Currency Demand Approach and Underground Economy in Qatar

[1*]Jauhari B. Dahalan, and [2]Awadh Ahmed Mohammed Al-Gamal

[1]Universiti Kuala Lumpur Business School, Malaysia;
[2]School of Economics, Finance and Banking, University Utara Malaysia, Malaysia;

Corresponding author: jauhari@unikl.edu.my

Abstract

The growth of the underground economy has become a serious challenge and concern to the official economy of many countries. Based on the adjusted currency demand function this paper estimates the magnitude of the underground economy behind tax evasion in Qatar over the period of 1980-2010. The results show that the average of the underground economy in Qatar constitutes 17.03% of the official GDP. While, the average of the tax evasion as a percent of the total non-oil tax revenues estimated at 16.50% and at 2.12% of the official GDP respectively.

Keywords: tax evasion, underground economy, gdp, tax revenues, Qatar.

Introduction

The research on underground economy has received a considerable attention among the economists over the world (Torgler & Schneider, 2009). This is due to its impact on macroeconomic variables (Trebicka, 2014). The extent and magnitude of the activities of the underground economy differ from country to country (Asiedu & Stengos, 2014; Putniŋs & Sauka, 2011).

Due to the concealed nature of the underground activities, various methods have been used to measure its size as no official data is available or can be collected (Schneider & Savasan, 2007). Thus, it is difficult to obtain an accurate estimation about the true size of the underground economy, either in emerging or advanced economies (Torgler & Schneider, 2009; AnaMaria, 2013). Nevertheless, many studies have been conducted for the developed countries (Schneider, 2006; Schneider & Enste, 2000; Schneider & Klinglmiar, 2005; Feld & Schneider, 2010; Dreher & Schneider, 2010; Schneider, Buehn, & Montenegro, 2010) and very few for developing countries (Schneider et al., 2010; Schneider & Klinglmiar, 2005).

Qatar, a member of the GCC countries is also experiencing growing activities of the underground economy. Financial restrictions for sending money out of the country by the foreign workers contribute to the use of illegal means to send their money to their home countries (Naufal & Termos, 2010). Foreign workers in Qatar are not allowed to transfer money that exceeds their total salaries received for the period of six months. The tight regulations imposed on the foreigners in Qatar have forced them to use relatives and friends or unlicensed financial intermediaries to send money home (Shah, 2009; Naufal & Vargas-Silva, 2010). According to Shah (2010), the illegal transfers of money from the country to abroad is predominantly practiced

among illegal workers. By resorting to illegal channels, they avoid paying taxes and higher processing fees (Naufal & Vargas-Silva, 2010).

Applying MIMIC model which is based on currency demand approach Schneider et al. (2010) found that the weighted average volume of the underground economy (as a percent of official GDP) in Qatar was 14.4%. The estimation is considered as weak and biased because of the assumption of equal velocity of money in both underground and formal economies (Ahumada, Alvaredo and Canavese; 2009). Therefore, the main drawback of the study is that the estimated coefficients are biased and unreliable. In the same vein, the estimated values may bring about a meaningful understanding of the actual phenomenon of the underground economy in Qatar.

By employing the Adjusted Currency Demand Approach (Ahumada, et al.; 2009) the study aims to measure the extent of the underground activities through a behavioral pattern of financial variable (example; tax burden). This study looks at the outflow of money and the activities of the underground economy in the Qatari economy.

The organization of this paper is as follows: Second section introduces an overview of Currency Demand Approach Evolution. The third section describes the methodology behind the model specification. In the fourth section, the results of the empirical analysis will be presented. The last section introduces the conclusion with the contribution.

Literature Review
The currency demand approach as a proxy to estimate the magnitude of the underground economy is based on the assumption that money in terms of cash is used to perform the transactions that were concealed from the authorities (Breusch, 2005; Ahumada et al., 2008). Unlike transactions in other form of assets that are documented in financial institutions and easily traced (AnaMaria, 2013), these transactions are hard to trace as they leave no observable tracks (Ahumada et al., 2009; Agbi, 2014). Therefore, an increase in the size of underground activities in the economy can be linked to an excessive use of cash (Berger, Pickhardt, Pitsoulis, Prinz, & Sarda, 2014). If the amount of cash used to undertake illegal transactions can be estimated, then this amount could be multiplied by the income elasticity of money to obtain a measure of the volume of the underground economy (Ahumada et al., 2007).

According to Schneider (2006), Cagan (1958) used currency demand approach to link the increased in money and the tax burden to the underground activities in the U.S. over the period of 1875 -1955. Applying the same approach, Gutmann (1977) estimated the size of the underground economy in the US over the period of 1937-1976 based on four fundamental assumptions (Fethi et al., 2006). First, the tight regulations and higher rate of tax burden forcing individuals to engage in underground economic activities (Gerxhani, 2004; Schneider et al., 2010). Second, cash is the only used as a medium to perform the concealed transactions in the underground economy, and the excessive use of cash is an indication of the expansion of the underground economic activities and tax evasion (Schneider, 2012; Schneider & Buehn, 2013). Third, the magnitude of the underground economy can be estimated based on the sample size of money demand over time (Fethi et al., 2006). Finally, the income elasticity of money (money velocity of income) is assumed to be the same in both economies (formal economy and underground economy). Then, the volume of the underground economy is calculated by multiplying the velocity of money with the value of illegal money that can be used to perform illegal activities (Ahmed & Ahmed, 1995; Breusch, 2005; Ahmed & Hussain, 2008).

Cagan's approach has also been employed by Tanzi (1980, 1982, 1983) for the US economy. The basic idea of Tanzi was to form a link between the ratios of money demand in relation to soared rates of the tax burden (Ahumada et al., 2009). Consequently, this was used to obtain new estimates of the volume of the underground economy for the US (Dell'Anno & Halicioglu, 2010).

Ferwerda et al. (2010) stated that Tanzi (1983) proposed his basic regression model for the currency demand and concentrated on the possible conventional causes or normal causes of raising tax burden and other causes of making agents to engage in the underground economy. In his model, the main factors included were the ratio of cash holdings to current and deposit accounts, a weighted average tax rate, a proportion of wages and salaries to the national income, the interest paid on savings deposits and the per capita income (Fethi et al., 2006; Ferwerda et al., 2010). Using currency demand function, the size and the growth trend of the underground economy can be estimated as the difference between the estimated volume of money or currency without tax variable i.e. fiscal variable or taxation variable; and the volume of actual currency with tax variable (Ahmed & Hussain, 2008). The process captures the estimation of extra volume of money that was assumed as money hold by agents for their transactions in the underground economy (Dell'Anno & Halicioglu, 2010).

Next, we assume that the income velocity of money (currency) is the same and its uses in the underground economy for legal demand for money, M1 in the official economy. Then, the volume of the underground economy can be calculated and then it also can be compared to the official statistics of GDP (Schneider & Klinglmiar, 2005). The method of currency demand is the most widely employed method in the study of the underground economy (Amin, 2008). It has been applied to measure the magnitude of the underground economy through an excessive use of money in terms of cash in many countries in the world (Hernandez, 2009). For example, it was applied in the studies on the U.S., Tanzania, Italy, New Zealand, Spain, Mexico, South Africa, Peru, Pakistan, Ghana, Ethiopia, Romania, Canada, Turkey, and Colombia. Nonetheless, some questions have been raised regarding some aspects of currency demand approach (Schneider & Hametner, 2014). First, not all transactions in the underground economy are using cash. Therefore, the total size of the underground economy (including transactions in the form of barter) may be larger than the one previously estimated (Schneider, 2006).

Second, only the financial variable such as tax burden was considered as a main cause of the underground economy (Schneider & Hametner, 2014; Schneider & Savasan, 2007). Meanwhile, other variables which may also contribute to the underground economy such as the tight regulation, and taxpayers' behavior toward the authority were ignored. Although lacking in the reliable data for the majority of the countries in the study, however these neglected variables may show a larger size of the underground economy (Schneider & Hametner, 2014). Third, the studies that were conducted using the currency demand approach to measure the extent of the underground economy were built on the assumption that the velocity of money has the same value in both economies (Alexandru & Dobre, 2011).

As claimed by Ahumada et al. (2007), the assumption is only commensurate if the income elasticity of money is one which is not the case with the previous studies. Therefore, the estimation of the underground economy should be adjusted as suggested by Ahumada et al. (2007: 2009). Finally, the method assumes that there are no illegal activities of the underground economy in the base year of the study's period. Where the assumption remains vulnerable to criticism, shirking this assumption nevertheless will require adjustment on the size of the underground

economy, and as a result the estimated size of the underground economy could be larger than that volume reported (Schneider & Buehn, 2013).

Research Method
Model Specification
Following the literature, the currency demand model is based on the recent model of currency demand approach of Ahumada et al., (2009) where the coefficient of income elasticity for money in the long run is not equal to one as in the previous studies. The model is expressed as follows:

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

Where $M1_t$ is the currency in circulation plus demand deposits at time t as the dependent variable, TR_t is the total non-oil tax revenues over all the economy at time t excluding the receipts of oil revenues, G_t is the nominal Gross Demostic Product 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 in equation (1) represents the opportunity cost of holding money i_t, which is interest rate on deposits over a period t, and π_t is the inflation rate at time t, i.e. $h_t = (i_t + \pi_t)$, a_0 is a constant, and $\mathcal{M}_t$ is the error terms.

By taking natural logarithms of both sides of equation (1), and substituting for h_t. The estimable model of currency demand function in equation (1) is now transformed into a linear form:

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

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

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

Zivot and Andrews (1992) Unit Root Test
The procedure of Zivot and Andrews (1992) unit root will be conducted in order to capture strong inferences about the order of integration of the variables in the currency demand function model of Qatar. A spurious finding in the presence of the structural break, and a sharp reduction in power of the properties of a series has been argued to be attributed to the usual ADF test (Gregory, Nason & Watt, 1996; Gregory & Hansen, 1996). Therefore, Zivot-Andrews's (1992) unit root test as one of the widely acclaimed unit root tests that takes into consideration the presence of structural break in the series is employed. The test allows for only one time break in each tested variable, in which case, the time break point is endogenously estimated at 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:

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

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

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

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

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

Where DU_t in equations (3) and (5) is a dummy variable for level shift at each time a break occurs, while DT_t^* in both equations (4) and (5) is a dummy variable representing change that occurs in the trend. The dummy of $DU_t = 1$ if $t > T_b$, or 0 if $t \le T_b$, while the dummy of $DT_t^* = t - T_b$ if $t > T_b$, or 0 if $t \le T_b$. Where 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 the whole models. f 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 non-stationary with one structural break point. If the t-statistics is greater than its critical value, it implies that the variable under test has no unit root with one break point or stationary with one break. Since rejection of null does not mean rejection of a unit root itself, but would imply rejection of unit root without a break (Lee & Strazicich, 2003). The critical values are provided by Zivot and Andrews (1992), while the optimal number of lag length will be based on Akaike Information criterion (AIC).

Gregory and 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 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 (1996a) have presented three models that allow to test the null against alternative hypothesis 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:

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

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

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

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:

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

Where Y_t the dependent variable of cointegrating system is, 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 these three models, $DU_{tk} = 1$ if $t > k$ and $DU_{tk} = 0$ if $t \le k$, where k is the break time point at which break occurs. The time break dates are achieved by an estimation of the cointegrating systems for all possible break dates. The time break date is chosen at a value that minimizes the t-statistics or at which absolute value of the test t-statistic is at its maximum compare to its critical values provided by Gregory and Hnsen (1996) using Monte Carlo experiments. The number of optimal lag length will be chosen automatically based on the criteria of Schwartz Bayesian information criterion (BIC), Akaike Information criterion (AIC) and t-test criterion (TTC)1. The three models above in equations (6), (7) and (8) are extended to test the cointegration relation for all the variables that are included in the currency demand function of Qatar. The new models can be expressed as follows:

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

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

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

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

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

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

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

---

1 The econometric software, RATS version 8.1 package will be used to perform the test of Gregory and Hansen's (1996) cointegration test.

Short Run Estimation and Diagnostic Tests

In this paper the dynamic short run Error Correction Model (ECM) will be 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:

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

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) will be re-written in a more general accurate specification as follows:

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

$$+\sum_{i=1}^{n}\varnothing_i\Delta ln(TR)_{t-j} + \sum_{i=1}^{n}\delta_i\Delta lnG_{t-j} + \sum_{i=1}^{n}\theta_i\Delta lnRem_{t-j}$$

$$+\sum_{i=1}^{n}\psi_i\Delta i_{t-j} + \sum_{i=1}^{n}\varphi_i\Delta \pi_{t-j} + \sum_{i=1}^{n}\gamma_i\Delta lnM1_{t-j}...(13)$$

Where Δ the difference operator, and the term is $\Delta lnM1_{t-j}$ 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) will be estimated using OLS and the insignificant lagged variables will be 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 will be 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 which were determined by Gergory and Hansen's (1996) methodology (see Singh & Pandey, 2009; Rao & Kumar, 2009; Omotor, 2011; Dritsakis, 2012; Kumar & Webber, 2013; Kumar, Webber & Fargher, 2013). The final version of short run dynamic error correction model will be 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.

Estimation of the Underground Economy

Following Ahumada et al (2009), Ahmed and Hussain (2008) and Macias and Cazzavillan (2009), the analysis of the underground economy in the Qatari economy is conducted. For each year over the study's period, the predicted values of the currency demand function will be derived first with the tax revenues variable ($\widehat{lnM1}_t *_T$) and in the second time, the predicted values of the currency demand

function will be derived without tax revenues variable ($\widehat{lnM1}_t **_{wT}$). The difference between these two predicted values is multiplied by the actual total value of money outside banks M1 over the period to give the level of illegal currency. The illegal money to demand currency ratio for each year will be formulated as follows:

Illegal money ($IM1_t$) = [($\ln\widehat{M1}_t *_T$)-($\ln\widehat{M1}_t **_{wT}$)]………………………….. (`14)

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 $IM1$. Mathematically, this can be expressed as follows:

Legal money ($LM1_t$) = [M1$-$ ($IM1_t$)]……………………………………… (15)

The most essential part of this paper is that its process of estimation will be subjected to the conditions suggested by Ahumada et al (2009) in estimating the volume of the underground economy. According to Ahumada et al. (2007) and based on the currency demand approach to estimating the underground economy, the velocity of income elasticity of money demand is an empirical issue and its calculation reflects both formal and informal transactions in the economy. Thus, the values of the velocity must be known prior to the estimation of underground economy (Macias & Cazzavillan, 2009). The velocity of money in the economy of Qatar is mathematically expressed as:

$$V = \frac{GDP_t}{M1 - (IM1_t)} \quad\text{...}(16)$$

Equation (16) is used to capture an estimation of the underground economy, whereas the size of the underground economy in the Qatari economy over the period 1980-2010 can be obtained by multiplying illegal money by the velocity of money as follows:

The underground economy(UE) $_t$ = $IM1_t$* V ……………………………… (17)

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

$$\frac{Underground_t}{Official\,GDP_t} = (\frac{Illegal\,Currency_t}{Legal\,Currency_t})^{\frac{1}{\beta}} = (\frac{Underground_t}{OfficialGDP_t})^{\frac{1}{\beta}} \quad\text{..............................}(18)$$

Equation (18) 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 study2. Ahumada et al. (2007) prove that it is wrong to assume the equality of the velocity of money using currency demand function in estimating the underground economy under the hypothesis that the coefficient of income elasticity is equal to one. Finally, the total tax evasion in the Qatari economy (for each year over the period of this study) is obtained by multiplying the estimates of the underground economy by the ratio of total tax revenue to the GDP. This can expressed as follow:

---

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

$$Tax\ Evasion\ (TE) = (UE_t) * \left(\frac{Total\ Tax\ Revenue_t}{GDP_t} \right) \tag{19}$$

Results and Discussion
Analysis of the Underground Economy in Qatar
Based on the estimated GH-2 model, Table 5 provides estimates of the size of the underground economy in Qatar over the period of 1980-2010. The results introduce that the underground economy in the Qatari economy grew from about R.Q4,839 billion in 1980 to R.Q71,908 billion in 2010. As a percentage of GDP, the average size of the underground economy constitutes 17.03% of the official GDP over the study's period. It was 16.90% of the official GDP in 1980 and 15.51% of the official GDP in 2010. As can be shown in Table 5, the average size of the underground economy in Qatar is greater than that average size, as reported by Schnieder et al. (2010).

From the results, the magnitude of the underground economy as a percent of the official GDP has been steadily increasing since 1980 to the end of 2010, excluding the year 1998s. This is because the average was at its peak point of 18.14% of the official GDP. The statistics of Table 5 indicate that the underground economy in the Qatari economy has increased significantly since 1980. The development of the trend for the underground economy in Qatar is less compared to some other Asian and African developing countries such as Bangladesh, Malaysia, Morocco, Guyana, Tanzania, Malawi, Ethiopia. However, the rank of the underground economy in the Qatari economy itself is relatively bigger than its official economy.

Table 5. Estimates of illegal money, underground economy and tax evasion in Qatar based on the GH-2 model over the period of 1980-2010.

Year	Legal Money (Bil. of RQ)	Illegal Money (Mil.of RQ)	Velocity of Money	Underground Eco. (Bil. of RQ)***	Under- ground Eco. (% of GDP)	Tax Evasion (Mil. of RQ)	Tax Ev. (% of GDP)
1980	1,680,211,724	593,868,276	1.51	4,838,740,199	16.9	189,621,972	0.66
1981	2,506,016,183	897,083,817	1.50	5,374,857,995	17.05	345,060,188	1.09
1982	2,800,476,372	994,363,629	1.48	4,701,512,021	17.00	336,478,098	1.22
1983	2,705,612,955	918,897,045	1.45	3,854,416,034	16.37	154,883,936	0.65
1984	3,062,021,239	1,072,478,761	1.46	4,114,358,476	16.86	292,172,718	1.20
1985	2,949,538,444	1,067,161,556	1.47	3,914,769,617	17.48	492,885,559	2.20
1986	3,300,653,900	1,186,526,100	1.45	3,220,739,710	17.51	496,602,939	2.70
1987	3,524,488,249	1,253,871,751	1.44	3,424,684,406	17.27	441,019,879	2.22
1988	2,510,161,208	888,368,793	1.47	3,760,665,993	17.11	288,992,430	1.31
1989	2,493,708,481	908,981,519	1.48	4,149,279,580	17.57	473,681,307	2.01
1990	2,974,347,065	1,080,702,935	1.48	4,667,545,738	17.42	530,656,337	1.98
1991	2,651,476,047	977,213,953	1.49	4,440,131,206	17.72	607,470,058	2.42
1992	2,917,861,117	1,071,918,883	1.49	4,894,656,642	17.59	629,066,775	2.26
1993	3,106,132,111	1,148,167,889	1.48	4,622,429,171	17.74	747,751,089	2.87
1994	2,856,341,752	1,053,958,248	1.49	4,748,743,098	17.69	665,881,923	2.48
1995	2,707,908,563	1,012,191,437	1.50	5,286,879,341	17.85	787,267,068	2.66
1996	2,833,110,305	1,051,889,695	1.50	5,820,138,795	17.65	729,458,830	2.21
1997	2,998,384,624	1,132,115,376	1.52	7,314,518,024	17.79	102,717,007	2.50
1998	3,047,351,134	1,168,948,866	1.52	6,772,382,737	18.14	1,386,406,274	3.71
1999	3,047,950,312	1,130,749,688	1.52	7,853,926,746	17.41	764,134,790	1.69
2000	3,243,051,926	1,205,848,074	1.54	11,117,391,485	17.20	833,726,973	1.29
2001	6,899,122,911	2,511,114,089	1.48	10,752,437,850	16.84	1,212,344,105	1.90
2002	8,805,002,450	3,228,558,550	1.47	11,912,047,900	16.90	1,756,623,147	2.49
2003	11,596,854,908	4,198,553,092	1.46	14,183,766,508	16.56	1,816,372,513	2.12
2004	14,481,574,996	5,338,949,004	1.47	19,213,438,575	16.66	3,123,696,041	2.71
2005	23,819,178,351	8,603,009,649	1.45	25,272,329,461	16.13	3,445,332,188	2.20
2006	31,767,705,818	11,479,338,182	1.45	35,076,201,265	15.93	4,553,687,612	2.07

2007	38,387,658,678	14,113,014,322	1.46	46,437,971,881	16.04	7,556,107,930	2.61
2008	49,204,626,155	18,101,079,845	1.47	66,262,269,945	15.83	9,657,497,306	2.31
2009	51,970,173,967	19,422,636,033	1.46	57,464,800,305	16.18	13,967,251,310	3.93
2010	64,302,127,030	23,276,425,970	1.45	71,908,106,879	15.51	9,162,547,145	1.98

Sources: From the authors' compilation based on the estimated coefficients of the currency demand model of Qatar.
*** refers to the estimates of the underground economy are corrected based on the correction condition, which was introduced by Ahumada et al. (2009).

The result also indicates that the size of the underground economy in Qatar reflects the informal employment of the foreign workers in the economy as a result of tight regulations levied. Qatar has largest number of immigrants, which constitute about 72.4%, 76.3%, 80.5% and 81.6% of the total population over the period of 1990, 2000, 2005 and 2010. The foreigners engage in illegal job to meet the payment of their sponsors, an amount of money they agreed, after they have been given permission to work in the country (Sturm et al., 2008). This is done in order to obtain faster profits. The result of the underground economy to the official economy in Qatar is demonstrated in Figure 1.
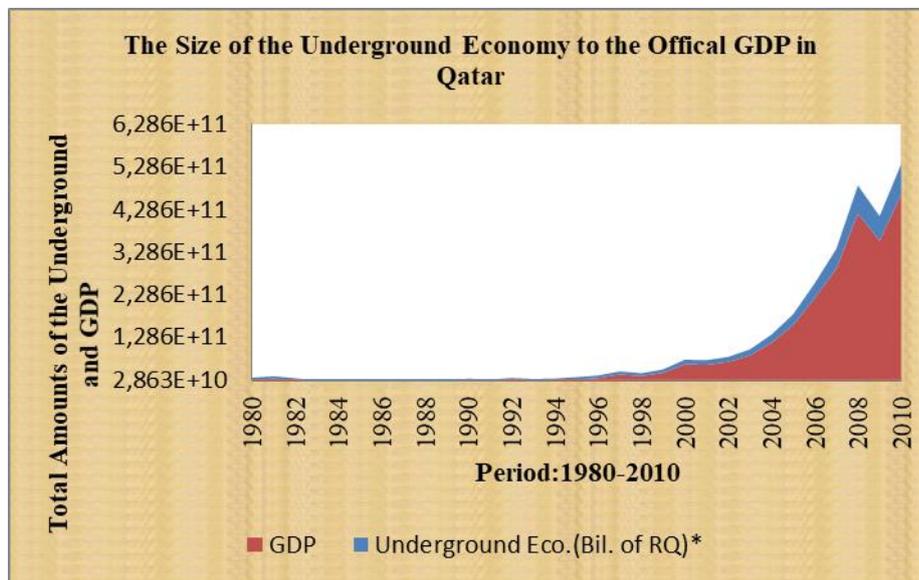
Source: Author's compilation based on the estimation
Figure 1: The size of the Underground Economy to the Official GDP in Qatar over the study period.

However, the results show that the size of illegal money in Qatar grew from about R.Q 594 million in 1980 to about R.Q23,276 billion in 2010. The level of the illegal money as a percent of money in circulation outside banks (M1) in the Qatari economy has been steadily growing since 1980 (26, 11%) till the end of 2010 (26,57%). The average size of the illegal money to the money outside the banks has reached about 26,70% over the study period. The result of the illegal money and legal to the total amount of money outside the bank in Qatar is shown in Table 5 and illustrated in Figure 2.
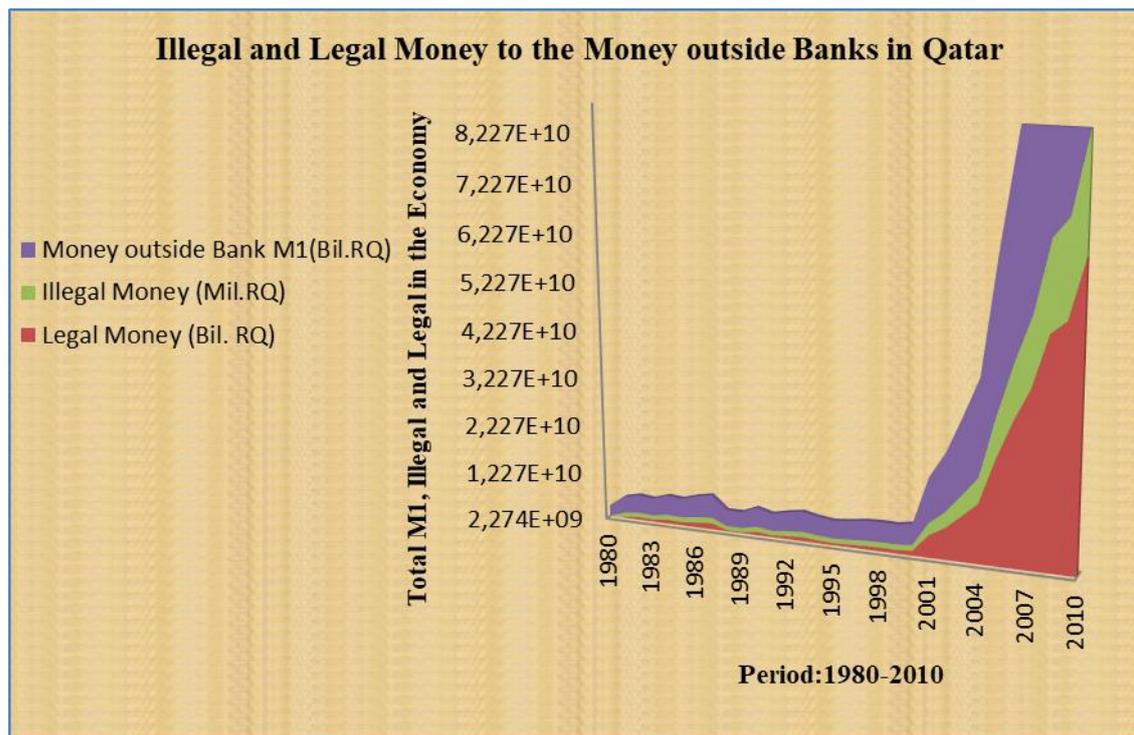
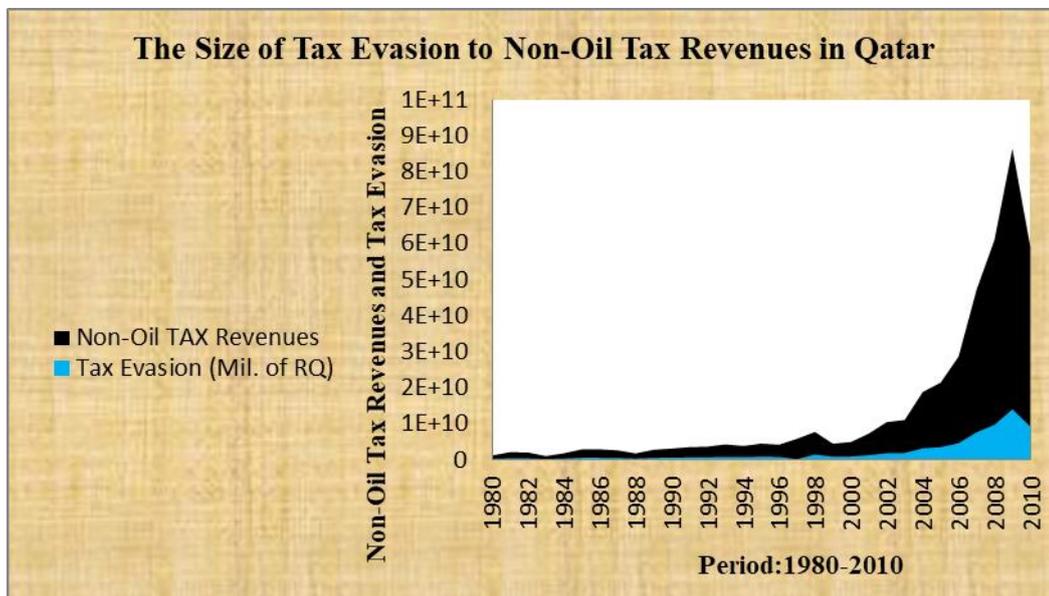Source: Author's compilation based on the estimation
Figure 2: The size of illegal, legal money to the money outside the banks in Qatar over the study period.

This finding provides that the underground economy in Qatar is brought about by the huge outflow of money to abroad illegally due to the distortion in the economic policies. In addition, an increase in the underground economic activities is attributed to the fact that illegal workers have no way to access legal banking services, which requires that workers in most cases should be resident of the country officially. However, even if the workers are resident officially, formal or informal workers have a limited financial constrain to remit (less than their salaries) their money home (De Brauw, Mueller, & Woldehanna, 2013). Since the owners have to account for the sources of large amounts of money owned, much money goes unrecorded through informal channels. In addition, there is no red tape restriction to sending money in illegal ways and the cost of sending such money is less than that in the formal ways (Freund & Spatafora, 2005; Beine, Lodigiani, & Vermeulen, 2012). To that extent, the size and growth of the tax evasion in the Qatari economy amounted to about R.Q 190 million in 1980 to R.Q 9,163 billion in 2010. It has been growing steadily since 1980 from 0.66% to 1.98% in the end of 2010, excluding the years of 1998 and 2009. The higher rates of tax evasion compared to the official GDP reached 3.71% in 1998 and 3.93% in 2009. The level of tax evasion as a percent of GDP is soaring rapidly since 1998. The higher level of tax evasion compared to the official GDP was estimated at R.Q 7.556, 9.657, 13.967 and 9.163 billion respectively in the last four years of the study period. The result of tax evasion to the official GDP is illustrated in Figure 3.

Source: Author's compilation based on the estimation
**Figure 3:** Tax evasion to the GDP in Qatar over the study period.

On the other hand, the results indicate that the tax evasion constitutes a significant portion of the non-oil tax revenues in the Qatari economy. The growth rate of tax evasion as a percent of total non-oil tax revenues was estimated at 16.90% in 1980 to about 15.50% in 2010. The average growth rate is 16.50% over the study period. The result suggests that tax evasion practices in the Qatari economy are concentrated among the Small and Medium-sized enterprises. The result can be shown as in Figure 4.

Source: Author's compilation based on the estimation
Figure 4: The size of tax evasion to the non-oil tax revenues in Qatar.

The results show that an increase of tax evasion in the Qatari economy is attributed to the higher growth rate of the tax burden in the economy. Since, the average rate of non-oil revenues as in percentage to the Gross Domestic Product in Qatar which reflects the tax burden amounted to 13.11% over the study period. The higher average rate was around 20% in 1998 and remained at the highest level over the

later period of study. The result on the size of tax evasion as a component of the underground economy in the Qatari economy could be a result of wrong fiscal policy, which led to loses in the revenues of the government. The increased tax burden is more costly to owners of business firms in the private sector (Dabla-Norris,Gradstein & Inchauste, 2008). In fact, this result confirms that taxation and underground economy move together over time, as it can be seen in Figure 5. However, the result suggests that tax evasion is a component of illegal activities of the underground economy in the Qatari economy. The underground economy involves different illegal activities.
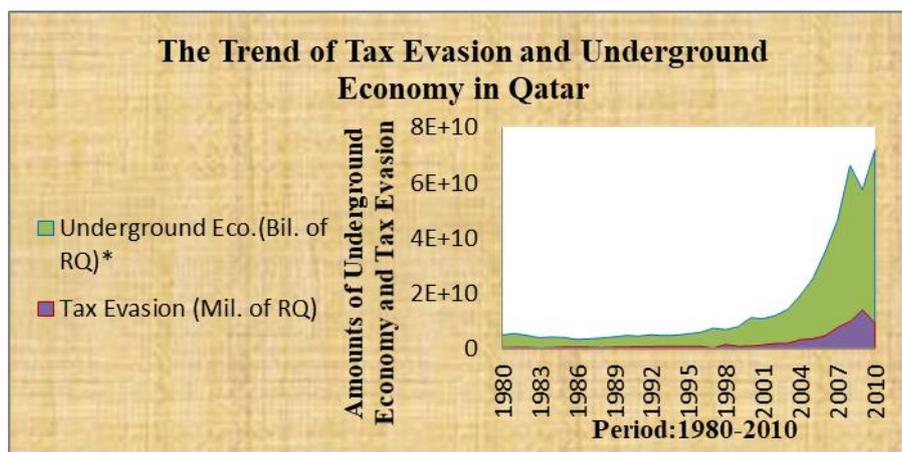
Source: Author's compilation based on the estimation
Figure 5: The trend of tax evasion in and underground economy Qatar over the study period.

Conclusions
This study estimated the size of the underground economy and tax evasion in the Qatari economy over the period of 1980-2010 using the Gregory and Hansen cointegration test based currency demand approach. The results suggest that the size of the underground economy in Qatar is growing significantly over the period of study. The level of the underground economy as a percent of the official GDP increased steadily from 1980 to 2010. The average size of the underground economy in Qatar constitutes 17.03% of the official GDP over the study period. It was 16.90% and 15.51% of the official GDP in 1980 and 2010 respectively, while the average size constitutes 17.03% of the official GDP. From the analysis, the average size of the underground economy in Qatar is greater than that reported by Schnieder et al. (2010). The development of the trend for the underground economy in Qatar is less in comparison to some other Asian and African developing countries such as Bangladesh, Malaysia, Morocco, Guyana, Tanzania, Malawi, and Ethiopia. However, the rank of the underground economy in the Qatari economy itself is relatively higher than its official economy.

The findings also reveal that the size of illegal money in the Qatari economy is around R.Q 594 million in 1980 to about R.Q 23,276 billion in 2010. The growth level of the illegal money as a percent of money outside banks (M1) in the Qatari economy had been steadily growing from 26, 11% since 1980 to 26,57% till the end of 2010. The average size of the illegal money to the money outside the banks has risen to about 26,70% over the period of study. However, the magnitude of the tax evasion amounted to about R.Q 190 million in 1980 to R.Q 9,163 billion in 2010. It had been growing steadily from 1980 to the end of 2010, excluding the year 1998 and 2009 respectively. The growth rate of the tax evasion as a percent of the official GDP in Qatar had been steadily increasing from 0.66% in 1980 to 1.98% in the end of 2010, and it was soaring rapidly since 1998. The higher rates of tax evasion in

comparison to the official GDP reached 3.71% in 1998 and 3.93% in 2009. The findings provide that the underground economy in Qatar stems from the higher rate of tax burden and the huge outflow of money that is remitted by the foreign workers to abroad illegally due to the distortion in the economic policies. The size mainly reflects the informal employment of the foreign workers in the economy as a result of the cheapest price of foreign labor compared to local.

To that extent, Qatar has the largest number of immigrants compared to its national population. The Qatari authorities embarked on tight regulation that can drive foreign workers to engage in illegal activities of the underground economy. Foreigners get permission to work by themselves within the country based on their agreement with their sponsors to pay back an agreed amount of money (Sturm et al., 2008). This study suggests that the size of the underground economy in Qatar should be taken into account when any economic policy is formulated. There are a number of reasons for this conclusion: First, due to its negative impact of reducing government revenues since the tax evasion is increasing and the oil reserves could not forever sustain the economy (Muceku & Muca, 2014). Second, the size of the underground economy is currently estimated at 15.51% of the official GDP as at end of 2010, which is bigger compared to the relative size of its economy. Finally, an increase in the illegal activities of the underground economy could be a damaging factor to economic development planning in the Qatari economy.

References

Ahumada, H., Alvaredo, F., & Canavese, A. (2009). The Monetary Method to Measure the Size of the Shadow Economy » A Critical Examination of its Use. Journal of Review Economics, 60 (5), 1069-1078.

Ahiabu, S. (2006). Inflation and the underground economy. University Library of Munich, Germany, MPRA Paper No.763.

Asiedu, E., & Stengos, T. (2014). An Empirical Estimation of the Underground Economy in Ghana. Economics Research International, 2014.

Agbi, S. (2014). The Virtuos and the Variance of the Various Approaches for Measuring Shadow Economy around the World: Implications for Policy Makers. European Journal of Business and Innovation Research, 2(6),40-55.

Ahumada, H., Alvaredo, F., & Canavese, A. (2007). The monetary method and the size of the Shadow economy: a critical assessment. Review of Income and Wealth, 53 (2), 363-371.

Ahumada, H., Alvaredo, F., & Canavese, A. (2008). The monetary method to measure the Shadow economy: The forgotten problem of the initial conditions. Economics Letters, 101(2), 97-99.

Alexandru, A. A. M. (2013). Estimating the size of Romanian shadow economy using Gutmann's simple currency ratio approach. Theoretical and Applied Economics, 18(10 (587)), 33-48.

Alexandru, A., & Dobre, I. (2011). The Impact of Unemployment Rate on the Romanian Shadow Economy: An Empirical Investigation Using Granger Causality Analysis. Economic Computation and Economic Cybernetics Studies and Research, ASE Publishing, 45(1), 55-76.

Ahmed, Q. M., & Hussain, M. H. (2008). Estimating the Black Economy through a Monetary Approach: A Case Study of Pakistan. Economic Issues, 13 (1), 45-60.

Ahmed, M., & Ahmed, Q. M. (1995). Estimation of the black economy of Pakistan through the monetary approach. The Pakistan Development Review, 34 (4), 791-807.

Banafea, W. A. (2014). Endogenous Structural Breaks and the Stability of the Money Demand Function in Saudi Arabia. International Journal of Economics & Finance, 6(1), 155-164.

Breusch, T. (2005). The Canadian Underground Economy: An Examination of Giles and Tedds. Canadian Tax Journal, 53 (2), 367-391.

Berger, W., Pickhardt, M., Pitsoulis, A., Prinz, A., & Sardà, J. (2014). The hard shadow of the Greek economy: new estimates of the size of the underground economy and its fiscal impact. Applied Economics, 46(18), 2190-2204.

Beine, M., Lodigiani, E., & Vermeulen, R. (2012). Remittances and financial openness. Regional Science and Urban Economics, 42(5), 844-857.

Cagan, P. (1958). The demand for currency relative to total money supply. Journal of Political Economy, 66(4), 303-328.

Dabla-Norris, E., Gradstein, M., & Inchauste, G. (2008). What causes firms to hide output? The determinants of informality. Journal of Development Economics, 85(1), 1-27.

Dreher, A., & Schneider, F. (2010). Corruption and the shadow economy: an empirical analysis. Public Choice, 144 (1-2), 215-238.

Dell'Anno, R., & Halicioglu, F. (2010). An ARDL Model of unrecorded and recorded economies in Turkey. Journal of Economic Studies, 37(6), 627-646.

De Brauw, A., Mueller, V., & Woldehanna, T. (2013). Motives to remit: evidence from tracked internal migrants in Ethiopia. World Development, 50(n), 13-23.

Engle, R. F., & Granger, C. W. (1987). Co-integration and error correction: representation, estimation, and testing. Econometrica: journal of the Econometric Society, 55(2), 251-276.

Fethi, M. D., Fethi, S., & Katircioglu, S. T. (2006). Estimating the size of the Cypriot Underground economy: A comparison with European experience. International Journal of Manpower, 27 (6), 515-534.

Feld, L. P., & Schneider, F. (2010). Survey on the shadow economy and undeclared earnings in OECD countries. German Economic Review, 11(2), 109-149.

Ferwerda, J., Deleanu, I., & Unger, B. (2010). Reevaluating the Tanzi-model to estimate the Underground Economy. Tjalling C. Koopmans Research Institute, Discussion Paper, 10 (4), 1-29.

Gerxhani, K. (2004). The informal sector in developed and less developed countries: a literature survey. Public choice, 120(3-4), 267-300.

Gutmann, P. M. (1977). The subterranean economy. Financial Analysts Journal, 33(6), 26-27.

Gregory, A. W., & Hansen, B. E. (1996). Residual-based tests for cointegration in models with Regime shifts. Journal of Econometrics, 70 (1), 99-126.

Gregory, A. W., Nason, J. M., & Watt, D. G. (1996). Testing for structural breaks in cointegrated Relationships. Journal of Econometrics, 71 (1), 321-341.

Hernandez, M. A. (2009). Estimating the Size of the Hidden Economy in Peru: A Currency Demand Approach. Revista de Ciencias Empresarialesy Economia, 8(1), 85-104.

Kumar, S. &Webber, D. J. (2013). Australasian money demand stability: application of structural break tests. Journal of Applied Economics, 45 (8), 1011-1025.

Kumar, S., Webber, D. J., & Fargher, S. (2013). Money demand stability: A case study of Nigeria. Journal of Policy Modeling, 35(6), 978-991.

Lee, J., & Strazicich, M. C. (2003). Minimum Lagrange multiplier unit root test with two Structural breaks. Review of Economics and Statistics, 85(4), 1082-1089.

Marcias, J. B., & Cazzavillan, G. (2009). The dynamics of parallel economies. Measuring the Informal sector in Mexico. Research in Economics, 63 (3), 189-199.

Muceku, H., & Muça, A. (2014). Informal Economy In Albania–Its Costs in the Country Development. Mediterranean Journal of Social Sciences, 5(9), 642.

Naufal, G.S., & Vargas-Silva, C. (2010). Remitters in Dubai. Swiss Society of Economics and Statistics, 146 (4), 769–780.

Naufal, G., S., & Termos, A. (2010). Remittances from the GCC Countries: A Brief Outlook. Migration and the Gulf, Middle East Institute, Washington, DC, 1 (2010), 37-41. Retrieved from: http://www.voltairenet.org/IMG/pdf/MigrationandtheGulf_.pdf.

Omotor, D. G., & O motor, P. E. (2011). Structural Breaks, Demand for Money and Monetary Policy in Nigeria. Ekonomski pregled, 62 (9-10), 559-582.

Putnins, T. J.,& Sauka ,A. (2011). Size and determinants of shadow economies in the Baltic States. Baltic Journal of Economics, 11(2), 5-25.

Rao, B., B., Singh, R., & Kumar, S. (2010). Do we need time series Econometrics. Applied Economics Letters, 17(7), 695-697.

Rao, B. B., & Kumar, S. (2009). Cointegration, structural breaks and the demand for money in Bangladesh. Applied Economics, 41(10), 1277-1283.

Schneider, F., & Buehn, A. (2013). Estimating the Size of the Shadow Economy: Methods, Problems and Open Questions. CESifo Working Paper No. 4448.

Schneider, F., Buehn, A., & Montenegro, C.E. (2010). New Estimates for the Shadow Economies all over the World. International Economic Journal, 24 (4), 443–461.

Schneider, F., & Savasan, F. (2007). Dymimic Estimates of the Size of Shadow Economies of Turkey and of Her Neighboring Countries. International Research Journal of Finance and Economics, 9(5), 126-143.

Schneider, F., & Klinglmair, R. (2005). Shadow economies around the world: What do we know?. European Journal of Political Economy, 21(3), 598–642.

Schneider, F. (2006). Shadow economies around the world: what do we really know?. European Journal of Political Economy, 21 (3), 598-642.

Schneider, F., & Enste, D. (2000). Shadow economies: Size, causes, and consequences. The Journal of Economic Literature, American Economic Association, 38 (1), 77–114.

Schneider, F., & Hametner, B. (2014). The Shadow Economy in Colombia: Size and Effects on Economic Growth. Peace Economics, Peace Science and Public Policy, 20(2), 293-325.

Singh, P., & Pandey, M. K. (2012). Is Long-Run Demand for Money Stable in India?– An Application of the Gregory-Hansen Model. The IUP Journal of Applied Economics, 11(2), 59-69.

Sturm, M., Strasky, J., Adolf, P., & Peschel, D. (2008). The Gulf Cooperation Council Countries-Economic Structures, Recent Developments and Role in the Global Economy. ECB Occasional Paper No.92.

Shah, N. M. (2009). The management of irregular migration and its consequence for development: Gulf Cooperation Council. International Labor Organization, working paper No. 431863. Retrieved from: http://www.ilo.org/wcmsp5/groups/public/---asia/---ro-bangkok/documents/publication/wcms_105105.pdf.

Taghavi, M. (2012). The Impact of Workers' Remittances on Macro Indicators: The case of the Gulf Cooperation Council. Middle Eastern and African Economies, 14 (9), 49-73.

Torgler, B., & Schneider, F. (2009). The impact of tax morale and institutional quality on the shadow economy. Journal of Economic Psychology, 30(2), 228-245.

Trebicka, B. (2014). Mimic Model: A Tool to Estimate the Shadow Economy. Academic Journal of Interdisciplinary Studies, 3(6), 295.

Tanzi, V. (1982). Underground economy and tax evasion in the United States: Estimates and implications. In Vito Tanzi, V. (1st Ed). The underground economy in the United States and abroad, 69-92. Lexington, MA: Lexington Books.

Zivot, E., & Andrews, D. W. K. (1992). Further evidence on the great crash, the oil-price shock, and the unit-root hypothesis. Journal of Business & Economic Statistics, 10 (1), 251-270.