground economy were different. Just like in Saudi Arabia, the frequency of the data was available from 1980-2010. Generally, the outcomes were not similar to the results of Saudi Arabia. It showed that the second model of Gregory-Hansen had strong statistical evidence as a measurement of the QCDM, proxied to capture estimates of the underground economy in Qatar. From the results, all the explanatory variables had their expected signs, statistically significant at 5% level and had a significant effect on the QCDM, except the variable of inflation rate, which was contrary to the theory, since it had a positive sign and statistically significant at 10% level.

The positive relationship between inflation rate and money demand may be attributed to the expansion of monetary policy undertaken by the Qatari authority over the study period. With a higher rate of inflation, agents demanded more money in order to generate a new output in the underground economy than to work in the official economy, while the overcrowding of buyers in an organized market was minimal. Thus, the turnover of goods and services in the underground markets increased and as a result, the underground economic activities increased relative to the formal sector (Ahiabu, 2006). The result here indicated that the size of the underground economy was a reflection of the performance of the official economy (FiroozAbadi, Razmi & Bahmani, 2015).

With respect to the estimation of the second cointegrating model of Gregory-Hansen, the last stage of the analysis aimed to quantify the volume of the underground economy, illegal currency and tax evasion in the Qatari economy. The results showed that the average rate of the underground economy in Qatar constituted 17.03% of the official GDP over the study period. The average size of the illegal money to the money outside the banks was about 26.70%; while, the rate of the tax evasion as a percentage of the official GDP, on average was estimated at 2.12% over the study period. This also indicated that tax evasion constituted a significant portion of the non-oil tax revenues in the Qatari economy.

The growth rate of tax evasion as a percentage of total non-oil tax revenues was estimated on average at 17.03% over the study period. However, the average rate of tax

evasion of the underground economy was estimated at 0.12%. The result suggested that tax evasion was a component of illegal activities of the underground economy in the Qatari economy, but it was much less than that estimated in the Saudi economy. This may be attributed to the relative size of the Saudi economy compared to other economies in the region. The underground economy involved different illegal activities in Qatar. The results also provided that the average size of the underground economy to the official GDP was equivalent to the average rate of tax evasion to the total non-oil tax revenues.

The result indicated that the size of the underground economy in Qatar reflected the informal employment of the foreign workers in the economy[52]. The size brought about by the huge outflow of money abroad illegally due to the distortion in the economic policies and red tape; the cost of sending such money was less costly using illegal ways than formal ways (Freund & Spatafora, 2005; Beine *et al.*, 2012).

The result showed that tax evasion practices in the Qatari economy were concentrated among the Small and Medium-sized enterprises. Finally, the findings indicated that the demand for money in the Qatari economy was attributed to the variables included in the QCDM, which had an impact on the individuals to increase their demand for cash for illegal activities of the underground economy.

[52]Qatar had largest number of aliens, which constituted about 72.4%, 76.3%, 80.5% and 81.6% of the total population over the period of 1990, 2000, 2005 and 2010 respectively.

The study progressed by analyzing the underground economy through the Emirati Currency Demand Model (ECDM) in the UAE over the study period of 1991:Q1-2010:Q4. The results showed that the first Gregory and Hansen model was preferred since it was consistent with the economic theory of money demand. From the results, the level shift dummy variable had no effect on the ECDM, while the other variables had a significant impact on the ECDM, except the variable of inflation rate, which had a negative sign, but statistically not significant. Thus, it did not affect the ECDM.

The study also analyzed the underground economy in the country, as well as illegal currency and tax evasion. The results indicated that the estimable size of the underground economy in the UAE was on average, 10.34% of the official GDP over the study period. The illegal money to money in circulation outside banks (M1) in the Emirati economy constantly increased since 1991:Q1 (58.56%) till the first quarter of 2006 (61.91%). Then, it continued to increase at a moderate level and on average reached 61.92%. On average, it was 59.68% over the study period.

The rate of tax evasion to the official GDP was on average at its lowest level (0.63%). The rate reached on average, 10.34% of the non-oil tax revenues over the study period. However, the rate of tax evasion as a percentage of the underground economy constituted on average 5.95% over the study period, which was equivalent to the average rate of non-oil tax revenues as percentage of GDP in the country. The results suggested that illegal activities were concentrated mainly among the foreign workers, which was a result of the absence of human rights of foreign workers.

The size of the underground economy may be due to the expansion of illegal money that may reflect the growing need of individuals to use money in the form of cash in the economy. This was to avoid the payment of tax and hide their illegal transactions, by buying drugs or sending money to their home countries, as the use of money did not leave traces for the authority to track. Cash had been the preferred instrument for individuals (particularly foreign workers who were doing self-business, staying illegally or overstaying) and they preferred to transfer money abroad.

In addition, the results indicated that the size of the underground economy itself was a benchmark to the policy-makers to revise their economic policies in such a way to restrict individuals from indulging in illegal activities. Also, the findings confirmed that the tax evasion was only a component of the underground economic activities. Nevertheless, they were moving together over time. The results suggested that the tax evasion practices in the Emirati economy may be concentrated among the importers, retailers and wholesalers. This was in addition to the tax evasion practices of the owners of the recruitment companies of foreign workers in the country.

The study also estimated the size of the underground economy in Kuwait, by selecting the best model from the three cointegrating models of Gregory and Hansen. The results suggested that the first Gregory and Hansen model (Dummy level shift) was the best model to estimate the Kuwaiti underground economy due to the following explanations. The model was the most consistent, in line with the economic theory of money demand.

Besides, all the coefficients of the variables included were statistically significant at 5% level. From the results, the level shift dummy variable and the other variables included had their expected effect on the Kuwaiti money demand model (KMDM), except the inflation rate, which had a significant positive effect on the KMDM. But it did not operate in line with economic theory of money demand. This relationship between the inflation rate and the money demand can be attributed to the fact that with continuing inflation rate in the economy, agents preferred to work in the underground economic activities than to work in the official economy in order to offset the effect of the inflation rate (Ahiabu, 2006). This situation led them to increase their demand for money to fund new investments, as the demand for money introduced an easier option for those trying to hide their underground activities.

Finally, the analysis concentrated on the estimates of the underground economy as well as the illegal currency and tax evasion. From the results, the size of the underground economy increased its contribution to the Kuwaiti's economy over the study period. It constituted a significant portion of its official GDP. As a percentage of the official GDP, the size of the underground economy was on average, 24.95%; while the average size of the illegal money to the money outside the banks was about 59.51%. However, the rate of the tax evasion to the official GDP was on average 2.83% over the study period. In terms of percentage, the average rate of the tax evasion to the total non-oil tax revenues was about 24.95%. The tax evasion as a percentage of underground economy constituted on average, 11.01% over the period.

As it is the case in other GCC countries, the results suggested that the expansion of the underground economy mirrored different sorts of illegal activities in the Kuwaiti economy, which were concentrated mainly among the local individuals and foreign workers[53]. The size may be due to the characteristics of the socio-economic environment of the Kuwaiti society. It may be attributed to the increased rates of unemployment among the Kuwaiti youth, the stringent regulations that was imposed on the foreigners working in the country and the absence of human rights toward foreign workers (Shah, 2013). In fact, the expansion of the narcotics trade in the Kuwait society was the most important manifestation of the underground economic activities. Because of the unemployment problem and too much money available to youth, the narcotics traffickers exploited the youth to resort to drugs (Leghari, 2002).

The results indicated that the excessive use of money in the Kuwaiti economy may reflect the true need of individuals to settle their illegal transactions in terms of cash[54]. The money passing from hand-to-hand did not leave traces for the authority to track, and did not require any cost of sending the money to their home countries, or those engaging in the smuggling and other illegal activities. However, the results provided that the tax evasion as a part of the underground economy had an impact on the tax revenues. It was recommended that the tax evasion practices in the Kuwaiti economy could be concentrated among the owners of the Small and Medium-sized enterprises in

[53]The foreigners constituted more than 70% of the total population in Kuwait over the study period.
[54]The use of money in terms of cash remained a favored instrument for foreign workers (particularly foreigners who were doing self-business, staying illegally or overstaying) to settle their payments or to send money abroad.

the private sector. Besides, it supported the fact that the tax burden causes individuals to evade taxes.

Finally, the analysis of this study also looked into the economy of Oman, as the last country of the sampled countries. The main objective was to quantify the size of the underground economy, illegal currency and tax evasion in the country. This was captured by picking the best model. Based on the results, the first model of the Gregory and Hansen (Dummy level shift model) was the best as a proxy to estimate the underground economy in Oman. This was because the coefficients of the variables included had their expected sign, and were statistically significant at 5% level of significance. It was also consistent with the economic theory of money demand. The findings indicated that all the variables included had a strong explanatory power in explaining the Omani Money Demand Model (OMDM).

The last stage of the analysis was to estimate the magnitude of the underground economy as well as the illegal currency and tax evasion. The results indicated that the magnitude of the underground economy as a percentage of the official GDP steadily increased since the first quarter of 1991. As a percentage of the official GDP, the size was on average, 32.35%. The average size of the illegal money to the money outside the banks was about 49.78% over the study period. However, the rate of the tax evasion to the official GDP was on average, 2.92%, while the rate was on average, 32.35% of the non-oil tax revenues over the study period, which was equivalent to the rate of the underground economy to the official GDP.

The results suggested that the underground economy in Oman itself was relatively bigger and constituted a significant portion of its official economy. The size may reflect the expansion of illegal employment of the foreign workers, besides the participation in illegal work by the unemployed people in the country. It may also come from the illegal activities that were concentrated mainly among the smugglers and Visa traders in the country.

The outcomes showed that people increased their demand for money in order to hide their informal transactions that had contributed to the growth of the underground economy, such as buying drugs or sending money to their home countries. This was because cash passing hand-to-hand did not leave traces for the authority to track (Dell'Anno & Halicioglu, 2010). In addition, it was suggested that the tax evasion practices in the economy of Oman had its manifestation in the practices of corruption and nepotism prevailing among the top senior officials in the country.

Besides, it may be concentrated among the owners of the business firms in the private sector and the owners of the recruitment companies of foreign workers that existed in the country. Table 6.1.1 summarized the estimated results of the underground economy, illegal money and tax evasion over the study period in the selected GCC countries.

Table 6.1.1

The Estimated Results of the Underground Economy, Illegal Money and Tax Evasion in the Selected GCC Countries over the Study Period

Countries	Study Period	UE/ GDP%	ILM1/ M1%	Tax Eva./ GDP%	Tax Eva./ NOTR%	Tax Eva./ UE%
Saudi	1980-2010	62.80	18.18	5.15	62.80	8.13
Qatar	1980-2010	17.03	26.70	2.12	17.03	0.12
UAE	1991:1-2010:4	10.34	59.68	0.63	10.34	5.95
Kuwait	1991:1-2010:4	24.95	59.51	2.82	24.95	11.01
Oman	1991:1-2010:4	32.35	49.78	2.92	32.35	9.01

Notes: UE referred to Underground Economy, GDP referred to Gross Domestic Product, ILM1 denoted Illegal Money in circulation, M1 represented Money in circulation, Tax Eva. referred to Tax Evasion and NOTR denoted Non-Oil Tax revenues.

***Source**: Author's calculations based on estimation results*.

6.2 Macroeconomic Policy Implication of the Underground Economy

The main intention of this study was to estimate the magnitude of the underground economy in the sampled countries. The estimated results showed the implications of the macroeconomic policies of the underground economy in the context of selected GCC countries. Some of these implications focused on the monetary policy, fiscal policy and labor market policy.

6.2.1 Monetary Policy

One of the main assumptions in calculating the size of the underground economy using the methodology of the CDA model was that individuals who worked in underground economic activities increased their use of cash in order to settle their illegal transactions. This was because the use of cash was the favorite instrument for them to evade paying taxes, as it did not leave traces for the authority to track the nature of those activities. Using cash to fund a transaction (whether illegal or legal), was not in isolation from the

economic policy in the country, but it was subjected to the changes in the monetary policy.

To understand the impact of the monetary policy on the underground economy, a common consensus among the authors was that the changes in the monetary policy's variables may affect the size of the underground economy (Dabla-Norris, & Feltenstein, 2003). The expansion or reduction in the size of the underground economy in a country is a reflection of individuals' performance in the economic system, which mainly may come as a result of wrong economic policies (Blackburn, Bose, & Capasso, 2012)[55].

From a monetary point of view, agents keeping or refraining from holding money relied on their response to the changes to the monetary policy instruments, such as the changes in the interest rate or changes in the inflation rate through expansionary policy by issuance of new banknotes. For example, with a continued decline in the interest rates, the bank's deposits were affected by a reduction, as the agents did not trust the capacity of banks in preventing their own deposits from the fluctuating risk of interest rates. This may push agents to prefer to enter into the underground economic activities than to invest in the formal economy. In case of the positive direction of the interest rate, the bank's capacity to re-employ its deposits increased and agents increased their deposits rather than demand more money.

In the context of the GCC economies, the characteristics of the banking and financial system were generally underdeveloped, as it was dominated by the royal families.

[55] Individuals flee to work into underground economic activities in order to escape legal obligations.

Under this structural weakness and poor performance of the system, investment activities of the underground economy may take place over the activities of the official economy. This is because agents tend to exploit new opportunities in the underground economy that make them free from red tape restriction and strict regulations; this enables them to obtain additional profits[56]. Besides, the GCC countries had a big number of foreign workers who constituted, on average, more than half of their national population and they were working for so long there. However, the foreign workers had no right of citizenship; they were not allowed to access the official financial institutions. With respect to this situation, it was rational to assume that illegal outflow of money mirrored predominantly the need for people to increase their use of cash in order to settle transactions or to hold and send money to their home.

Indeed, the GCC economies had a unique condition that exerted pressure on the individuals to participate in illegal activities of the underground economy (Naufal, 2010). For example, one of the unique characteristics in the GCC economies was the continued increase of printing new banknotes into circulation (despite immense monetary returns from exporting of oil) and adding to the money supply[57]. This situation may reflect the expansion in holding money by public to settle and hide their illegal activities. Furthermore, it may be interpreted as the huge expansion in the outflow of money abroad, which may represent a channel for money laundering as one of illegal activities. The analysis provided that it was important for the policy-makers to

[56] Individuals were working in the underground economic activities in order to avoid the legal restrictions (FiroozAbadi *et al.*, 2015).

[57] See the economic reports of the GCC economies about the annual increase in rate of the currency component of money supply over the study period.

take into consideration the size of the underground economy in formulating the macroeconomic policies. Empirical analysis showed that the underground economy was not only an essential component of the official economy, but it had developed from the changes in the economic policy of the official economy.

The results indicated that the effect of the monetary policy on the size of the underground economy had its manifestation in the economies of the GCC through the following arguments: First, the currency demand function model for each individual country in the study confirmed that the pattern of using cash in the underground economy was different from that in the official economy. This was shown from the bigger estimable size of the illegal currency to the money outsides banks. It was a reflection of the behavior of people in the underground economy, and the failure of the monetary policy to make them work in the official economy, where people preferred to increase their use of cash in the underground economy more than in the official economy. Thus, the bigger the size of the population the more cash required in the underground economy. It was observed that the velocity of money in the informal credit market showed that illegal transactions were greater than that in the formal credit market[58].

Second, the volume of the underground economy may be affected indirectly through lower interest rates, which motivate depositors to withdraw their deposit balances from the financial institutions in the form of cash, and then increase their demand for currencies in the economies. The prominent increase in the demand for money relative

[58] In fact, it was greater than that one in the formal in the context of Saudi, Qatar and Oman.

to deposit accounts may mirror the growing expansion of the underground economic activities, or an indication of the other activities that individuals want to conceal from the authorities.

Third, the continuation of the outflow of money abroad via unlicensed financial intermediaries that existed in the countries of the GCC can affect the size of the underground economy, since the strict regulations levied on the individuals in the official financial institutions may exert pressure on people to resort to illegal channels.

The persistent issuance of banknotes was used to offset the growing outflow of money (legally or illegally). The new banknotes may become a part of the money used to settle illegal activities of the underground economy. In this context, the monetary policy-makers should take into account the underground economy in order to minimize its effects on the official economy.

6.2.2 Fiscal Policy

Studies on the underground economy had shown that the fiscal policy variables represented a key factor in determining the extent of the underground economy. The currency demand function model considered the government taxes that reflected the overall tax burden imposed by the authority as one of the important variables among other financial variables in introducing an estimate of the underground economy.

In analyzing the potential effect of the taxation policy, the policy-makers need to account for the impact of the tax structure (oil tax and non-oil tax revenues) on the size of the underground economy. The taxation structure of the non-oil tax revenues and strict legislations that were accompanied by unfair taxes and the rampant corruption in the GCC economies may be the crucial elements to the taxpayers in their decisions about whether or not to work in the underground economy.

In fact, the taxpayers who were paying taxes in the private sector of the official economies of the GCC countries settled their tax obligations by evaluating the benefits that can be obtained[59]. Therefore, a new form of the tax burden and strict legislation could lead to worsening government revenues through an erosion of the current amount of taxes. This was because of taxpayers moving in such a way to avoid paying taxes and the extortion of tax officials by operating in the underground economic activities.

In other words, engaging in the activities of the underground economy was beneficial for them in case of the continuance of the present taxation system. The empirical results showed that the overall burden of the non-oil taxes in the GCC economies had an effect on the agents to participate in the activities of the underground economy. It is known that the government budgets in the economies of the GCC which relied intensively on the monetary receipts of the crude oil, may no longer cover the general public services over time. In this context, the estimable amounts of the tax evasion, evaluated in terms

[59] The GGC countries adopted the replacement schemes of the foreign workers by their local citizens, where the companies and eenterprises must provide new opportunities for their unemployed citizens up to certain levels. In fact, the companies and enterprises were required to grant them monthly salaries, even if they did not add any value to the activity.

of cash, may provide a sign to the GCC governments to take account of the size of tax evasion in their fiscal policies.

Indeed, the size reflected (as an important component of the underground economy) the contribution of the private sector to the underground economy of the GCC countries, which may also reflect the practices of fiscal fraud via the owners of companies and Small and Medium Enterprises. These companies and enterprises did not obtain statutory accounts that offered a disclosure on their true income earned during a certain period.

With the continuation of tax evasion, the governments need to revise their fiscal policies that can improve the performance of the taxation system through the tax collection administration. In general, it should be oriented on how to prevent the erosion of the tax base, which may lower the government revenues and exacerbate the budget deficit.

6.2.3 Labor Market Policy

The labor market policy in the GCC economies plays a key role in driving individuals to participate in the underground economy. Over the last four decades, the rapid growth of economic activity, as a result of oil exportation led the GCC countries to increase their demand for foreign workers from different countries all over the world. The purpose was to develop and enhance their economies. Although the policy aimed to improve the economy, the huge number of foreign workers became a serious problem over time. The countries appeared to be foreign nationals-populated.

In discussing the impact of labor market policy on the underground economy, it can be seen that the labor ministries of the GCC countries adopted the policy of *kefalah* system to enhance legal employment and deficit in the labor market. But the policy had an opposite effect on the official economy, since it enabled and facilitated the local citizens to recruit foreign workers excessively.

One of the issues associated with the policy was the huge emergence of recruitment agencies that contributed to the underground economic activities. An example of this statement stems from the fact that the majority of the recruitment companies were fictitious and set up mainly to attract workers who were willing to pay for job permits. Indeed, the owners of the recruitment companies did not provide opportunities for the workers. The true activity of the companies was just to recruit legally the workers by visa under the name of a certain sponsor. In most cases, the sponsor granted the worker permission to work freely by himself within the country; they hold his passport in order to ensure that the worker will pay the amount of money they agreed upon (Sturm *et al.*, 2008).

The explanation here showed that the main activity of these agencies became concentrated on the illicit trade of visas for foreign workers, particularly, those who have entered legally into the countries via these companies or those who overstayed (Shah, 2008). In fact, foreign workers may have overstaying status after their contracts

expired. With the need to meet their living costs within the country, they usually resort to working in the underground economic activities.

In other words, the continued activity of these agencies increased the informal employment in the private sector, as well as their participation in the underground economy. With the continuation of the poor labor circumstances, foreign workers were involved in the underground activities in order to obtain quicker incomes as they need to pay a sum of money to their sponsors or to evade the additional costs of renewing their visas[60].

Shah (2009) and Angel-Urdinola and Tanabe (2012) showed that the informal employment in the economies of the GCC countries constituted 20.2% of their GDP. It is a reflection of the huge number of foreign workers who entered the GCC countries via these companies, which constituted, on average, 70% of the total workforce in 2005.

Indeed, the GCC countries did not take much action to restrict informal employment of the illegal workers. This was because it became beneficial to the economies, as it provided new jobs opportunities for unemployed people. Thus, it was obvious that the extent of the underground economy was determined by the labor market policies. Worse still, labor conditions and the government policies of the GCC exerted pressure on the illegal workers (in particular those who were doing self-business, or who were working in the

[60]The prevailing situation in the GCC countries is that the foreign workers were subject to extortion by their sponsor (Shah, 2009).

enterprises of the private sector) to increase their contribution to the underground economy more than their contribution to the official economy.

In a general and more specific note, the underground economy in the GCC countries had a significant impact on the whole economy, because of its size and reaction to the official economy's variables. The current level of the underground economy may contribute to distorting the development and economic planning of the country. The macroeconomic policy-makers have to consider the magnitude of the underground economy. It should be included in their economic policies to ensure reforms that can improve the monetary and fiscal policies, as well as the development and planning models.

Continuing the underground economic activities at its current size may hinder the knowledge of the GCC governments about the actual volumes of the underground economy, and exacerbate the distortion of the official information. Thus, understanding the nature of the socio-economic sources of the underground economy could guide the GCC governments on how to minimize its size and lower its effects. The governments of the GCC countries have to evaluate their policies that have been driving individuals to work in the underground economy. In this context, analysing the interaction between the performance of the official economy and the underground economy must be considered when formulating their economic policies.

Despite the importance of this study in quantifying the size of the underground economy of the GCC countries, the government should better focus on the nature of the illegal activities, rather than knowing the size of the underground economic activities.

6.3 Recommendations for Future Research

In the literature, the calculation of the magnitude of the underground economy relied on the measurement method used and the variables included, which are of interest to researchers. In the case of the GCC economies, future studies should take into account the most influential factors in determining the size of the underground economy, such as the widespread corruption and growing number of unemployed people, unfair tax burden that did not consider the benefit for individuals in the economy, lower wages of foreign workers and smuggling activities.

Due to the fact that the national income accounts of the GCC countries did not offer official statistics on the underground economy, the estimates captured may not be able to fully provide the characteristics of the underground economy. In this context, researchers should consider avoiding the bias of omitted variables and the lack of information on the underground economy. Besides, the need to use different methodologies that may help in deepening the understanding of the underground economy in the GCC economies should be considered.

In the present research, estimating the size of the underground economy was indirectly captured by applying the currency demand function model, which attributed the

excessive use of money to the changes in the fiscal variables. Although there is a robust and significant relationship between money demand and the non-oil tax revenues in each individual model of the sampled countries, this study recommended researchers to consider alternative fiscal variables, such as public expenditure. As the GCC countries are classified as monetary economies and relied totally on the receipts of the oil revenues in funding their public expenditures, public expenditure may provide an indication of the activities that are associated with the underground economic activities, and may also provide a different inference on the size of the underground economy.

6.4 Limitation of the Study

Although there are several methods to quantify the size of the underground economy, this study has been conducted within one of the indirect monetary methods, which is CDFM. The important assumption made in the study is that all transactions in the underground economy are executed using cash. This is considered as a logical assumption as the transactions by cash are not traceable and further complicate the authority from taking any action against the illegal activities.

Despite the pioneer attempt of this study to estimate the extent of the underground economy in the sampled countries, the study had some limitations. Firstly, the study was not undertaken to measure the size of the underground economy in all the GCC countries. While there are six GCC countries, the study dealt with only five countries. Bahrain was excluded in the sample. This was because the Bahraini economy is the smallest relative to others.

Secondly, the analysis period did not cover the same time frame for all the economies in the sample, This was due to unavailability of sufficient data for some key variables that affect money demand, such as non-oil tax revenues and interest rate on deposits.

Thirdly, the main objectives of the study were to capture estimation of the underground economy, illegal currency and tax evasion in the sampled countries using the currency demand function model indirectly. The lack of official data for some variables (such as the rampant corruption and unemployment) may have affected the demand for money model for the sampled countries.

Fourthly, another limitation of the study relate to currency demand function model. The final estimates obtained from the model did not discriminate between the various sectors of the underground economy. It may be larger in one sector and very small in another. The bias here should be accounted for when the governments design their macroeconomic policies. These restrictions did not reduce the advantage of the currency demand function model's methodology in formulating macroeconomic policies especially as they relate to underground economy. It provided vital indications of the developments and characteristics of the underground economy in the GCC countries as a whole.

Lastly, the matter of the underground economy in the GCC countries was not touched separately prior to this study. Therefore, the study of underground economy and its

components should be analyzed through the macroeconomic, organizational and institutional factors that motivate people to engage in underground activities. However, the organizational and institutional factors were not part of the scope of this study.

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