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

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Awadh Ahmed Mohammed Gamal*
School of Economics, Finance and Banking, College of Business, Universiti Utara Malaysia

Jauhari Dahalan
School of Economics, Finance and Banking, College of Business, Universiti Utara Malaysia

ABSTRACT

The paper estimates the size of the underground economy and tax evasion in the UAE over the period of 1991:1-2010:4. The study based on currency demand approach model as a proxy to measure the underground economy. The results indicate that the size of the underground economy in the UAE grew significantly on average of 10.34% of the GDP over the study period. The rate of tax evasion on the non-oil tax revenues reached, on average, 10.34% over the study period. Nevertheless, the rate of tax evasion to the GDP remained, on average, at its lowest level at 0.63%.

Keywords: Underground Economy, Tax Evasion, Currency Demand Approach, Structural Break

1. INTRODUCTION

The expansion of the underground economic activities has become a challenge and poses a considerable impact on the macroeconomic of the formal economy (Trebicka, 2014). Due to its hidden nature, no official data is accessible or can be collected (Schneider & Savasan, 2007; Torgler & Schneider, 2009; AnaMaria, 2013).

The studies of the underground economy are mostly confined to the developed and transition economies with a few conducted on the developing countries (Schneider, Buehn, & Montenegro, 2010; Schneider & Klinglmiar, 2005) and the studies are not yet exausted. There are very little studies on the underground economy in oil producing economy particularly the Gulf countries (Sturm, Strasky, Adolf, & Peschel, 2008).

The United Arab Emirates (the UAE) as a member of the GCC, also experiencing the growing problem of underground economic activities. The problem arises due to illegal transfers of money to home countries as well as the increasing level of corruption in the illicit trade of visas of foreign workers by the recruitment companies (Shah, 2008).

According to Shah (2009), the recruitment companies are fictitious and set up mainly to attract workers who are willing to pay for job permits. The illegal foreign workers who have entered the UAE via these companies constitute 27% of the total workforce. Accordingly, these companies also involved in tax evasion practices due to their illegal activities. The illegal employment of foreign workers hired by business enterprises has led to massive tax evasion practices in order to obtain greater profits.

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Schneider and Enste (2000) argue that the underground economic activities are the result of the wrongful policies by the authorities. These foreign workers are subject to strict regulations imposed on them besides the low wages that they received. They are being deprived from many things including bringing their families to the host country. As many of them having families back home, they resort to sending their income to home countries through relatives and friends or via unlicensed financial intermediaries (Naufal & Termos, 2010).

The foreign workers are not allowed to send home money exceeding their total salary received for a period of six months. These rules and other restrictions imposed on the foreign workers lead them to turn to the service of unlicensed financial intermediaries, money laundering and smuggling of luxury commodities such as new cars, which are eventually converted into cash as ways of sending their money home (Taghavi, 2012).

Thus far no study has been conducted which focused mainly on the underground economy or tax evasion in the UAE. The aim of this study is to estimate the extent of the underground economy and tax evasion in the UAE over the period of 1991:1-2010:4. This study employed an Adjusted Correction of Currency Demand Approach (CDA) in its latest form as introduced by Ahumada, Alvaredo and Canavese (2009).

The study considers the behavioural pattern of a financial variable in order to gauge for illegal activities of the underground economy[1]. Unlike the previous studies that link the money inflows as a measurement of the underground economy in the recipient economies, this study used the money outflow as an indicator for the activities of the underground economy in the UAE.

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 BRIEF OVERVIEW OF RELEVANT LITERATURE

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. 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
	Trade with stolen goods, drug dealing and manufacturing, prostitution, gambling,	Barter of drugs, stolen goods, smuggling, and so forth. Produce

[1] . The financial variable includes the different sources of taxation of the economy as a proxy to mirror the participation of indviduals in the underground economic activities, excluding the tax on gas and oil companies. The companies working in the oil sector have no way of avoiding the payment of tax as the activity is the main source to fund the government functions, and therefore, it is monitored. Thus, there is no option for the companies to evade, but to settle their tax obligations.

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Illegal activities	smuggling, fraud, and so forth.		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 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 barters.

In this paper, the term for underground economy refers to legal or illegal activities that are not reported in the National Account Income Statistical of the UAE. 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), but are not reported to tax authorities and documented in the statistics of the National Account Income of the country (Tedds, 2005; Hernandez, 2009).

Schneider and Klinglmair (2005); Schneider (2004); and Schneider et al. (2010) estimated the magnitude of the underground economy in 110, 145 and 162 countries including UAE over of three different time periods; 1999-2000, 1999-2003 and 1999-2007, under various classifications of development. However, in these studies the UAE is grouped together with other Asian developing countries of different level of economics development. The results represent all of the economies including the UAE, despite the different sample sizes and periods of the study.

Finally, the findings are based on a combination of the multiple indicator multiple cause (MIMIC) procedure and on the currency demand approach. The approach assumes equality of the velocity of money in both economies (underground and formal). The assumption is correct, only if the income elasticity of money is unity, which is not the case as presented in the study by Ahumada et al.(2009). As a result, 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 UAE.

A recent study by Elgin and Oztunali (2012) using the two-sector dynamic general equilibrium model for 161 shows that the average size of the underground economy in the UAE is 24.4% as a percentage of the formal economy over the period 1986-2008. They assumed that the productive activity of the household sector in the underground economy depends on the informal technology that is exclusive to the labor input. The adoption of this informal technology also to generate the informal production that is diificult for government to capture, and as well as to elude tax payment.

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The critics of this assumption however claimed that the fiscal productivity of the household sector does not necessary rely on the labor input due to the nature of some activities (the sex trade the UAE), which 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 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. Alm and Embaye (2013) estimated the size of the underground economy in 111 countries including UAE. The estimated average size in the UAE is 17.76% over the period of 1984-2006. The estimation is lacked of strength because countries are grouped together regardless the economy status of the countries. Thus, the study may not provide the full picture of the key explanatory factors (for example, corruption, tight labor regulations, unemployment, sex work, money laundering, etc.) that can motivate agents to engage in illegal activities in a country. Finally, the study was conducted based on the traditional assumption of the currency demand approach, which assumes the velocity of money in both economies (underground and official economy) is the same. Thus, the estimation obtained has to be corrected as suggested in Ahumada, Alvaredo and Canavese (2007).

3. DATA AND METHODOLOGY

3.1. Model specification

The model is based on the recent form of currency demand function which was developed by Ahumada et al., (2009).

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

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[2], G_t is the real 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):

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

[2] . 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.

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

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

3.1.1 Unit root test

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 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 level shift or intercept of series at unknown time break point, T_b:

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

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

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

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

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

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).

3.1.2 Gregory - Hansen cointegration test

Gregory and Hansen's (1996) cointegration test is an extension of Engle-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 & Pandey, 2012; Banafea, 2014). The test is a residual-based approach to test the null hypothesis of no cointegration against the alternative

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hypothesis of cointegration with one unknown structural break (Gregory & Hansen, 1996; Kumer, Webber & Fargher, 2013). It allows for I(1) variables over all the system at one unknown time break point (Omotor, 2011). The determination of a potential unknown break point is endogenously estimated, since the time break point is unknown (Gregory & Hansen, 1996). Gregory and Hansen (1996) presented three models to test for 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, $DU_{tk} = 1$ if $t > k$ and $DU_{tk} = 0$ if if $t \leq k$, 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. 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)[3].

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 UAE. The new models can be expressed as follows:

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

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

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

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

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

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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-Granger (1987), in order to realize a robust inference from the cointegrating relationship.

3.1.3 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, Singh and Kumar (2010). To do this, the currency demand function in its first adjustment in Equation (2) is transformed into the following form:

$$\Delta lnM1_t = -\lambda[\alpha lnM1_t - (\alpha_0 + \beta_1 \ln TR_t + \beta_2 \ln G_t + \beta_3 \ln \mathrm{Re}\, m_t + \gamma_1 i_t + \gamma_2 \pi_t)] \quad (12)$$

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:

$$\Delta lnM1_t = -\lambda[\alpha lnM1_t - (\alpha_0 + \beta_1 \ln TR_t + \beta_2 \ln G_t + \beta_3 \ln \mathrm{Re}\, m_t + \gamma_1 i_t + \gamma_2 \pi_t)] + \sum_{i=1}^{n} \phi_i \Delta \ln TR_{t-j} + \sum_{i=1}^{n} \delta_i \Delta \ln G_{t-j} + \sum_{i=1}^{n} \theta_i \Delta \ln \mathrm{Re}\, m_{t-j} + \sum_{i=1}^{n} \psi_i \Delta i_{t-j} + \sum_{i=1}^{n} \varphi_i \Delta \pi_{t-j} + \sum_{i=1}^{n} \gamma_i \Delta \ln M1_{t-j} \quad (13)$$

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. Finally, a diagnostic tests are performed to determine the reliability of the model.

Following Ahmed and Hussain (2008) and Macias and Cazzavillan (2009), the analysis of the underground economy of the UAE 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

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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 UAE can be obtained by multiplying illegal money by the velocity of money. Finally, the total tax evasion in the UAE'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:

$$\text{Illegal money } (\text{IM1}_t) = [(\ln\widehat{M1}_{t}{}^{*}{}_{T})-(\ln\widehat{M1}_{t}{}^{**}{}_{wT})]^{*}\ \text{LM1}_t \quad (14)$$

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

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

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

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

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[4].

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

The data for money outside banks (M1), GDP and interest rate on deposits 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, inflation rates are collected from the online statistics data of the economywatch web.

4. EMPIRICAL RESULTS

4.1 Unit root test

The results of Zivot-Andrews unit root test in level and first difference are presented in Table 2. Considering the type of models, the results indicate that the null hypothesis of non-stationary at level can not be rejected. However, the results also suggest that the variables are integrated in order one or I(1) process at the 5 percent significance level.

[4] . 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.

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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)	4	-2.71**	4.42	I(0)	1999:2	B	6.03**	4.42	I(1)	2007:3	B
Ln(TR)	4	-1.88**	4.42	I(0)	2001:1	B	5.39**	4.42	I(1)	2006:2	B
Ln(G)	4	-3.89**	4.42	I(0)	2008:1	B	6.86**	4.42	I(1)	2006:1	B
Ln(REM)	4	-2.62**	4.42	I(0)	2001:3	B	7.29**	4.42	I(1)	2007:3	B
(I)	4	-2.40**	5.08	I(0)	2000:2	C	7.90**	4.42	I(1)	2001:2	B
(π)	4	-0.87**	5.08	I(0)	2007:1	C	8.62**	4.42	I(1)	2007:3	B

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

The Zivot-Andrews break points of 1999 and 2000 coincide with a soaring oil revenue as a result of increasing oil prices in the global market (Ministry of Economy, 1999; 2000). The time break point of 2001 coincides with the impact of the event of the September 11 attacks on the growth of the UAE economy. The break points of 2006 and 2007 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 respectively. Also, the break point of 2008 coincides with the impact of the global financial crisis (Ministry of Economy, 2008).

The empirical results of Gregory and Hansen cointegration test are presented in Table 3. The results show that the *t*-statistics of ADF are significant at the 5% level in all the three models indicate that the null hypothesis of no cointegration in all models is rejected. This implies that money demand in all the models has long run relationship with its explanatory variables. The break point of 2006:Q1coincides with the effect of the oil prices increased in the global market on the public budget of the UAE government, which led to an impact on the accelerated growth of the UAE economy.

The break point 1996:Q3 corresponds to the effect of the reduction in the prices of imports from abroad, as the UAE economy pegged its currency to the US Dollar. The break point 2000:Q3 coincides with the economic diversification policy implemented by the government in order to develop all the sectors in the economy. The plots of the estimated results of Gregory-Hansen's cointegration test are presented in Figures 1, 2 and 3.

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

Type of model	**TB**	**ADF-Stat.**	**t-Crit.5%**	**Reject of Null**
GH-1(Equation 9)	2006:Q1	-5.22(2)**	-4.61	Yes.
GH-2(Equation10)	1996:Q3	-6.18(2)**	-4.99	Yes
GH-3(Equation11)	2000:Q3	-5.64(2)**	-4.95	Yes

Notes: 1. ** denotes the level of significance at 5 %. The numbers in parentheses are the lags.
2. Chosen for an optimal lag length based on the Schwartz Bayesian Information Criterion (BIC), Akaike Information Criterion (AIC) and t-test Criterion (TTC).

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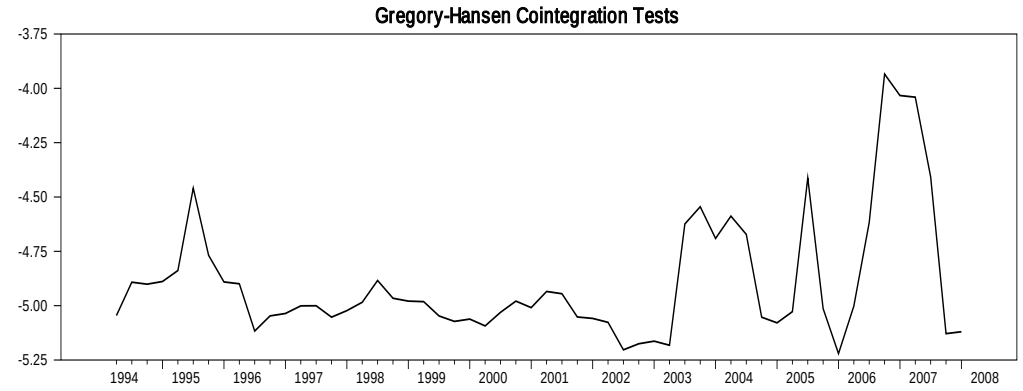
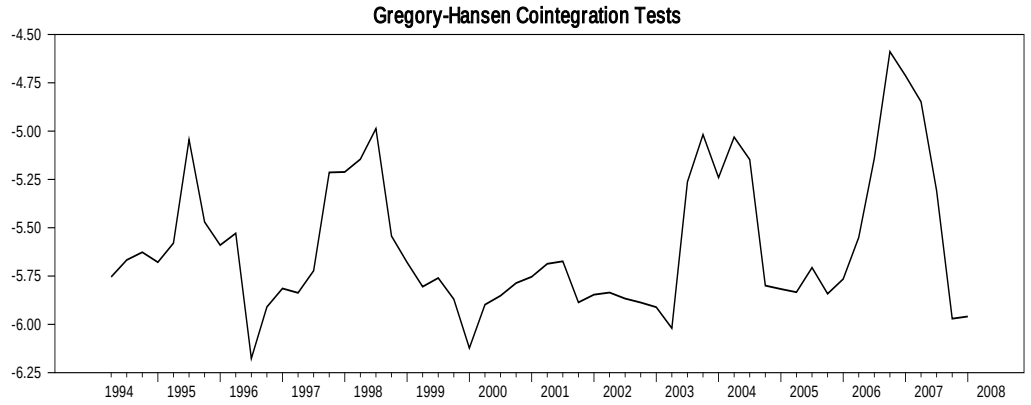
Figure 1. Plot of GH-1 for money demand LM1



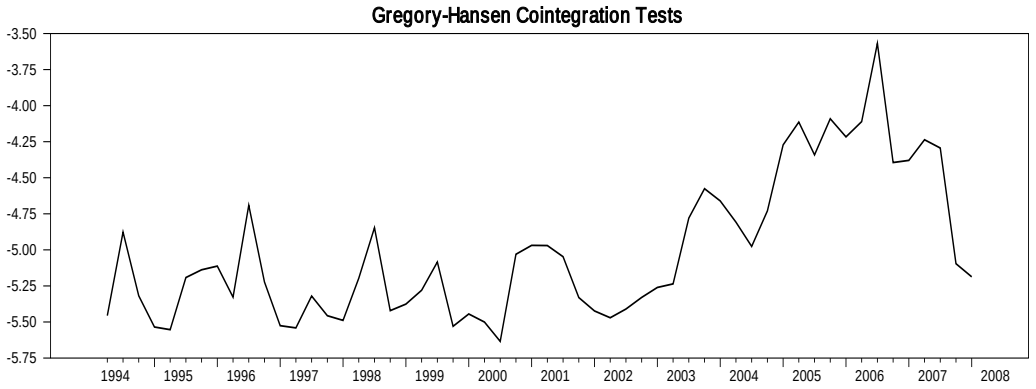
Source: RAT's output based on Author's estimation

Figure 2. Plot of GH-2 for money demand LM1



Source: RAT's output based on Author's estimation

Figure 3. Plot of GH-3 for money demand LM1



Source: RAT's output based on Author's estimation

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4.2 Long run estimates

To obtain the estimates of the best predicted model with structural break in the long run period, this paper proceeds to estimate all the three cointegrating equations, 9, 10 and 11 as reported in Table 4. The results indicate that there is a long run relationship between the currency demand function of the UAE economy and its explanatory variables. Models GH-2 and GH-3 are not acceptable because the negative sign of income elasticity and non-oil tax revenues. Making no sense in the estimating the volume of the underground economy in the UAE.

Table 4. Cointegrating Equations for money demand Ln(M1) over 1991:Q1-2010:Q4

Variable	GH-Model 1(Dum2006:Q1)	GH-Model 2(Dum1996:Q3)	GH-Model 3(Dum2000:Q3)
Intercept	-14.9	14.5	-19.4
Dummy	-0.01(0.46)	0.04(1.57)*	-0.5(-2.82)**
Trend	---	0.01(6.33)**	---
Ln(TR)	0.06(1.63)***	0.23(5.56)**	-0.05(-1.41)***
Dum*Ln(TR)	---	---	0.57(2.26)**
Ln(G)	1.28(12.30)**	-1.02(-2.7)**	2.21(13.09)**
Dum* Ln(G)	---	---	-1.24(-3.52)**
Ln(REM)	1.06(11.24)**	0.49(4.33)**	0.55(4.82)**
Dum* Ln(REM)	---	---	0.89(4.34)**
(I)	-0.09(-7.05)**	-0.09(-7.85)**	-0.06(-4.87)**
Dum*(I)	---	---	-0.19(-5.01)**
(π)	-0.001(-0.25)	0.04(4.83)**	0.08(5.84)**
Dum*(π)	---	---	-0.07(-3.75)**

Notes: 1. The t-ratios are in the parentheses follow the coefficients.
2. **, *** refer to level of significance at 5%, and 10% respectively.

Model GH-1 model is preferred since it holds expected signs which is consistent with the economic theory of money demand. The coefficients of variables included are statistically significant at the 5 percent level, except the non-oil tax revenues variable, which is statistically significant at the 10% level. The inflation with a negative sign, but insignificant. Thus, has no effect on the money demand model of the UAE economy.[5]

The findings show that the level shift dummy variable has no effect on the money demand function. It is clear that the coefficient of non-oil tax revenue variable has a positive sign and has an effect on the currency demand function in the UAE economy. This confirms the hypothesis that an increase in the tax burden rate on the taxpayers leads to increase in the demand for money. The variables of the outflow of money abroad, the GDP and the interest rate on deposits, have a strong explanatory power on the money demand model in the UAE economy.

[5] . With regards to the Keynesian theory, inflation means too much money chasing limited goods. In the case of the Emirati economy, the demand for money may not be affected by inflation, due to the fact that the purchasing behavior of Emirati individuals constitutes one-fifth of the total population; therefore, they do 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), inflation in the economy of the UAE is imported, as the Emirati economy has pegged its Dirham to the U.S. Dollar. Thus, inflation has its sources in external channels.

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Despite the variable of non-oil tax revenue having a correlation to the money demand, it also has a weak power to explain 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% increases 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 abroad increases money demand by 1.06%. A one unit decrease in the interest rate on the deposits increases the demand for money by 9%.

4.3 Short run estimates

Based on the result of Gregory-Hansen cointegration model 1, the residuals obtained must be tested for its stationary. This is to investigate the order of integration of the residuals as suggested in Engle-Granger (1987). The test coincides with its null hypothesis of unit root in the residuals against the alternative that residuals are stationary. The result is presented in Table 5.

Table.5 Testing for residuals

Variable	ADF-Stat.	t-Crit.5%	P-Value	Decision	*I(d)*
ε	-4.92	-3.47	0.0007	Reject Null	Stationary I(0)

Note: The test is conducted with an intercept and trend, the optimal lag selection is based on BIC.

It shows that the maximum absolute value of ADF test statistic is 4.52, which is greater than its critical value of 3.57. It is statistically significant at the 5% level. The result shows that the null hypothesis is rejected, since the residuals are stationary in level. This implies that there is a long run relationship among the variables under investigation. The result indicates that an estimation of the dynamic adjustment of the ECM must be obtained. To this end, the method of GETS approach is applied. The dependent variable of money demand $\Delta lnM1_t$, is regressed on its lags, its own explanatory variables with their current and lagged term ($\Delta lnTR_t$,$\Delta ln\, G_t$,$\Delta lnRem_t$, Δi_t and $\Delta\pi_t$), and the one period lagged residual that is obtained from an estimation of the Gregory and Hansen model 1 as in the cointegrating equation 9 (see Singh & Pandey, 2012; Rao & Kumar, 2009). With an application of four periods lags, the lagged variables are subjected to the scratching tests till the last parsimonious fitted version of the adjustment of ECM is obtained as in the equation (20)[6]:

$$\Delta \ln M1_t = \underset{}{0.01} - \underset{(-4.66)**}{0.16ECM_{t-1}} - \underset{(-1.99)**}{0.46\Delta \ln G_{t-1}} + \underset{(1.78)**}{0.05\Delta \ln Tax_{t-1}} - \underset{(-0.88)}{0.07\Delta \ln \mathrm{Re}\, m_{t-2}} + \underset{(2.71)**}{0.02\Delta i_{t-4}} + \underset{(1.58)***}{0.8\Delta \pi_t} + \underset{(6.73)**}{0.56\Delta \ln M1_{t-1}} \quad (20)$$

Based on the results, the coefficients of the variables in the ECM are statistically significant at the 5%, and at the 10% levels of the inflation variable. However, the coefficient of the outflow of money is insignificant. The coefficient of the lagged ECM has its negative sign and is significant at the 5% level. The coefficient denotes the percentage (about 16%) of disequilibrium in the Gregory-Hansen Model 1 of the currency demand in the Emirati economy.

[6].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.

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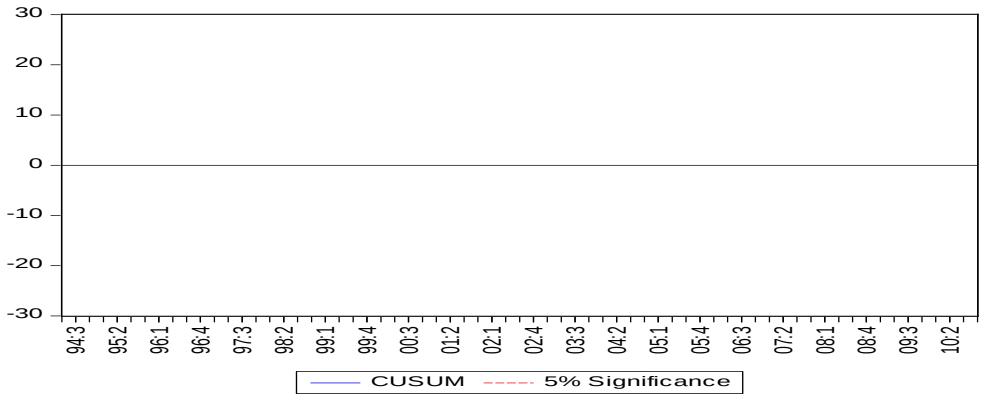
The disequilibrium is compensated by dynamic adjustment of short run error term in each quarter. The adjustment of the ECM inhibits the explanatory variable of the money demand moving away from each other. This suggests that the excessive use of money is followed in the next period through a drop in the money balances, which economic agents would tend to save in the economy. The adjusted R-squared indicates that roughly 54% of the variation in money demand in the Emirati economy can be explained within its determinants. In addition, the statistic value of the Durbin-Watson test (DW-statistic = 2.1) confirms that there is no evidence of serial correlation or heteroscedastic disturbances in the estimated model.

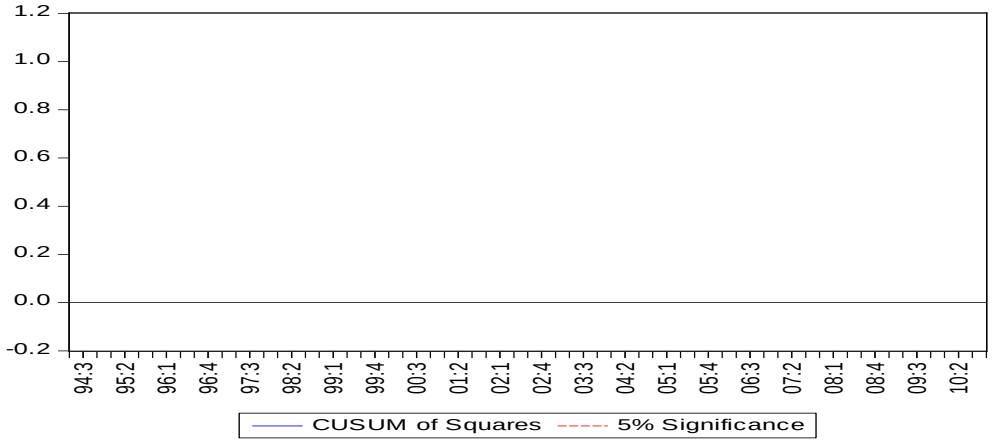
Additionally, the results indicate that the statistical diagnostic tests for dynamic ECM are fine but not for normality test. Lastly, investigating the stability in the Emirati money demand model may produce a sign about the capability of the monetary policy. For this purpose, the CUSUM and CUSUMSQ tests are conducted to examine the stability of the estimated parameters in the model of GH-1. The estimated coefficients are plotted against the break points and based on the first set of *n* observations. The plots are presented in Figures 4 and 5.

Figure4: Plot of CUSUM statistics for the GH-1model



Source: Eview's ouput

Figure 5: Plot of CUSUMSQ statistics for the GH-1model



Source: Eview's ouput

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As can be observed from Figure 4, the plot of CUSUM statistics of money demand staying within its critical lines at the 5% level of significance. It shows the stability of the currency demand model. However, the plot of the CUSUMSQ statistics crosses its critical lines. From figure 5, the plot indicates that the money demand model in the economy of the UAE deviates from within the critical lines. The result shows that the occurrence of instability started from the beginning of 1997:Q1 to early 2006:Q1. It is likely that the instability of the UAE money demand function is 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 went up as a result of reliance of the economy on imports from abroad. The global inflation has its pressure on the economy of the UAE through the exchange rate channel, as the local currency is pegged to the US Dollar[7]. For an effective monetary policy in the economy of the UAE, it is necessary for the government to give more consideration to the use of the money demand M1 in case of unexpected instability.

4.4 Analysis of the underground economy in the 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 are reported in Table 6. The results indicate that the size of the underground economy grew from about Dirham UAE 10,053 billion in 1991:Q1to Dirham UAE 26,169 billion in 2010:Q4. As a percentage of the official GDP, the size of the underground economy 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 6, the average size of the underground economy in the UAE is less than the average size, reported by Schnieder et al. (2010). It is also less than some other Asian and African developing countries such as Malaysia, Bangladesh, Morocco, Malawi, Guyana, Tanzania, and Ethiopia. The difference in 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 is hard to track, in 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 appears that the practices of illegal activities are concentrated mainly among the foreign workers, and arise as a result of the absence of human rights of 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 the 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 indicate that the magnitude of the underground economy as a percentage of the official GDP has been steadily increasing 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% .

[7]. Due to the reduction of the Emirati Dirham against the US Dollar (Minstry of Economy, 2006).

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Table 6. Estimates of Illegal Money, Underground Economy and Tax Evasion in the UAE Based on the GH-1 Model over the Period of 1991:Q1-2010:Q4

Year	Legal Money (Bil. of Dirham UAE)	Illegal Money (Bil. of Dirham UAE)	Velocity of Money	Underground Eco. (Bil. of Dirham UAE)***	Underground Eco. (% of GDP)	Tax Evasion (Mil. of Dirham UAE)	Tax Ev. (% of GDP)
1991Q1	1,265,256,772	1,787,782,290	2.81	10,053,681,806	10.03	576,870,477	0.57
1991Q2	1,324,561,858	1,864,711,579	2.79	10,073,754,683	9.10	555,273,862	0.55
1991Q3	1,382,678,548	1,938,438,640	2.78	10,094,639,106	9.95	531,774,355	0.52
1991Q4	1,439,685,966	2,008,884,347	2.76	10,115,690,961	9.90	506,403,881	0.51
1992Q1	1,473,208,903	2,039,634,847	2.75	10,172,145,730	9.82	466,784,203	0.45
1992Q2	1,537,358,400	2,117,672,850	2.74	10,175,547,593	9.77	442,800,534	0.43
1992Q3	1,609,537,273	2,206,806,477	2.73	10,164,507,732	9.72	421,910,729	0.40
1992Q4	1,689,695,132	2,307,086,118	2.71	10,139,955,672	9.70	404,070,576	0.39
1993Q1	1,839,793,922	2,489,674,828	2.69	9,892,526,004	9.60	368,532,415	0.36
1993Q2	1,911,100,497	2,583,805,753	2.68	9,927,156,025	9.59	364,985,514	0.35
1993Q3	1,964,636,668	2,661,582,082	2.68	10,035,510,627	9.61	372,618,218	0.36
1993Q4	2,000,356,733	2,723,049,517	2.69	10,217,145,743	9.65	391,484,518	0.37
1994Q1	1,965,724,666	2,710,744,084	2.72	10,647,696,859	9.76	447,106,161	0.41
1994Q2	1,988,637,371	2,760,768,879	2.73	10,898,479,308	9.82	478,858,489	0.43
1994Q3	2,015,629,234	2,816,589,516	2.74	11,148,387,390	9.88	511,985,233	0.45
1994Q4	2,046,656,160	2,878,250,090	2.75	11,397,357,155	9.93	546,497,074	0.48
1995Q1	2,092,253,873	2,967,675,815	2.76	11,682,787,184	10.01	596,557,004	0.51
1995Q2	2,127,021,129	3,032,361,683	2.77	11,914,262,393	10.06	628,251,732	0.53
1995Q3	2,161,403,790	3,094,322,773	2.77	12,130,860,970	10.09	655,588,445	0.54
1995Q4	2,195,353,471	3,153,607,466	2.78	12,333,072,652	10.12	678,514,537	0.56
1996Q1	2,200,010,558	3,166,458,192	2.80	12,430,520,305	10.14	692,074,938	0.56
1996Q2	2,244,575,287	3,237,955,963	2.78	12,641,007,723	10.16	708,029,716	0.57
1996Q3	2,300,136,728	3,324,394,522	2.78	12,874,120,843	10.17	721,458,582	0.57
1996Q4	2,366,671,917	3,425,796,833	2.79	13,129,942,987	10.18	732,351,644	0.57
1997Q1	2,487,408,097	3,590,576,278	2.78	13,569,274,728	10.14	710,710,404	0.53
1997Q2	2,558,634,688	3,702,505,937	2.78	13,806,031,508	10.15	728,501,006	0.54
1997Q3	2,623,472,427	3,810,105,698	2.78	14,000,872,735	10.17	755,793,896	0.55
1997Q4	2,681,986,764	3,913,310,111	2.79	14,152,327,423	10.23	792,687,076	0.57

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Year	Legal Money (Bil. of Dirham UAE)	Illegal Money (Bil. of Dirham UAE)	Velocity of Money	Underground Eco. (Bil. of Dirham UAE)***	Underground Eco. (% of GDP)	Tax Evasion (Mil. of Dirham UAE)	Tax Ev. (% of GDP)
1998Q1	2,705,679,187	4,011,789,563	2.81	14,193,721,135	10.40	934,950,215	0.69
1998Q2	2,763,632,778	4,105,648,472	2.81	14,273,733,664	10.42	953,481,221	0.70
1998Q3	2,826,786,670	4,195,119,580	2.81	14,336,927,601	10.41	943,217,509	0.68
1998Q4	2,895,619,615	4,279,724,135	2.80	14,381,413,149	10.36	904,273,678	0.65
1999Q1	2,981,907,381	4,297,100,432	2.76	14,020,458,622	10.10	697,465,970	0.50
1999Q2	3,063,485,035	4,390,819,652	2.75	14,144,224,775	10.04	659,305,331	0.47
1999Q3	3,146,991,869	4,503,656,568	2.74	14,396,617,029	10.02	648,566,439	0.45
1999Q4	3,231,580,814	4,636,458,249	2.75	14,782,487,572	10.04	665,075,257	0.45
2000Q1	3,276,011,716	4,821,285,159	2.79	16,015,581,439	10.27	861,622,865	0.55
2000Q2	3,379,822,037	4,980,631,088	2.79	16,380,881,315	10.28	872,602,420	0.55
2000Q3	3,501,430,870	5,146,897,255	2.79	16,592,814,071	10.24	849,913,291	0.52
2000Q4	3,642,284,817	5,318,637,058	2.77	16,645,227,861	10.17	793,858,190	0.49
2001Q1	3,835,097,169	5,439,270,018	2.72	16,005,276,743	9.88	588,455,078	0.36
2001Q2	4,018,490,155	5,627,455,157	2.70	15,878,707,886	9.76	516,094,972	0.32
2001Q3	4,215,670,483	5,836,118,579	2.67	15,777,610,815	9.64	458,190,572	0.28
2001Q4	4,425,050,277	6,066,848,160	2.65	15,710,670,077	9.55	414,326,450	0.25
2002Q1	4,659,855,019	6,250,754,356	2.62	15,323,868,490	9.34	330,363,952	0.20
2002Q2	4,882,637,130	6,558,878,495	2.61	15,495,240,326	9.35	335,130,035	0.20
2002Q3	5,101,689,250	6,927,263,875	2.63	15,875,051,301	9.45	374,526,755	0.22
2002Q4	5,320,133,411	7,352,788,464	2.65	16,436,249,404	9.61	449,542,752	0.26
2003Q1	5,361,395,448	7,710,073,302	2.71	17,576,596,613	9.99	676,491,864	0.38
2003Q2	5,673,207,041	8,276,074,209	2.73	18,204,478,358	10.13	782,966,310	0.44
2003Q3	6,060,417,005	8,943,989,245	2.74	18,811,811,188	10.24	880,970,581	0.48
2003Q4	6,521,101,282	9,715,742,468	2.75	19,406,655,079	10.32	970,067,627	0.52
2004Q1	7,249,837,125	10,798,045,688	2.74	19,993,189,019	10.31	965,754,023	0.50
2004Q2	7,775,869,411	11,698,560,276	2.75	20,582,229,628	10.40	1,069,392,452	0.54
2004Q3	8,296,003,871	12,621,769,566	2.76	21,156,506,731	10.52	1,198,059,947	0.60
2004Q4	8,811,082,603	13,566,831,460	2.78	21,708,058,333	10.64	1,352,427,845	0.66
2005Q1	9,434,599,000	14,777,088,500	2.79	22,031,162,638	10.82	1,608,364,607	0.79
2005Q2	9,897,560,138	15,665,127,362	2.81	22,588,393,549	10.93	1,786,753,226	0.86
2005Q3	10,312,797,136	16,474,952,864	2.82	23,200,238,434	11.02	1,961,418,938	0.93
2005Q4	10,680,812,300	17,206,062,700	2.83	23,871,296,979	11.11	2,132,054,349	0.99

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2006Q1	10,190,935,331	16,554,556,857	2.86	25,030,093,544	11.18	2,315,278,073	1.03
2006Q2	10,792,297,787	17,646,272,526	2.86	25,660,467,947	11.25	2,470,394,432	1.08
2006Q3	11,666,692,774	19,184,846,288	2.87	26,185,666,046	11.30	2,613,999,287	1.13
2006Q4	12,811,812,548	21,172,585,890	2.86	26,605,803,104	11.36	2,745,900,076	1.17
2007Q1	15,384,092,334	25,626,610,791	2.86	26,787,349,437	11.45	2,973,583,436	1.27
2007Q2	16,600,369,640	27,713,552,235	2.85	27,049,608,146	11.47	3,038,749,841	1.29
2007Q3	17,628,147,501	29,439,461,874	2.85	27,263,892,029	11.47	3,048,252,359	1.28
2007Q4	18,470,954,207	30,800,811,418	2.84	27,429,468,403	11.45	3,002,081,978	1.25
2008Q1	18,812,942,589	31,174,385,536	2.83	27,798,247,993	11.37	2,816,868,758	1.15
2008Q2	19,423,751,896	32,044,294,979	2.82	27,749,797,282	11.32	2,694,393,159	1.10
2008Q3	19,984,808,606	32,790,050,769	2.80	27,541,854,531	11.26	2,550,856,484	1.04
2008Q4	20,498,349,441	33,409,416,184	2.79	27,173,128,133	11.18	2,386,584,321	0.98
2009Q1	20,988,912,897	33,672,188,666	2.76	25,857,685,661	11.02	2,038,244,415	0.87
2009Q2	21,413,885,658	34,114,575,279	2.74	25,471,316,878	10.95	1,900,064,799	0.82
2009Q3	21,780,132,685	34,524,047,003	2.73	25,240,729,342	10.90	1,806,312,160	0.78
2009Q4	22,082,251,773	34,906,006,039	2.73	25,170,311,623	10.87	1,756,395,843	0.76
2010Q1	21,854,916,333	34,650,583,667	2.73	25,517,121,416	10.89	1,809,761,914	0.77
2010Q2	22,204,915,409	35,231,459,591	2.73	25,672,473,478	10.90	1,822,900,609	0.77
2010Q3	22,670,721,176	36,034,966,324	2.74	25,889,928,856	10.92	1,855,657,833	0.78
2010Q4	23,251,673,479	37,061,764,021	2.74	26,169,049,960	10.94	1,908,121,864	0.79

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

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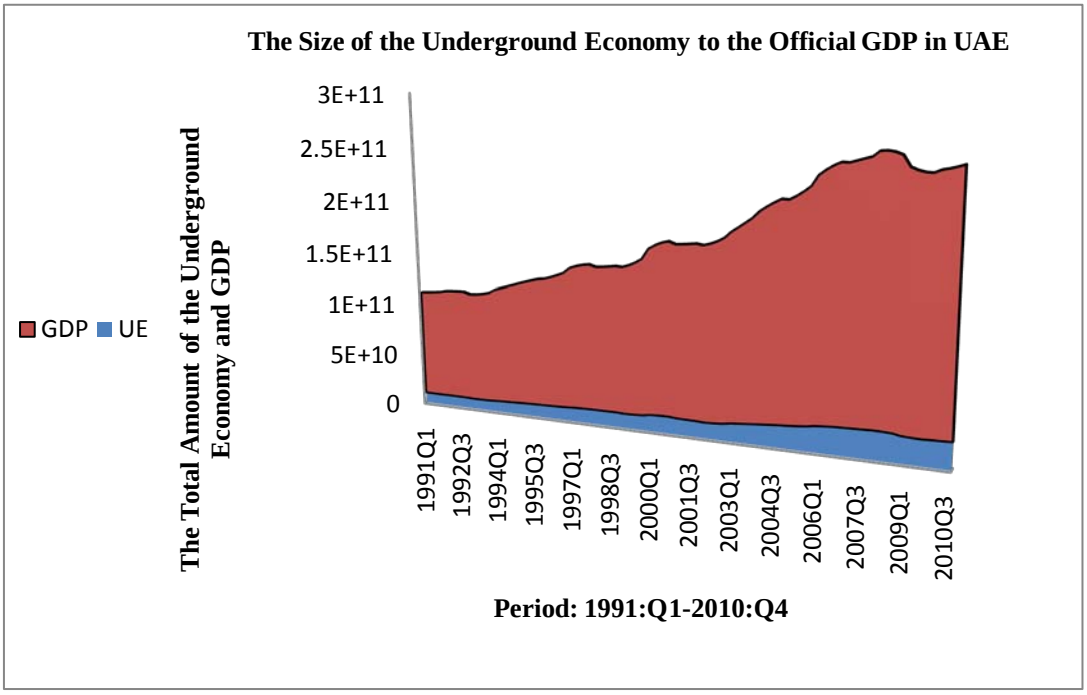
From the results, the trend for the size of the underground economy in the UAE has also increased significantly and constantly since the first quarter of 1991. Also, the result of the estimable size of the underground economy mirrors the tight regulations that have been imposed on the foreigners living in the country. An expansion 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 restrict the expansion. The size of the underground economy to the official economy in the UAE is illustrated in Figure 6.

Figure 6: The size of the Underground Economy to the Official GDP in the UAE over the Study Period



Source: Author's compilation based on the estimation

However, the findings show that the magnitude of the illegal money in the UAE grew from Dirham UAE 1,788 billion in the first quarter of 1991 to Dirham UAE 37,062 billion at the end of 2010. The highest level of illegal money began from 2006:Q1 onwards. In terms of percentage, the extent of the illegal money to money in circulation outside banks (M1) in the Emirati economy has been constantly increasing since 1991:Q1 (58,56%) till the first quarter of 2006 (61,91%). It has since persisted to increase at a moderate level and on average has reached 61.92%. The result indicates that the expansion of illegal money to 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, and hide their illegal transactions such as by buying drugs or sending money to their home countries[8]. Since, the use of money does not leave traces for the

[8] . As it is the case in the GCC countries, foreign workers have no way to access legal banking services and face financial constraints to remit (less than their salaries) their money home (De Brauw, Mueller, & Woldehanna, 2013). In addition, there is no red tape restriction to sending money illegally and the cost of

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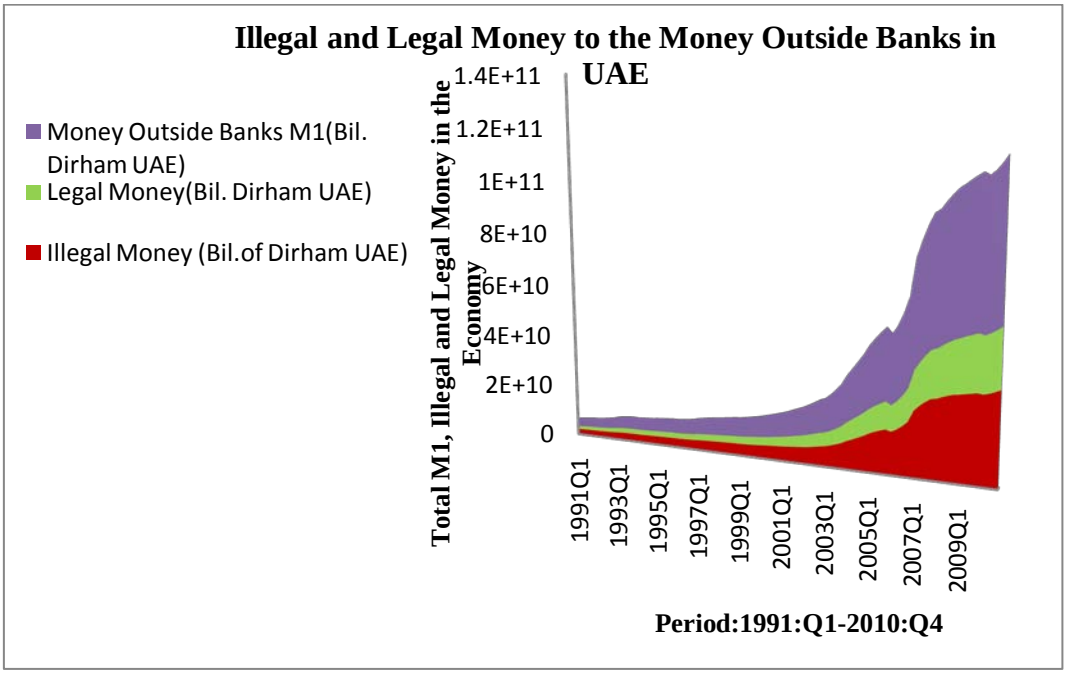
authority to track. In addition, the cash payments remain a preferred instrument for foreign workers (particularly foreign workers who are doing self-business, staying illegally or overstaying) to transfer money abroad as the Emirati Dirham is globally acceptable. Figure 7 illustrates the size of illegal and legal money to the total money outside banks in the country.

Figure 7: The Size of Illegal, and Legal Money to the Money Outside the Banks in the UAE over the Study Period



Source: Author's compilation based on the estimation

The amount of tax evasion was Dirham UAE 577 million in the beginning of 1991 and Dirham UAE 1,908 billion at 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 remains, on average at its lowest level (0.63%). The highest magnitude of 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. The trend subsequently went downwards. Figure 8 displays the size of the tax evasion to the official GDP in the UAE over the study period.

sending such money is less than using formal legal ways (Freund & Spatafora, 2005; Beine, Lodigiani, & Vermeulen, 2012). Therefore, a lot of money goes undocumented through informal channels.

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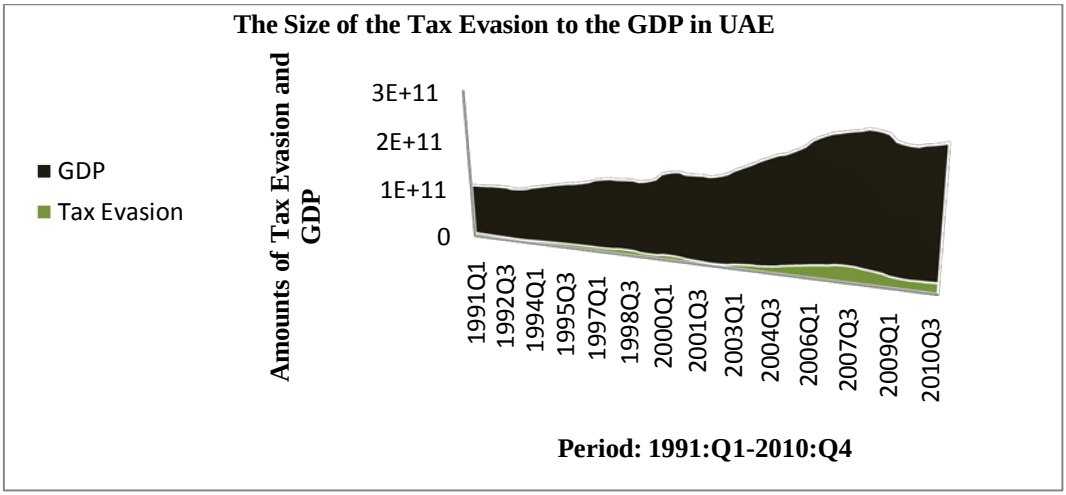
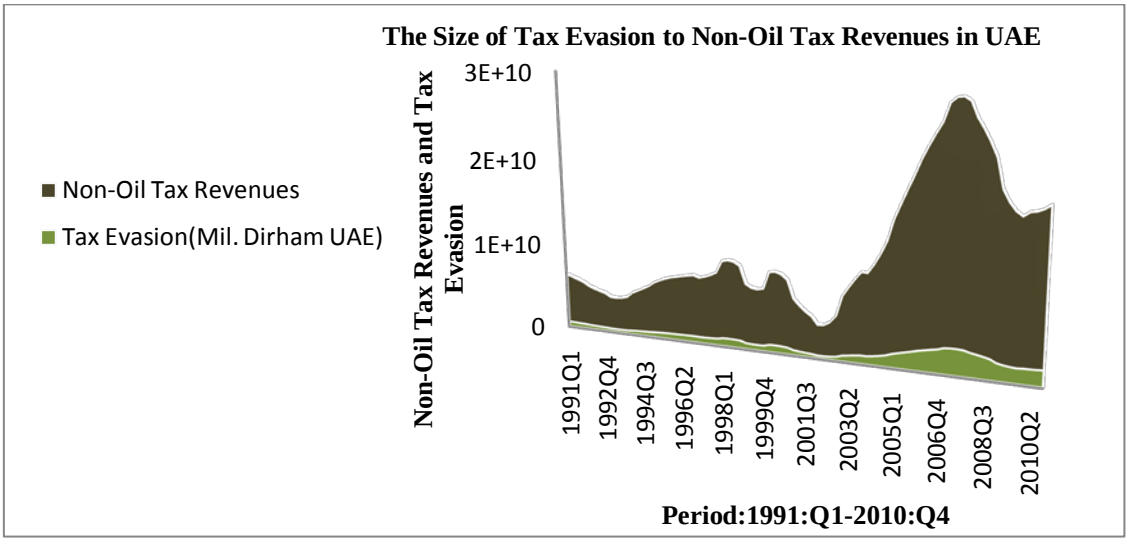
Figure 8: Tax Evasion to the GDP in the UAE over the study period



Source: Author's compilation based on the estimation

It is observed that the size of the tax evasion constitutes a significant portion of the non-oil tax revenues in the economy of the UAE. In percentage, the average growth rate of the tax evasion constitutes 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 shows that the tax evasion as a component of the underground economy has an influence on the tax revenues. Nevertheless, the non-oil tax revenues do not represent the main source of funding the public budget of the Emirati economy compared to the tax revenues levied on the oil companies. As the non-oil tax revenues come predominantly from the custom duties and the other tax revenues, the results suggest that the tax evasion practices in the Emirati economy may be concentrated among the importers, retailers and wholesalers. This is in addition to the tax evasion practices of the owners of the recruitment companies of foreign workers that exist in the country. The result is illustrated in Figure 9.

Figure 9: The Size of Tax Evasion to the Non-Oil Tax Revenues in the UAE



Source: Author's compilation based on the estimation

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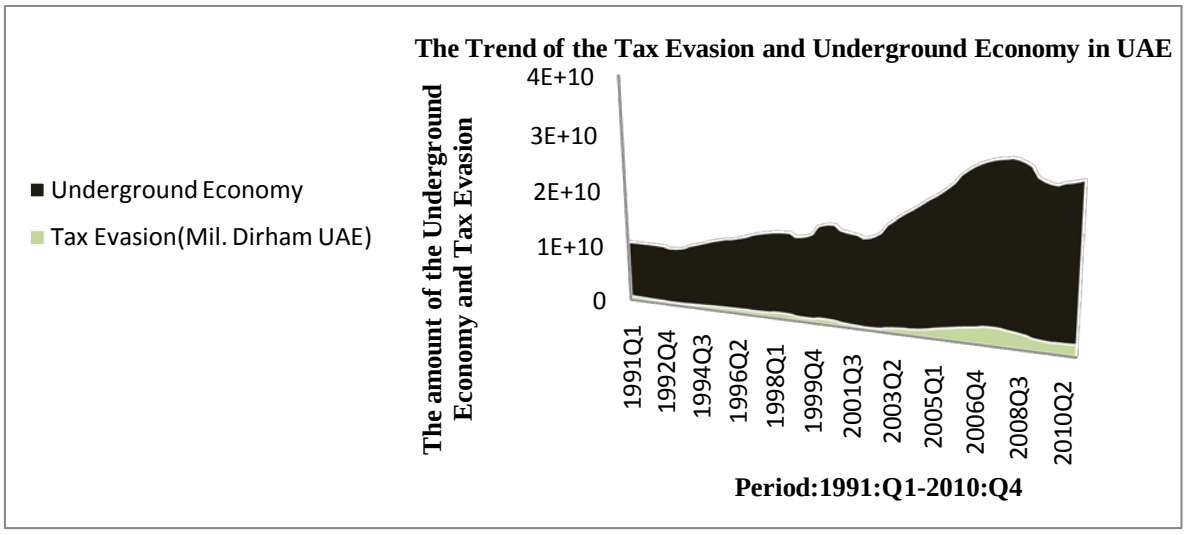
The results indicate that the size of the tax evasion in the Emirati economy may be attributed to the tax burden imposed on the agents, which is costly to them, and motivates them to evade taxes. The average rate of non-oil tax revenues as a percentage of GDP in the UAE reveals the tax burden amounted to 5.95% over the study period. The highest rate, 8.16% in 2005 continued to increase and varied between 7.16% to 9.80%. The most important of this analysis is that the ratio of the tax evasion to the non-oil tax revenues is equal to the ratio of the underground economy to the GDP. This result confirms that the tax evasion is only a component of the underground economic activities; nevertheless, they move together over time. This is illustrated in Figur 10.

Figure 10: The trend of Tax Evasion in and Underground Economy in the UAE over the Study Period



Source: Author's compilation based on the estimation

5. CONCLUSIONS

This study quantifies the extent of the underground economy and tax evasion in the Emirati economy over the period of 1991:Q1-2010:Q4. 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 results indicate that the size of the underground economy in the UAE grew significantly over the study period. The results also indicate that the magnitude of the underground economy as a percentage of the official GDP steadily increased since the first quarter of 1991 to the last quarter of 2010, except the four quarters of 2007. The size constitutes, on average, 10.34% of the official GDP. From the results, the average size of the underground economy in the UAE is less than that average size, as reported by Schnieder et al. (2010); and Alm and Embaye (2013). The difference in size may be attributed to the methodology, variables used, and the study period. However, the rank of the underground economy in the Emirati economy itself is relatively higher than its official economy.

The rank is a benchmark to the policy makers to revise the economic policies in order to restrict individuals from engaging in illegal activities. The results also show that the amount of illegal money in the Emirati economy was Dirham UAE 1,788 billion in the first quarter of 1991 to Dirham UAE 37,062 billion at the end of 2010. The result indicates that the expansion of illegal money to money outside banks may reflect the

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growing need of individuals to use currency in terms of cash. This is to avoid the payment of tax, hide their illegal transactions, such as buying drugs or sending money to their home countries. In addition, the cash payments remain a preferred instrument for foreign workers (who are legally living, doing self-business, staying illegally or overstaying) to send money abroad, as the Emirati Dirham is globally acceptable.

Tax evasion amounted to Dirham UAE 577 million in the beginning of 1991 and Dirham UAE 1,908 billion at 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 remains, 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 went downwards.

The analysis suggests that the tax evasion as a component of the underground economy has an influence on the tax revenues. Nevertheless, the non-oil tax revenues do not represent the main source of funding of the public budget of the Emirati economy compared to the tax revenues levied on the oil companies. The non-oil tax revenues come predominantly from the custom duties and other kinds of tax. The results suggest that the tax evasion practices in the Emirati economy could be prevalent among the importers and the owners of the recruitment companies of foreign workers that exist in the country. Lastly, the results suggest that the estimated 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 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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