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Estimating the Size of the Underground Economy in Saudi: Evidence From Gregory-Hansen Cointegration Based Currency Demand Approach

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Abstract

The objective of this study is to estimate the extent of the underground economy, illegal currency and tax evasion in the Saudi economy over the period of 1980-2010. The study uses the Gregory and Hansen cointegration test based on the recent form of the currency demand approach as a proxy to indirectly quantify the underground economy. The study's contribution is in contrast to previous studies that have linked the positive impact of money inflows to the demand for money as a measurement of the underground economy in the recipient economies. This study is the first to includes the variable of money outflows as an important factor that can be an index for the practice of individuals in the activities of the underground economy in the Saudi economy.The outcomes provide that the average size of the underground economy constituted 62.80% of the official GDP over the study period. The size was 64.25% of the official GDP in 1980 and 57.82% of the official GDP in 2010. However,the average size of the illegal money to the money outside banks reached about 18.18%. The rate of 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 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%. From the results, the plot of CUSUM and CUSUMSQ statistic tests for ln(M1) indicating that the model of Saudi money demand is stable over the study period.

Keywords: Underground economy, Illegal currency, Tax evasion, Zivot and andrews unit root test, Gregory-hansen cointegration, Currency demand approach.

Contribution of Study

This study is the first to include the variable of money outflows as an important factor that can be an index for the practice of individuals in the activities of the underground economy in the Saudi economy.

1. Introduction

The underground economy has become an inevitable issue for most economies of the world (Voicu, 2012). This is due to the fact that the expansion of the underground economic activities has a considerable impact on the macroeconomic variables of the official economy (Trebicka, 2014). The size of the underground economy differs from one country to another (Putniņš and Sauka, 2011; Asiedu and Stengos, 2014). However, due to the hidden nature of the underground economic activities, it is somehow difficult to have accurate estimation. In addition, no official data for this phenomenon is accessible or can be collected in developed, developing and emerging economies (Schneider and Savasan, 2007; AnaMaria *et al.*, 2009; Torgler and Schneider, 2009).

To date, the existing studies undertaken on this issue have been mainly devoted to developed, transition and highly developed OCED countries (See for example, (Schneider and Enste, 2000; Schneider and Klinglmair, 2005; Schneider, 2006; Dreher and Schneider, 2010; Feld and Schneider, 2010; Schneider *et al.*, 2010)). Only a few studies are available on the size of the underground economies in developing countries (Schneider and Klinglmair, 2005; Schneider *et al.*, 2010). In particular, studies on the underground economy in Gulf countries are scarce and lacking, in spite of the nature of the countries, in terms of oil production and exportation (Sturm *et al.*, 2008).

Saudi Arabia as a member of the GCC, acquires the largest economy in the region (Al-khathlan, 2013). Saudi experiencing the growing problem of underground economic activities, which may arise from illegal transfers of money to home countries by foreigners, who constitute 90.1% of total labor force

of the Saudi economy in 2009 (Saudi Arabian Monetary Agency (SAMA), 2014)[1]. In the literature, several factors have been identified as inducing people to participate in underground economic activities (see studies of (Bajada and Schneider, 2009; Torgler and Schneider, 2009; Asiedu and Stengos, 2014; Torosyan and Filer, 2014)). In the case of the Saudi Arabia, it may be attributed to the increased level of corruption in the illicit trade of visas of foreign workers[2] by the recruitment companies and the expansion of the money laundering activities and narcotics trade in the Saudi economy (Shah, 2008; AL-Asmari, 2014). In the other words, it becomes a consequence of the reaction among a 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 economic activities. In addition, because the labor market restrictions in the Saudi economy, it may express to be a medium to elude unfair taxes towards those agents who tend to accomplish a faster income. Since; their transactions in the underground economy are subject to less red tape or less official procedures[3].

As the underground economy has a several sorts of illegal activities, it mirrors irregular economic activities that have made by staying immigrants or those are overstaying their visas, and other economic agents in the economy. Studies that have been conducted on the underground economy in many countries have estimated tax evasion, which represents loss of fiscal revenue for the government. But so far, no study has been conducted separately to measure the size of the underground economy or tax evasion in the Saudi economy.

The underground economy has different kinds of illegal or even legal activities that have not been recorded; nonetheless, it is likely to have negative effects on the official economic planning of the country (Naufal and Termos, 2010). Therefore, the aim of this study is to estimate the extent of the underground economy, illegal currency and tax evasion in the Saud economy over the period of 1980-2010. This study is conducted using an Adjusted Correction of Currency Demand Approach (CDA) in its latest form as introduced by Ahumada *et al.* (2009). This is due to the fact that the CDA methodology is the most popular method in the literatures to estimate the volume of the activities of the underground economy (Pickhardt and Sarda, 2006; AnaMaria *et al.*, 2009; Asante, 2012). Besides, it is a technique appropriate to the conditions of the emerging economies to evaluate the size of the underground economy in terms of currency.

The contribution of this study is in contrast to previous studies that have linked the positive impact of money inflows to the demand for money as a measurement of the underground economy in the recipient economies. This study is the first to includes the variable of money outflows as an important factor that can be an index for the practice of individuals in the activities of the underground economy in the Saudi economy.

The remainder of this paper is planned as follows. The next section offers the concept and a short overview of the available literature on the underground economy. The third section describes the methodology along with the model specification. In the fourth section the results of the empirical analysis are presented. The last section concludes the study.

2. A Brıef Overvıew of Relevant Lıterature

To date, there is no consensus among authors about how the underground economy is defined (Schneider and Hametner, 2014). Each definition looks upon underground economic activities from one given point of view and ignores the other. 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. This is shown in Table 1.

Table-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 neighbour help.

Source: taken from Asiedu and Stengos (2014).

From Table 1, the definition 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 barters.

In this paper, the term underground economy refers to legal or illegal activities that are not reported in the National Account Income Statistical of the Saudi. It is the description of all the economic activities (whether legal or illegal, market and non-market) that add value to the Gross Domestic Product (GDP),

[1] The Saudi economy has more than 9.5 million of foreign workers, who constitute more than 31percent of its total populations.

[2] . The illicit trade of visas of foreign workers by the recruitment companies in the Saudi economy constituted 70% of the visas issued by the Saudi ministry of Labour, which was sold in the black market. Since, the foreign workers have to pay 10 thousand Riyal Saudi for visa that costs 3 thousand Shah (2008).

[3] Due to the cost of using foreign workers (in terms of productivity) in Saudi remains 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 the tight labor regulations and then, to obtain greater profits.

but which are not reported to tax authorities and documented in the statistics of the National Account Income of the country (Tedds, 2005; Hernandez, 2009).

As is the case for the GCC countries, studies on the underground economy in the Saudi economy are very scarce. In the literature, a few studies on the underground economy in the Kingdom of Saudi Arabia have been documented. For example, studies by Schneider and Klinglmair (2005); Schneider (2004) and Schneider *et al.* (2010) estimate the magnitude of the underground economy in 110, 145 and 162 countries using one, three and nine years data, respectively, over different time period of 1999-2000, 1999-2003 and 1999-2007, and under various classifications of development. The following points could be noted from the studies: First, in all these studies, the Saudi economy has been included in the same sample size with different Asian developing countries. Thus, these studies do not distinguish the differences in economic environment among those countries. Second, Schneider and Klinglmair (2005); Schneider (2004) and Schneider *et al.* (2010) report the same results for the economy of the Saudi Arabia and other economies, despite the different sample sizes and periods of study. Lastly, the last findings obtained using the MIMIC model are mainly based on the available estimations of currency demand approach, which has also been applied to many countries. Therefore, these studies do not take into consideration the weakness of the traditional currency demand approach, which mainly assumes the equality of the 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 as presented in the previous study by Ahumada *et al.* (2009).

The main drawback of the studies is that the estimated coefficients may be biased and unreliable. In the same vein, the estimated values may not reflect a full picture of the actual phenomenon of the underground economy of the Saudi economy. A recent study on the underground economy of the Saudi economy was conducted by Elgin and Oztunali (2012). The study uses a new approach, named the two-sector dynamic general equilibrium model, for 161 countries, over the period of 1950-2009. In relation to the economy of the Saudi Arabia, the average size of the underground economy in the Saudi economy was 18.4% as a percentage of the official economy over the period 1986-2008. In spite of the great effort of Elgin and Oztunali in this study, the model does not consider the environmental differences among the countries included. In addition, Elgin and Oztunali in their model assume that the productive activity of the household sector in the underground economy depends on the informal technology that is exclusive to the labor input. Besides, the household devotes a part of its time to employ informal technology in order to generate the informal production that is hard for government to capture, and the household eludes tax payment even if the tax burden is zero.

The criticism of this assumption is that it is not necessary that the fiscal productivity of the household sector in the underground economy relies on the labor input. This is because of the nature of some underground economic activities (such as illicit trade of visas of foreign workers by the recruitment companies in the Saudi economy), that can generate untaxed income (Mahdavi, 2013). Second, the assumption that household depends only on the labor input in production is also inappropriate or irrational since several kinds of illegal activities require entrepreneurship, such as people working in the activity of money laundering. Finally, the assumption of nil tax and tax evasion by households are only rational due to the behavioral nature of individuals, not the tax burden. In the case of nil tax, there is no reason for households to hide its production and evade taxes.

3. Data and Econometrıc Methods

3.1. Model Specıfıcatıon

The actual model is based on the recent form of currency demand function which was developed by Ahumada *et al.* (2009). The model is 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, TR_t is the total non-oil tax revenues of the overall economy at time t[4], G_t is the Gross Domestic Product(GDP) at time t, Rem_t is the outflow of money that is remitted by the foreign workers to their home countries at time t, h_t represents the opportunity cost of holding money i_t, is the interest rate on deposits over a period t, and π_t is the inflation rate at time t, i.e. $h_t = (i_t + \pi_t)$, α_0 is a constant, and ε_t is the error terms.

Taking natural logarithms of both sides of equation (1), and substituting for h_t gives a linear form of equation (2):

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

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

$$\beta_1, \beta_2, \beta_3 > 0, \gamma_1, \gamma_2 < 0.$$

In terms of time series data analysis, the unit root tests of the variables are a precondition to the investigation of the cointegration relationship in the long run. To this end, the procedure of Zivot and Andrews (1992) unit root is conducted. The test allows for only one time break in each tested variable, in

[4] . It is very hard for companies working in the oil sector to avoid the payment of tax, even if the government increases the tax burden rate on those companies. This is due to the fact that the productive activity of the oil sector is monitored by the government. Therefore, the tax burden rate imposed on the oil companies in the countries of the GCC may not exert impact to generate the underground economic activities, since the companies have no way to evade taxes.

which case, the time break point is endogenously estimated at an unknown point as it occurs at time t. The test consists of three models as follows:

Model (A): the change in the intercept of series at unknown time break point, T_b:

$$\Delta Y_t = \hat{\mu}^A + \hat{\theta}^A DU_t + \hat{\beta}^A t + \hat{d}^A D(T_b)_t + \hat{\alpha}^A Y_{t-1} + \sum_{i=1}^{k} C_i{}^A \Delta Y_{t-i} + \hat{e}_t \quad (3)$$

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

$$\Delta Y_t = \hat{\mu}^B + \hat{\beta}^B t + \hat{\gamma}^B D\mathrm{T}_t^* + \hat{\alpha}^B Y_{t-1} + \sum_{i=1}^{k} C_i{}^B \Delta Y_{t-i} + \hat{e}_t \quad (4)$$

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

$$\Delta Y_t = \hat{\mu}^C + \hat{\theta}^C DU_t + \hat{\beta}^C t + \hat{\gamma}^C D\mathrm{T}_t^* + \hat{d}^C D(T_b)_t + \hat{\alpha}^C Y_{t-1} + \sum_{i=1}^{k} C_i{}^C \Delta Y_{t-i} + \hat{e}_t \quad (5)$$

Where DU_t in equations (3) and (5) is a dummy variable for level shift at each time a break occurs, while $D\mathrm{T}_t^*$ in both equations (4) and (5) is a dummy variable representing change that occurs in the trend. The dummy, $DU_t = 1 \text{ if } t > T_b$, or 0 if $t \le T_b$, while the dummy, $D\mathrm{T}_t^* = t - T_b \text{ if } t > T_b$, or 0 if $t \le T_b$. T_b is the date at which structural break takes place. The guideline for choosing the date of a structural break is by selecting the minimum value of the *t*-statistics for testing the null of $\hat{\alpha} = (\alpha - 1) = 1$ for all the models. If the *t*-statistics is less than its critical values at all levels of significance, it implies that the included variable has a unit root or is non-stationary with one structural break point. Otherwise, it implies that the variable under test has no unit root with one break point or is stationary with one break. The critical values are provided by Zivot and Andrews (1992) while the optimal number of lag length is based on Akaike Information Criterion (AIC).

3.2. Gregory and Hansen Cointegration Test

Gregory and Hansen (1996) cointegration test is an extension of Engle and Granger (1987) technique of cointegration test. It is applied to investigate the long run relationship between currency demand function and its determinants in the presence of a possible structural break (Singh and Pandey, 2012; Banafea, 2014). The test 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 and Hansen, 1996; Kumar *et al.*, 2013). It allows for I(1) variables over all the system at one unknown time break point (Omotor and Motor, 2011). The determination of a potential unknown break point is endogenously estimated, since the time break point is unknown (Gregory and Hansen, 1996). Gregory and Hansen (1996) have presented three models that allow to test the null against alternative hypotheses of long run relationship taking into account the existence of structural break in the cointegrating relationship.

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

$$Y_t = \mu_1 + \mu_2 DU_{tk} + \alpha_1 X_t + e_t \quad (6)$$

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

$$Y_t = \mu_1 + \mu_2 DU_{tk} + \mu_3 t + \alpha_1 X_t + e_t \quad (7)$$

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:

$$Y_t = \mu_1 + \mu_2 DU_{tk} + \alpha_1 X_t + \alpha_2 X_t DU_t + e_t \quad (8)$$

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 the time subscript and e_t is an error term.

In all the three models, $DU_{tk} = 1 \text{ if } t > k$ and $DU_{tk} = 0 \text{ if if } t \le k$, where *k* is the break time point at which break occurs. The time break dates are achieved by estimation of the cointegrating systems for all possible break dates. The time break date is chosen at a value that minimizes the t-statistics or at which absolute value of the t-statistics test is at its maximum compare to its critical values provided by Gregory and Hansen (1996) using Monte Carlo experiments. The number of optimal lag length is chosen automatically based on the criteria of Schwartz Bayesian Information Criterion (BIC), (AIC) and t-test criterion (TTC)[5].

The three models in equations (6), (7) and (8) are extended to test the cointegration relationship of all the variables included in the currency demand function of the Saudi Arabia. The new models can be expressed as follows:

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

$$lnM1_t = \mu_1 + \mu_2 DU_{tk} + \alpha_1 ln(TR)_t + \alpha_2 lnG_t + \alpha_3 lnRem_t + \alpha_4 i_t + \alpha_5 \pi_t + \varepsilon_t \quad (9)$$

[5] .The econometric software, RATS version 8.1 package is be used to perform the Gregory and Hansen (1996). cointegration test.

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

$$lnM1_t = \mu_1 + \mu_2 DU_{tk} + \mu_1 t + \alpha_1 ln(TR)_t + \alpha_2 lnG_t + \alpha_3 lnRem_t + \alpha_4 i_t + \alpha_5 \pi_t + \varepsilon_t \quad (10)$$

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

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

The choice of the best model to investigate the long run relationships between currency demand and its determinants is based on the model that is consistent with the theory and passes the diagnostic tests. However, the residuals obtained should be tested for its stationarity in level as introduced by Engle and Granger (1987) in order to realize a robust inference from the cointegrating relationship.

3.3. Short Run Estimation and Diagnostic Tests

In this paper the dynamic short run Error Correction Model (ECM) is constructed based on the LSE-Hendry method called the General to Specific (GETS) approach as explained by Rao *et al.* (2010). To do this, the currency demand function in its first adjustment in Equation (2) is transformed into the following form:

$$\Delta lnM1_t = -\lambda[lnM1_t - (\alpha_0 + \beta_1 ln(TR)_t + \beta_2 lnG_t + \beta_3 lnRem_t + \gamma_1 i_t + \gamma_2 \pi_t)] \quad (12)$$

Where λ refers to 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. The independent variable that may interpret the behavior of currency demanded can also change in the current and past time period. Thus, equation (12) can be re-written in a more general accurate specification as follows:

$$\Delta lnM1_t = -\lambda[lnM1_t - (\alpha_0 + \beta_1 ln(TR)_t + \beta_2 lnG_t + \beta_3 lnRem_t + \gamma_1 i_t + \gamma_2 \pi_t)] + \sum_{i=1}^{n} \varnothing_i \Delta ln(TR)_{t-j}$$
$$+\sum_{i=1}^{n} \delta_i \Delta lnG_{t-j} + \sum_{i=1}^{n} \theta_i \Delta lnRem_{t-j} + \sum_{i=1}^{n} \psi_i \Delta i_{t-j} + \sum_{i=1}^{n} \varphi_i \Delta \pi_{t-j} + \sum_{i=1}^{n} \gamma_i \Delta lnM1_{t-j} \quad (13)$$

Where Δ is the difference operator, and the term $\Delta lnM1_{t-j}$ describes the changes in the lagged dependent variable. The term ECM is the difference between the actual and estimated currency demand at time $t-1$, which is included in the equation (13) in order to introduce most capable fit of general dynamic specification of the adjustment process. In line with this technique, equation (13) is estimated using OLS and the insignificant lagged variables are discarded till the last fitted version of the adjustment model of the short run dynamic error correction is obtained.

In essence, the short run error correction model is obtained based on the estimation of the equation (13). Hence, the dependent variable of currency demand is regressed on its lags, its own determinants with their current and lagged terms and the one period lagged residuals that are obtained from the cointegrating equation as determined by Gregory and Hansen (1996) methodology (see (Rao and Kumar, 2009; Omotor and Motor, 2011; Dritsakis, 2012; Kumar and Webber, 2013; Kumar *et al.*, 2013)). The final version of short-run dynamic error correction model is tested for normality, serial correlation, functional form (for model misspecification), heteroscedasticity of the residuals and the stability test of currency demand function using Cumulative Sum of Recursive Residuals (CUSUM) and Cumulative Sum of Squares of Recursive Residuals (CUSUMSQ) tests.

4. Steps in Estımatıng the Underground Economy

Following Ahmed and Hussain (2008) and Marcias and Cazzavillan (2009) the analysis of the underground economy of the Saudi economy is conducted by the following steps. First, for each quarter over the study's period, the predicted values of the currency demand function is derived first with the non-oil tax revenues variable ($\widehat{lnM1}_t *_T$); and secondly without non-oil tax revenues variable ($\widehat{lnM1}_t * *_{wT}$). The difference between these two predicted values is multiplied by the actual total value of money of outside banks *M1* over the period to give the level of illegal currency. Second, assuming that the total money in the economy can either be used for legal or illegal transactions, the true legal money in the economy is computed by taking the difference between total actual money outside banks *M1* and illegal money$IM1$. Third, the values of the velocity of income elasticity of money demand must be known to capture the estimation of the underground economy. Foruth, the size of the underground economy in the Saudi economy can be obtained by multiplying illegal money by the velocity of money. Lastly, the total tax evasion in the Saudi's economy is obtained by multiplying the estimates of the underground economy by the ratio of total non-oil tax revenue to the GDP. The former steps are mathematically expressed in the following equations:

$$\text{Illegal money } (\text{IM1}_t) = [(\ln\widehat{M1}_t *_T) - (\ln\widehat{M1}_t * *_{wT})] \quad (14)$$

$$\text{Legal money } (\text{LM1}_t) = [\text{M1} - (\text{IM1}_t)] \quad (15)$$

$$Velocity of Money = \frac{GDP_t}{\text{M1} - (\text{IM1}_t)} \quad (16)$$

$$\text{The underground economy}(\text{UE})_t = \text{IM1}_t * V \quad (17)$$

$$TaxEvasion(TE) = (UE_t) * \left(\frac{TotalTax\,\mathrm{Re}venue_t}{GDP_t} \right) \quad (18)$$

4.1. Procedure to Correct the Estimates of the Underground Economy

This paper assumes that the coefficient value of GDP_t (Income elasticity of money demand) is different from unity. So, the estimation of predicted values of the underground economy must be corrected using the suggested condition by Ahumada *et al.* (2007). Ahumada *et al.* (2007) proved that it is wrong to assume the equality of the velocity of money using currency demand function to estimate the underground economy under the hypothesis that the coefficient of income elasticity is equal to one[6]. This is shown in equation (19) as follows:

$$\frac{Underground_t}{Official\,GDP_t} = \left(\frac{Illegal\,Currency_t}{Legal\,Currency_t}\right)^{\frac{1}{\beta}} = \left(\frac{Underground_t}{OfficialGDP_t}\right)^{\frac{1}{\beta}} \quad (19)$$

The data for money outside banks (M1), GDP and inflation rates are collected from the World Bank Data. The total non-oil tax revenues and the outflow of money abroad are collected from the General Secretary of GCC countries, while, interest rate on deposits is collected from the annual reports of Saudi Arabia Monetary Agency(SAMA).

5. Empırıcal Fındıngds

5.1. Unit Root Test Results in Level and First Difference

The paper starts by investigating the order of integration of the variables included in the model using (Zivot and Andrews, 1992). The results of Zivot-Andrews unit root test in level and first difference are presented in Table 2. Regarding the type of models, the results indicate that all tested variables are non-stationary at 5% significance level. Hence, the null hypothesis of non-stationarity cannot be rejected. However, the examined variables are stationary in its first difference or integrated I(1) process at the 5% level of significance, excluding the variable of interest rate on deposits, which is stationary at 10% significance level. Therefore, the null hypothesis for all tested series can be rejected. The Zivot-Andrews time break point for the year 1986 coincides with the oil price crash (Banafea, 2014).

The break dates of 1987 and 1988 correspond to the economic policy of the Saudi government that 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 reconcile with the event of the First Gulf War and its impact on the Saudi economy (Khadria, 2010; Hvidt, 2013). At that time, the Saudi economy had the largest budget deficit, which led the government to reduce its expenditure (Ghali, 1997). The time break points for the years 1992-1995 coincide 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 expenditure (Al-shahrani and Alsadiq, 2014).

The time break point of 2000 corresponds to the adoption of economic reform through the Seventh Economic Development Plan which aimed to enhance and restructure the Saudi economy. The Saudi government was focused on preparing the economy for Globalization and Privatization so as to become a member of the World Trade Organization (WTO) and to enhance the implementation of the Saudization System as a strategic option (Ramady, 2010). The break point for the year 2001 coincides with the event of the September 11 attacks (Banafea, 2014).

The time break point of 2003 matches the rapid surge in the economic growth, which reflects the hike in the oil revenues (Cevik and Teksoz, 2013). Lastly, the break date of 2005 coincides with the event when the Saudi economy officially joined the WTO (Banafea, 2014).

Table-2. ZA unit root test results in level and first difference

Variable	K	$t_{\hat{\alpha}}$	t-Crit.	I(d)	TB	Model	$t_{\hat{\alpha}}$	t-Crit.	I(d)	TB	Model
Ln(M1)	1	-3.97**	5.084.	I(0)	2001	C	6.44**	5.08	I(1)	1993	C
Ln(TR)	1	-4.43**	93	I(0)	1986	A	4.65***	4.58	I(1)	1995	A
Ln(G)	1	-2.69**	4.93	I(0)	2003	A	6.31**	4.93	I(1)	1988	A
Ln(REM)	1	-3.92**	4.93	I(0)	1988	A	5.12**	4.93	I(1)	1995	A
(I)	1	-4.45**	5.08	I(0)	1990	C	4.88***	4.82	I(1)	1994	C
(π)	1	-4.22**	4.93	I(0)	2005	A	7.08**	4.93	I(1)	1992	A

Notes: 1.*, ** and *** denote level of significance at 1%, 5% and 10 respectively.
2. The optimal lag selection is based on Schwert (1989) criteria.
3. A, B and C refer to the change in the intercept, trend only, and change in both intercept and the trend respectively.

5.2. Gregory-Hansen Coıntegratıon Test Results

The empirical results of Gregory and Hansen cointegration test are presented in Table 3. The results show that the t-test-statistics of ADF are significant at the 5% level in the models of GH-2:Eq.13, SA and the model of GH-3: Eq.14, SA, respectively. Hence, the null hypothesis of no cointegration in the GH-2 and GH-3 models, with a structural break point is rejected. Thus, the results conclude that the Saudi money demand in GH-2 and GH-3 models have a long-run relationship with its explanatory variables over the study period. Thus, the variables are cointegrated over time. However, the results indicate that the model of money demand in GH-1: Eq.12, SA is statistically insignificant, thus failing to reject the null

[6] . Equation (19) corrects the estimation of the underground economy when the coefficient of income elasticity is not equal to one which is the expected case in this paper.

hypothesis of no cointegration with a structural time break. Therefore, there is no long-run relationship between money demand and its determinants in the GH-1 Model.

The estimation findings of Gregory-Hansen cointegration test are plotted in Figures 1, 2 and 3. The time break points mirror some of the events that have occurred and had an impact on the economy. For instance, the break date point of 1985 coincides with the reduction in the oil revenues, which led to an increase in the public budget deficit of the country (Al-khathlan, 2013). However, the break date of 2005 matches the occasion that the economy of Saudi Arabia became a member of the WTO, and the break date point of 1997 refers to the East Asian economic crisis (Banafea, 2014).

Table-3. Results of Gregory-Hansen Cointegration test for money demand model

Type of model	TB	ADF-Stat.	*t*-Crit.	Reject of Null
GH-1(Eq.12,SA)	1985	-3.99(0)	-4.61	No.
GH-2(Eq.13,SA)	2005	-4.97(0)***	-4.72	Yes
GH-3(Eq.14,SA)	1997	-6.66(0)**	-4.95	Yes

Notes: 1. ** and *** denote to the level of significance at 5 % and 10%. The numbers in parentheses are the lags. 2.Chosen for an optimal lag length is based on the criteria of Schwartz Bayesian information (BIC), Akaike Information criterion (AIC) and t-test criterion (TTC).
Source: Eview's ouput

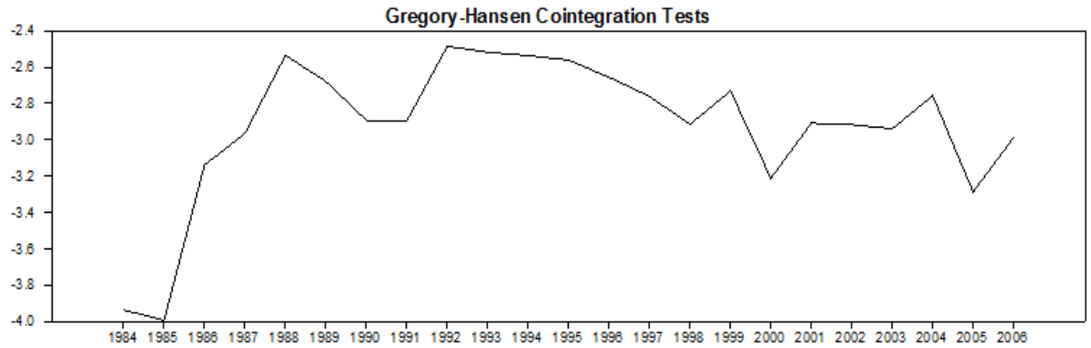

Figure-1. Plot of GH-1 for money demand LM1 in Saudi
Source: RAT's output based on Author's estimation

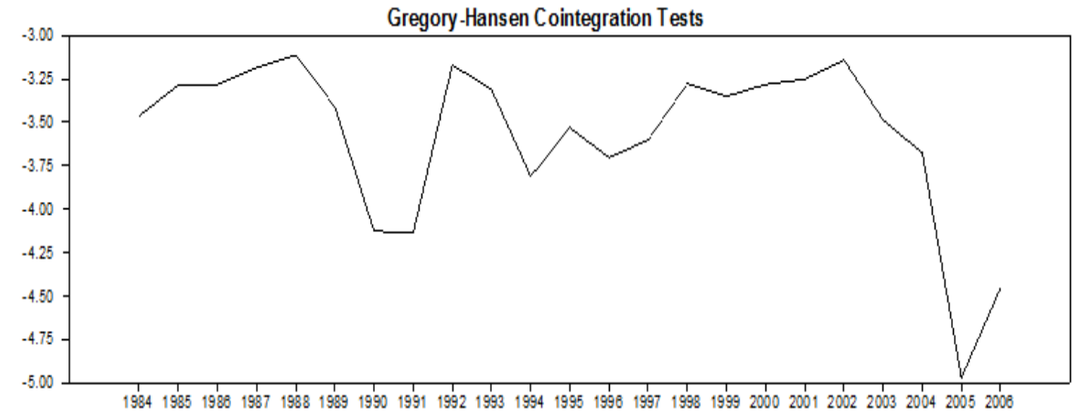

Figure-2. Plot of GH-2 for money demand LM1 in Saudi
Source: RAT's output based on Author's estimation

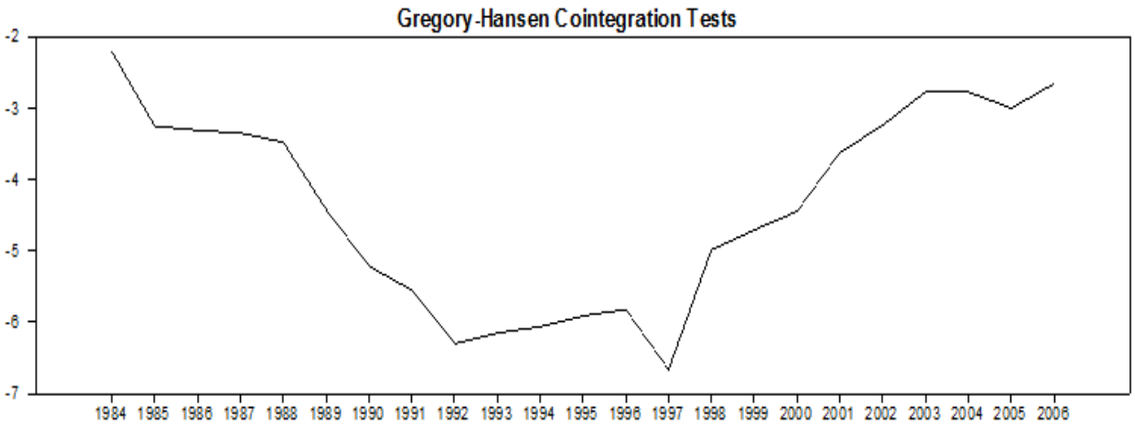

Figure-3. Plot of GH-3 for money demand LM1 in Saudi
Source: RAT's output based on Author's estimation

5.3. Long Run Estimates

To investigate the long-run relationship between 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, 9,10 and 11 by applying Engle-Granger technique, as extended by Gregory and Hansen (1996). The results of the estimation are provided in Table 4.

Table-4. Cointegrating Equations for money demand Ln(M1) in Saudi over 1980-2010

Variable	GH-Model1(Dum1985)	GH-Model 2(Dum2005)	GH-Model 3(Dum1997)
Intercept	-2.25	9.16	7.15
Dummy	-0.19(-3.25)**	0.16(3.76)**	-13.85(-3.97)**
Trend	---	0.02(6.89)**	---
Ln(TR)	0.46(2.92)**	0.19(1.90)**	0.19(1.49)***
Dum*Ln(TR)	---	---	-0.21(-1.00)
Ln(G)	0.64(4.06)**	0.03(0.27)	-0.20(-1.59)***
Dum* Ln(G)	---	---	1.13(6.71)**
Ln(REM)	0.09(0.78)	-0.06(-.74)	0.40(9.91)**
Dum* Ln(REM)	---	---	0.27(1.31)***
(I)	-0.01(-1.39)***	-0.02(-2.76)**	-0.6(-0.89)
Dum*(I)	---	---	-0.8(-0.82)
(π)	0.002(0.29)	0.001(0.26)	-0.3(-0.62)
Dum*(π)	---	---	-0.7(-0.70)

Notes: 1. The t-ratios are in the parentheses follow the coefficients.
2. *,** and *** refer to the level of significance at 1%, 5% and 10% respectively.
Source: RAT's output based on Author's estimation

From the results, From the results, the model of GH-1 is not applicable, since it failed to reject its null hypothesis of no cointegration. The GH-3 model with regime shift is not acceptable since the sign of income elasticity is negative, which makes no sense of the money demand function as indirect method to estimate the underground economy. The results show that the GH-2 Model has strong statistical evidence as a measurement of the currency demand, proxied to obtain estimates of the underground economy in the Saudi economy, due to the following reasons. First, the underlying variable of interest in the model, which is the financial variable of non-oil tax revenue, has an expected sign, and is consistent with economic theory. Second, the coefficient of the variable is statistically significant at the 5%level. It is observed that the financial variable of non-oil tax revenue has a statistical effect on the money demand model of the Saudi economy. The long-run period estimation indicates that a 1% increase in tax burden, increases the demand for money by taxpayers by 0.19%. Additionally, the results signify that both variables, the dummy and trend, have significant impact on the money demand model of the Saudi economy. Also, the results indicate that the interest rate on deposits has a negative sign in line with economic theory and is 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 display that the variable of GDP has its expected positive sign, and has a statistically insignificant effect on the money demand. Indeed, the GDP variable is used as a scale variable that can reflect 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 relies on the production of crude oil, which comprises more than half of the country's output and it has no integration with other sectors in the economy (Fadil, 1985; Al-bassam, 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 is not affected. With regards to this fact, it is likely that the money demand in the Saudi economy is not affected by the total GDP, which constitutes 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 has a negative sign and has statistically insignificant effect on the Saudi 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 rely on the foreign workers who are staying in the country.
With tight regulations imposed on the foreigners, foreign workers in Saudi economy send billions of dollars to their home countries[7] . These amounts of money sent abroad are not used for investment or consumption in the economy of Saudi Arabia. In recognition of this fact, the money demand in the Saudi economy may not be influenced by the outflow of money (Al-khathlan, 2013).

The finding also indicates that the variable of inflation rate is statistically insignificant. It has no influence on the money demand of the Saudi economy and does not support the economic theory. The unexpected relationship of inflation and money demand could be attributed to the Saudi monetary authority adopting a preventative monetary policy that keeps the inflation rate at a moderate level[8] (Al-Towaijri and Al-Qudair, 2006).
The result here may be due to the fact that the main objective of the Saudi monetary authority is price stability (Al-shebel and Al-Hassan, 2001). This consequence reflects that the consumer price index in the Saudi economy has an advantage of stability on average over time (SAMA, 2014). Thus, the money demand of the Saudi economy is not influenced by inflation rate.

5.4. Short Run Estimation

From the estimates result of Gregory-Hansen cointegration model 2, the residuals obtained have to be examined for its stationarity at order zero or I(0) process. This is to investigate the order of integration of the residuals as suggested in Engle and Granger (1987). The ADF test coincides with its null

[7] . The Saudi economy has more than 9.5 million of foreign workers, who constitute 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).
[8] . The inflation rates of the Saudi economy were at moderate level since 1980-2003. From 2003 up to 2010, it fluctuated due to some external factors that caused it to increase Al-Towaijri (2011), SAMA (2014).

hypothesis of a unit root in the residuals against the alternative hypothesis that residuals are stationary. The finding is reported in Table 5.

Table-5. Testing for residuals of the Cointegrating Gregory-Hansen Model2

Variable	ADF-Stat.	t-Crit. 5%	P-Value	Decision	*I(d)*
ε	-4.29	-3.59	0.010	Reject of Null	Stationary I(0)

Note: The test is conducted with an intercept and trend.
Source: Eview's ouput

The result reveals that the ADF test statistic is at its maximum absolute value of 4.29. It is statistically greater than its critical value of 3.57 at the 5% level of significance. The test result indicates that the null hypothesis can be rejected since the residuals are stationary in level. The result concludes that the Saudi money demand model has a long-run relationship with its determinants.

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

The method deals with an application of maximum two period lags, and the lagged variables were subject to the deletion tests till the last parsimonious fitted version of the adjustment model of ECM was obtained. The last version of the model also was subject to the diagnostic tests. The finding of the short run dynamic ECM is reported as in the equation (20)[9]:

$$\Delta \ln M1_t = \underset{}{0.01} - \underset{(-3.68)}{0.51} ECM_{t-1}{}^{**} + \underset{(1.67)}{0.15} \Delta \ln G_t{}^{***} - \underset{(-1.44)}{0.07} \Delta \ln Tax_t{}^{***} + \underset{(2.05)}{0.16} \Delta \ln \mathrm{Re}\, m_{t-1}{}^{**} + \underset{(0.52)}{0.2} \Delta i_{t-1} + \underset{(1.33)}{3} \Delta \pi_{t-2}{}^{***} + \underset{(2.22)}{0.37} \Delta \ln M1_{t-1}{}^{**} \quad (20)$$

$$DW = 1.89,\ R^2 = 0.63,\ Adjusted\ R^2 = 0.51,\ SER = 0.008,\ Period: 1980 - 2010$$

$$\chi^2_{SC} = 0.46(0.79),\ \chi^2_{hs} = 1.35(0.24),\ \chi^2_{ff} = 6.67(0.08),\ \chi^2_{N} = 0.23(0.89)$$

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) are statistically significant at the 5% level and have a positive effect on the money demand. The coefficient of the variable of the GDP is 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 has a negative sign in the short-run at the 10 % level of significance. The coefficient of the variable of inflation is statistically significant at the 10% level and has a positive impact on the money demand; while, the coefficient of interest rate is statistically insignificant.

From the results, the coefficient of the lagged variable of the ECM has a negative sign and is significant at the 5% level of significance. The coefficient mirrors the speed of amendment between the two periods: long-run and short-run, and indicates that 51% of disequilibrium in the prior period is amended in the current period. It confirms the idea that the variables under attention are moving together over time or are cointegrated.

The adjusted R-squared suggests that 51% of the variation in the Saudi money demand model is interpreted within its determinants. In addition, the statistic value of the Durbin-Watson test (DW-statistic = 1.89) provides that the estimated model has no problem of serial correlation or heteroscedasticity in the disturbances.As for the diagnostic tests of the estimable model of (ECM), the results reveal that the dynamic ECM has no problem with all statistical diagnostic tests. Lastly, testing for the stability in the model of Saudi money demand may offer an indication about the capability of the monetary policy. The tests of CUSUM and CUSUMSQ are used to investigate the stability of the estimated parameters in the model of GH-2. The plots are presented in Figures 4 and 5. From the result, the plot of CUSUM and CUSUMSQ statistic tests for ln(M1) do not cross its critical value line at the 5% level of significance, and hence, the study concludes that the model of Saudi money demand is stable over the study period.

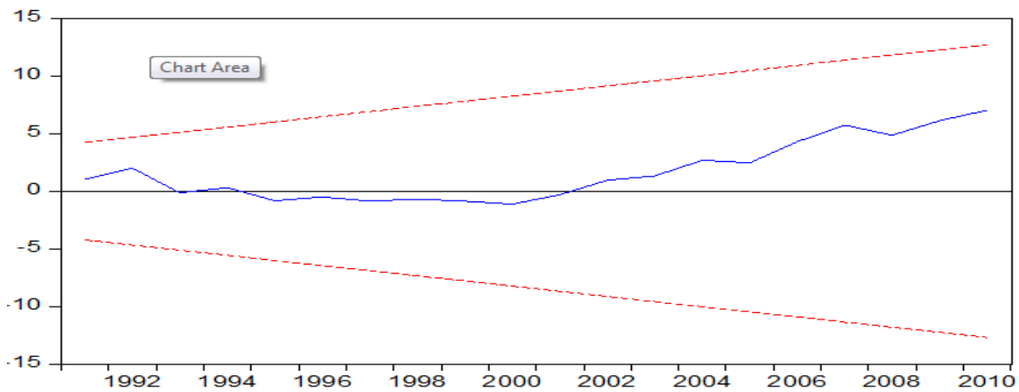

Figure-4. Plot of CUSUM statistics for the GH-2 model based on AIC
Source: Eview's ouput

[9].Notes: 1.The numbers in parentheses refer to the t-values of the estimated coefficients.
2. ** and *** refers to the significance levels at 5% and 10%.
3.The numbers in parentheses are the P-values of χ^2 distribution of the statistical diagnostic tests in the model at 5% level of significance.

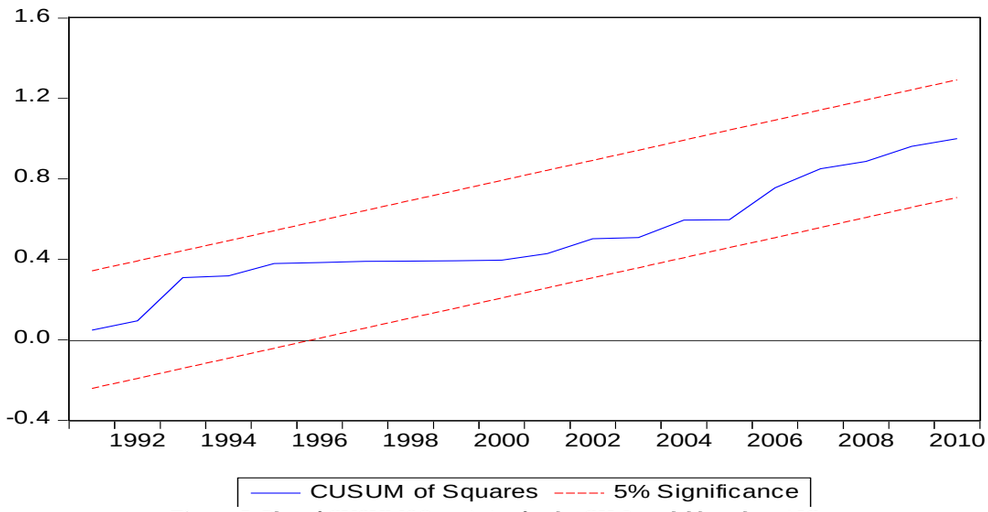

Figure-5. Plot of CUSUMSQ statistics for the GH-2 model based on AIC

Source: Eview's ouput

5.6. Analysis of the Underground Economy in the Saudi Economy

Based on the estimated GH currency demand model-2, Table 6 offers 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 provide that the underground economy in Saudi 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 period. The size was 64.25% of the official GDP in 1980 and 57.82% of the official GDP in 2010.

It was approximately two-thirds of the official GDP at the beginning of the study period, and greater than the average size, as reported by Schneider *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 Saudi is bigger compared to some other Asian and African developing countries such as Bangladesh, Malaysia, Morocco, Guyana, Tanzania, Nigeria, Malawi and Ethiopia.

Table-6. Estimates of Illegal Money, Underground Economy,illegal money and Tax Evasion in Saudi Based on the GH-2 model over the period of 1980-2010

Year	Legal Money (Bil. of RS)	Illegal Money (Bil.of RS)	Velocity of Money	Underground Eco.(Bil. of RS)*	Underground Eco. (% of GDP)	Tax Evasion (Bil. of RS)	Tax Ev. (% of GDP)
1980	48,077,534,011	10,877,865,989	1.33	351,213,395,689	64.25	18,501,858,254	3.38
1981	59,455,918,698	13,524,781,302	1.33	400,007,887,856	64.29	25,338,708,364	4.07
1982	68,072,713,545	15,709,086,455	1.32	344,066,399,336	65.64	39,497,630,941	7.53
1983	69,005,776,092	15,928,323,908	1.31	294,073,483,289	66.05	40,487,698,461	9.09
1984	67,526,414,416	15,449,885,584	1.30	275,828,471,060	65.61	32,911,974,235	7.83
1985	66,646,922,508	15,178,877,492	1.30	246,803,588,682	65.58	29,604,520,626	7.87
1986	70,490,011,288	15,787,088,712	1.29	208,901,052,588	64.87	22,078,561,654	6.86
1987	73,960,918,567	16,581,881,433	1.28	208,440,456,615	64.95	23,645,217,394	7.37
1988	76,343,869,053	17,085,230,947	1.28	214,042,334,497	64.76	23,442,926,152	7.09
1989	74,612,156,229	16,771,843,771	1.29	231,585,824,047	64.86	25,100,111,718	7.03
1990	83,072,031,290	18,871,968,710	1.30	284,492,645,416	65.05	34,588,571,777	7.91
1991	98,300,165,835	21,703,834,165	1.28	309,609,010,931	62.95	22,139,254,052	4.50
1992	101,016,647,774	22,441,352,226	1.29	322,860,130,768	63.25	25,841,637,355	5.06
1993	99,536,072,017	21,972,927,983	1.28	311,406,190,255	62.92	22,317,862,067	4.51
1994	103,048,159,112	22,645,840,888	1.28	314,917,363,221	62.60	20,962,564,381	4.16
1995	102,629,762,281	22,780,237,719	1.29	336,596,294,094	63.09	25,723,713,604	4.82
1996	108,935,742,321	24,178,257,679	1.29	371,285,004,204	62.85	27,090,227,197	4.58
1997	115,630,164,884	25,660,835,116	1.29	387,659,391,165	62.74	28,555,203,234	4.62
1998	114,585,788,228	25,821,211,772	1.29	349,823,579,409	63.99	39,426,890,298	7.21
1999	128,516,252,179	28,299,747,821	1.28	376,072,827,573	62.31	26,795,988,819	4.44
2000	135,851,223,980	29,858,776,020	1.28	436,924,611,261	61.83	26,983,143,109	3.81
2001	147,402,771,038	32,296,228,962	1.28	423,460,257,352	61.70	27,299,555,332	3.97
2002	166,247,132,441	36,325,867,559	1.27	434,612,853,114	61.47	28,828,021,688	4.07
2003	182,888,977,993	40,333,022,007	1.28	496,828,393,973	61.74	38,281,783,372	4.75
2004	216,544,730,578	47,395,269,422	1.27	572,056,305,220	60.94	37,958,095,540	4.04
2005	233,701,538,261	50,870,461,739	1.28	710,688,841,131	60.10	35,936,811,744	3.03
2006	256,873,221,605	56,069,778,395	1.28	801,406,605,946	60.00	41,530,237,059	3.10
2007	315,400,715,897	68,709,284,103	1.27	861,520,552,074	59.72	48,143,672,602	3.33
2008	348,967,349,445	77,053,650,555	1.29	1072,997,408,865	60.07	70,660,892,887	3.95
2009	429,829,370,439	92,045,629,561	1.25	821,342,981,674	58.77	44,305,820,202	3.17
2010	516,498,117,795	109,415,882,205	1.25	942,506,828,757	57.82	41,256,935,422	2.53

Sourecs: Author's compilation based on the estimated coefficients of the Saudi currency demand model. * refers to the corrected estimates of the underground economy based on the correct condition, which introduced by Ahumada *et al.* (2009)

The result confirms 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 Saudi are demonstrated in Figure 6.

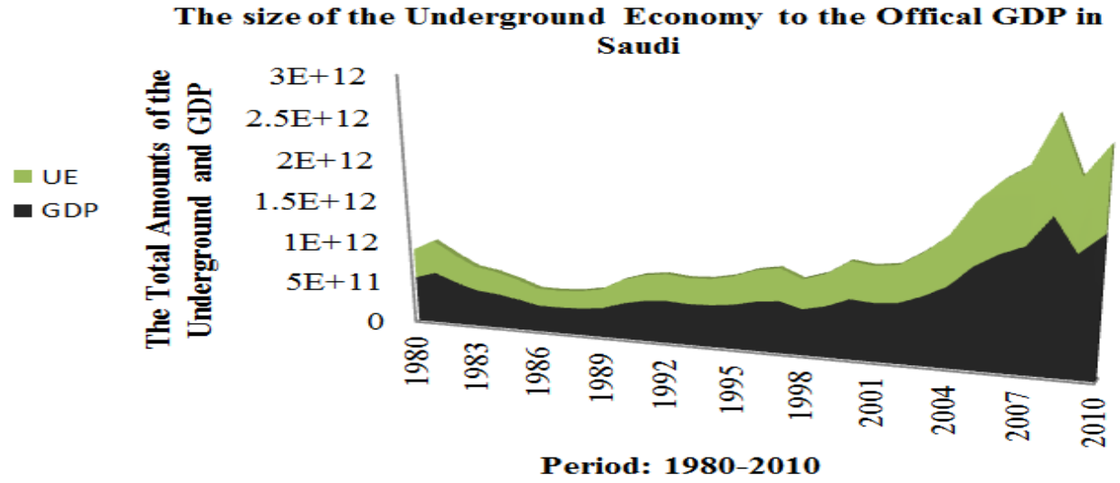

Figure-6. The size of the Underground Economy to the official GDP in Saudi over the Study Period
Source: Author's compilation based on the estimation

The volume of the underground economy in Saudi may reflect irregular economic activities undertaken by staying immigrants or those overstaying their visas, and other economic agents in the country.[10] 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 is a consequence of the reaction among 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 economic activities.[11] Thus, it may become a medium to elude unfair taxes and labor market restrictions in order to earn faster income.

However, the results display 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 banks reached about 18.18% over the study period.

The result of the illegal and legal money to the total amount of money outside the banks in the Saudi economy is illustrated in Figure 7. These amounts of illegal money may mirror the volume of hidden and illicit transactions settled by cash, leaving no trace to be tracked by the authorities. Examples of such activities include avoiding taxes, money laundering, illegal transfers, drug trafficking and other criminal activities involving the use of money (AL-Asmari, 2014).

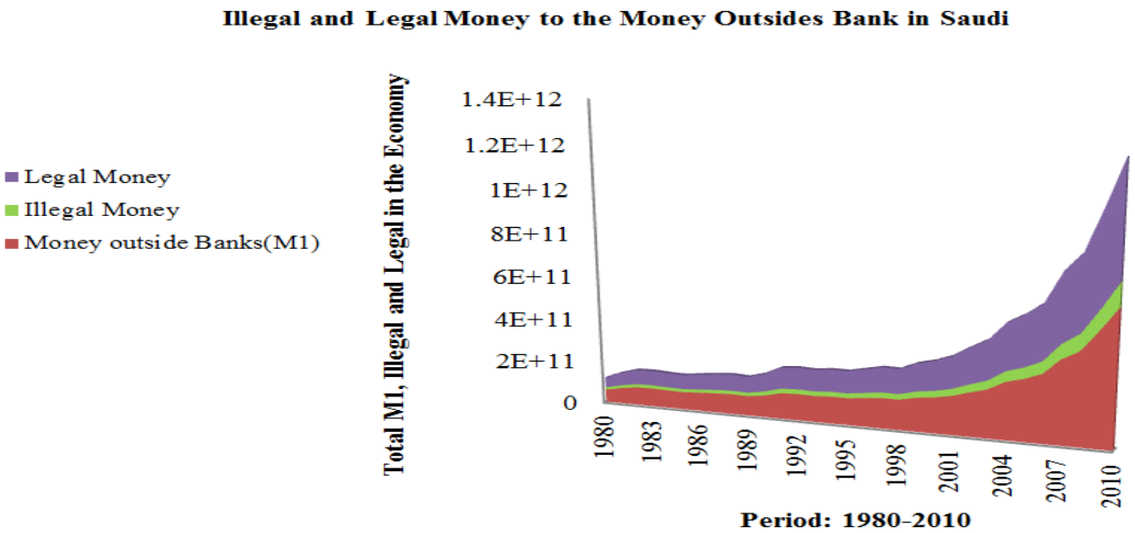

Figure-7. The Size of Illegal, Legal Money to the Money Outside the Banks in Saudi over the Study Period
Source: Author's compilation based on the estimation

In terms of tax evasion, the size and growth of tax evasion in the Saudi economy amounted to about R.S 18,501 billion in 1980 to R.S 41,256 billion in 2010. The highest level of tax evasion compared to the official GDP was estimated to be about R.S 70,660 billion in 2008. The rate of 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 in 2010. The high rates of tax evasion compared to the official GDP fluctuated from

[10] . The foreign workers in the private sector of the Saudi economy constitute more than 9.5 million of the total population Al-khathlan (2013).
[11] . For example, corruption, tight labor regulations and increasing for the costs of tax are the kay factors that push agents to move into illegal activites.

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%. The result of tax evasion to the official GDP is plotted in Figure 8.

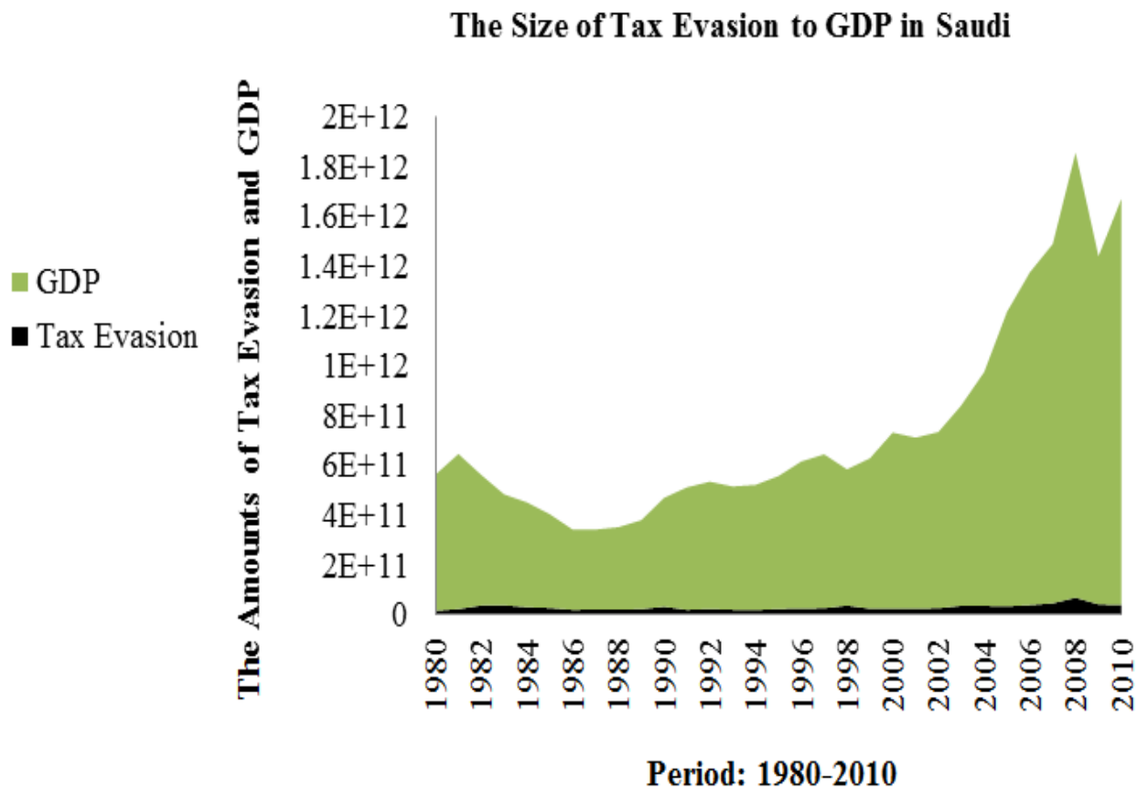

Figure-8. Tax Evasion to the GDP in Saudi over the Study Period
Source: Author's compilation based on the estimation

On the other hand, the outcomes show that tax evasion is an important part of the non-oil tax revenues in the Saudi economy. As a percentage of the total non-oil tax revenues, the rate of tax evasion was estimated at 64.25% in 1980 to about 57.82% at the end of the period, while, its trend was downwards. The average rate was 62.80% over the study period. The outcome suggests that tax evasion practices in the Saudi economy are concentrated among the Small and Medium-sized enterprises as it is the case in the GCC countries. The result is plotted in Figure 9.

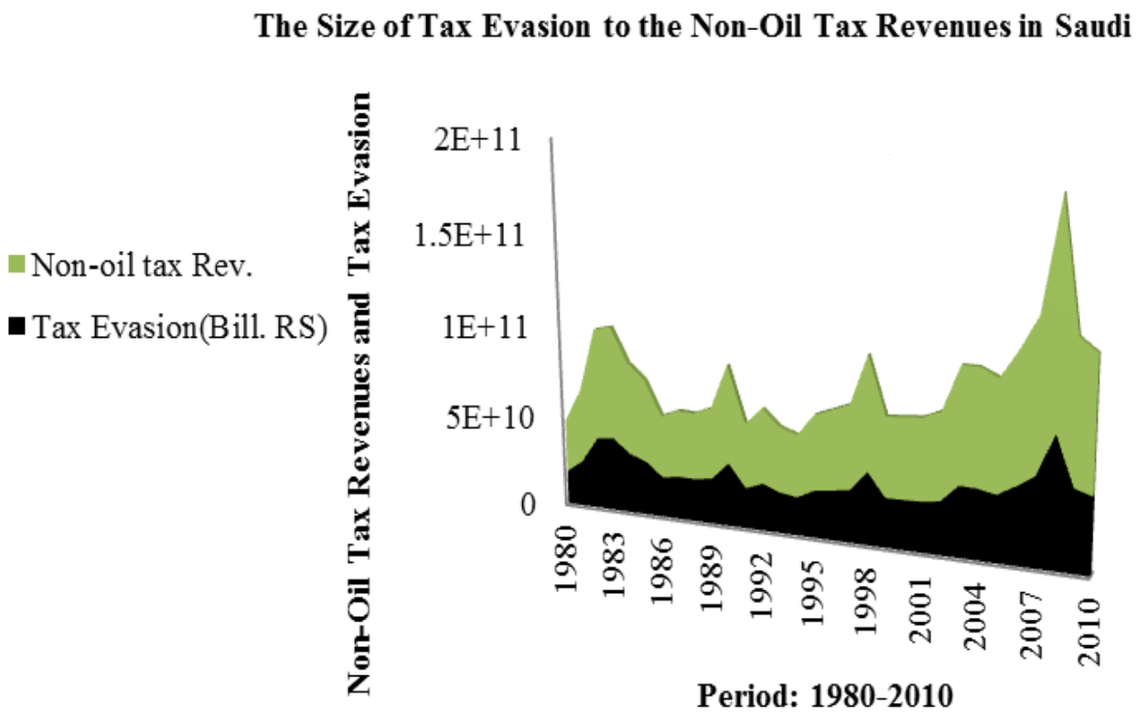

Figure-9. The Size of Tax Evasion to the Non-Oil Tax Revenues in Saudi over the study period
Source: Author's compilation based on the estimation

Increase of tax evasion in the Saudi economy may be attributed to the increased growth rate of the tax burden on the taxpayers in the economy, since the average rate of non-oil revenues as a percentage of GDP in Saudi amounted to 8.09% over the study period. The average rate was around 10.15% during the 1980s, while the higher average rate was about 13.9%, 12% and 12.1% in 1983, 1984 and 1985, respectively. Afterwards, the rate of the tax burden was declined. Nevertheless, the rate of decrease in the

level of the tax burden rate compared to the 1980s period is relatively large in relation to the GDP of the Saudi economy. The outcome on the magnitude of tax evasion as a significant portion of the underground economy in Saudi could be the result of wrong fiscal policies and costly labor regulation policies which led to loss of revenue.

As a percentage of the underground economy, the average rate of 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 an upward direction during the period of 1982-1990. During the later period of study, the trend was decreasing, but at a steady level. The result can be seen in Figure10.

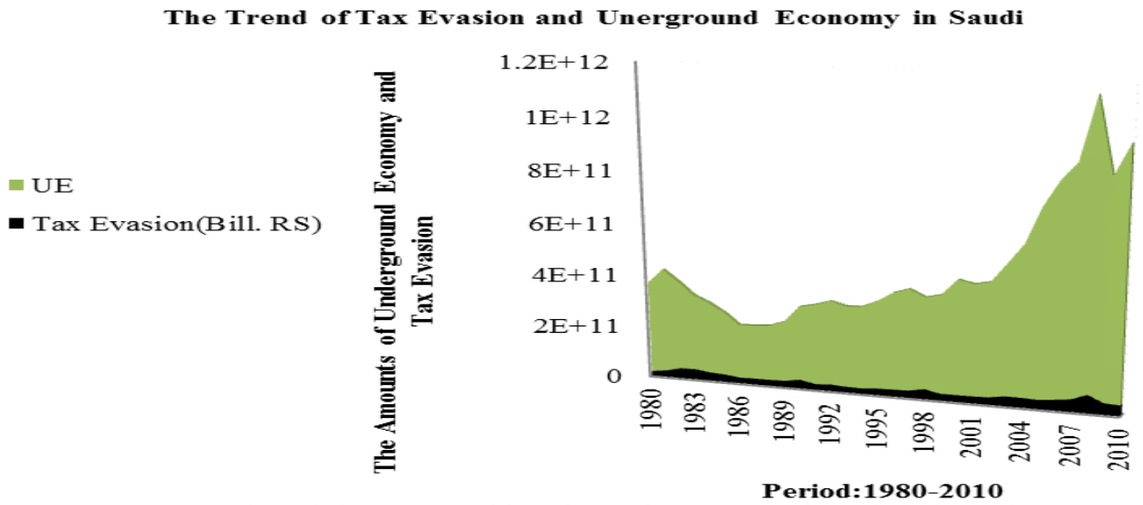

Figure-10. The trend of Tax Evasion and the Underground Economy in Saudi over the Study Period
Source: Author's compilation based on the estimation

The result here supports the fact that tax burden is the main driving factor for agents to engage in underground economic activities. However, the result indicates that tax evasion is a component of the illegal activities of the underground economy in Saudi, as the underground economy comprises different illegal activities.

6. Conclusıon

This study quantifies the extent of the underground economy,illegal money and tax evasion in the Saudi economy over the period of 1980-2010. The study uses the Gregory and Hansen cointegration test based on the recent form of the currency demand approach as a proxy to estimate the underground economy. The outcomes provide that the underground economy in Saudi grew from about R.S 351,213 billion in 1980 to R.S 942,506 billion in 2010. It was approximately two-thirds of the official GDP at the beginning of the study period, and greater than that the average size, as reported by Schneider *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 results indicate that the volume of the underground economy in Saudi may reflect irregular economic activities undertaken by staying immigrants or those overstaying 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 labor market restrictions in order to earn faster income.

However, the results display 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 banks reached about 18.18% over the study period.

The result suggests that the amounts of illegal money may mirror the volume of hidden and illicit transactions settled by cash, leaving no trace to be tracked by the authorities. Examples of such activities include avoiding taxes, money laundering, illegal transfers, drug trafficking and other criminal activities involving the use of money (AL-Asmari, 2014).

In terms of tax evasion, the size and growth of tax evasion in the Saudi economy amounted to about R.S 18,501 billion in 1980 to R.S 41,256 billion in 2010. The rate of 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 in 2010. the outcomes show that tax evasion is an important part of the non-oil tax revenues in the Saudi economy. As a percentage of the total non-oil tax revenues, the 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 suggests that tax evasion practices in the Saudi economy are concentrated among the Small and Medium-sized enterprises as it is the case in the GCC countries.

Lastly, the results suggest that the estimated size of the underground economy may provide indication to authorites in the country. As the size of the underground economy distorts the economic policies, particularly the fiscal and monetary policies, and hinders the economic planning process. Thus, the policy makers have to revise their policies in order to reduce this expansion.

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