THE REPUBLIC OF TURKEY
BAHCESEHIR UNIVERSITY

THE EFFECT OF HOUSING ON NET ERROR OMISSIONS: AN APPLICATION TO TURKISH CASE

Master Thesis

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ISTANBUL, 2015

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INSTITUTE OF SOCIAL SCIENCE
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ABSTRACT

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Net error and omission, which can be defined as 'differences on balance sheet' composed from some statistical differences. On the other hand, net error and omission defines off the record money, in other words, untaxed income.
Besides, housing sector is one of the sources for money laundering especially for developing and underdeveloped economies. Thant means, untaxed money is cleaned easily with housing sector.

In that study, the aim is exploring the effect of housing sector on money laundering in Turkey. Quarterly data is used for that research among 1999 to 2014. For the housing sector, housing loans and real effective Exchange rate is used to see its relationship between net error and omission. In the first part of the study, net error and omission, real effective exchange rate and housing sector of the Turkey is observed deeply.

In the second part of the study, some descriptive statistics is given to see the context of the variables. Primarily, to see the heteroscedasticity, Wald Test is applied on variables. Then to see the presence of unit roots, ADF test (Augmented Dickey – Fuller) is performed. The lags and stationarities for time series are determined. To see the interaction of variables, Granger Causality Test and VAR models are carried out. As a result, cointegration analysis results are found as significant, while Granger causality results are not significant. Also, the coefficients of VAR models are not significant.

Keywords: Net Error and Omission, Housing Sector, Real Effective Exchange Rate

ÖZET

KONUT SEKTÖRÜNÜN NET HATA NOKSAN ÜZERİNE ETKİSİ: TÜRKİYE ÜZERİNE BİR UYGULAMA

Gülen Arıkan

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Ödemeler dengesindeki farklılıkları kapsayan net hata noksan kalemi, bazı istatistiksel farklar nedeni ile oluşmaktadır. Ayrıca, net hata noksan kalemi, ülke bütçesine giren kayıt dışı, yani vergilendirilmemiş geliri de temsil eder niteliktedir.
Konut piyasası ise, gelişmekte olan ve az gelişmiş ülkeler için kara para aklamakta kullanılan araçlardan biri konumundadır. Vergilendirilmemiş paralar, konut piyasası yardımı ile piyasaya kolaylıkla dâhil edilebilmektedir.

Bu çalışmada, 1999-2014 yılları arasında, çeyrek dönemlik veriler kullanılarak, Türkiye'ye giren kayıt dışı paranın aklanmasında, konut sektörünün etkisi araştırılmak istenmiştir. Konut kredileri ve reel efektif döviz kuru ile ilgili çeyrek yıllık veriler kullanılarak, konut sektöründeki değişimlerin, net hata noksan kalemi ile ilişkili olup olmadığı incelenmiştir. Çalışmanın ilk kısmında Türkiye örneği için net hata ve noksan kalemi, reel efektif döviz kuru ve ülkenin konut piyasası üzerinde durulmuştur.

İkinci kısımda, bazı temel istatistiksel yöntemlerle veriler hakkında özetleyici bilgi sunulması amaçlanmıştır. Öncelikle değişen varyans olup olmadığını görmek için Wald Testi, daha sonra da zaman serilerindeki birim kökün varlığını incelemek adına ADF testi (Augmented Dickey – Fuller) uygulanmıştır. Zaman serilerindeki gecikmeler ve durağanlıklar saptanmıştır. VAR modelleri ve Granger Nedensellik Testi uygulanmış ve verilerin birbirlerini etkileyip etkilemediği incelenmiştir. VAR modelindeki katsayılar istatistiksel olarak anlamsızken, yapılan Granger nedensellik testi sonucunda da değişkenler arasında nedensellik tespit edilememiştir. Ancak, eşbütünleşme analizi sonuçları istatistiksel olarak anlamlı sonuçlar vermiştir.

Anahtar Kelimeler: Net Hata Noksan, Reel Efektif Döviz Kuru, Konut Piyasası

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ABBREVIATIONS

ADF	:	Augmented Dickey-Fuller
AIC	:	Akaike Information Criterion
E&O	:	Errors and Omissions
ECM	:	Error Corrected Model
GDP	:	Gross Domestic Production
INV	:	Investment
NEO	:	Net Error and Omission
SIC	:	Schwartz Bayesian Information Criterion
VAR	:	Vector Auto Regression
VAT	:	Value Added Tax

SYMBOLS

Model parameters	:	α_0 ,α_1
Constant	:	k
Time trend	:	T
Hypothesis	:	H_0 , H_1
Number of lags	:	P
ADF t-statistics	:	φ
Lags	:	Y_{t-1}, Y_{t-2}...$Y_{t-p,}$
Intercept	:	Θ_0
Trend	:	$\gamma\rho$

1. INTRODUCTION

The discussion on net errors and omissions revolves around the statistical differences that are experienced in the balance of payment records. In particular, as per the description of Maddison (2014), the errors and the omissions in the balance of payment accounts are cumulatively different in these index data. In particular, the understanding of the source of the errors and the cumulative differences present a situation where the analysis of the country's position index needs very detailed empirical presentations. Looking at the description of the balance of payment for Turkey, their accounts from the year 2000 to the year 2014 present some very solid differences in the data. In particular, this review will seek to identify the link behind this balance of payment for Turkey and the country's housing industry and, in particular, the countries housing permit revenues. At the end, the main aim of the study will be identifying the methods of money laundering in Turkey.

It will be particular, to the identification of housing as one key indicator in the choice for economic performance and the descriptions of economic indexing. Primarily, housing is one basic entity and is evident in the very economy. It is for these reasons that equally the argument develops of the need to have the housing index as an imperative support in economic performance indices as housing represent the concern of population in an economy.

The aim of that study is identifying the link behind behind the balance of payment for Turkey and the country's housing industry. However, why we are looking at that linkage? Because net error and omission indicator shows us 'untaxed earnings'. In other words, the money which is earned illegally. To see, the variables used are net error and omission, housing loans, real effective exchange rate of Turkish Lira. Housing loans and real effective exchange rate of Turkish Lira represents the housing sector of Turkey. Interest rates, inflation and exchange rates are all highly correlated. If exchange rate increases, interest rate tends to increase. In theory one might think that higher interest rates would induce more saving instead of borrowing. That means, if people borrow money truly for their needs that should cause a decrease in housing loans during high exchange rate periods. Because rational people think at the margin. If people borrow housing loans to clean their black money, they are insensible with the exchange rate.

In addition, used methods for the study are Augmented Dickey Fuller Test to see the unit roots for time series. Granger Causality Analysis, Wald Test, VAR Models and Cointegration Analysis are used to see the long term and short term cause and effect relationship between the variables. At the end, it is possible to see that housing industry is a good source for money laundering in Turkey.

2. LITERATURE REVIEW

According to Ibrahim (2013) and the World Bank (2015), there has been a drop and the balance of payment for Turkey in comparative years. Equally, the success of steeping a rise in this scenario can be attributed to the housing indices of the economy. In particular, this presents as a drop in the business cycle of the economy. It should be kept in mind that housing data are some of the most fundamental descriptions of keeping records of an economic performance. In particular, housing indices are constructed from the statistics of housing statistics that present an indication of the urban population, the building permits that the economy has issued and lastly the number of housing completions. Equally, this will also be inclusive of the property and housing taxes that the Turkish economy has for both resident and non-resident property owners.

According to Ibrahim (2013), the net errors and omissions in Turkey's balance of payment data has been subject to a number of shocks in the recent past. With data from the year 2000, in particular the errors and omissions to the year 2011 presented some of the most defining moments. For that, the state was set on an explanation path on what exactly was behind the inflow and the sharp rise of the net errors and omissions. [See Appendix 2]

Looking at this description, it is evident that the attaining of a balance in this economy is still farfetched. In particular, this presents a situation in which the economy is twisting and turning to the reports of the consecutive years. Equally, looking at the description of the central bank of Turkey's balance of payment current account balance, [see Appendix 3] the current account balance of the economy seems dropping gradually from the records of the year 2003.

With these two highlights, it is evident that the Turkey economy serves as one that is equally affected by the spills of its errors and omissions accounts. In particular, drawing reference to the possibility of this coming from the housing sector, the truth is not farfetched. This equally comes from the description by Ibrahim (2013) on the possibility of the influence that the housing industry has on the other facets of the economy like energy and employments indices.

2.1 HOUSING DATA FOR TURKEY

The description of Maddison (2014) maintains that housing data in Turkey as a developing nation is a measure by the number of new residential buildings that are coming up in their records. In essence, the description of a growth or a slump in these records will maintain the descriptions and the valuation from an angle of actual value for the new and upcoming residential property, the historical data available and the forecast of the economic calendar for the economy.

According to the Trading Economist (2015), the indices of new housing constructions in Turkey relay some relative calm in industry from the year 2002 with some sharp rise in between 2011 and 2012; nevertheless this still comes down to the average line presenting as shown by Appendix 4.

With reference from the appendices 2 and 3, the presentation will be highly imperative of a similarity in the net errors and omissions accounts and the fluctuations in the new residential buildings. This may arguably be an assumption; however from with the developments that Ibrahim (2013) presents, the assumption is referenced and credited to even stronger sentiments. This will be with reference to the changes in new housing and residential buildings as one of the primary factors in the changes in the balances of payment accounts and equally the major influential factor in the net errors and omissions accounts.

Therefore, in the case of any slowdown in the pace of construction investments or equally arise in the rise of construction investment. It will be clear to assume that these effects will be felt to the errors and omissions balance from the predominantly housing investments. In particular, it is with this rise in the number of housing units that will be described equally as a rise in the income tax and permit rate that accrue from housing units. Therefore, imploring on the suggestions of Ibrahim (2013), the assumption of the errors and omissions account fuelling the positive balance of payment accounts as one very possible scenario.

Comparatively, it will be important to establish that there is a relationship as that which can be evidenced by the values in the errors and omissions accounts per the records of the World Bank (2015) and those of the construction index from the Turkish Statistical Institute (2015).

Computing the housing index[1] as an average of the high and the lows for the year, the following are the Excel computations representing a fair valuation after truncation of the errors and omissions balances to four significant figures.

Table 2.1: Building and construction index relationship with Errors and Omissions balances

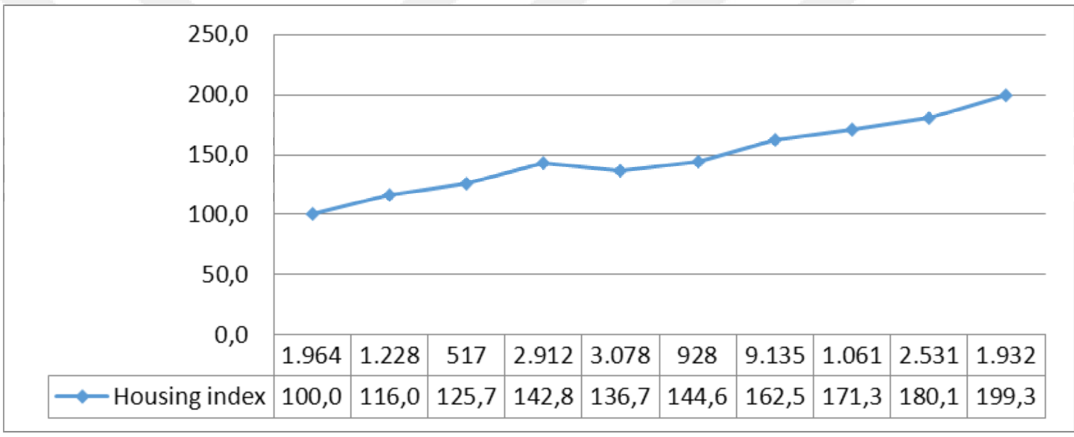
Year	Q 1	Q 2	Q 3	Q 4	Ave. Index	E&O '000,000	
2005	98.4	98.7	101.0	101.9	100.0	1,964	
2006	105.6	118.9	119.7	119.7	116.0	1,228	
2007	124.5	125.8	125.9	126.6	125.7	517	
2008	138.8	153.8	142.2	136.6	142.8	2,912	
2009	135.4	136.6	137.4	137.5	136.7	3,078	
2010	142.3	142.8	145.5	147.8	144.6	928	
2011	154.3	161.0	166.7	168.2	162.5	9,135	
2012	170.3	171.3	171.4	172.1	171.3	1,061	
2013	175.3	178.2	182.3	184.5	180.1	2,531	
2014	195.1	198.5	201.7	201.9	199.3	1,932	16.92

Source: World Bank

[1] Housing indices are constructed from the statistics of housing statistics that present an indication of the urban population, the building permits that the economy has issued and lastly the number of housing completions

Looking at this presentation, it is evident that there is a very strong relationship between the housing indices and the balance in the errors and omissions accounts. In particular, the beta calculations for the same translate as 16.92 ratio relationships between the two. This imperatively can be translated as factual to the concentration of the housing index influence on the value of the error and omission balance by a cumulative 16.92 percent. With this assumption, it will equally be practical to assume that the housing index equally provide for the 16 percent figure balance of payments in the current account balances. With all factors constant, this suggestion is described by the relationship between image 1 and image 2.

Graph 2.1: Plotting average housing index against errors and omissions balances from 2005 to 2014:



Source: World Bank

The trend in the housing index reveals a spectral growth in the presentation of the current account balance as earlier suggested. Nevertheless, what this trend and the graph present is the effect that housing indices have on the positivity of the errors and omissions accounts. Keeping in mind that these are in the number of new construction units, and they have an effect on the boost to the positive value of the errors and omissions balance. Subject to the defence by Ibrahim (2013), this translates into an assertion of the errors and omissions being the main push in the boost that the Turkish economy has received from the year 2004 to 2014.

Therefore, it will be important to estimate and evoke the reality that is behind the formation of the periodic positive value in the net errors and omissions balance as one that is associated with the major players affecting housing revenues in Turkey. Looking at what Emrath (2014) suggests that the revenues that are attributed to construction are very influential in maintaining a positive balance of payment by the state. With the article invoking a comparative economy of the United States that is estimating an average of $ 110,957 in taxes for a single family home, the magnitude of housing taxes cannot be assumed. Equally, looking the revelation of the Turkish statistical Institute; also, the description of the Turkish housings construction rate also reveals a smiling mode for the revenue collection with the 2014 permits bid adjustments raising these rates on square area construction by more than 86 percent (Turkish Statistical Institute, 2015)

2.2 REAL EFFECTIVE EXCHANGE RATE OF TURKISH LIRA

Röhn (2015) analyze the consequences of 2001 macroeconomic crisis in Turkey that has led to extreme interest rate surges and default levels of housing loans, many of which were adjustable-rate. After the crisis, Turkish government started to abolish adjustable-rate loans altogether and to allow only fixed-rate lending. Because of that decision, the limited product range created difficulties for both consumers and lenders. The lack with access to long-term fixed-rate funding in Turkish Lira, with which landers has faced incurred large interest rate mismatches, or had to resort to swapped EUR or USD funding, which made them dependent on foreign counterparties. TYR BASKET INV declined from 1,039717197 in 2001 Q1 to 0,729288215 in 2001 Q4. Due to the funding risks involved, maturities shortened to 5–8 years.

Köhn and Pischke (2011) discuss the additional amortization burden, cumulated with interest rates in the range of 15–20 percent into payment rates that made housing loans unaffordable. At the same time, Turkish borrowers, considering about 30 percent devaluation of the Turkish Lira in 2001, were loath to take loans in foreign currencies, policy to address affordability that is widely used among some emerging markets. During 2004 and 2005 interest rates declined and Turkish government began reforming housing finance, liberalizing mortgage products, while presenting new consumer protection and foreclosure legislations. The new housing finance law allows adjustable-rate loans. However, the rate adjustments need to be connected with an official index and an interest rate cap is needed for the three initial years of the loan (Köhn and Pischke, 2011).

As inflation remains one of the biggest economic problem for Turkey. Ciampi (2009) discuss Turkish stabilization policy of 2000, which were based on a crawling exchange rate and has led to the deepest economic crisis in Turkish history, in February 2001. Central Bank of the Republic of Turkey had no other choice than to release Turkish Lira to floating course. Thus, according to Ciampi (2009), Turkish Lira experienced massive depreciation, which resulted in the annual inflation rate soaring to 68 percet at the end of 2001. The fiscal program, which were started in 2002 aimed to fast paced disinflation. The plan was to reduce inflation rate to 35 percent in 2002, in 2003 achieve reduce to 20 percent, in 2004 reduce inflation rate to 12 percent, and in 2005 to 8 percent. Taking into account the idea to bringing inflation down from historically high levels, CBRT interpreted these numbers as “upper bounds” but not as point targets. Nevertheless, results were surprisingly successful and during the period of implicit inflation targeting, inflation dropped from 68 percent at the end of 2001 to 7,7 percent at the end of 2005 (Ciamp, 2009).

International Business Publications (2015) analyze Turkish economic policy regarding inflation decreasing. Thus, after period of steadily fall between 2002 and 2005, inflation expectation became more volatile, particularly because of frequent overshooting of inflation targets, since 2010 inflation expectations have stabilized. The CBRT began to set point inflation targets in 2002 and then 2006 it shifted towards a fully-fledged inflation-targeting regime with a medium-term mid-point and a ± 2 percent uncertainty band. The inflation target, however, has been breached every year since 2006 except in 2009 and 2010 years, when mid-point of the target was increased to 7.5 and 6.5 percent correspondingly from a previously constant 4 percent. This action has likely contributed to pushing up inflation expectations (IBP, 2015).

2.3 HOUSING TRENDS IN TURKEY COMPARED TO GLOBAL CHANGES

According to the most recent trends that were released by one of the leading global audit and accountancy companies, the housing sector in Turkey maintains the key interest that it has been having as a global example of positivity to net balances (Delliote and Touche, 2015). In essence, this reveals what had been earlier on highlighted as a repetitive trend in the housing revenues that the Turkish government has managed to source. Seemingly, the sources from the World Bank other than the data that shows the growth in this sector seem to concur with the exponential growth in this sector. In fact, Dilek (2015) goes ahead to describe the Turkish housing sector as one of the strongest and emergent real estate trends in Europe. Perhaps it will be interesting to identify the trends that are exhibiting and pushing this upward and the positive performance of the Turkish real estate market.

In general, there is some lesson that can be learned from history, in the tradition financial securities market, the ranking of housing and generally property mortgages were ranked as a triple A (AAA). By this, it meant that the stability of the housing sector ever defaulting as a mean of security was one of an almost 100 percent guarantee. According to the presentation by Puri et al., (2011) on the aftermath of the economic crisis of the Year 2007 and 2008, the main reason was the soaring of mortgage securities in the United States. Based on this description, one will wonder why the Turkish market is however seemingly less volatile and might still rate as an AAA investment. The concept of the triple A investment describes a position in which the defaulting option that borrowers might have cannot be very severe to reach the point at which borrower will default and opt to lose property or housing. In essence, this analogy seems to be still very valid in the Turkish economy.

The World Bank (2010) describes the housing market in Turkey as driven by the demand fuelled by a combinations of population growth, increased records and statistics in urbanisation, growth in the personal and collective economy’s income the most important of these affordable financing for housing. (See appendix 5)

2.3.1 Availability of Affordable Finance for Housing

In many texts, this might be assumed to be mortgages fee and mortgage loans. However, the Turkish case is presumably very different. As per Dilek (2015), there exists a price bubble factor in the Turkish housing market. For this reason, there has been a good comparison of the VAT on rents and income from housing, which seem to the factor holding this sector constant to sanity. Nevertheless, their analysis takes into consideration the price to rent ratios and the price to income ration all dispel similar trends [see appendix 5 and appendix 6]. These trends tend to have some implicit reference to a similar presentation like that of the American market. This is primarily based on the fact that the income collective generated in the economy can be argued to have been reinvested in the economy all based on the assumption of future returns being rewarding. However, as far as literature over the American 2007 and 2008 crisis is concerned, the finances into this mortgage crisis were all borrowed. Nevertheless, the Turkish economic system seems to be working on a different doctrine of the cost of finance for the housing sector. Reinvestment of income in the economy depicted by the trend by Dilek (2015) is proof of the fact of creating capital. Therefore, it will be very assertive of this text to imply that wealth creation from the housing case in Turkey is the key factor in the positive growth and positive trends in the net errors and omissions balance. Nevertheless, this picks cannot be assumed to have been all smooth owing to the analysis of Dilek (2015) that equally scripts of disparities in the cost of construction, the inflation rates and the prices for new houses [see Appendix 7]. This relationship, however, describes the rate of housing growth as higher than those of inflation even with the promise by the government of Turkey to help in financing first time buyer.

2.3.2 The Urgency of Need for Housing

According to an article written by Sur, World Bank, 2010, shows the push that the economy in Turkey has had on the housing sector as a push that is warranted by the urgency in transformation. This in essence describes an immediate geophysical and natural push for good housing. The Turkey regions are prone to a number of historical earthquakes, and this essentially presents the seismic plates that geography concerns, with a record of 38 earthquakes in history and damages amounting to $ 16 billion. With this description, the need for urban housing that was quality and very durable was very eminent. In essence, the text is the description of the demand for the market in Turkey is one that created naturally. It is with such urgency that equally the government and other international organizations like the World Bank seem to have encouraged the growth of profitability for this sector of their economy. In particular, the private sector seems to have equally joined in the profits generation, it will, therefore, be true to assume that with heavy capital investments from the government and the internal organisation subject to the natural calamities, the performance of the sector was one that was set for profitability.

With the description that has been maintained in the presentation of the errors and omissions account balance, the expectation will be for Turkey to record more positive shifts in housing balances as Property Wire (2014) equally predicts. This will imply on the growing demand of housing and the fact that the government has equally identified support for first time owners, equally the foreign sales subject to the years 2013 and 2014 record growth from 10,710 homes to 17,104 homes, which is a 59.70 percent increment.

With the report that revels in the natural calamities in the Turkish economy, it will be implicit that the states will spend heavily in this sector making it even more productive. In particular, this will mean that the net errors and omissions balances as recording on the balance of account payment for the country will be on a rising trend based on these geographical pushes. On the other extreme, it will be imperative to consider the eventuality of the feared catastrophes in the Turkish economy. In particular, this describes as the eventuality of the feared quakes damages in the market. This will again imply a repeated cycle of damages and another construction boom. In essence, this means that the vitality and the expectation of this market falling and therefore affecting the errors and omissions balance can be material but only to the of very limited periods of time. Equally with the expectations of Property Wire (2014) description of better tidings for the local housing market, this arguably presents as a situation in which the market will be in a boom preferable and amusable more than the current rate seen in the year 2014.

Looking at the text presentation, it will be true to state that the Turkish economy will for a long time be an epitome of the reality behind the description of how best to offset the balance of payment using the errors and omissions net balance. From the initial description the growth in housing data in Turkey, to the defence that the world bank has provided in this literature review, it will be true to assume that the description of the net error and omissions can be a crucial balancing point for GDP performance. In particular, this implies of the reality behind the growth in the housing sector lays in the capital creation rather than what the American description had initially maintained as compared with the failure in the 2007 – 2008 financial crisis lessons from the mortgage sector.

Therefore, it will be imperative to describe that the current trends that are seen in the positive balance growth in the Turkish economy, are materially from the growth of the net errors and omission balance equally trailing from the housing sector in Turkey.

3. DATA AND METHADOLOGY

In economics, testing causality among various variables is a significant, but difficult task since it is a social science assignment that is non- experimental. In an empirical data, only one sole factor is put under investigation as all other factors remain fixed. The fixed ones are the possible causes of fluctuation of a dependent factor. Therefore, the researcher can experiment every independent factor with the dependent variable and leave the other variables fixed and observe the effect (Chang 2007). Besides, in economics, which is a social science, every variable affects a similar variable in a simultaneous way. Therefore, experiments cannot be a solution of getting an effect from the independent variables. Unlike science, in social science there are various challenges that a researcher has to overcome. For instance, when two factors correlate in social science, it does not mean that one factor is a causality of the other (Lin 2015). This fact makes it hard for one to differentiate between such two factors. This challenge leads to another challenge where the researcher tends to ignore some common factors (Lin 2015). The result is the disappearance of the major causality carrying on the minor ones. In all the social science fields, the two challenges may not have possible solutions. Since the social scientists and philosophers are the most affected, they apply graphical models, especially when curbing the second challenge. For the first one, the fact remains that cause always paves the way for the effect (Pasquale 2015). Although correlation in social science does not imply causality, one has to assume some issues to get the analysis of the cause and effect.

In that study, the dependent variable is Net Error and Omission data for Turkey. As the description of World Bank, 'Net errors and omissions are derived as the balance on the financial account minus the balances on the current and capital accounts.' On the other hand, there are three different independent variables. One of them is 'Building Index'. According to World Bank: 'Housing indices are constructed from the statistics of housing statistics that present an indication of the urban population, the building permits that the economy has issued and lastly the number of housing completions.' In addition, the computation of the index is done with the average of highs and lows of the corresponding year. However, it was not possible to reach those index values for the observed years. That's why, we did not put them into account for the data analysis.

Secondly, housing loan is another independent variable used during the analysis. Housing loan is described as, purchasing money to raise capital to buy a real estate. The last independent variable for this study is real effective exchange rate for Turkey. Real effective exchange rate, in other words Turkish Lira Basket is described by World Bank as: “Nominal effective exchange rate is the weighted average value of the Turkish lira relative to the basket of the countries’ currencies that have a significant share in Turkey's foreign trade. Weights are determined using bilateral trade flows. As for real effective exchange rate, it is obtained by purifying relative price effects in nominal effective exchange rate.

For the analysis, quarterly data is used between the years 1999 and 2014. As a package program, Minitab, E-Views and SPSS are used for the tests.

Regression Analysis should be performed to see the relationship between dependent variable and independent variables. However, we did not give the results of regression since the normality assumption of the regression analysis is not provieded. In addition, there was serial correlation on housing loans variable. Moreover, the amount of data was not enough to apply regression analysis. The dependent variable, net error and emission, may highly correlate with the other independent factors but are they all causalities? To answer that question, Granger Causality Test is performed to see if the independent variables are a cause of the dependent variable. Lastly, to perform Granger Causality test, firstly the data is tested if they are stationary or not with Augmented Dickey Fuller test.

3.1 REGRESSION ANALYSIS

Regression analysis entails the identification of the relationship between a given dependent variable and other independent variables. A hypothesized model of the relationship together with estimates of the variable values is used to form an approximated regression equation. When the model is satisfactory after being tested, it can be utilized to forecast the figures of the dependent variable once given those of the independent variable. For instance, a linear regression model that describes an association between a dependent variable y and an independent variable x can be represented as

$$Y = \alpha_0 + \alpha_1 X + k \tag{3.1}$$

Regression analysis mostly utilizes the least square method in the development of the estimates of the parameters (Vogt and Johnson). The correlation coefficient can be described as a measure of linear relationship present between two variables. The correlation coefficient values lie between -1 and +1. A coefficient of +1 shows that the two variables that are studied has a perfect positive relationship. On the other hand, coefficients of -1 show that the two variables studied have a perfect negative relationship. In a simple linear regression, the square root of the coefficient of determination gives as the sample correlation coefficient (Vogt and Johnson). Regression correlation analysis, however, does not determine the cause and effect of the relationship between variables. It just indicates how and to what extent variables are related to each other. The correlation coefficient is used in measuring the degree of linear association between two variables. Therefore, the conclusion on the cause and effect of the relationship between variables has to be based on the views of the analyst.

Lastly, to apply regression analysis, some assumptions should be provided. The most important ones are; the residuals should be normally distributed, no serial correlation or autocorrelation should be detected. For the multiple regression, the independent variables should be unreliant to each other, which means heteroscodasticity.

3.2 ADF (AUGMENTED DICKEY-FULLER TEST STATISTIC)

Augmented Dickey-Fuller is one of the statistical tests used to test stationarity of the series (unit root in time series). Dickey and Fuller pioneered it in 1979 with an objective of examining the null hypothesis that the series contain unit root against the alternative that it is stationary. Attempts to regress non-stationary series would generate spurious results (results with a high R-squired that is not representative), (Brooks, 2008). The test is conducted on three series; without an intercept, with an intercept, and with an intercept and a trend. The t-statistic is used to determine the series suitability for regression, especially because most of time series data are non-stationary.

First ADF t-test on series of order (p) that has no trend and with a potential slow-turning around zero, in such a test, the following equation is estimated (Alexander 2008).

$$\Delta Y_t = \varphi Y_{t-1} + \theta_1 \Delta Y_{t-1} + \theta_2 \Delta Y_{t-2} + \cdots + \theta_p \Delta Y_{t-p} + \mu_t \quad (3.2)$$

The lag length determined by either Schwartz Bayesian Information Criterion (SIC) or minimizing the Akaike Information Criterion (AIC) or dropping lags until the statistically significant is determined. Most of statistical software provides these options to choose from. ADF does not have a time trend or an intercept. While applying this test, t-statistic is used to estimate φ and it is referred as ADF t-statistic. However, Dickey-Fuller t-test does not follow the conventional t-distribution because its sampling distribution has a long left hand tail and it is skewed to the left. The statistic software used provides critical values for the test. It is necessary to note that the test is left tailed.

While conducting the ADF t- tests, the following null hypothesis is tested (Choi 33):

$$H_0: \varphi = 0$$

Against the alternative

$$H_1: \varphi < 0$$

In case the test accepts the null hypothesis (therefore reject the alternative), the error term is not white noise and, therefore, the series is non-stationary and should be differenced to make it stationary. In case the null hypothesis is rejected (therefore reject the null), the error term is white noise and the data need not to be differenced.

The second case, Augmented Dickey-Fuller is used to test a series that is potentially slow-turning around a non-zero value and flat. In testing the stationarity of such data, the following equation is used.

$$\Delta Y_t = \theta_0 + \varphi Y_{t-1} + \theta_1 \Delta Y_{t-1} + \theta_2 \Delta Y_{t-2} + \cdots + \theta_p \Delta Y_{t-p} + \mu_t \quad (3.3)$$

This equation has no time trend but has a constant value that is an intercept. Similar as with the first case, the lag length is determined by SIC, AIC, and dropping logs till the significant lag is reached. Statistical packages provide these options to choose from. Once the lag length is determined, the value of φ is determined using t-statistics and the conclusion whether the error term is normally distributed and the data would require to be differenced before estimating the series.

While conducting the ADF t- tests for the above series, the following null hypothesis is tested (Choi 33):

$H_0: \varphi = 0$

Against the alternative

$H_1: \varphi < 0$

If $\varphi = 0$ then we accept the null hypothesis and reject the alternative. This means that the error term is not white noise and, therefore, the data in question is not stationary and, therefore require differencing to make it stationary. In case $\varphi < 0$ the null hypothesis is rejected and accept the alternative that the error term is white noise and the data should be regressed without differencing.

The third Augmented Dickey-Fuller t-test is on series with a trend either up or down and is potentially slow-turning around and has a trend. To test the normality of the error term for such data, the following equation is tested.

$$\Delta Y_t = \theta_0 + \varphi Y_{t-1} + \gamma\rho + \theta_1 \Delta Y_{t-1} + \theta_2 \Delta Y_{t-2} + \cdots + \theta_p \Delta Y_{t-p} + \mu_t \qquad (3.4)$$

The above equation has an intercept and a trend. Just like the previous two applications, SIC, and AIC, and optimum lag testing that are provided an option in statistical packages. The t-statistic is used to test φ coefficient to determine whether the series is stationary or include time trend in the regression model to correct the deterministic trend. The test is also left-tailed.

The ADF t- tests for the above series model; the following null hypothesis is tested (Strauss 2004):

$H_0: \varphi = 0$

Against the alternative

$H_1: \varphi < 0$

If $\varphi = 0$ and the null hypothesis and reject the alternative. This means that the data is not stationary and, therefore, the data in question require differencing to make it stationary. In case $\varphi < 0$ the null hypothesis is rejected and accept the alternative that the data is trend stationary and need to be analyzed using time trend rather than making it stationary. Exponential trend requires the data to be converted into log linear before making it stationary.

The critical value for the augmented Dickey-Fuller statistic with intercept and without trend is –2.96 (p = 0.05 percent) and series with intercept and trend is –3.56 (p = 0.05 percent).

3.3 GRANGER CAUSALITY ANALYSIS

According to Granger, when defining causality, one has to assume that what has passed causes or affects what is present and that is to come always. The other assumption is that the cause contains important details about the effect (Chang 2007). These applications are applicable in the Granger Causality method to achieve the goals of the causality test. The two assumptions help one to understand, which variable Granger causes the other. For instance, a variable ‘z’ becomes a Granger cause of variable ‘y’ if the past values for variable ‘z’ contain handy information in predicting values for variable ‘y’ (Pasquale 2015).

Granger-Causality has a number of components. The first one is temporary and explains that variable ‘y’ can only be Granger-Caused by past values of variable ‘Z’. Since the future never affects the past or the present, the values of variable ‘y’ can never affect variable ‘Z’. The other component is exogeneity; it implies that variable ‘Z’ should not Granger- Cause variable ‘Y’ for it to be exogenous of ‘y’ (Chang 2007). The third component is independence; this implies that the two variables, ‘y’ and ‘z’, can only be independent if they do not Granger-Cause one another. The last component is asymmetry: it is related to the first component where the past of variable ‘Z’ granger-Cause variable ‘Y’. In asymmetric interpretation, if variable ‘Z’ Granger-Cause variable ‘Y’, then the values of variable ‘Y’ have no impact on the future of variable ‘Z’. This test is also keen on time series to evaluate which variable is preceding the other, or they are in a simultaneous move. Thus, Granger-Causality does not simply express a causality relationship between variables. It is not a must for one variable be a cause or effect of the other one. This test applies to both the bi-variate and multivariate variable (Pasquale 2015).

The Granger causality test of this research will use various methods to analyze how the independent factors affect the dependent factor. The dependent variable, net error and emission, may highly correlate with the other three independent factors but are they all causalities. It will also investigate whether they have any effect on the dependent variable or they just correlate. Besides, it will find out which of the three variables has the highest effect on net errors and emission variable. To answer these questions, the researcher has to use various methods to investigate and analyse them.

3.3.1 Traditional Granger-Cause Method

One of the common methods is the traditional Granger-Cause method. It is the Granger-Causality test that is applicable when testing the causal correlation of two variables: it involves the use of simple VAR (Vector Auto regression). In this method, one regresses variable 'y' to its lagged values and also to lagged values of valuable 'Z'. After the regression, one performs a null hypothesis that explains that the approximated coefficients for the lagged values of 'z' are equal to zero (Chang 2007). The rejection of this null hypothesis implies that variable 'z' is a Granger-Cause of variable 'y'. Variable 'z' becomes a Granger Cause of 'y' if the history of 'z' and 'y' combined can easily predict the history of 'y' in a better way than how the history of variable 'y' can explain itself (Chang 2007). The Granger Cause becomes absent in situations where the history of 'z' has no effect on the history of variable 'y', meaning that the equation results to zero.

$$Yt = a0 + a1Yt\text{-}1 + \ldots + apYt\text{-}p + b1zt\text{-}1 + \ldots + bpzt\text{-}p + ut \qquad \textbf{(3.5)}$$

$$Zt = c0 + c1zt\text{-}1 + \ldots + cpzt\text{-}p + d1Yt\text{-}1 + \ldots + dpYt\text{-}p + vt \qquad \textbf{(3.6)}$$

On the other hand, the researcher concludes on Granger–Causality in the two variables if the equation is greater than zero.

$$Yt > a0 + a1Yt\text{-}1 + \ldots + apYt\text{-}p + b1zt\text{-}1 + \ldots + bpzt\text{-}p + ut \qquad \textbf{(3.7)}$$

$$Zt > c0 + c1zt\text{-}1 + ... + cpzt\text{-}p + d1Yt\text{-}1 + ... + dpYt\text{-}p + vt \quad \textbf{(3.8)}$$

By assuming that a, b, c, and d are not correlated, in equation (3.7), expresses variable 'y' is lagged by variable 'z' and vice versa is illustrated in equation (3.8). Although the traditional Granger-Causality method is easy to apply, it has several limitations. One of the drawbacks is that this method is biased: it does not consider the effects that other variables may have on the independent variable (Pasquale 2015). Thus, it becomes sensitive when specifying a model and also when analysing the number of lags. If this method was not biased, it could give differing results. Thus, this method becomes fragile and unreliable, especially if it were to give Granger-Causality empirical evidence between two variables. The other drawback is that data on time series in this method is non-stationary. The integration between the two variables makes the F-test invalid (Chang 2007). This is because the distribution of the statistical data for the two variables is never standard. However, a researcher can solve this problem by investigating the importance of each coefficient using the t-statistic test. Due to such drawbacks, the research Granger causality can combine this method with other methods. The other method that can strengthen the Traditional Granger-Causality test is the VAR procedure as Toda and Yamamoto explain.

3.3.2 Toda and Yamamoto's VAR Procedure

Toda and Yamamoto's VAR procedure is a multivariable VAR representation that can solve the problem of biasness in the previous methods (Chang 2007). However, the problem of non-stationary becomes worse in this method. The variables in this method are multiple and, therefore, the probability of them having the same time trend is low. For instance, Net and Error omission may have different effects from the three independent variables during similar time duration. As such, it becomes hard to analyse the integration of various variables and get the accurate VAR (Shaouelgi, Boulila 2015). Nevertheless, this method remains applicable since, in a number of studies, the interest is highly on the hypothesis test other than the co-integration affiliation.

In addition to Toda and Yamamoto's VAR procedure, the researcher applies other procedures to evaluate the co-integration of the multiple variables (Jin 2008). Such methods include the Johansen procedure and also that of Stock and Watson. These two procedures relate the rank of a VAR model matrix and its distinctive derivation. Johansen used this procedure in a co-integration analysis, but it involved the transformation of VAR into an ECM (Error Corrected Model) to pin-point the coefficients related to the causality (Jin 2008).

To avoid integration and complexity, in calculating cause and effects of construction in Turkey, the Granger Causality test can agree to Toda and Yamamoto's VAR procedures. The statistical implication of this method illustrates valid parameter estimation even when the VAR is not co-integrating. In any case, a number of researchers are not interested in testing the transformation of VAR to ECM (Shaouelgi, Boulila 2015). Thus, the T and Y VAR procedures make the investigation easy and bring out clear and accurate estimations. The major concern of Toda and Yamamoto's VAR procedure is evaluating the importance of the lagging valuables, which is a major goal when testing an analysis of multiple variables.

3.4 COINTEGRATION ANALYSIS

Introduced in 1980 by Clive Granger and Paul Newbold, and improved by Robert Engle and Granger in 1987, cointegration analysis has become an essential instrument for representation, testing, estimating and modeling of time series analysis. Clive Grander (2010), founder of cointegration method explain how the cointegration method were developed, and discuss some possible ways of where cointegration method could be applied next. In addition, Grander (2010) also discussing some issues that may be possible in the cointegrated quantile time series, for example as with inequalities within the standard VAR model (Grander, 2010).

Thus, Carol (2008) in discuss application of cointegration analysis in analysis of market risk, and its practical application for financial econometrics. Author provide a broad research over academic publications on the existence of cointegration in financial markets, and concludes that cointegration is widely applied in hedge funds, trading strategies, commodity analyst models, etc. (Carol, 2008). Bleikh and Young (2014) analyze application of cointegration as common econometric tool for empirical analysis in areas, where long-run relations affect observed values, for example, where long-term interest rates determined by short-term rates, etc.

Hendry and Juselius (2006) describe the concept of cointegration with its empirical application in modelling and forecasting of statistical econometrics. Special interest authors dedicate to discussion over the inference procedures appropriate in integrated-cointegrated vector autoregressive processes (VARs). Particular attention has been paid to the properties of such processes, to the modelling of deterministic terms, and to the determination of the cointegration vector numbers. In their research, Hendry and Juselius (2006) conclude that application of cointegration analysis requires careful thought about model specification and interpretation, and an increased emphasis on the appropriate treatment of deterministic terms.

3.4.1 Wald Test

The survey conducted by Cameron and Trivedi reveals that the Wald test is an outstanding hypothesis, which requires estimation of the unrestricted model without the imposition of the restrictions of the null hypothesis. Modern technological systems allow estimation of unrestricted modes even if it appears to be more difficult. Cameron and Trivedi define the main disadvantage of the Wald test, which lies in the lack of invariance to algebraically equivalent parametrization of the null hypothesis (Cameron 2005).

Patrick K. Watson states that the test tends to perform the data with the aim to check for restrictions on the parameters of statistical models based on sample data. Moreover, it is one of the three basic tests of checking restrictions, along with the Lagrange multiplier test and the likelihood ratio test. The test is asymptotic, which means that the reliability of the findings demands a large amount of data (Watson 2010).

Christine Preisach points out that the Wald test on the spatial parameters after estimation on the general model is one of the most reliable approaches to reveal the nature of spatial correlation (Preisach 2015). In comparison to the Language Multiplier test, the power of a spatial error parameter of Wald test appears to be higher in a presence of the non-zero spatial lag parameters. The sparser weighting matrix provides ensures a power of the Wald test.

Alastair R. Hall provides two disadvantages of the Wald test. The first lies in irrelevancy to a reparameterization of the mods or the restriction, which means that the outcome of the Walt test might provide unpredictable statistics. The second disadvantage lies in being less well approximate by the x^2 distribution in finite samples in comparison with the Lagrange multiplier test and the likelihood ratio test (Alastair 2005).

4. FINDINGS

Table 3.1: Descriptive Statistics

	N	Minimum	Maximum	Mean	Std. Deviation	Skewness		Kurtosis	
	Statistic	Statistic	Statistic	Statistic	Statistic	Statistic	Std. Error	Statistic	Std. Error
NET ERROR OMI.	67	-3316,00	2918,00	2,0873E2	1320,52690	-,203	,293	-,081	,578
NEO Accumulated	67	561,00	15455,00	8,5445E3	3873,77475	-,395	,293	-1,072	,578
TRY BASKET	67	,3882	3,2039	1,682085E0	,5895288	-,190	,293	,470	,578
TRY BASKET INV	67	,31212	2,57599	,7334631	,47278562	2,443	,293	5,462	,578
HOUSING LOANS	64	7,31E7	1,69E10	4,7561E9	3,78308E9	,762	,299	,303	,590
Valid N (listwise)	64								

Descriptive statistics are given to see the summary of the variables. In other words, the general poinst of the variables such as mean, normality, and standart deviation can be observed from the table above. According to descriptive statistics results, 64 valid samples are used. None of the variables are normally distributed. That's why, regression analysis could not applied. All of the variables have some standart deviation. However the highest variability is observed in accumulated net error and omission variable. The lowest variability is observed in real effective Exchange rate of Turkish Lira with 0.47.

Table 3.2: Augmented Dickey-Fuller and Philips-Perron Stationary Tests

			Daily	Daily	Daily
TRY Basket	Trend and Intercept	Level	-4,0886	1,10%	S
Housing Loans	Trend and Intercept	Level	-5,5255	0,1%	S
NEO	Trend and Intercept	Fisr Difference	-7,7112	0,,00%	S

Augmented Dickey Fuller test is applied to see if the variables of time series are stationary at level, or not. To see, the exact results. ADF test is applied with the presence of trend and intercept. As it is mentioned in the methodology part, if the variables are stationary at level, it is not possible to apply cointegration analysis. In the table above, since TRY Basket and Housing loans are stationary at level, I could not apply granger causality test, instead net error and omission is stationary at first difference.

Moreover it is possible to apply VAR for the data.

Table 3.3: Estimates of VAR Model and WALD Tests and Granger Causality Test

Net Error Omission vs	Wald Test			Granger Causality Test (From Convenience yields to ZCIS Rate)		
	Lags[1]	Probability	Decision[2]	f-statistic	Probability	Decision[3]
Housing Loans	4	13,09%	No short term causality from Hosing Loans to NEO	1,7738	14,88%	Housing Loans DOES NOT Granger caus NEO
TRY Basket	1	72,14%	No short term causality from try Basket to NEO	0,0809	72,27%	TRY Basket DOES NOT Granger cause NEO

Even it is not possible to apply Granger causality test with stationary variables, I applied it to see the insignificant results. According to Akaike and Schwartz Information criteria, 4 lags for housing loans, and 1 lag for real effective exhange rate found appropriate. As I mentioned before, with 95 percent confidence level, Granger causality test could not reject the null hypothesis. That means, there is no significant Granger cause between housing loans to net error omission and real effective Exchange rate to net error omission.

Table 3.4: Estimates of Serial Correlation, Breusch-Pagan-Godfrey Heteroscedasticity and Normality Tests

	Serial Correlation			Breusch-Pagan-Godfrey Heteroscedasticity Test		Normality Testing	
Variables	Lags[1]	Chi-Square Probability	Decision[2]	Chi-Square(14) Probability	Decision[3]	Jarque-Bera Probaility	Decision[4]
Housing Loans	4	3,84%	Serial Correlation Exists	59,09%	No Heteroscedasticity	74,17%	Not Normally Distributed
TRY Basket	1	70,78%	No Serial Correlation	23,12%	No Heteroscedasticity	89,42%	Not Normally Distributed

According to the results of Heteroscodasticity test (Breusch Pagan Godfrey), normality test (Jarque-Berra), Wald test, VAR model and Granger causality analysis;

Firstly, none of the variables are normally distributed. On the other hand, we cannot detect heteroscodasticity among any of the variables. Moreover, serial correlation exists on housing loans. However, for TRY basket, there is no serial correlation detected. When we look at the Granger causality results, housing loans does not granger cause on net error and omission. The other way round is also valid. That means, TRY basket also does not cause granger causality. For all of the decisions, 95 percent reliability is used.

As it is mentioned in the methodology part, the serial correlation and the distribution of the variables prevent us to apply regression analysis.

Table 3.5: Cointegration Analysis

Unrestricted Cointegration Rank Test (Trace)

Hypothesized No. of CE(s)	Eigenvalue	Trace Statistic	0.05 Critical Value	Prob.**
None *	0.318394	31.66518	25.87211	0.0085
At most 1	0.098643	6.750473	12.51798	0.3713

However according to results, cointegration analysis is statistically significant with 95 percent trustworthy when net error and omission is dependent. Thant means, it is possible to say that there is a significant cause and effect relationship between variables. As it is mentioned in the methodology part, Granger causaltiy analysis looks at long run relationship. That means, there is a Granger causality between variables in the long run.

5. DISCUSSION AND CONCLUSION

As a conclusion, the aim of that study was answering that question: Does housing sector have an effect on net error and omission of Turkey's budget, since the net error and omission is a kind of indicator of untaxed money. For that, we checked net error and omission of Turkey, housing loans and also, real effective exchange rate. According to the results, cointegration analysis was statistically significant. On the other hand, since we have stationary data at level for net error and omission, we could not apply Granger causality test.

All in all, the lags of the variables are determined according to Akaike Information Criterion and Schwarz Information Criterion. Two different lagged models are found as appropriate. With the Wald test, we checked if housing loan is a good variable for the cause and effect relationship. In the first model, four lag is applied for housing loans and real effective Exchange rate. According to the results of Wald test, we could not reject the null hypothesis. That means, the model is not significant.

Secondly, the data was not normally distributed according to Jarque-Berra results. There were no autocorrelation and heteroscodasticity according to Breusch Godfret tests.

Lastly, we could apply cointegration analysis with the results found. Cointegration results rejected null hypothesis with 95 percent confidence level. It is possible to say that there is no short term relation with housing sector and net error omission according to data used. However, it might be possible to say, in the long run, they are of relevance.

The main reason behind insignificant results might be the limited resource for Turkey. Housing data are recently collected. That means, there is no out of order test. In the future, if more data is collected, it will be possible to apply out of sample test and using more appropriate methods.

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Appendix 1

Data Set

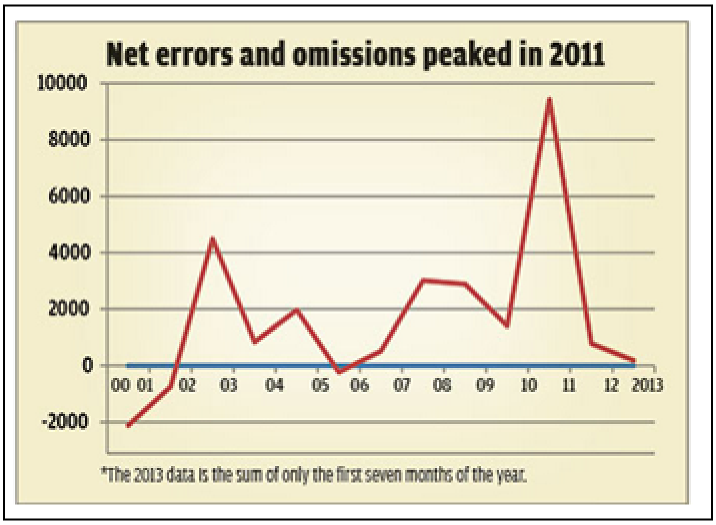
Date	NET ERROR OMISSIONS	NEO Accumulated	TYR BASKET	TYR BASKET INV	HOUSING LOANS
31.3.1999	561	561	0,3882	2,575991757	73140000
30.6.1999	817	1378	0,4286	2,333177788	96280000
30.9.1999	788	2166	0,4763	2,099517111	91850000
31.12.1999	528	2694	0,5473	1,827151471	203810000
31.3.2000	445	3139	0,5768	1,73370319	1036020000
30.6.2000	224	3363	0,6054	1,651800463	1862170000
29.9.2000	423	3786	0,6262	1,596933887	2065690000
29.12.2000	554	4340	0,647	1,545595054	1768160000
30.3.2001	-112	4228	0,9618	1,039717197	136950000
29.6.2001	-864	3364	1,1587	0,863036161	79340000
28.9.2001	-966	2398	1,4658	0,682221313	91290000
31.12.2001	1328	3726	1,3712	0,729288215	173340000
29.3.2002	-754	2972	1,2624	0,792141952	235970000
28.6.2002	-409	2563	1,5799	0,632951453	773350000
30.9.2002	181	2744	1,6522	0,605253601	766770000
31.12.2002	994	3738	1,6955	0,58979652	804100000
31.3.2003	628	4366	1,7928	0,557786702	1037750000
30.6.2003	1333	5699	1,5232	0,656512605	1220460000
30.9.2003	173	5872	1,5068	0,663658083	1957820000
31.12.2003	1965	7837	1,5888	0,629405841	3789550000
31.3.2004	1425	9262	1,465	0,682593857	6364480000
30.6.2004	1218	10480	1,6443	0,608161528	8909370000
30.9.2004	-199	10281	1,6875	0,592592593	5286250000
31.12.2004	636	10917	1,5822	0,632031349	6566210000
31.3.2005	1074	11991	1,5513	0,644620641	2674914432
30.6.2005	1570	13561	1,4707	0,679948324	3070679000
30.9.2005	-1311	12250	1,4832	0,674217907	4085883000
30.12.2005	-2105	10145	1,4759	0,67755268	4478967000
31.3.2006	1333	11478	1,4911	0,670645832	5225733000
30.6.2006	451	11929	1,8083	0,553005585	6167372000
29.9.2006	-493	11436	1,718	0,582072177	1733237000
29.12.2006	-1306	10130	1,6419	0,60905049	2477814432
30.3.2007	416	10546	1,617	0,61842919	2445707921
29.6.2007	-993	9553	1,5333	0,652188091	4122337616
28.9.2007	-2781	6772	1,4603	0,684790796	4279964709
31.12.2007	-478	6294	1,4432	0,692904656	4686533195
31.3.2008	2528	8822	1,7086	0,585274494	5338118062
30.6.2008	-3316	5506	1,5812	0,632431065	4736859490

30.9.2008	9	5515	1,5285	0,654236179	3704384796
31.12.2008	2182	7697	1,847	0,541418517	1580609235
31.3.2009	1839	9536	1,9366	0,516368894	2478973147
30.6.2009	952	10488	1,851	0,540248514	3972123723
30.9.2009	-402	10086	1,829	0,546746856	5990524340
31.12.2009	728	10814	1,8227	0,548636638	8780666879
31.3.2010	-829	9985	1,7848	0,560286867	6543199147
30.6.2010	-1048	8937	1,7618	0,567601317	7527883712
30.9.2010	-376	8561	1,7086	0,585274494	6853165866
31.12.2010	-276	8285	1,8058	0,553771182	10897186326
31.3.2011	273	8558	1,8663	0,535819536	9770539894
30.6.2011	1880	10438	1,9879	0,503043413	9379439278
30.9.2011	923	11361	2,1748	0,459812397	5327081391
30.12.2011	-768	10593	2,1712	0,460574797	5278661872
30.3.2012	1990	12583	2,0806	0,480630587	4799125252
29.6.2012	-828	11755	2,0515	0,487448209	6814300826
28.9.2012	1946	13701	2,0545	0,486736432	6520870863
31.12.2012	-996	12705	2,0681	0,483535612	10334269494
29.3.2013	-1715	10990	2,0642	0,484449181	12339062256
28.6.2013	-2033	8957	2,2182	0,450815977	16917626858
30.9.2013	2893	11850	2,3742	0,421194508	11196068396
31.12.2013	687	12537	2,5515	0,391926318	9946817251
31.3.2014	2918	15455	2,5442	0,393050861	7243016551
30.6.2014	-1624	13831	2,5098	0,398438123	7802323244
30.9.2014	-290	13541	2,5781	0,387882549	10487981243
31.12.2014	-1122	12419	2,5791	0,387732155	10991177330

Source: Bloomberg

Appendix 2

Trends in the net errors and omissions balance 2000-

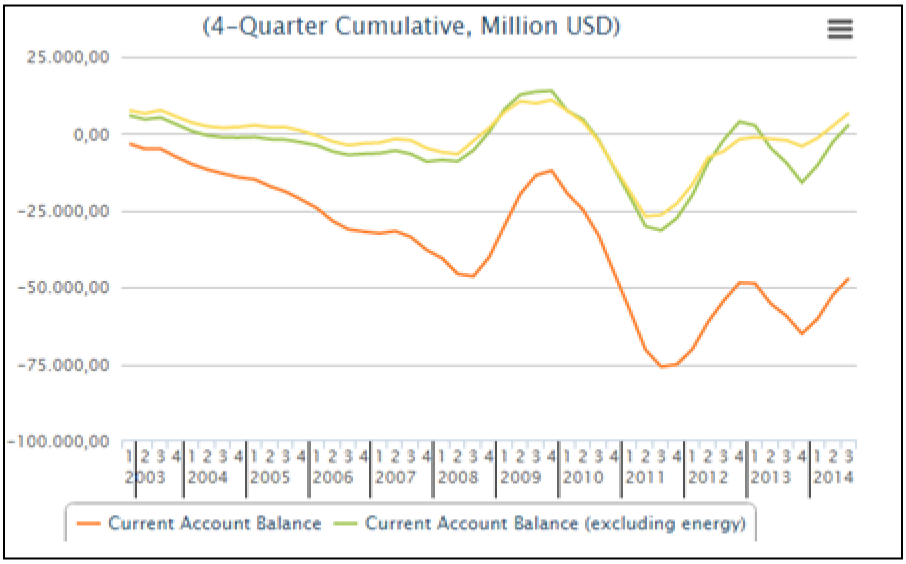


2014

Source: Ibrahim, 2013

Appendix 3

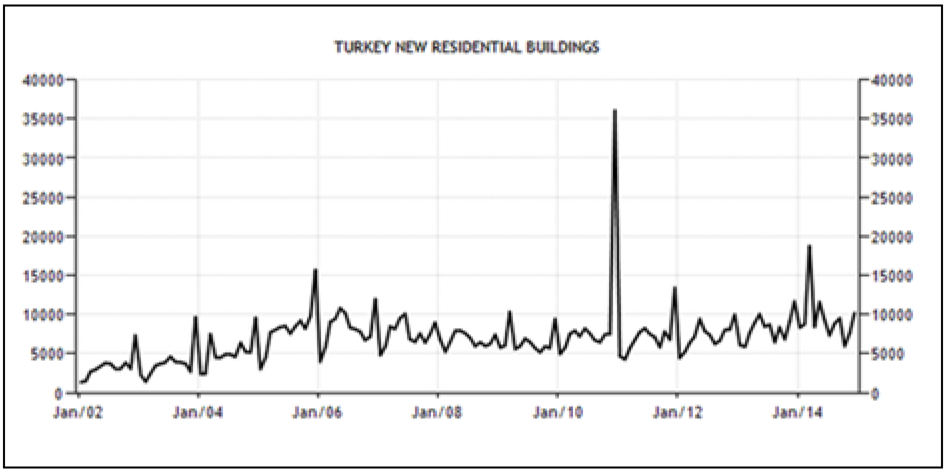
Current account balance trends [4th Quarter cumulative 2003 -2014]



Source: Ibrahim, 2013

Appendix 4

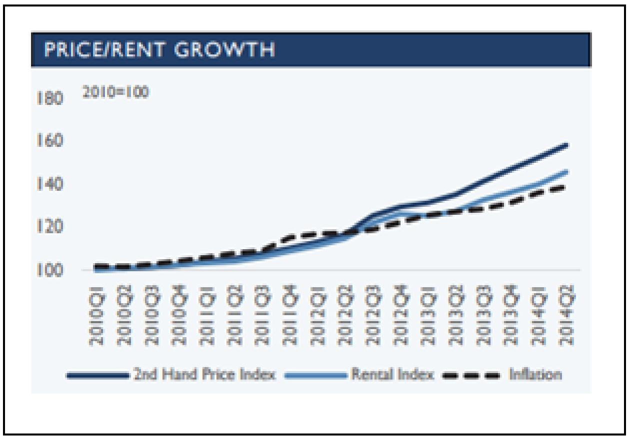
Turkey's New Residential Buildings



Source: Central Bank of Turkish Republic

Appendix 5

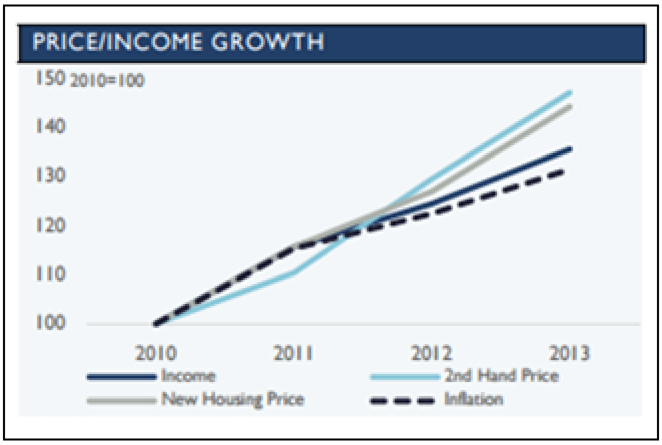
Price Rent Growth



Source: Türkiye İstatistik Kurumu

Appendix 6

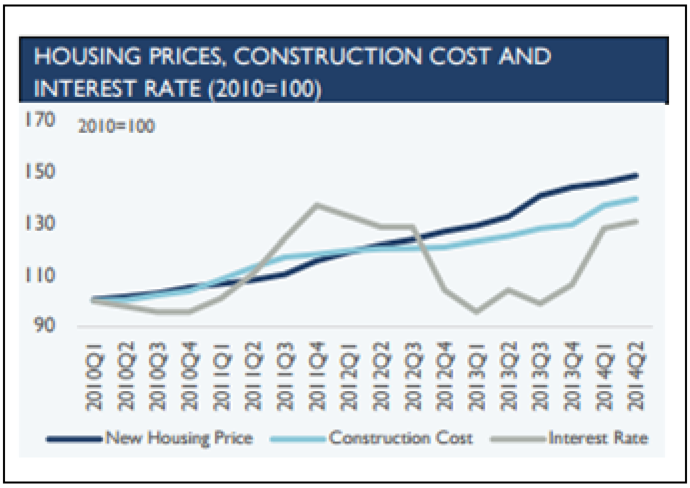
Price Income Growth



Source: Türkiye İstatistik Kurumu

Appendix 7

Housing Prices



Source: Türkiye İstatistik Kurumu

Appendix 8

Results

Null Hypothesis: HOUSING_LOANS has a unit root
Exogenous: Constant, Linear Trend
Lag Length: 2 (Automatic - based on AIC, maxlag=10)

		t-Statistic	Prob.*
Augmented Dickey-Fuller test statistic		-5.525518	0.0001
Test critical values:	1% level	-4.115684	
	5% level	-3.485218	
	10% level	-3.170793	

*MacKinnon (1996) one-sided p-values.

Augmented Dickey-Fuller Test Equation
Dependent Variable: D(HOUSING_LOANS)
Method: Least Squares
Date: 11/25/15 Time: 21:09
Sample (adjusted): 1999Q4 2014Q4
Included observations: 61 after adjustments

Variable	Coefficient	Std. Error	t-Statistic	Prob.
HOUSING_LOANS(-1)	-0.638287	0.115516	-5.525518	0.0000
D(HOUSING_LOANS(-1))	0.281524	0.122927	2.290179	0.0258
D(HOUSING_LOANS(-2))	0.463916	0.120570	3.847698	0.0003
C	-4.30E+08	4.48E+08	-0.961435	0.3405
@TREND("1999Q1")	1.08E+08	22412514	4.827547	0.0000

R-squared	0.373359	Mean dependent var	1.79E+08
Adjusted R-squared	0.328599	S.D. dependent var	1.96E+09
S.E. of regression	1.61E+09	Akaike info criterion	45.31128
Sum squared resid	1.45E+20	Schwarz criterion	45.48430
Log likelihood	-1376.994	Hannan-Quinn criter.	45.37909
F-statistic	8.341356	Durbin-Watson stat	1.840629
Prob(F-statistic)	0.000024		

Null Hypothesis: D(NEO_ACCUMULATED) has a unit root
Exogenous: Constant, Linear Trend
Lag Length: 0 (Automatic - based on AIC, maxlag=10)

		t-Statistic	Prob.*
Augmented Dickey-Fuller test statistic		-8.053734	0.0000
Test critical values:	1% level	-4.105534	
	5% level	-3.480463	
	10% level	-3.168039	

*MacKinnon (1996) one-sided p-values.

Augmented Dickey-Fuller Test Equation
Dependent Variable: D(NEO_ACCUMULATED,2)
Method: Least Squares
Date: 11/25/15 Time: 21:09
Sample (adjusted): 1999Q3 2015Q3
Included observations: 65 after adjustments

Variable	Coefficient	Std. Error	t-Statistic	Prob.
D(NEO_ACCUMULATED(-1))	-1.038300	0.128922	-8.053734	0.0000
C	305.3823	352.0833	0.867358	0.3891
@TREND("1999Q1")	-3.078981	9.010302	-0.341718	0.7337

R-squared	0.511850	Mean dependent var	17.89231
Adjusted R-squared	0.496104	S.D. dependent var	1912.199
S.E. of regression	1357.387	Akaike info criterion	17.30957
Sum squared resid	1.14E+08	Schwarz criterion	17.40992
Log likelihood	-559.5609	Hannan-Quinn criter.	17.34916
F-statistic	32.50511	Durbin-Watson stat	1.976710
Prob(F-statistic)	0.000000		

Null Hypothesis: TYR_BASKET_INV has a unit root
Exogenous: Constant, Linear Trend
Lag Length: 7 (Automatic - based on AIC, maxlag=10)

		t-Statistic	Prob.*
Augmented Dickey-Fuller test statistic		-10.62528	0.0000
Test critical values:	1% level	-4.121303	
	5% level	-3.487845	
	10% level	-3.172314	

*MacKinnon (1996) one-sided p-values.

Augmented Dickey-Fuller Test Equation
Dependent Variable: D(TYR_BASKET_INV)
Method: Least Squares
Date: 11/25/15 Time: 21:11
Sample (adjusted): 2001Q1 2015Q3
Included observations: 59 after adjustments

Variable	Coefficient	Std. Error	t-Statistic	Prob.
TYR_BASKET_INV(-1)	-0.514973	0.048467	-10.62528	0.0000
D(TYR_BASKET_INV(-1))	0.033983	0.077807	0.436765	0.6642
D(TYR_BASKET_INV(-2))	0.006633	0.077564	0.085521	0.9322
D(TYR_BASKET_INV(-3))	0.054601	0.070030	0.779679	0.4393
D(TYR_BASKET_INV(-4))	-0.132592	0.068766	-1.928149	0.0596
D(TYR_BASKET_INV(-5))	0.175051	0.071403	2.451596	0.0178
D(TYR_BASKET_INV(-6))	0.055989	0.074607	0.750461	0.4566
D(TYR_BASKET_INV(-7))	0.113735	0.072148	1.576401	0.1214
C	0.420457	0.042763	9.832301	0.0000
@TREND("1999Q1")	-0.003400	0.000490	-6.932342	0.0000

R-squared	0.801959	Mean dependent var	-0.020906
Adjusted R-squared	0.765584	S.D. dependent var	0.083741
S.E. of regression	0.040544	Akaike info criterion	-3.419571
Sum squared resid	0.080549	Schwarz criterion	-3.067446
Log likelihood	110.8773	Hannan-Quinn criter.	-3.282115
F-statistic	22.04703	Durbin-Watson stat	1.841248
Prob(F-statistic)	0.000000		

Dependent Variable: D(NEO_ACCUMULATED)
Method: Least Squares
Date: 11/25/15 Time: 20:44
Sample (adjusted): 2000Q2 2015Q1
Included observations: 60 after adjustments
D(NEO_ACCUMULATED) = C(1)*D(NEO_ACCUMULATED(-1)) + C(2)
*D(NEO_ACCUMULATED(-2)) + C(3)*D(NEO_ACCUMULATED(
-3)) + C(4)*D(NEO_ACCUMULATED(-4)) + C(5)
*HOUSING_LOANS(-1) + C(6)*HOUSING_LOANS(-2) + C(7)
*HOUSING_LOANS(-3) + C(8)*HOUSING_LOANS(-4) + C(9)

	Coefficient	Std. Error	t-Statistic	Prob.
C(1)	0.006408	0.134207	0.047747	0.9621
C(2)	-0.096322	0.134223	-0.717628	0.4763
C(3)	-0.018952	0.135094	-0.140290	0.8890
C(4)	0.207279	0.135609	1.528505	0.1326
C(5)	-8.97E-08	9.93E-08	-0.903864	0.3703
C(6)	-1.39E-08	1.27E-07	-0.109786	0.9130
C(7)	3.24E-07	1.27E-07	2.542587	0.0141
C(8)	-2.22E-07	9.93E-08	-2.234685	0.0298
C(9)	147.6783	316.1281	0.467147	0.6424

R-squared	0.167987	Mean dependent var	164.7500
Adjusted R-squared	0.037476	S.D. dependent var	1361.343
S.E. of regression	1335.591	Akaike info criterion	17.36962
Sum squared resid	90973968	Schwarz criterion	17.68377
Log likelihood	-512.0885	Hannan-Quinn criter.	17.49250
F-statistic	1.287144	Durbin-Watson stat	1.924146
Prob(F-statistic)	0.271111		

Wald Test:
Equation: Untitled

Test Statistic	Value	df	Probability
F-statistic	1.821766	(4, 51)	0.1390
Chi-square	7.287065	4	0.1215

Null Hypothesis: C(5)=C(6)=C(7)=C(8)=0
Null Hypothesis Summary:

Normalized Restriction (= 0)	Value	Std. Err.
C(5)	-8.97E-08	9.93E-08
C(6)	-1.39E-08	1.27E-07
C(7)	3.24E-07	1.27E-07
C(8)	-2.22E-07	9.93E-08

Restrictions are linear in coefficients.

Pairwise Granger Causality Tests
Date: 11/25/15 Time: 20:46
Sample: 1999Q1 2015Q3
Lags: 4

Null Hypothesis:	Obs	F-Statistic	Prob.
HOUSING_LOANS does not Granger Cause D(NEO_ACCUMULATED)	59	1.77386	0.1488
D(NEO_ACCUMULATED) does not Granger Cause HOUSING_LOANS		0.90660	0.4673

Dependent Variable: D(NEO_ACCUMULATED)
Method: Least Squares
Date: 11/25/15 Time: 20:50
Sample (adjusted): 1999Q3 2015Q3
Included observations: 65 after adjustments
D(NEO_ACCUMULATED) = C(1)*D(NEO_ACCUMULATED(-1)) + C(2)
*TYR_BASKET_INV(-1) + C(3)

	Coefficient	Std. Error	t-Statistic	Prob.
C(1)	-0.036745	0.128715	-0.285477	0.7762
C(2)	115.9190	407.5193	0.284450	0.7770
C(3)	117.9355	334.8224	0.352233	0.7259

R-squared	0.002452	Mean dependent var	193.9538
Adjusted R-squared	-0.029727	S.D. dependent var	1338.037
S.E. of regression	1357.779	Akaike info criterion	17.31014
Sum squared resid	1.14E+08	Schwarz criterion	17.41050
Log likelihood	-559.5797	Hannan-Quinn criter.	17.34974
F-statistic	0.076194	Durbin-Watson stat	1.976982
Prob(F-statistic)	0.926723		

Wald Test:
Equation: Untitled

Test Statistic	Value	df	Probability
t-statistic	0.284450	62	0.7770
F-statistic	0.080912	(1, 62)	0.7770
Chi-square	0.080912	1	0.7761

Null Hypothesis: C(2)=0
Null Hypothesis Summary:

Normalized Restriction (= 0)	Value	Std. Err.
C(2)	115.9190	407.5193

Restrictions are linear in coefficients.

Pairwise Granger Causality Tests
Date: 11/25/15 Time: 20:52
Sample: 1999Q1 2015Q3
Lags: 1

Null Hypothesis:	Obs	F-Statistic	Prob.
TYR_BASKET_INV does not Granger Cause D(NEO_ACCUMULATED)	65	0.08091	0.7770
D(NEO_ACCUMULATED) does not Granger Cause TYR_BASKET_INV		0.04794	0.8274

Wald Test:
Equation: Untitled

Test Statistic	Value	df	Probability
F-statistic	0.124815	(2, 59)	0.8829
Chi-square	0.249630	2	0.8827

Null Hypothesis: C(3)=C(4)=0
Null Hypothesis Summary:

Normalized Restriction (= 0)	Value	Std. Err.
C(3)	2.30E-08	5.40E-08
C(4)	-98.75647	561.0953

Restrictions are linear in coefficients.

Pairwise Granger Causality Tests
Date: 11/25/15 Time: 20:57
Sample: 1999Q1 2015Q3
Lags: 1

Null Hypothesis:	Obs	F-Statistic	Prob.
TYR_BASKET_INV does not Granger Cause D(NEO_ACCUMULATED)	65	0.08091	0.7770
D(NEO_ACCUMULATED) does not Granger Cause TYR_BASKET_INV		0.04794	0.8274
HOUSING_LOANS does not Granger Cause D(NEO_ACCUMULATED)	62	0.01958	0.8892
D(NEO_ACCUMULATED) does not Granger Cause HOUSING_LOANS		0.03259	0.8573
HOUSING_LOANS does not Granger Cause TYR_BASKET_INV	63	0.73095	0.3960
TYR_BASKET_INV does not Granger Cause HOUSING_LOANS		1.67467	0.2006

Dependent Variable: D(NEO_ACCUMULATED)
Method: Least Squares
Date: 11/25/15 Time: 20:55
Sample (adjusted): 1999Q3 2015Q1
Included observations: 63 after adjustments
D(NEO_ACCUMULATED) = C(1)*D(NEO_ACCUMULATED(-1)) + C(2)
*TYR_BASKET_INV(-1) + C(3)*HOUSING_LOANS(-1) + C(4)

	Coefficient	Std. Error	t-Statistic	Prob.
C(1)	-0.006670	0.130849	-0.050974	0.9595
C(2)	240.4493	482.0382	0.498818	0.6198
C(3)	2.30E-08	5.40E-08	0.425717	0.6719
C(4)	-98.75647	561.0953	-0.176007	0.8609

R-squared	0.004964	Mean dependent var	184.8571
Adjusted R-squared	-0.045631	S.D. dependent var	1331.477
S.E. of regression	1361.516	Akaike info criterion	17.33197
Sum squared resid	1.09E+08	Schwarz criterion	17.46804
Log likelihood	-541.9571	Hannan-Quinn criter.	17.38549
F-statistic	0.098119	Durbin-Watson stat	2.002655
Prob(F-statistic)	0.960761		

Date: 11/25/15 Time: 21:17
Sample (adjusted): 1999Q3 2015Q3
Included observations: 65 after adjustments
Trend assumption: Linear deterministic trend (restricted)
Series: NEO_ACCUMULATED TYR_BASKET_INV
Lags interval (in first differences): 1 to 1

Unrestricted Cointegration Rank Test (Trace)

Hypothesized No. of CE(s)	Eigenvalue	Trace Statistic	0.05 Critical Value	Prob.**
None *	0.318394	31.66518	25.87211	0.0085
At most 1	0.098643	6.750473	12.51798	0.3713

Trace test indicates 1 cointegrating eqn(s) at the 0.05 level
* denotes rejection of the hypothesis at the 0.05 level
**MacKinnon-Haug-Michelis (1999) p-values

Unrestricted Cointegration Rank Test (Maximum Eigenvalue)

Hypothesized No. of CE(s)	Eigenvalue	Max-Eigen Statistic	0.05 Critical Value	Prob.**
None *	0.318394	24.91471	19.38704	0.0071
At most 1	0.098643	6.750473	12.51798	0.3713

Max-eigenvalue test indicates 1 cointegrating eqn(s) at the 0.05 level
* denotes rejection of the hypothesis at the 0.05 level
**MacKinnon-Haug-Michelis (1999) p-values

Unrestricted Cointegrating Coefficients (normalized by b'*S11*b=I):

NEO_ACCUMULATED	TYR_BASKET_INV	@TREND(99Q2)
-0.000115	3.076565	0.031312
-0.000463	-1.563714	0.047826

Unrestricted Adjustment Coefficients (alpha):

D(NEO_ACCUMULATED)	149.1469	408.4059
D(TYR_BASKET_INV)	-0.045713	0.002890

1 Cointegrating Equation(s): Log likelihood -476.2089

Normalized cointegrating coefficients (standard error in parentheses)

NEO_ACCUMULATED	TYR_BASKET_INV	@TREND(99Q2)
1.000000	-26678.83	-271.5236
	(6032.17)	(123.738)

Adjustment coefficients (standard error in parentheses)

D(NEO_ACCUMULATED)	-0.017199
	(0.01947)
D(TYR_BASKET_INV)	5.27E-06
	(1.0E-06)

Dependent Variable: D(NEO_ACCUMULATED)
Method: Least Squares
Date: 11/25/15 Time: 21:19
Sample (adjusted): 1999Q3 2015Q3
Included observations: 65 after adjustments
D(NEO_ACCUMULATED) = C(1)*(NEO_ACCUMULATED(-1) - 26678.8345434*TYR_BASKET_INV(-1) - 271.52358285 *@TREND(99Q1) + 19632.8404899) + C(2)*D(NEO_ACCUMULATED(-1)) + C(3)*D(TYR_BASKET_INV(-1)) + C(4)

	Coefficient	Std. Error	t-Statistic	Prob.
C(1)	-0.017199	0.019468	-0.883463	0.3805
C(2)	-0.026471	0.129601	-0.204249	0.8388
C(3)	1026.252	2161.925	0.474693	0.6367
C(4)	233.7153	184.6711	1.265576	0.2105

R-squared	0.013769	Mean dependent var	193.9538
Adjusted R-squared	-0.034734	S.D. dependent var	1338.037
S.E. of regression	1361.076	Akaike info criterion	17.32950
Sum squared resid	1.13E+08	Schwarz criterion	17.46331
Log likelihood	-559.2088	Hannan-Quinn criter.	17.38230
F-statistic	0.283880	Durbin-Watson stat	1.983040
Prob(F-statistic)	0.836842		

Wald Test:

Equation: Untitled

Test Statistic	Value	df	Probability
t-statistic	0.474693	61	0.6367
F-statistic	0.225334	(1, 61)	0.6367
Chi-square	0.225334	1	0.6350

Null Hypothesis: C(3)=0
Null Hypothesis Summary:

Normalized Restriction (= 0)	Value	Std. Err.
C(3)	1026.252	2161.925

Restrictions are linear in coefficients.

Breusch-Godfrey Serial Correlation LM Test:

F-statistic	0.476026	Prob. F(1,60)	0.4929
Obs*R-squared	0.511636	Prob. Chi-Square(1)	0.4744

Test Equation:
Dependent Variable: RESID
Method: Least Squares
Date: 11/25/15 Time: 21:21
Sample: 1999Q3 2015Q3
Included observations: 65
Presample missing value lagged residuals set to zero.

Variable	Coefficient	Std. Error	t-Statistic	Prob.
C(1)	0.016857	0.031293	0.538688	0.5921
C(2)	1.267043	1.841044	0.688220	0.4940
C(3)	272.7633	2206.968	0.123592	0.9021
C(4)	-249.7100	406.6814	-0.614019	0.5415
RESID(-1)	-1.289788	1.869403	-0.689946	0.4929

R-squared	0.007871	Mean dependent var	-7.00E-14
Adjusted R-squared	-0.058271	S.D. dependent var	1328.793
S.E. of regression	1366.960	Akaike info criterion	17.35237
Sum squared resid	1.12E+08	Schwarz criterion	17.51963
Log likelihood	-558.9520	Hannan-Quinn criter.	17.41836
F-statistic	0.119007	Durbin-Watson stat	1.964514
Prob(F-statistic)	0.975231		

Heteroskedasticity Test: Breusch-Pagan-Godfrey

F-statistic	1.420808	Prob. F(4,60)	0.2381
Obs*R-squared	5.624114	Prob. Chi-Square(4)	0.2290
Scaled explained SS	4.238794	Prob. Chi-Square(4)	0.3747

Test Equation:
Dependent Variable: RESID^2
Method: Least Squares
Date: 11/25/15 Time: 21:22
Sample: 1999Q3 2015Q3
Included observations: 65

Variable	Coefficient	Std. Error	t-Statistic	Prob.
C	1965733.	1427411.	1.377131	0.1736
NEO_ACCUMULATED(-1)	-24.86850	223.2216	-0.111407	0.9117
TYR_BASKET_INV(-1)	-3062205.	4079381.	-0.750654	0.4558
NEO_ACCUMULATED(-2)	98.49564	219.4427	0.448844	0.6552
TYR_BASKET_INV(-2)	1792985.	3644817.	0.491927	0.6246

R-squared	0.086525	Mean dependent var	1738527.
Adjusted R-squared	0.025626	S.D. dependent var	2292138.
S.E. of regression	2262578.	Akaike info criterion	32.17571
Sum squared resid	3.07E+14	Schwarz criterion	32.34297
Log likelihood	-1040.711	Hannan-Quinn criter.	32.24171
F-statistic	1.420808	Durbin-Watson stat	1.845908

Normality test (Jarque Bera Test)

RESIDUALS ARE NORMALLY DISTRIBUTED

PROBABILITY IS 0,861266

Prob(F-statistic)	0.238063

ÖZGEÇMİŞ

Adı Soyadı : Gülen ARIKAN

Sürekli Adresi : Mecidiye Mahallesi Çifteimamlar Sokak No:1 Daire:5 Ortaköy Beşiktaş

Doğum Yeri ve Yılı : Adana, 1990

Yabancı Dili : İngilizce

İlk Öğretim : Bilimkent Okulları, 2004

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