HAIGAZIAN UNIVERSITY

INTEGRATING THE GCC: A LOOK INTO MONEY DEMAND FUNCTIONS

By

EMAD SAMIR GHARZUDDINE

A Thesis

Submittied in Partial Fulfillment of the Requirements for the Degree of Masters In Business Adminstration of the Faculty of Business Adminstration and Economics at Haigazian University.

Beirut, Lebanon

August 2015

Haigazian University

Acknowledgement

First of all, I would like to thank my advisor and second reader, Dr. Samih Azar and Dr. Fadi Asrawi respectively, for their support and guidance through writing this thesis paper. They have put a lot with me in order to reach this milestone in my life and for that, I will be forever grateful. I thank you again.

Moreover, I would like to thank my Mom, Dad and Kareem (my brother) for their love and constant motivation throughout this period, I love you.

Last but not Least, I would also like to thank my friends (Keedi, Tones, John, Jalal, Antoine, Jawad, Aya, Khazer, Nadine, Hind, Adam, Mira, Makram, Wael, Omar, Lea and Ziad) for their patience and for being there to hear my never ending nagging during this period.

Finally, I would like to thank my girlfriend, Serena, for being there with me through the thick and thin, I love you. Like Micheal Bassey Johnson said, “People will walk in and walk out of your life, but the one whose footstep made a long lasting impression is the one you should never allow to walk out.”

An Abstract of the Thesis:

Emad Samir Gharzuddine for Masters in Business Administration emphasis Finance

Title: Integrating the GCC: A Look into Money Demand Functions

We construct an individual and panel data for GCC's six countries to estimate the money demand function of the individual countries, while examining the co-integration hypothesis among the different variables of the money demand function using Pedroni's panel co-integration tests. We find strong evidence that the money demand functions are stable, while the scale and interest elasticities signs abide by the theory. Moreover, we find out that the GCC's money demand function is only a function of income.

Contents

Introduction

Improving economic relationships on healthy foundations has dependably been a notable objective between overall countries. For that purpose, governments have been facilitating monetary, financial, and economic strategies in order to achieve an ideal win-win situation. Although conveying a typical vision for financial development does not generally mean a strong usage or achievement in that space; a few nations have been persuaded, that it is an absolute necessity to join or structure monetary unions to achieve progress. The primary motivation behind that was the raising weight of globalization and growing financial requirements that have made it harder for economies to cope all alone. A rundown of nations enriched with common topographical, social, financial, and monetary traits have tried to take after a unification of forces to achieve a monetary unification. At the highest priority on this rundown comes six Gulf nations: Bahrain, Oman, Kuwait, Qatar, Saudi Arabia, and United Arab Emirates.

The above nations now understand that their overwhelming dependence on a solitary overwhelmed commodity (oil) in such an unstable and quick paced world sector sets ahead an uncertain future for their financial vicinity. Those reasons for vulnerability have urged the Gulf nations into applying actions towards broadening the monetary bases through "improving the broadness and profundity of their budgetary and capital markets", as guaranteed by Darrat and Al-Shamsi (2005). These activities were first evident when the chosen nations decided to walk

the way of solidarity by making the Gulf Cooperation Council (GCC) in 1981. From that point forward, those 6 states were marked as the GCC nations.

Taking after that, progress has been created; although a large portion of the researchers who examined the GCC have agreed on the conspicuous moderate pace of the procedure. One of the indications of this progression was the marking of The Unified Economic Agreement between the governments of the member nations. This understanding concentrated on making general lines of participation in exchange trade, development of individuals and capital, coordination for development, specialized collaboration, transport and interchanges, and money related and financial coordination. But there has not been any studies for an OCA from the money demand function perspective. There has been a lot studies testing for OCA in different regions through different theories, mainly on Mundell's theory of Optimal Currency Area written in 1961, which focuses on labor mobility, capital mobility, trade concentration and product diversity, sticky prices, and demand and supply shocks. But he failed to stress, or even mention anything regarding money demand. In economics, money demand is the desire to hold financial assets in a form of money (bank deposits or cash). Money demand can refer to the demand of money narrowly defined as M1 (non-interest-bearing holdings) or in a broader sense with respect to M2 or M3. It can be used for stabilization purposes which is extremely important for an economy, that no one can ignore its importance. Hence studying the money demand function of individual countries, you would get a clear view about the stability in each country. Perhaps, one of the key criteria's for an OCA could be that countries should have stable money demand relations in order to achieve successful monetary integration. Basically speaking, money demand relations represent an accepted benchmark against which monetary

developments can be examined. As Rother & Diogo (1998) stated in their paper on money demand and monetary union for the countries of West Africa, that money demand stability has become a crucial element in the establishment of monetary union. They conclude that there is a stable money demand in the chosen countries, which allows for accurate future projection of a monetary union. In specific, the presence of a well-specified and stable relationship between money and prices can be observed as a pre-requisite for the use of monetary aggregates in the method of monetary policy. We test for co-integration in order to examine if in the long run the variables being tested have a correlation which is an important finding in this research paper. Moreover, after testing co-integration on an individual level, a panel co-integration is going to be examined between the GCC countries in order to see if there exists a long-run correlation between them all. Co-integration is an essential tool that needs to be used in order to give a better picture of any sort of monetary union formation. This paper covers the subject of estimating money demand functions of the 6 GCC countries and then testing for co-integration on a country-to-country level and then between the countries. The paper is divided as follow, Chapter 2 is going to be an overview of money demand. Chapter 3 would be a survey of the literature review found on money demand functions. Chapter 4 is the empirical data analysis for the money demand functions of individual GCC countries and a panel analysis, while also determining any unit roots in the variables and co-integration and the significance of the results. Chapter 5 would be pointing out the limitations of the research paper. Finally, chapter 6 would be the conclusion of the empirical data analysis.

What is Money Demand?

Demand for money is a demand of how much wealth anyone would wish to hold in the form of money at any time. It is consequently a stock demand. Wealth is a stock, and people must decide how to allocate that stock of wealth between different kinds of assets -- for example an income earning securities, a house, cash or a checking account. Holding wealth such as cash or checking deposits barely earn little or any interest. It would be more logical to hold wealth in the form of assets that yield income. Note that:

1. There is a cost connected with holding money balances (giving up interest payments),

2. There is no intrinsic value in the money balances held apart from their use as a medium of exchange. Generally, people get money in order to buy things. While holding it, money doesn't provide any other benefit.

Economists identify three types of money demand (Keynes, 1936):

1) *Transactions motive.* The transactions motive for demanding money arises from the fact that most transactions comprise a medium of exchange (exchange of money). Because it is essential to have money available for transactions, there will be demand for money. The total number of transactions in an economy tends to increase as income rises. Hence, as GDP or income rises, the transactions demand for money also rises. Regularly speaking, if an economy is healthy and steady, then there is a high transaction demand for money, as people are buying more good and services in the economy.
2) *Precautionary motive.* People demand money as a precaution against an ambiguous future. Unforeseen expenses, such as medical or car bills, often require instantaneous

payment. The need to have money accessible in such situations is discussed as the precautionary motive for demanding money.

3) *Speculative motive.* Like other stores of value, money is an asset. The demand for assets depends on both its opportunity cost and rate of return. Usually, holding money provides no rate of return and regularly depreciate in value due to inflation. The opportunity cost of holding money is the interest rate that can be earned by lending or investing the money on hand. The speculative motive for demanding money arises in circumstances where holding your own money is perceived to be less of risk than the alternate of lending the money or investing it in other assets.

A Survey of the Literature Review

In monetary economics, the quantity theory of money explains that money supply has a direct, proportionate relationship with the price level. For example, if currency increases, there would be a proportionate increase in the price of goods. This is where Cambridge equation formally represents the Cambridge cash-balance theory, an alternative approach to the classical quantity theory of money. Both quantity theories, Cambridge and classical, attempt to express a relationship among the amount of goods produced, the price level, amounts of money, and how money moves. The Cambridge equation focuses on money demand instead of money supply. The theories also differ in explaining the movement of money: In the classical version, associated with Fisher, money moves at a fixed rate and serves only as a medium of exchange while in the Cambridge approach money acts as a store of value and its movement depends on the interest of holding cash. Economists linked with Cambridge University, including Marshall, Pigou, and Keynes contributed to a quantity theory of money that gave

more attention to money demand than the money supply oriented classical form. The Cambridge economists argued that a certain percentage of the money supply will not be used for transactions; instead, it will be held for the accessibility and security of having cash directly on hand. The Cambridge economists also thought wealth would play a role, but wealth is often omitted from the equation for simplicity. The Cambridge equation is thus: ***MV = PY (where V is equivalent to 1/k).*** Where M is denoted by Money Supply, V is Velocity, P is Price Level and Y is income.

The money market is an economic model describing the demand and supply for money in a country. Businesses and consumers have a demand for money, including checking and cash and savings accounts, and they use financial institutes for this purpose. Economists illustrate money demand using a demand curve. The demand curve for money demonstrates the quantity of money demanded at a given interest rate. The demand curve for money is downward sloping, which means that people want to hold less of their wealth in the form of money the higher that interest rates on bonds and other alternative investments are. The supply curve for money demonstrates the quantity of money supplied at a given interest rate. Unlike a typical supply curve in the product market, the supply curve for money is vertical, because it does not depend on interest rates. It depends entirely on decisions made by the central bank. As Laidler (1993) said that empirical models, just like in theory, generally specify money demand as a function of real balances. Stating the equation:

M (D)/P = F(S, OC)

M (D) is Money Demand

P is the Price Level

S is the Scale Variable (for example real income, real wealth)

OC is Opportunity Cost (for example, interest rate and exchange rate)

Equilibrium in the money market takes place when the quantity of money demanded is equal to the quantity supplied. This doesn't hold for short-run estimation but in the long-run, assumption of equilibrium is usually the case, hence M (D) = M (S). To find the equilibrium in the money market, we need now to determine the supply of money. Therefore, the equilibrium in the money market is given by: M (S) / P = F (S, OC), Real Money Supply = Real Money Demand (Roubini & Backus, 1997)

Money demand function has been a popular topic in economics between developed and developing countries because it provides monetary authority with a clear picture of the actions and reactions of change in macroeconomic aggregates to a change in money supply. Sriram (1999) concluded that money demands theories are so diverse as if on spectrum, emphasizing the speculative, transaction, precautionary or utility considerations. These series address a wide range of hypotheses. One significance in particular is that, all theories share common important variables amongst nearly all of them. They bring into view relationships between quantity of money demanded and a few important variables linking the real sector of the economy to money. The difference in these series is that they might consider similar variables to explain money demand, they mostly differ in the specific role assigned to each. One consensus emerges from the literature is that empirical work is driven by a blend of theories. However, thinking of money demand function, mostly people perceive this as a function of many variables, but according to Poole (1970), he stated that in order for targeting money

supply to be viable, the money demand function needs to be parsimoniously specified and stable, or an interest rate policy would be superior otherwise.

Different authors have written about their research in different countries, and a valuable deduction from all of them is that every author uses different variables and different measures. For example, Bruggeman (2000) stated that M1 definitions tend to be relatively consistent between a lot of EU countries, which helps in comparison. While Halicioglu and Ugur (2005) backed Bruggeman statement by assessing M1 in Turkey and concluding that M1 is a good measurement because it is a good measure of the liquidity in an economy, since it largely involves financial assets held for transaction purposes. Moreover, the central bank is able to regulate this aggregate more precisely than broader aggregates as M2 and M3.

Adding on to the literature found, Ericsson, Hendry & Prestwich (1997), stated that money may be demanded in any modern economy for at least two reasons, 1) as an inventory to smooth alterations between expenditure and income streams, and 2) as one among several assets in a portfolio. Both demands lead to a long-run specification in which nominal money demand depends on the price level, a scale variable (I), inflation, and a vector of rates of returns on various assets. The conclusions of these studies are similar, they give the same deduction as the economic theory, while also estimating the elasticity's in the money demand equation (M (D)/P = F(S, OC)). As Sriram (2001) stated that the scale variable is positively related to the money demand function. The foreign interest rates exert negative influence because with an increase in foreign interest rate, it will induce the domestic residents to increase their holding of foreign assets which will funded by lowering their domestic money holdings. He found out after his

research that money and scale variables usually enter in log forms, while interest rates appear either in log form or in levels. Therefore, estimates of the coefficient for scale variable directly provides the measure of income elasticity, they exhibit either elasticity's or semi-elasticity's depending on the way they are put forward in the formulation. A couple of the countries where tested for income and interest elasticity's. For example India, Income Elasticity came out to be 0.874 & Interest Elasticity came out to be -0.109. Moreover, in Indonesia, income elasticity came out to be 0.880 & interest elasticity was -1.05.

Moreover, Bae and De Jong (2007) substantiated the theory by examining the US elasticity of money demand with respect to interest rate and stated that the interest rate shouldn't be an increasing function of the money demand, but it should be a decreasing function. This is because as the public cuts its money holdings, each consecutive reduction shouldn't be less difficult. While the interest elasticity of money demand is a decreasing function of interest rate. Baumol (1952) and Tobin (1956) used an inventory theory model for cash balances and demonstrate that the money demands transaction portion depends on interest rates, rather than what Keynes assumed. They both find from the model that Income Elasticity of Money should be 0.5 and that Interest Elasticity should be -0.5. Moreover, Handa (2000) pointed out that on the long-run income elasticity, studies reported the elasticity of M1 to be much lower than unity and usually 0.7. These differences of elasticity's between M1 and other money supply criteria's depend on the income elasticity of time deposits. Time deposit demands are controlled by portfolio decisions, while M1 demand is controlled by current transactions needed to facilitate availability of other fairly safe and highly liquid financial assets in the economy. This significantly affects the demand elasticity's for time deposits. This means is can

vary considerably among countries and over time. Moreover, according to the Stracca (2001) in his paper on the functional form of money demand M1 in the euro area, he stated that the demand for narrow money M1 in the euro area is a financial innovation that tends to push forward the ideal border between monetary and non-monetary assets, making narrow aggregates less relevant for monetary policy. He pointed out two important reasons why analyzing M1 in the euro area is interesting.

1) Due to their high degree of liquidity, Instruments included in narrow money M1 might have a tighter and timelier correlation with aggregated spending than comparatively a lesser amount of liquid financial instruments kept also for saving purposes. Narrow money may therefore be an important indicator of impending inflationary pressures.
2) An important feature of M1 is that no or little interest is paid on them.

Different tests and statistical methodologies were used in mostly each paper, even deciding if the money demand functions should be in log form or not. Zarembka (1968) concluded that the log-linear version is the most appropriate functional mathematical form for money demand because it is a form of linear combinations of the variables in the model, which makes it possible to apply linear regression (possibly multivariate). Also Azar (2014) asks an important question whether interest rate variable should enter logarithm function or not. Stating that it depends on the stability of the constrained and the unconstrained MDF over a period. When coefficients on scale and price level variables are inhibited to be unitary, then interest rate should be as is. On the other hand, when all constraints are relaxed, then interest rate enters in its logarithm form. Adding that there is evidence that imposed constraints do not hold well

statistically. The conclusion is that there should be log-log model of money demand functions. Another question comes into mind when estimating money demand function with respect to interest rate, is that should we consider short-run or long-run interest rates? According to economic fundamentals, short run interest rates may fluctuate according to demand and supply but will always tend to a long run interest rate in the long run. And since we are dealing with estimating money demand to see if it stable in the long run, the best indicator for such a function is long run interest rates.

Studies on estimating MDF's have taken two different directions. The first direction of studies (for example, Dekle and Pradhan 1997; Siddiki 2000; Pradhan and Subramanian 2003; Khalid 1999; Hoque and AlMutairi 1996; Weliwita and Ekanayake 1998; Hamori and Hamori 1999; Hamori and Tokihisa 2001; Ramajo 2001) estimate MDF's on a country-by-country basis. The reported finding had mixed results. From the studies mentioned before that find a long-run relationship, not all have clearly verified the stability of the money demand function; those that have verified stability of the MDF, however, also report mixed results (Bahmani-Oskooee and Rehman 2005). The second direction of studies has estimated money demand functions using recent developments in panel unit root and panel co-integration testing procedures. This approach to estimating money demand functions is at a promising stage. Narayan and Mishra (2009) estimated the money demand function for a panel of 5 South Asian countries, which are India, Bangladesh, Sri Lanka, Pakistan and Nepal by using panel co-integration. Their major findings is that there is evidence that the demand for money and its determinants (real income, interest rates and real exchange rate) are co-integrated both on individual level and in a panel framework. Elasticities coefficients for individual countries showed that real income and real

exchange rates have been positive, whereas the interest rate was negatively signed and only significant for India and Bangladesh. Moreover, the tests for the stability of the money demand function showed mixed results, except for Nepal, they found evidence of stable money demand functions. Dreger, Reimers and Roffia (2006) tested money demand functions & panel co-integration in ten potential EU countries (Cyprus, Czech Republic, Estonia, Hungary, Latvia, Lithunia, Malta, Poland, Slovak Republic and Slovenia) with respect to Real GDP, CPI, Interest Rate M2 and another test with the same variables while adding exchange rate. The results shows that the tests indicate no co-integration exists amongst real broad money, real GDP and the interest rate. All tests don't reject the null hypothesis of no co-integration in this panel. For the test including the exchange rates only one test rejects the null of no co-integration. Also, they performed Dynamic Ordinary Least Squares were the results came out to be that income elasticity of the money demand function is significantly above unity (equal to 1) in all cases. The panel income coefficient is higher than the comparable value for the euro area money demand function. The interest rate elasticity is significantly negative and fairly small.

Moving along the research, we want to estimate the money demand function of the GCC countries and see if they are co-integrating at an individual level and then at a panel level. Granger (1983 & 1986) demonstrated that the notion of stable long-run equilibriums is the statistical equivalence of co-integration. When co-integration does hold and if an economic shock happens that causes disequilibrium, there exists a distinct short-run dynamic adjustment method such as the error-correction model that pushes back the system towards the long-run equilibrium. Engle & Granger (1987) added on that co-integration does imply the existence of a dynamic error-correction form relating to the variables in question. Since we are dealing with

the GCC countries, there isn't a lot of data compared to other countries or regions. But looking from Perron (1991) studies, he suggested that a span of data is more important than frequency for the power of co-integration test. A key study in panel co-integration came from Pedroni (1995) who tested the null of no co-integration in dynamic panels with multiple regressors and calculated rough critical values for the tests. The tests allow for significant heterogeneity between individual members of the panel, counting heterogeneity in both the long-run co-integrating vectors along with heterogeneity in the dynamics linked with short-run deviations from these co-integrating vectors. For example, Mark & Sul (2003) have estimated MDF utilizing panel data. Mark and Sul (2003) considered the MDF for a panel of 19 OECD nations. They utilized Pedroni's (1999) panel co-integration methodology and discovered evidence of co-integration between money demands and its variables. Moreover, Nachega (2001) states that likelihood ratio tests of Cameroon are first based on assuming one co-integrating vector for analysis of the MDF. He later identifies the full system on an assumption of three co-integrating vectors and imposing restrictions on beta coefficients. He also adds that all the coefficients of the MDF have the expected signs. The MDF in Cameroon is positively elastic with respect to deposit rate and income. The income elasticity of broad money demand is positive and is estimated at 1.1 (close to unity) which is consistent with the quantity theory hypothesis. A unitary income elasticity suggests that as a real income changes, there is a proportionate increase in demand for real broad money.

Another important study which is quite relevant to the GCC, is the one done by Hamori (2008), where he analyzed the money demand function in the Sub-Saharan African region using a panel data analysis. Money demand function's empirical analysis using the unit root and co-

integration procedures is widely known to be challenging when the sample size is small. Certainly, this is applicable on the Sub-Saharan region since annual data is only available in many cases (just like the GCC). However, this problem was solved through the use of a nonstationary panel analysis, which has lately endured remarkable improvements. The results of the research confirmed co-integrating relationship of money demand in the Sub-Saharan African region. Going into more details of this literature, he analyzes the money demand function with relation to M1. He conducts three types of co-integration tests:

1) Residual-based panel co-integration test developed by Pedroni (1999, 2004): This consists of seven component tests: panel rho-test, the panel v-test, panel ADF test, panel PP-test, group rho-test, group ADF test and group PP-test. In the null hypothesis, residuals are nonstationary (i.e., there is no co-integration). In the alternative hypothesis, residuals are stationary (i.e., there is a co-integration among the variables).
2) Residual-based panel co-integration test developed by Kao (1999): same method as the Pedroni tests, but it specifies cross-section intercepts and homogeneous coefficients on the first-stage regressors. In the null hypothesis, residuals are nonstationary (i.e., there is no co-integration). In the alternative hypothesis, residuals are stationary (i.e., there is a co-integration among the variables).
3) Johansen-type panel co-integration test developed by Wu and Maddala (1999): There are two kinds of Johansen tests: Fisher test from trace test and Fisher test from maximum eigenvalue test.

Evidence of co-integration amongst the variables with relation to M1 existed in the Sub-Saharan region. After that, Fully Modified Ordinary Least Squares (FMOLS) is used to estimate the money demand function. The sign condition of the money demand with respect to the scale elasticity coefficient and interest elasticity coefficient holds as the theory stated. Caporale (2008) examines co-integration of money demand relationship in five industrial countries (Germany, Canada, USA, UK and Japan). The results for Germany, USA, UK and Canada indicate the possibility of a co-integrated relationship. He also states that money targeting appears to be a suitable monetary policy structure for Germany, USA and Canada but not in the UK, where the income elasticity is estimated to be negative, or Japan, where the relationship is not stable.

Adding to that, another recent study by Azar (2014) about Demand of Money in Lebanon, he tested co-integration between the three variables (M2, Index of Consumer and Business Confidence and foreign exchange rate) by using the Johansen (1991, 1995) approach. Moreover he applied two tests, the trace test and maximum Eigen value statistic. Estimation of coefficients came out to be 2.6465 for the scale elasticity, which is relatively much higher than 1 and could lead to a rise to diseconomies of scale for holding money. While the exchange rate elasticity came to be -2.0569. Moreover, three other alternative co-integration tests where used, which were Fully Modified OLS (Phillips and Hansen 1990), Canonical Co-integrating Regression (Park 1992) and the Dynamic OLS (Saikkonen, 1992; Stock and Watson 1993).

Looking for literature that is more relevant to our research on estimating money demand functions in the GCC, Darrat and Mutawaa (1996) estimated the UAE's money demand function. Non-Oil GDP was interpolated to obtain quarterly data and estimated an ECM by OLS.

They then regressed the first difference of UAE's M1 log on the first difference of each Non-Oil GDP log, foreign and local interest rates, nominal exchange rate, log of inflation rate and error correction term. It showed that M1 exhibits empirical superiority. Variables are stable and have the expected signs. To add upon the few research done on the GCC, Khatib and Towaijari (1999) used the OLS to estimate KSA's money demand function. Regression was done from the log of the real M1 onto the log of non-oil GDP. Residuals were used to estimate an ECM. Conclusion was that the effect of interest rate was statistically non-significant and low.

Taking into consideration everything stated in the above literature review about estimating money demand, I will be estimating the money demand function of each of the GCC countries on a country-by-country approach and then in a panel approach. Moving on to the next section is where we state the hypothesis of this thesis.

Hypotheses of the Thesis:

1) The Demand functions will be parsimonious
2) Scale Elasticity is Positive with respect to Money Demand
3) Scale Elasticity Coefficient of the individual GCC countries is 1
4) Interest Elasticity is Negative with respect to Money Demand
5) Interest Elasticity Coefficient of the individual GCC countries is – 0.5
6) Variables are non-stationary on an individual level
7) Variables are non-stationary on a panel level
8) Panel Co-integration with relation to M1 is significant
9) Panel Interest Rate will be affected by Saudi Arabia

10) Money Demand Function of the GCC is a function of Income as the Cambridge School of Thought states

Data Analysis:

Data and Sample: Yearly Data for the period 1980 – 2014 collected from the International Monetary Fund (IMF), World Bank, UN Data, Arab Monetary Fund, Banque Du Liban, International Financial Statistics (IFS), UNCTAD, Zawya and Bloomberg Finance.

Methodology: Estimating the money demand functions using the co-integration, applying the Augmented Dicky-Fuller test, and applying the Johansen-Juselius Co-integration test on each individual money demand function and then using a panel co-integration test on the panel money demand function.

Variables:

Dependent Variables:

- M1

Independent Variables:

- Real GDP
- Consumer Price Index
- Interest Rate

LOG (M1/CPI):

Variable	***LOG (M1/CPI)***				
Augmented Dicky-Fuller Level					
Country (Lag) [Sample Size]	**ADF T-Stat**	**Probability**	**Critical Value 1%**	**Critical Value 5%**	**Critical Value 10%**
Bahrain (1) [30)	-2.738397	0.2293	-4.2846	-3.5629	-3.2153
Kuwait (0) [31]	-0.766839	0.9585	-4.2733	-3.5578	-3.2124
Oman (0) [31]	-0.94941	0.9372	-4.2733	-3.5578	-3.2124
Qatar (0) [31]	-0.94941	0.9372	-4.2733	-3.5578	-3.2124
Saudi Arabia (0) [31]	0.739721	0.9995	-4.2733	-3.5578	-3.2124
United Arab Emirates (0) [31]	-1.363638	0.8524	-4.2733	-3.5578	-3.2124
Augmented Dicky-Fuller First Difference Level					
Country	**ADF T-Stat**	**Probability**	**Critical Value 1%**	**Critical Value 5%**	**Critical Value 10%**
Bahrain (0) [30)	-4.349084	0.0086	-4.2846	-3.5629	-3.2153
Kuwait (0) [30]	-5.042726	0.0016	-4.2846	-3.5629	-3.2153
Oman (0) [30]	-6.791617	0	-4.2846	-3.5629	-3.2153
Qatar (0) [31]	-6.791617	0	-4.2846	-3.5629	-3.2153
Saudi Arabia (0) [30]	-5.0692	0.0015	-4.2846	-3.5629	-3.2153
United Arab Emirates (0) [30]	-5.07691	0.0014	-4.2846	-3.5629	-3.2153

Table 1: ADF Log (M1/CPI)

United Arab Emirates:

First we test the Log (M1/CPI) for non-stationarity on the Level and then on the first difference. The null hypothesis is LOG (M1/CPI) UAE has a unit root, while the alternate hypothesis is LOG (M1/CPI) UAE has no unit root. The results come out as follows:

Taking the absolute value of the ADF t-statistic comes out to be 1.363638 which is smaller than the critical values at 1%, 5% and 10% levels. Hence we do not reject the null, meaning that the Log (M1/CPI) is non-stationary at Level. Moving on to the first difference test

Taking the absolute value of the ADF t-statistic comes out to be 5.076910 which is larger than the critical values at 1%, 5% and 10% levels. Hence we reject the null, meaning that the Log (M1/CPI) is stationary at first difference level.

Bahrain:

Testing the Log (M1/CPI) for non-stationarity on the Level and then on the first difference. The null hypothesis is Log (M1/CPI) BA has a unit root, while the alternate hypothesis is Log (M1/CPI) BA has no unit root. The results come out as follows:

Taking the absolute value of the ADF t-statistic comes out to be 2.738397 which is smaller than the critical values at 1%, 5% and 10% levels. Hence we do not reject the null, meaning that the Log (M1/CPI) is non-stationary at Level. Moving on to the first difference test

Taking the absolute value of the ADF t-statistic comes out to be 4.349084 which is larger than the critical values at 1%, 5% and 10% levels. Hence we reject the null, meaning that the Log (M1/CPI) is stationary at first difference level.

Oman:

First we test the Log (M1/CPI) for non-stationarity on the Level and then on the first difference. The null hypothesis is Log (M1/CPI) OM has a unit root, while the alternate hypothesis is Log (M1/CPI) OM has no unit root. The results come out as follows:

Taking the absolute value of the ADF t-statistic comes out to be 0.949410 which is smaller than the critical values at 1%, 5% and 10% levels. Hence we do not reject the null, meaning that the Log (M1/CPI) is non-stationary at Level. Moving on to the first difference test

Taking the absolute value of the ADF t-statistic comes out to be 6.791617 which is larger than the critical values at 1%, 5% and 10% levels. Hence we reject the null, meaning that the Log (M1/CPI) is stationary at first difference level.

Kuwait:

Testing the Log (M1/CPI) for non-stationarity on the Level and then on the first difference. The null hypothesis is Log (M1/CPI) KW has a unit root, while the alternate hypothesis is Log (M1/CPI) KW has no unit root. The results come out as follows:

Taking the absolute value of the ADF t-statistic comes out to be 0.766839 which is smaller than the critical values at 1%, 5% and 10% levels. Hence we do not reject the null, meaning that the Log (M1/CPI) is non-stationary at Level. Moving on to the first difference test

Taking the absolute value of the ADF t-statistic comes out to be 5.042726 which is larger than the critical values at 1%, 5% and 10% levels. Hence we reject the null, meaning that the Log (M1/CPI) is stationary at first difference level.

Qatar:

First we test the Log (M1/CPI) for non-stationarity on the Level and then on the first difference. The null hypothesis is Log (M1/CPI) QA has a unit root, while the alternate hypothesis is Log (M1/CPI) QA has no unit root. The results come out as follows:

Taking the absolute value of the ADF t-statistic comes out to be 0.949410 which is smaller than the critical values at 1%, 5% and 10% levels. Hence we do not reject the null, meaning that the Log (M1/CPI) is non-stationary at Level. Moving on to the first difference test

Taking the absolute value of the ADF t-statistic comes out to be 6.791617 which is larger than the critical values at 1%, 5% and 10% levels. Hence we reject the null, meaning that the Log (M1/CPI) is stationary at first difference level.

Saudi Arabia:

Note that Saudi Arabia does not deal with interest rates as it is religiously forbidden in the country, therefore the interest rate variable is not applicable for Saudi Arabia.

First we test the Log (M1/CPI) for non-stationarity on the Level and then on the first difference. The null hypothesis is Log (M1/CPI) SA has a unit root, while the alternate hypothesis is Log (M1/CPI) SA has no unit root. The results come out as follows:

Taking the absolute value of the ADF t-statistic comes out to be 0.739721 which is smaller than the critical values at 1%, 5% and 10% levels. Hence we do not reject the null, meaning that the Log (M1/CPI) is non-stationary at Level. Moving on to the first difference test

Taking the absolute value of the ADF t-statistic comes out to be 5.069200 which is larger than the critical values at 1%, 5% and 10% levels. Hence we reject the null, meaning that the Log (M1/CPI) is stationary at first difference level.

Significance:

Non-stationary data is defined as unpredictable and cannot be forecasted or modeled. The results attained by using non-stationary time series may be false in that they may indicate a connection between two variables where one does not exist. In order to receive stable, reliable results, the non-stationary data needs to be converted into stationary data. In comparison to the non-stationary process that has a variable variance and a mean that does not remain adjacent, or returns to a long-run mean after a certain amount of time, the stationary process reverts around a continuous long-run mean and has a constant variance which is independent of time. As we have tested under the Log (M1/CPI) form of every country, the variable is non-stationary at Level or at a first difference level for each separate country. This is a good indication, because when the variable is differentiated, it becomes stationary, which is a positive indication for forecasting future movements. This gives us evidence that we are able to

proceed with the Johansen – Juselius co-integration test to see the relationship between the variables in every individual country.

LOG (GDP/CPI):

Variable	*LOG (GDP/CPI)*				
Augmented Dicky-Fuller Level					
Country (Lag) [Sample Size]	**ADF T-Stat**	**Probability**	**Critical Value 1%**	**Critical Value 5%**	**Critical Value 10%**
Bahrain (0) [33]	-2.264465	0.4409	-4.2529	-3.5485	-3.2071
Kuwait (0) [33]	-2.570459	0.2951	-4.2529	-3.5485	-3.2071
Oman (0) [33]	-1.968865	0.5969	-4.2529	-3.5485	-3.2071
Qatar (0) [33]	-2.180208	0.4849	-4.2529	-3.5485	-3.2071
Saudi Arabia (0) [33]	-2.615998	0.276	-4.2529	-3.5485	-3.2071
United Arab Emirates (0) [33]	-2.31056	0.4173	-4.2529	-3.5485	-3.2071
Augmented Dicky-Fuller First Difference Level					
Country	**ADF T-Stat**	**Probability**	**Critical Value 1%**	**Critical Value 5%**	**Critical Value 10%**
Bahrain (0) [32]	-5.247388	0.0008	-4.2627	-3.553	-3.2096
Kuwait (1) [31]	-5.312893	0.0008	-4.2733	-3.5578	-3.2124
Oman (0) [32]	-6.562628	0	-4.2627	-3.553	-3.2096
Qatar (0) [32]	-5.577695	0.0004	-4.2627	-3.553	-3.2096
Saudi Arabia (0) [32]	-4.77318	0.0028	-4.2627	-3.553	-3.2096
United Arab Emirates (0) [31]	-4.266486	0.0102	-4.2733	-3.5578	-3.2124

Table 2: ADF Log (GDP/CPI)

United Arab Emirates:

Testing the Log (GDP/CPI) for non-stationarity on the Level and then on the first difference. The null hypothesis is Log (GDP/CPI) UAE has a unit root, while the alternate hypothesis is Log (GDP/CPI) UAE has no unit root. The results come out as follows:

Taking the absolute value of the ADF t-statistic comes out to be 2.310560 which is smaller than the critical values at 1%, 5% and 10% levels. Hence we do not reject the null, meaning that the Log (GDP/CPI) is non-stationary at Level. Moving on to the first difference test

Taking the absolute value of the ADF t-statistic comes out to be 4.266489 which is larger than the critical values at 5% and 10% levels, but not at 1% whose t-statistic comes out to be 4.273277. Hence we reject the null at 5% and 10%, but not at 1%, meaning that the Log (GDP/CPI) is stationary at first difference level for critical values 5% and 10%.

Bahrain:

Testing the Log (GDP/CPI) for non-stationarity on the Level and then on the first difference. The null hypothesis is Log (GDP/CPI) BA has a unit root, while the alternate hypothesis is Log (GDP/CPI) BA has no unit root. The results come out as follows:

Taking the absolute value of the ADF t-statistic comes out to be 2.264465 which is smaller than the critical values at 1%, 5% and 10% levels. Hence we do not reject the null, meaning that the Log (GDP/CPI) is non-stationary at Level. Moving on to the first difference test

Taking the absolute value of the ADF t-statistic comes out to be 5.247388 which is larger than the critical values at 1%, 5% and 10% levels, hence we reject the null, meaning that the Log (GDP/CPI) is stationary at first difference level for critical values 1%, 5% and 10%.

Oman:

Testing the Log (GDP/CPI) for non-stationarity on the Level and then on the first difference. The null hypothesis is Log (GDP/CPI) OM has a unit root, while the alternate hypothesis is Log (GDP/CPI) OM has no unit root. The results come out as follows:

Taking the absolute value of the ADF t-statistic comes out to be 1.968865 which is smaller than the critical values at 1%, 5% and 10% levels. Hence we do not reject the null, meaning that the Log (GDP/CPI) is non-stationary at Level. Moving on to the first difference test

Taking the absolute value of the ADF t-statistic comes out to be 6.562628 which is larger than the critical values at 1%, 5% and 10% levels. Hence we reject the null, meaning that the Log (GDP/CPI) is stationary at first difference level.

Kuwait:

Testing the Log (GDP/CPI) for non-stationarity on the Level and then on the first difference. The null hypothesis is Log (GDP/CPI) KW has a unit root, while the alternate hypothesis is Log (GDP/CPI) KW has no unit root. The results come out as follows:

Taking the absolute value of the ADF t-statistic comes out to be 2.570459 which is smaller than the critical values at 1%, 5% and 10% levels. Hence we do not reject the null, meaning that the Log (GDP/CPI) is non-stationary at Level. Moving on to the first difference test

Taking the absolute value of the ADF t-statistic comes out to be 5.312893 which is larger than the critical values at 1%, 5% and 10% levels. Hence we do reject the null, meaning that the Log (GDP/CPI) is stationary at first difference level.

Qatar:

Testing the Log (GDP/CPI) for non-stationarity on the Level and then on the first difference. The null hypothesis is Log (GDP/CPI) QA has a unit root, while the alternate hypothesis is Log (GDP/CPI) QA has no unit root. The results come out as follows:

Taking the absolute value of the ADF t-statistic comes out to be 2.180208 which is smaller than the critical values at 1%, 5% and 10% levels. Hence we do not reject the null, meaning that the Log (GDP/CPI) is non-stationary at Level. Moving on to the first difference test

Taking the absolute value of the ADF t-statistic comes out to be 5.577695 which is larger than the critical values at 1%, 5% and 10% levels. Hence we do reject the null, meaning that the Log (GDP/CPI) is stationary at first difference level

Saudi Arabia:

Testing the Log (GDP/CPI) for non-stationarity on the Level and then on the first difference. The null hypothesis is Log (GDP/CPI) SA has a unit root, while the alternate hypothesis is Log (GDP/CPI) SA has no unit root. The results come out as follows:

Taking the absolute value of the ADF t-statistic comes out to be 2.615998 which is smaller than the critical values at 1%, 5% and 10% levels. Hence we do not reject the null, meaning that the Log (GDP/CPI) is non-stationary at Level. Moving on to the first difference test

Taking the absolute value of the ADF t-statistic comes out to be 4.773180 which is larger than the critical values at 1%, 5% and 10% levels. Hence we do reject the null, meaning that the Log (GDP/CPI) is stationary at first difference level

Significance:

As we have tested under the Log (GDP/CPI) form of every country, the variable is non-stationary at Level and then is stationary at a first difference level for each separate country. This gives us evidence that we are able to proceed with the Johansen – Juselius co-integration test to see the relationship between the variables in every individual country.

LOG (INT):

Variable	***LOG (INT)***				
Augmented Dicky-Fuller Level					
Country (Lag) [Sample Size]	**ADF T-Stat**	**Probability**	**Critical Value 1%**	**Critical Value 5%**	**Critical Value 10%**
Bahrain (1) [28]	-0.985282	0.9307	-4.3098	-3.5742	-3.2217
Kuwait (1) [32]	-2.684066	0.2491	-4.2627	-3.553	-3.2096
Oman (0) [29]	-0.567047	0.9738	-4.2967	-3.5684	-3.2184
Qatar (2) [27]	-5.300848	0.001	-4.324	-3.5806	-3.2253
Saudi Arabia (1) [17]	-2.623121	0.2752	-4.5716	-3.6908	-3.2869
United Arab Emirates (3) [16]	-3.55138	0.0656	-4.6162	-3.7105	-3.2978
Augmented Dicky-Fuller First Difference Level					
Country	**ADF T-Stat**	**Probability**	**Critical Value 1%**	**Critical Value 5%**	**Critical Value 10%**
Bahrain (0) [27]	-4.116284	0.016	-4.324	-3.5806	-3.2253
Kuwait (2) [30]	-4.364635	0.0083	-4.2846	-3.5629	-3.2153
Oman (3) [25]	-3.374849	0.0769	-4.3561	-3.595	-3.2335
Qatar (1) [31]	-4.596297	0.0053	-4.324	-3.5806	-3.2253
Saudi Arabia (2) [15]	-3.386469	0.0886	-4.6679	-3.7332	-3.3103

United Arab Emirates (0) [18]	-2.98703	0.1607	-4.5326	-3.6736	-3.2774

Table 3: ADF Log (INT)

United Arab Emirates:

Testing the Log (INT) for non-stationarity on the Level and then on the first difference. The null hypothesis is Log (INT) UAE has a unit root, while the alternate hypothesis is Log (INT) UAE has no unit root. The results come out as follows:

Taking the absolute value of the ADF t-statistic comes out to be 3.551380 which is smaller than the critical values at 1%, 5% but not at 10% level. Hence we do not reject the null, meaning that the Log (INT) is non-stationary at Level. Moving on to the first difference test

Taking the absolute value of the ADF t-statistic comes out to be 2.987030 which is smaller than the critical values at 1%, 5% and 10% levels, hence we do not reject the null, meaning that the Log (INT) is non-stationary at first difference level for critical values.

Bahrain:

Testing the Log (INT) for non-stationarity on the Level and then on the first difference. The null hypothesis is Log (INT) BA has a unit root, while the alternate hypothesis is Log (INT) BA has no unit root. The results come out as follows:

Taking the absolute value of the ADF t-statistic comes out to be 0.985285 which is smaller than the critical values at 1%, 5% but not at 10% level. Hence we do not reject the null, meaning that the Log (INT) is non-stationary at Level. Moving on to the first difference test

Taking the absolute value of the ADF t-statistic comes out to be 4.116284 which is larger than the critical values at 5% and 10% levels, while at 1% whose t-statistic comes out to be 4.323979. Hence we reject the null at 5% and 10%, but not at 1%, meaning that the Log (INT) is stationary at first difference level for critical values 5% and 10%.

Oman:

Testing the Log (INT) for non-stationarity on the Level and then on the first difference. The null hypothesis is Log (INT) OM has a unit root, while the alternate hypothesis is Log (INT) OM has no unit root. The results come out as follows:

Taking the absolute value of the ADF t-statistic comes out to be 0.567047 which is smaller than the critical values at 1%, 5% and 10% level. Hence we do not reject the null, meaning that the Log (INT) is non-stationary at Level. Moving on to the first difference test

Taking the absolute value of the ADF t-statistic comes out to be 3.374849 which is smaller than the critical values at 1%, 5% but not at 10% levels. Hence we do not reject the null at 1% and 5% but we do reject the null at 10% because the t-statistic is larger, meaning that the Log (INT) is stationary at first difference level for critical value at 10%.

Kuwait:

Testing the Log (INT) for non-stationarity on the Level and then on the first difference. The null hypothesis is Log (INT) KW has a unit root, while the alternate hypothesis is Log (INT) KW has no unit root. The results come out as follows:

Taking the absolute value of the ADF t-statistic comes out to be 2.684066 which is smaller than the critical values at 1%, 5% and 10% level. Hence we do not reject the null, meaning that the Log (INT) is non-stationary at Level. Moving on to the first difference test

Taking the absolute value of the ADF t-statistic comes out to be 4.364635 which is larger than the critical values at 1%, 5% and 10% levels, hence we do reject the null, meaning that the Log (INT) is stationary at first difference level for critical values.

Qatar:

Testing the Log (INT) for non-stationarity on the Level and then on the first difference. The null hypothesis is Log (INT) QA has a unit root, while the alternate hypothesis is Log (INT) QA has no unit root. The results come out as follows:

Taking the absolute value of the ADF t-statistic comes out to be 5.300848 which is larger than the critical values at 1%, 5% and 10% level. Hence we do reject the null, meaning that the Log (INT) is stationary at Level. Moving on to the first difference test

Taking the absolute value of the ADF t-statistic comes out to be 4.596297 which is larger than the critical values at 1%, 5% and 10% levels, hence we do reject the null, meaning that the Log (INT) is also stationary at first difference level for critical values.

The case of Qatar being stationary is for the simple reason that the span of the data too small. As we see, we have sample size 27 and 31 in the difference levels, maybe with more data, it would affect the outcome.

Saudi Arabia:

Saudi Arabia does not deal with interest rates due to religious reasons, they deal with Islamic Banking, which non-interest-bearing funds.

Significance:

As we have tested under the Log (INT) form of every country, the variable is non-stationary at Level or at a first difference level for each separate country. This gives us evidence that we are able to proceed with the Johansen – Juselius co-integration test to see the relationship between the variables in every individual country except Saudi Arabia.

Level INT:

Variable	***(INT)***				
Augmented Dicky-Fuller Level					
Country (Lag) [Sample Size]	**ADF T-Stat**	**Probability**	**Critical Value 1%**	**Critical Value 5%**	**Critical Value 10%**
Bahrain (0) [28]	-1.1303	0.9061	-4.3098	-3.5742	-3.2217
Kuwait (1) [32]	-3.082512	0.1269	-4.2627	-3.553	-3.2096
Oman (1) [28]	-1.864561	0.6467	-4.3098	-3.5742	-3.2217
Qatar (2) [27]	-2.526272	0.3136	4.32398	-3.5806	-3.2253
Saudi Arabia (1) [17]	-2.28748	0.419	-4.5716	-3.6908	-3.2869
United Arab Emirates (3) [16]	-4.020874	0.0291	-4.6162	-3.7105	-3.2978
Augmented Dicky-Fuller First Difference Level					
Country 023103	**ADF T-Stat**	**Probability**	**Critical Value 1%**	**Critical Value 5%**	**Critical Value 10%**

Bahrain (0) [28]	-4.172582	0.0141	-4.324	-3.5806	-3.2253
Kuwait (2) [32]	-4.412329	0.0074	-4.2846	-3.5629	-3.2153
Oman (3) [28]	-3.455915	0.0657	-4.3561	-3.596	-3.2335
Qatar (1) [27]	-4.520381	0.0064	-4.324	-3.5806	-3.2253
Saudi Arabia (0) [17]	-3.192141	0.1169	-4.5716	-3.6908	-3.2869
United Arab Emirates (3) [16]	-2.702364	0.2481	-4.6679	-3.7332	-3.3103

Table 4: ADF Normal Level INT

As we shift our model into an non-logarithm form for interest rate, the results for the Log (M1/CPI) and Log (GDP/CPI) through the Augmented Dicky-Fuller test remains the same as the previous chapter, but our attention is now on the interest rate.

United Arab Emirates:

Taking the absolute value of the t-statistic, we realize that the t – stat is smaller than the critical values at 1% only and is larger than the critical values at 5% and 10%, meaning that we don't reject the null at 1%, hence the variable is non-stationary at Level. Moving onto the first difference level, the t-stat is smaller than the critical values at 1%, 5% and 10%, meaning the variable is non-stationary at first difference level.

Bahrain:

Taking the absolute value of the t-statistic, we realize that the t – stat is smaller than the critical values at 1%, 5% and 10%, meaning that we don't reject the null, hence the variable is non-stationary at Level. Moving onto the first difference level, the t-stat is smaller than the critical

values at 1% only, while it is larger than the critical values at 5% and 10%, meaning the variable is stationary at first difference level.

Oman:

Taking the absolute value of the t-statistic, we realize that the t – stat is smaller than the critical values at 1%, 5% and 10%, meaning that we don't reject the null, hence the variable is non-stationary at Level. Moving onto the first difference level, the t-stat is larger than the critical values at 10% only, while it is larger than the critical values at 1% and 5%, meaning the variable is stationary at first difference level.

Kuwait:

Taking the absolute value of the t-statistic, we realize that the t – stat is smaller than the critical values at 1%, 5% and 10%, meaning that we don't reject the null, hence the variable is non-stationary at Level. Moving onto the first difference level, the t-stat is larger than the critical values at 1%, 5% and 10%, meaning the variable is stationary at first difference level.

Qatar:

Taking the absolute value of the t-statistic, we realize that the t – stat is smaller than the critical values at 1%, 5% and 10%, meaning that we don't reject the null, hence the variable is non-stationary at Level. Moving onto the first difference level, the t-stat is larger than the critical values at 1%, 5% and 10%, meaning the variable is stationary at first difference level.

Saudi Arabia:

As stated earlier in the analysis of the Log (INT) of Saudi Arabia that it is applicable due to religious reasons. The same applies here in this section.

Significance:

As we have tested under the Level of INT form of every country, the variable is non-stationary at Level or at a first difference level for each separate country. This gives us evidence that we are able to proceed with the Johansen – Juselius co-integration test to see the relationship between the variables in every individual country except Saudi Arabia. On the other hand, Co-integration is a special case where adding a few nonstationary processes together, results in a stationary process. But there are some cases that the Level come out to be stationary. Stationary is an essential property in defining a time series process. A stationary variable fluctuates around its mean, where the mean acts as an attractor and it will cross the mean line an infinite number of ways. Moreover, as stated before, non-stationarity is important in order to apply the Johansen – Juselius co-integration test.

Johansen – Juselius Co-Integration Test:

This test of co-integration has been established in the 1990s based on a maximum likelihood estimation that was developed by Johansen. One of its numerous strengths lays in its ability to estimate long run equilibrium relationships by including short run dynamics. More than a few literatures, such as Cheung and Lai (1993), & Gonzalo (1994), have shown that this test is an effective test of co-integration for multivariate time series. Nonetheless, the main strength in my analysis, is that the Johansen- Juselius test offers more credible co-integration results when the span of data is prioritized over the number of observations.

We will be applying two Johansen – Juselius tests in our analysis in one table for each GCC country. The two tests will be include:

1) Log (M1/CPI), Log (GDP/CPI) and Log (INT)

2) Log (M1/CPI), Log (GDP/CPI) and Level INT

Moreover, in each table there will estimation of the scale and interest elasticity for each country.

United Arab Emirates:

Country	***United Arab Emirates*** ***[Sample Size: 15]***		
Johansen-Juselius Co-Integration - Trace Test			
	Critical Value at 0.05	Probability (LOG(INT)) ***Lag Length: 1 to 2***	Probability (INT) ***Lag Length: 1 to 2***
None *	29.79707	0.0012	0.017
At Most 1	15.49471	0.1775	0.2527
At Most 2	3.841466	0.5924	0.6829
Johansen-Juselius Co-Integration - Maximum Eigenvalue			
	Critical Value at 0.05	Probability (LOG(INT))	Probability (INT)
None *	21.13162	0.0018	0.0243
At Most 1	14.2646	0.1395	0.1984
At Most 2	3.841466	0.5924	0.6829
Vector Error Correction Estimates (t-stat in parentheses)			
	Coefficient (LOG(INT)) *Adj. R-Squared = 0.117423*		Coefficient (INT) *Adj. R-Squared = 0.121552*

Scale Elasticity	1.971629 (66.2401)	1.940497 (43.8099)
Interest Elasticity & Semi-Elasticity	-0.487642 (-5.42325)	-0.009018 (-4.13117)

Table 5: Johansen-Juselius Co-integration UAE

The Trace Test with respect to Log (INT) Indicated 1 co-integrating equation at 5% level, while the Maximum Eigenvalue test also indicates 1 co-integrating equation at 5% level. Moreover, with respect to Level INT, there is at least one co-integrating equation in the Trace Test and one co-integrating equation from the maximum eigenvalue test.

On the other hand, testing for the coefficients for scale and interest elasticity in both tests, we conclude that it follows the theory with the scale elasticity being positive and the interest elasticity & semi-elasticity (with respect to Level INT) being negative.

Bahrain:

Country	***Bahrain*** ***[Sample Size: 24]***		
Johansen-Juselius Co-Integration - Trace Test			
	Critical Value at 0.05	Probability (LOG(INT)) ***Lag Length: 1 to 2***	Probability (INT) ***Lag Length: 1 to 2***
None *	29.79707	0.0032	0.0066
At Most 1	15.49471	0.4673	0.5559
At Most 2	3.841466	0.8216	0.7965
Johansen- Juselius Co-Integration - Maximum Eigenvalue			
	Critical Value at 0.05	Probability (LOG(INT))	Probability (INT)
None *	21.13162	0.0014	0.0025
At Most 1	14.2646	0.3857	0.4749
At Most 2	3.841466	0.8216	0.7965
Vector Error Correction Estimates (t-stat in parentheses)			

	Coefficient (LOG(INT)) *Adj. R-Squared = 0.612290*	Coefficient (INT) *Adj. R-Squared = 0.612662*
Scale Elasticity	1.128637 (50.2192)	1.140145 (50.0717)
Interest Elasticity & Semi Elasticity	-0.380003 (-5.42550)	-0.004133 (-5.06478)

Table 6: Johansen-Juselius Co-integration Bahrain

The Trace Test, with respect to Log (INT) Indicated 1 co-integrating equation at 5% level, while the Maximum Eigenvalue test also indicates 1 co-integrating equation at 5% level. Moreover, with respect to Level INT. There is at least one co-integrating equation in the Trace Test and one co-integrating equation from the maximum eigenvalue test.

On the other hand, testing for the coefficients for scale and interest elasticity in both tests, we conclude that it follows the money demand theory with the scale elasticity being positive and the interest elasticity & semi-elasticity (with respect to Level INT) being negative.

Oman:

Country	***Oman*** ***[Sample Size: 24]***		
Johansen- Juselius Co-Integration - Trace Test			
	Critical Value at 0.05	Probability (LOG(INT)) ***Lag Length: 1 to 3***	Probability (INT) ***Lag Length: 1 to 1***
None *	29.79707	0	0.0008
At Most 1 *	15.49471	0.0201	0.098
At Most 2	3.841466	0.7057	0.2147
Johansen- Juselius Co-Integration - Maximum Eigenvalue			
	Critical Value at 0.05	Probability (LOG(INT))	Probability (INT)
None *	21.13162	0.001	0.0023

At Most 1 *	14.2646	0.0126	0.1125
At Most 2	3.841466	0.7057	0.2147
Vector Error Correction Estimates (t-stat in parentheses)			
	Coefficient (LOG(INT)) *Adj. R-Squared = 0.436605*		Coefficient (INT) *Adj. R-Squared = 0.452272*
Scale Elasticity	0.655507 (10.3973)		1.101812 (16.9292)
Interest Elasticity & Semi Elasticity	-1.83293 (-8.65324)		-0.013997 (-4.26284)

Table 7: Johansen-Juselius Co-integration Oman

The Trace Test, with respect to Log (INT) Indicated 1 co-integrating equation at 5% level, while, the Maximum Eigenvalue test also indicates 1 co-integrating equation at 5% level. Moreover, with respect to Level INT, there is at least one co-integrating equation in the Trace Test and one co-integrating equation from the maximum eigenvalue test.

On the other hand, testing for the coefficients for scale and interest elasticity in both tests, we conclude that it follows the money demand theory with the scale elasticity being positive and the interest elasticity & semi-elasticity (with respect to Level INT) being negative.

Kuwait:

Country	***Kuwait*** ***[Sample Size: 29]***		
Johansen- Juselius Co-Integration - Trace Test			
	Critical Value at 0.05	Probability (LOG(INT)) ***Lag Length: 1 to 2***	Probability (INT) ***Lag Length: 1 to 1***
None *	29.79707	0.0007	0.0014
At Most 1	15.49471	0.1478	0.0299
At Most 2	3.841466	0.3781	0.6824
Johansen-Juselius Co-Integration - Maximum Eigenvalue			

	Critical Value at 0.05	Probability (LOG(INT))	Probability (INT)
None *	21.13162	0.0013	0.015
At Most 1	14.2646	0.1344	0.0195
At Most 2	3.841466	0.3781	0.6824
Vector Error Correction Estimates (t-stat in parentheses)			
	Coefficient (LOG(INT)) *Adj. R-Squared = 0.138310*		Coefficient (INT) *Adj. R-Squared = 0.228067*
Scale Elasticity	0.507852 (7.33369)		0.735294 (10.7860)
Interest Elasticity & Semi Elasticity	-2.184655 (-7.28016)		-0.019563 (-4.63417)

Table 8: Johansen-Juselius Co-integration Kuwait

The Trace Test, with respect to Log (INT), Indicated 1 co-integrating equation at 5% level, while the Maximum Eigenvalue test also indicates 1 co-integrating equation at 5% level. Moreover, with respect to Level INT, there is at two co-integrating equation in the Trace Test and two co-integrating equation from the maximum eigenvalue test. On the other hand, testing for the coefficients for scale and interest elasticity in both tests, we conclude that it follows the theory with the scale elasticity being positive and the interest elasticity & semi-elasticity (with respect to Level INT) being negative.

Qatar:

Country	***Qatar*** ***[Sample Size: 25]***		
Johansen- Juselius Co-Integration - Trace Test			
	Critical Value at 0.05	Probability (LOG(INT)) ***Lag Length: 1 to 2***	Probability (INT) ***Lag Length: 1 to 1***
None *	29.79707	0	0.0001
At Most 1 *	15.49471	0.004	0.0028
At Most 2	3.841466	0.8325	0.0114
Johansen- Juselius Co-Integration - Maximum Eigenvalue			

	Critical Value at 0.05	Probability (LOG(INT))	Probability (INT)
None *	21.13162	0	0.0125
At Most 1 *	14.2646	0.0022	0.019
At Most 2	3.841466	0.8325	0.0114
Vector Error Correction Estimates (t-stat in parentheses)			
	Coefficient (LOG(INT)) *Adj. R-Squared = 0.482739*		Coefficient (INT) *Adj. R-Squared = 0.448770*
Scale Elasticity	0.961718 (11.3902)		0.848669 (9.96701)
Interest Elasticity & Semi - Elasticity	-2.024906 (-13.0957)		-0.004171 (-1.33344)

Table 9: Johansen-Juselius Co-integration Qatar

The Trace Test, with respect to Log (INT), Indicated 2 co-integrating equation at 5% level, while the Maximum Eigenvalue test also indicates 2 co-integrating equation at 5% level. Moreover, with respect to Level INT, there is at least 3 co-integrating equation in the Trace Test and 3 co-integrating equation from the maximum eigenvalue test.

On the other hand, testing for the coefficients for scale and interest elasticity in both tests, we conclude that it follows the theory with the scale elasticity being positive and the interest elasticity & semi-elasticity (with respect to Level INT) being negative.

Saudi Arabia:

Country	***Saudi Arabia*** ***[Sample Size: 30]***		
Johansen- Juselius Co-Integration - Trace Test			
	Critical Value at 0.05	Probability (LOG(INT)) ***Lag Length: 1 to 1***	Probability (INT) ***Lag Length: 1 to 2***
None *	15.49471	0.0003	0
At Most 1 *	3.841466	0.0112	0.0006
Johansen- Juselius Co-Integration - Maximum Eigenvalue			

	Critical Value at 0.05	Probability (LOG(INT))	Probability (INT)
None *	14.2646	0.0022	0
At Most 1 *	3.841466	0.0112	0.0012
Vector Error Correction Estimates (t-stat in parentheses)			
	Coefficient *Adj. R-Squared = 0.102753*		
Scale Elasticity	1.068261 (10.5793)		

Table 10: Johansen-Juselius Co-integration Saudi Arabia

As stated before in the research, that Saudi Arabia doesn't deal with Interest Rate. Hence we only apply the Johansen – Juselius test on Log (M1/CPI) & Log (GDP/CPI), were the Trace Test Indicated 2 co-integrating equation at 5% level. Moreover, the Maximum Eigenvalue test also indicates 2 co-integrating equation at 5% level.

We estimate the coefficient of the scale elasticity to be positive, which abides by the theory of money demand functions.

Significance:

As we reach this point, we have successfully presented that there exists a strong relationship between the variables in each GCC economy at different levels. The above results from the Johansen-Juselius test clearly prove that a reliable linkage between the long run futures of the macro economies. Moreover, the coefficients prove that there is a stable money demand function in all the GCC, something that could be of great importance in forming a monetary union in the future.

Likelihood Ratio Test – Chi Square Distribution

This part of the research is where we test if the scale elasticity is equal to +1 and if the interest elasticity is equal to – 0.5. We apply the Log Likelihood Ratio Test with Chi Square Distribution

on each individual country. We analyze the probability of each result, and based on that, we make our interpretations. In such a test, the null hypothesis is as follows:

	For Scale Elasticity	For Interest Elasticity
Null Hypothesis	Coefficient equal to 1	Coefficient equal to -0.5
Alternate Hypothesis	Coefficient not equal to 1	Coefficient not equal to -0.5

Table 11: Hypothesis of Likelihood Ratio Test

If the probability of the likelihood ratio test comes out to be zero, we reject the null.

We apply the same logic as we did with the Johansen – Juselius approach, were two tests where applied with respect to Log (INT) and Level INT.

Likelihood Ratio Test - Chi Square Distribution - LOG(INT)		
Country [Sample Size]	Probability Scale Elasticity Coefficient =1	Probability Interest Elasticity Coefficient = - 0.5
Bahrain [28]	0.000749	0.101738
Kuwait [32]	0.000009	0.000041
Oman [29]	0.000134	0.000019
Qatar [27]	0.752081	0
Saudi Arabia [17]	0.568711	N/A
United Arab Emirates [16]	0.00006	0.906964

Table 12: Likelihood Ratio Test – Log (INT)

Country [Sample Size]	Probability Scale Elasticity Coefficient =1	Probability Interest Elasticity Coefficient = - 0.5
Bahrain [28]	0.000307	0.560267
Kuwait [32]	0.026949	0.124804
Oman [28]	0.240342	0.032487
Qatar [27]	0.194091	0.021725
Saudi Arabia [17]	0.568711	N/A
United Arab Emirates [16]	0.001406	0.920902

As we can see from the table above, with respect to Scale Elasticity, that the only two countries in the GCC that's have a coefficient of +1 are Saudi Arabia and Qatar. Were as, with respect to interest elasticity, there are also two countries that have the coefficient is -0.5 which are Bahrain and United Arab Emirates.

Moving on to the likelihood ratio test with respect to Level INT, we find that the countries that have a scale elasticity coefficient of +1 are Oman, Qatar and Saudi Arabia. Were as, the countries that have an interest elasticity coefficient of – 0.5 are Bahrain, Kuwait and United Arab Emirates.

Panel Tests:

Table 13: Likelihood Ratio Test – (INT)

This section we will be discussing panel tests in two different approaches:

1) Unit Root Panel Test
2) Panel Co-Integration

Unit Root Panel Test:

After assessing each individual country's money demand function and variable non-stationarity, we move onto panel co-integration using Group Unit Root Test, Hadri Unit Root Test, Panel Least Squares, Panel Dynamic Least Squares, Panel Fully Modified Least Squares, Pedroni Residual Co-integration Test, Kao Residual Co-Integration Test and Johansen-Fisher Panel Co-integration Test in order to assess if there is non-stationarity between the countries and if co-integration exists between the GCC countries.

Unit Root Panel Test	***Log (M1/CPI)*** ***[Lag Length: 1]***	
Group Unit Root Test - Level		
Test (Sample Size)	Statistic	Probability
Levin, Lin & Chu t* (186)	0.25615	0.6011
Breitung t-stat (180)	2.24653	0.9877
Group Unit Root Test - First Difference Level		
	Statistic	Probability
Levin, Lin & Chu t* (180)	-4.12017	0
Breitung t-stat (174)	-2.69458	0.0035
Hadri Unit Root Test - Level		
	Statistic	Probability

Hadri Z-Stat (198)	6.79089	0
Heteroscedastic Consistent Z-Stat (198)	6.7593	0
Hadri Unit Root Test - First Difference Level		
	Statistic	Probability
Hadri Z-Stat (198)	2.74137	0.0031
Heteroscedastic Consistent Z-Stat (192)	3.10145	0.001

Table 14: Panel Root Test – Log (M1/CPI)

We begin by using the Group Unit Root Test on Log (M1/CPI) for all 6 countries, where the null hypothesis is a Unit Root Exists (non-stationary) and the alternative hypothesis is a Unit Root does not exist (stationary).

As we see from the table above, that all the probabilities are not equal to 0, which indicates that we do no reject the null, hence the variable Log(M1/CPI) for all the six countries is non-stationary at Level. Moving on to the first difference,

We find out that all the probabilities are equal to 0, which indicates rejection of the null, hence the variable Log (M1/CPI) for all six countries is stationary at first difference.

Using another test which is the Hadri Unit Root Test, where the null hypothesis is Stationarity while the alternative hypothesis is No Stationarity. Using the Hadri test on Log (M1/CPI) for the six countries, we get the following results. Unlike the Group Unit Root Test used before, if the probability is equal to 0, then we do not reject the null. As we can see that the probabilities are equal to 0, hence we do not reject the null, stating that the variable is stationary at Level. Moving on to the first difference,

We find out that the probabilities are still 0, which means that the variable Log (M1/CPI) is stationary at the first difference as well.

Unit Root Panel Test	***Log (GDP/CPI)*** ***[Lag Length: 1]***	
Group Unit Root Test - Level		
Test (Sample Size)	Statistic	Probability
Levin, Lin & Chu t* (198)	-3.96142	0
Breitung t-stat (192)	1.7223	0.9575
Group Unit Root Test - First Difference Level		
	Statistic	Probability
Levin, Lin & Chu t* (192)	-2.96061	0.0015
Breitung t-stat (186)	-6.35555	0
Hadri Unit Root Test - Level		
	Statistic	Probability
Hadri Z-Stat (210)	7.65042	0
Heteroscedastic Consistent Z-Stat (204)	7.23168	0
Hadri Unit Root Test - First Difference Level		
	Statistic	Probability
Hadri Z-Stat	3.50065	0.0002
Heteroscedastic Consistent Z-Stat	3.26582	0.0005

Table 15: Panel Root Test – Log (GDP/CPI))

Shifting our concentration onto the second tested variable which is Log (GDP/CPI), we begin by using the Group Unit Root Test,

As we can see that we have 2 outcomes, according to the Levin, Lin & Chu method, we reject the null hypothesis, hence the variable is stationary at Level. On the other hand, according to the Breutung t-stat, we do not reject the null, meaning that the variable is non-stationary at Level. Moving on to the first difference,

Unlike the Level, both methods give the same result, which is probability equal to 0, hence we reject the null, meaning that the variable Log (GDP/CPI) for the six countries is stationary at the first difference level.

Testing the data with Hadri's Unit Root Test at Log and first difference level, we obtain the following results. The probabilities are equal to 0, which means that we do not reject the null hypothesis. In the Hadri Unit Root test, this indicates that the variable is stationary at Level. Moving on to the first difference. The results are similar to the Level, meaning that the variable at the first difference is also stationary.

Unit Root Panel Test	***Log (INT)*** ***[Lag Length: 1]***	
Group Unit Root Test - Level		
Test (Sample Size)	Statistic	Probability
Levin, Lin & Chu t* (78)	2.39772	0.9918
Breitung t-stat (72)	-0.3325	0.3698
Group Unit Root Test - First Difference Level		
	Statistic	Probability
Levin, Lin & Chu t* (60)	-1.39288	0.0818
Breitung t-stat (54)	-3.50175	0.0002
Hadri Unit Root Test - Level		
	Statistic	Probability
Hadri Z-Stat (114)	2.10789	0.0175

Heteroscedastic Consistent Z-Stat (96)	0.96147	0.1682
Hadri Unit Root Test - First Difference Level		
	Statistic	Probability
Hadri Z-Stat	2.01213	0.0221
Heteroscedastic Consistent Z-Stat	2.87996	0.002

Table 16: Panel Root Test – Log (INT)

Moving on to our last variable which is the Log (INT), we apply the same tests on this variable, which are the Group Unit Root Test and the Hadri Unit Root Test, and the following results come out to be:

Looking at the probabilities at the Level, we do not reject the null, which is an indication of non-stationarity of the variable. Moving on to the first difference level:

As we can see that we have 2 outcomes, according to the Breitung t-stat method, we reject the null hypothesis, hence the variable is stationary at first difference level. On the other hand, according to the Levin, Lin & Chu t*, we do not reject the null, meaning that the variable is non-stationary at first difference level.

Using the Hadri level on the variable Log (INT), we get the following results, starting with the Level:

The probabilities are not equal to 0, which indicates a rejection of the null and non-stationarity on the first difference level, while looking at the first difference, we get the following results: Looking at the probabilities at the first difference, we realize that the probabilities are close and equal to 0, hence we do no reject the null, meaning stationarity exists at the first difference.

Panel Co-integration:

The final part of the data analysis uses Log (M1/CPI) as a function of Log (GDP/CPI). We using several co-integration tests in order to test for non-stationarity and then co-integration. We start off with the Panel Least Squares: As we can see the probabilities are equal to 0, which means that we reject the null, which means that there is stationarity. Moving on to the Panel Dynamic Least Squares (DOLS) & Panel Fully Modified Least Squares (FMOLS), we obtain the same results as the Panel Least Squares, where the probability is equal to 0, which signifies stationarity in the function.

Panel Co-Integration	***Log (M1/CPI) function of Log(GDP/CPI)***		
Panel Least Squares (198) – Adjusted R-Squared = 0.872582			
	t - Statistic	Coefficient	Probability
C	240.2492	19.37587	0
LRY	36.74357	1.741964	0
Panel Dynamic Least Squares (DOLS) (189) – Adjusted R-Squared = 0.989326			
	Statistic	Coefficient	Probability
LRY	19.81781	1.098538	0
Panel Fully Modified Least Squares (FMOLS) (192) – Adjusted R-Squared = 0.985963			
	Statistic	Coefficient	Probability

LRY	19.69817	1.077368	0
Pedroni Residual Co-Integration Test – Lag Length 1 – (210)			
	Statistic	Weighted Statistic	Probability
Panel v-Statistic	2.686515	2.686515	0.0036
Panel rho-Statistic	-3.117004	-3.117004	0.0009
Panel PP-Statistic	-5.556661	-5.556661	0
Panel ADF-Statistic	-5.953569	-5.953569	0
Kao Residual Co-Integration Test – Lag Length 8 – (210) – Adjusted R-Squared = 0.150059			
	t - Statistic	Residual Variance	Probability
ADF	-4.470851	0.015629	0
Johansen Fisher Panel Co-Integration Test - Lag 1 1 – (210)			
	Fisher Stat. (Trace Test)		Probability
None	70.73		0
At Most 1	25.15		0.0141
	Fisher Stat. (Max-Eigen Test)		Probability
None	64.41		0
At Most 1	25.15		0.0141
Johansen Fisher Panel Co-Integration Test - Lag 1 2 – (210)			
	Fisher Stat. (Trace Test)		Probability
None	47.15		0
At Most 1	24.73		0.0162
	Fisher Stat. (Max-Eigen Test)		Probability
None	39.95		0.001
At Most 1	24.73		0.0162
Johansen Fisher Panel Co-Integration Test - Lag 1 3 – (210)			
	Fisher Stat. (Trace Test)		Probability
None	33.24		0.0009
At Most 1	21.26		0.0467
	Fisher Stat. (Max-Eigen Test)		Probability
None	27.36		0.0069
At Most 1	21.26		0.0467
Johansen Fisher Panel Co-Integration Test - Lag 1 4 – (210)			
	Fisher Stat. (Trace Test)		Probability
None	40.46		0.0001
At Most 1	17.62		0.1279
	Fisher Stat. (Max-Eigen Test)		Probability
None	37.04		0.0002
At Most 1	17.62		0.1279

Table 17: Panel Root Test – Log (M1/CPI) function of Log (GDP/CPI)

We start to conclude the research by using several co-integration tests, beginning with Pedroni's Residual Co-integration test. In this test the null hypothesis is No Co-integration Exists and the alternative hypothesis is Co-integration Exists.

Looking at all the panel statistics, we realize that the probabilities are all equal to 0, which means that we reject the null, hence there is co-integration amongst the six countries.

Using another co-integration test to give more evidence to the research, we use Kao Residual Co-Integration Test, where the same hypothesis as Pedroni's exists.

Looking at the probability, we find that it is equal to 0, hence co-integration does exist amongst the six countries.

The final co-integration test we use is the Johansen-Fisher co-integration test, were we run the data 4 times against 4 difference lag intervals, starting with the first lag interval 1 1:

The probabilities from the Trace and Maximum Eigenvalues, we realize the probability is equal to 0, which means that there is at least 1 co-integrating equation between the variables. While this is also evident in all the other lag intervals 1 2, 1 3 & 1 4.

Significance:

After using all these co-integrating test on the panel GCC data, we conclude that Money Demand in the GCC is a function of Income only. Tests regarding interest rate failed to show us anything significant about the interest rate in the GCC (note that even we Saudi Arabia Excluded from the tests, we didn't find anything significant). The coefficient came out to be positive, which is completely against what the theory states. After analyzing this issue, I started to check for outlier's in the data. An Outlier is basically is an observation point that is distant

from other observations on a graph. Moving on, further assessing all the data used in this test, everything seemed ordinary except for the interest rate. This could be a reason for the results coming out as it did. Moreover, interest rates in the GCC haven't been published over a span of time like European countries. So the Cambridge theory applies here in the GCC.

Recommendations:

My recommendation for this topic are:

1) Another research should be done after 20 years in order to gain more data, not only annually, but also quarterly or semi-annually. It would build a better picture on the foundation of our findings.
2) Results have shown in panel co-integration that the GCC's money demand function is a function of income only and not interest rate, which means that the GCC is only effected by Income, the higher income they have, the more money they demand. While interest rate does not affect money demand. The GCC countries should look into this issue, explaining why, regardless of Saudi Arabia deals with interest rates or not, the countries aren't affected the right way with respect to money demand.
3) The Level form on Interest rate came out to stationary on a nomal level and at first difference, especially that no outliers were present in my data, there should be an in-depth examination of this reason.
4) Finally, following the results of this research, I would highly recommend the GCC establish a joint monetary union, one of the main aspect of an establishment of Monetary Policy is stable money demand functions (as stated in the paper), amongst other variables which are proven in other literature on Optimal Currency Areas.

Conclusion:

The purpose of this research was to examine the money demand functions of the GCC countries and testing the stability of those functions in order to assess the feasibility and sustainability of a joint monetary union. We have proved that the estimation of the money demand function of each GCC country abides by the theory, which states the scale and interest elasticity are positive and negative respectively. Moreover, we have checked for stationarity and non-stationarity of the variables. Also, we have proved that there is co-integration on an individual country basis, while also proving for co-integration between all the countries together. Looking at it from an OCA level, Beyer (2009) studied the Money Demand Functions in the European Union, and found evidence that even after the 2007 financial crisis, money demand was still stable in between these countries. Moreover, Naime (2005) found evidence in his paper that along with the OCA criteria's that the GCC has to meet, there are some additional conditions that are proved to be satisfied for a successful monetary union. These conditions include credible policy actions by member countries that make their policies converge to mutual trends that are consistent with achieving a monetary union. Evidence from this paper show that common trends are existent in between the GCC countries from a money demand perspective. This should signify that there could be a possibility of the GCC countries into establishing a monetary union, there is no theory that states a stable money demand function is a prerequisite for monetary union, but it is a good sign that all the GCC countries have individual money demand function, while having common co-integrating factors is definitely something to take into consideration. But the question remains, "since the Panel GCC money demand function is only a function of income, how will the case of the interest rate be solved?"

Limitations:

There are a few limitations in this research paper:

1) The fact there isn't a lot of data on the GCC country, it doesn't span a lot of years, so the data fluctuates between 1970, 1980 and at most 1990 data. Of course the more data we have, the more significance and evidence contributes to this study, but I believe the approach towards this study is a good foundation to build on in the future.
2) Another limitation is that Saudi Arabia does not deal with interest rate, is it a religious infringement to make money off interest rate. This is where the concept of Islamic banking comes in, where "interest" is paid in a different way by acquiring an equity through bank funding and then selling it for a higher price. The difference in prices is what the bank charges, so there is no set percentage in order to study its effect on money demand.

References

· Alyousha, A. (1997): Investigating Bahrain business cycles, Applied Economics, vol. 29, Issue 1, pp. 43-50.

· Azar, S (2011), "The Demand for Broad Money in Lebanon"

· Azar, S (2014), "The Demand for Money in the United States, 1959.1 - 2013.11" Australian International Academic Centre

· Bae, Y. and de Jong, R. M. (2007), Money demand function estimation by nonlinear

cointegration. J. Appl. Econ., 22: 767–793. doi: 10.1002/jae.915

· Bahmani-Oskooee, Rehman H (2005) Stability of money demand function in Asian developing countries. Appl Econ 37:773–792

· Bai J, Perron P (1998) Estimating and testing linear models with multiple structural changes. Econometrica 66:47–78

· Bai J, Perron P (2003) Computation and analysis of multiple structural change models. J Appl Econom 18:1–22

· Beyer, A., (2009), " A Stable Model for Euro Area Money Deman Revisiting the Role of Wealth", European Central Bank.

· Banerjee, A., Dolado, J.J., Hendry, D. F., and Smith, G.W. (1986), Exploring Equilibrium Relationships in Econometrics through Static Models: some Monte Carlo Evidence, Oxford Bulletin of Economics and Statistics, vol. 48, 253-277.

· Blanchard OJ, Quah D (1989) The dynamic effects of aggregate demand and supply disturbances. Am Econ Rev 79:655–673

· Calza A, Sousa J (2003) Why has broad money demand been more stable in the Euro area than in other economies? A literature review, European Central Bank Working Paper Series No.261

· Caner M, Hansen BE (2001) Threshold autoregression with a unit root. Econometrica 69:1555–1596

· Caporale, G. (2008), "Fractional Co-integration and Co-integration in Five Industrial Countries", Brunel University, Working Paper No.11-02

· Cluadia M. Buch, (2001), "Money demand in Hungary and Poland", Applied Economics, 33, 989-999.

· Darrat, A. and Mutawa, A. (1996): Modeling Money Demand in the United Arab Emirates, The Quarterly Review of Economics and Finance, vol. 36, No. 1.

· Dekle R, Pradhan M (1997) Financial liberalisation and money demand in ASEAN countries: implications for monetary policy. IMF Working Paper 97/36. IMF, Washington

· Dickey D., W. A. Fuller (1981), "Likelihood ratio statistics for autoregressive time series with unit root", Econometrica, vol.49, No.4, Evanston, Illinois, The Econometric Society.

· Doowitz, I., and Ibrahim, E., (1987), "An Error Correction Approach to Money Demand: The case of Sudan", Journal of Development Economics, Vol. 26, No. 2, pp.257-75.

· Dreger, C., Reimers, H., Roffina, B. (2006), " Long-run Demand In the New EU Member States with Exchange Rates Effect", European Central Bank, Working Papers Series.

· Duca JV (1995) Should bond funds be added to M2. J Bank Financ 19:131–152

· Eken, S., Cashin, P., Erbas Nuri, S., Martelkino, J. and Mazarai, A., (1995), "Economic Dislocation and Recovery in Lebanon", IMF Occasional Paper, No. 120.

· Eken, S., Cashin, P., Erbas Nuri, S., Martelkino, J., and Mazarai, A. (1995): Economic Dislocation and Recovery in Lebanon, IMF Occasional Paper, No. 120.

· Friedman M, Schwartz AJ (1963) A monetary history of the United States, 1867–1960. Princeton University Press, Princeton

· Goldfeld, S M. & Daniel E. Sichel, (1990), "The Demand for Money.". In the Handbook of Monetary Economics, 1, B. M. Friedman & H. Hahn (eds). Amsterdam:North-Holland.

· Hamori N, Hamori S (1999) Stability of the money demand function in Germany. Appl

Econ Lett 6: 329–332

· Hamori S, Tokihisa A (2001) Seasonal cointegration and the money demand function: some evidence from Japan. Appl Econ Lett 8:305–310

· Hansen B (1992) Tests for parameter instability in regressions with I(1) processes. J Bus Econ Stat 10:321– 335

- Hoque A, Al-Mutairi N (1996) Financial deregulation, demand for narrow money and monetary policy in Australia. Appl Financ Econ 6:301–305

· Hossain, Akhtar (1994): The Search for a Stable Money Demand Function for Pakistan: An Application of the Methodology of Cointegration, The Pakistan Development Review, vol. 33, No. 4, pp. 969-83.

· Hueng CJ (1998) The demand for money in an open economy: some evidence for Canada. North Am J Econ Financ 9:15–31

· Im, K., Pesaran, H. and Shin, Y. (1997): Testing for Unit Roots in Heterogeneous Panels, University of Cambridge, DAE Working Paper, No. 9526.

· Jason, F. Vaccavo, (2005), "Cross-country Evidence on the Demand for Money", Unpublished Thesis, Calgary, Alberta, Canada.

· Jean-Claude Nachega, (2001), “A Cointegration Analysis of Broad Money Demand in Cameroon”, International Monetary Fun, (WP/01/26).

· Johansen, S. and Juselius, K. (1990) “Maximum Likelihood estimation and inference on cointegration with application to the demand for money”, Oxford Bulletin of Economics and Statistics, Vol. 52, 169-210.

· Khalid AM (1999) Modelling money demand in open economies: the case of selected Asian countries. Appl Econ 31:1129–1135

· Khatib-Kswani, M and Towaijari, H. A. (1999): Cointegration Error Correction and the Demand for money in Saudi Arabia, Economia-Internazionale, vol. 52, No. 3, pp. 299-308.

· King R, Plosser C, Stock JH, Watson MW (1991) Stochastic trends and economic fluctuations. Am Econ Rev 81:819–840

· Laidler DEW (1980) The demand for money in the US yet again. In: Brunner K, Meltzer A (eds) On the state of macroeconomics. Carnegie–Rochester Conference Series on Public Policy, p 12

· Laidler, D. (1993): the Demand for Money: Theories, Evidence and Problems, Harper Collins College Publishers, 4th edition, New York.

· Levin, A. and Lin,C. F. (1993): Unit Root Tests in Panel Data: New Results , University of California, San Diego, Discussion Paper, No. 93-56.

· Lown C, Peristiani S, Robinson KJ (1999) What was behind the M2 breakdown? Federal Reserve Bank of Dallas Financial Industry Studies Working Paper No. 02/1999

· Mankiw NG (1991) The reincarnation of Keynesian economics, NBER Working Paper No. 3885

· Mark NC, Sul D (2003) Cointegration vector estimation by panel DOLS and long-run money demand. Oxf Bull Econ Stat 65:655–680

· Mehra YP (1997) A review of the recent behaviour of M2 demand. Fed Res Bank Richmond Econ Q 83:27–43

· Moosa, Imad A. (1992): The Demand for Money in India: A Cointegration Approach, The Indian Economic Journal, vol. 40, No. 1, pp. 101-115.

· Naime, S. (2005), “Monetary Policy Coordination and the Prospects of a Monetary Union Between GCC Countries”, ERF 12th Annual Conference

· Pedroni P (1999) Critical values for co-integration tests in heterogeneous panels with multiple regressors. Oxf Bull Econ Stat Special Issue 653–670

· Pedroni P (2000) Fully modified OLS for heterogonous co-integrated panels. Adv Econ 15:93–130

· Pedroni, P. (1997): Panel Cointegration: Asymptotic and Finite Sample Properties of Pooled Time Series Tests with an Application to the PPP Hypothesis: New Results, unpublished manuscript, Indiana University.

· Pedroni, P. (1999): Critical Values for Cointegration Tests in Heterogeneous Panels with Multiple Regressors, Oxford Bulletin of Economics and Statistics, vol. 61, No. 4, pp. 653-670.

· Pedroni, P. (2000): Fully Modified OLS for Heterogeneous Cointegrated Panels, Advances in Econometrics, vol. 15, pp. 20

· Pedroni, P. (2001): Panel Cointegration: Asymptotic and Finite Sample Properties of Pooled Time Series Tests with an Application to the PPP Hypothesis, unpublished manuscript, Indiana University.

· Perron, P. (1991): Test Consistency with Varying Sampling Frequency, Econometric Theory, vol.7, pp. 341-68.

· Phillips PCB, Hansen BE (1990) Statistical inference in instrumental variable regression with I(1) processes. Rev Econ Stud 57:99–125

· Phillips, P. (1992): Hyper-Consistent Estimation of a Unit Root in Time Series Regression, Cowles Foundation Discussion Papers, No. 1040.

· Phillips, P. and Ouliaris, S. (1990): Asymptotic Properties of Residual Based Tests for Cointegration, Econometrica, No. 58, pp. 165-193.

· Pradhan BK, Subramanian A (2003) On the stability of demand for money in a

developing economy: some empirical issues. J Dev Econ 72:335–351

· Quah, D. (1992): Exploiting Cross-Section Variations for Unit Root Inference in Dynamic Data, Economic Letters, 44, pp. 9-19.

· Quah, D. (1992): International Patterns of Growth: Persistence in Cross-Country Disparities, unpublished manuscript, London School of Economics.

· Ramajo J (2001) Time-varying parameter error correction models: the demand for money in Venezuela, 1983:1-1994:IV. Appl Econ 33:771–782 Siddiki JU (2000) Demand for money in Bangladesh: a cointegration analysis. Appl Econ 32:1977–1984

· Rother, P & Diogo, I (1998), "Money Demand and Regional Monetary Policy in West African Economic and Monetary Union", International Monetary Fund Working Paper,

· Sriram, S. (1999): Survey of Literature on Demand for Money: Theoretical and Empirical Work with Special Reference to Error-correction Models, IMF Working Paper, WP/99/64.

· Sriram, S. (2001): A Survey of Recent Empirical Money Demand Studies, IMF Staff Papers, Vo. 47, No 3, pp. 334-365.

· Weliwita A, Ekanayake EM (1998) Demand for money in Sri Lanka during the post-1977 period: a cointegration and error correction analysis. Appl Econ 30:1219–1229

· Westerlund J (2006) Testing for panel cointegration with multiple structural breaks. Oxf Bull Econ Stat 68:101–132

· Yashiv, E. (1994): Money Demand in a High Inflation Economy: the Case of Israel, the Review of Economics and Statistics, V. 76, pp. 186-191.