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A DIRECT TEST OF THE ENDOGENEITY OF MONEY: IMPLICATIONS FOR GULF COOPERATİON COUNCIL (GCC) COUNTRIES

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A direct test of the endogeneity of money: implications for Gulf Cooperation Council (GCC) countries

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Abstract

This paper contributes to the ongoing discussion about the endogeneity of money supply by empirically investigating the GCC countries. We propose and implement a direct test of money supply endogeneity that depends on econometric specification of exogeneity. To be able to make comparisons with previous studies in the literature, we also conducted Granger Causality tests to analyze the causality relationship between bank credit and money supply. Both of the empirical studies provide empirical evidence for the endogeneity of money supply in GCC countries. The results of the paper have many significant monetary policy implications for the upcoming monetary unification of the GCC countries.

1 Introduction

There is an ongoing debate about the endogeneity of money supply and empirical studies present contradictory results. In this study, we investigate the endogeneity of money in the Gulf Cooperation Council (GCC) countries. We propose and implement an alternative methodology to test the theory of endogeneity of money. We also implement Granger causality tests as previously used in the literature to be able to make comparisons. This study presents empirical evidence about endogeneity of money from the GCC countries using a direct test of endogeneity which has not been used in the literature before.

The empirical methodology implemented to analyze endogeneity of money has been criticized. For example, Fontana (2003) argues that "There is also the empirical question of determining the causality between money and monetary reserves. Correlation does not imply causality; therefore, empirical progress, if any, is particularly difficult in the case of monetary issues". In this study, we contribute to the discussion about the empirical methodology of the analysis money supply endogeneity and propose a direct test that uses econometric specification of exogeneity. This methodology is based on the instrumental variable regressions and C statistic. By using the C statistic test of exogeneity the contemporaneous relationship can be examined.

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The C statistic method has many advantages compared to causality tests. The methods previously used in the literature depend too much on the selection of lag length and they only give approximate results since they do not directly test endogeneity. Although endogeneity of money and quantity theory of money indicate that there is a contemporaneous relationship between money and bank credit (and other variables), the methods previously used in the literature only test the relationship between bank credit and future values of variables. For example, a Granger causality test with 8 lags analyze whether changes in bank credit have significant effects on money supply in the next 8 time periods which is just an approximation for the endogeneity hypothesis. The C statistic method does not suffer from these weaknesses.

Another significant feature of the paper is the analysis of monetary dynamics in the GCC countries. The GCC economies, namely, Bahrain, Kuwait, Oman, Qatar, Saudi Arabia and United Arab Emirates (UAE) are heading towards monetary unification and single monetary policy in 2010. Understanding the monetary dynamics is incremental in successful implementation of monetary policy. As indicated by Fontana and Palacio-Vera (2002), endogenous money theory has significant propositions for monetary policy compared to alternative monetary views. By contrast, to the policy prescriptions of mainstream theory, endogenous money theorists support the idea that central banks have very limited power to impose any quantitative constraint over changes in the stock of money. Thus, our results have important policy implications for the upcoming monetary union of GCC countries since the country specific features will be incremental in effective monetary policy implementation.

The theory of money supply endogeneity is one of the major contentions of the Post Keynesian economics. Contrary to the Post Keynesian notion, the simplistic neoclassical approach argues that supply of money is strictly determined through central bank initiatives. Post Keynesian economists express the idea that money supply growth is basically determined endogenously within the financial markets, i.e. the banking system. Moore (1988) explains the mechanism behind endogeneity of money supply as the following:

> "When economic units borrow from banks, deposits and, therefore, bank money are created. When the loans are repaid, deposits are destroyed. The interest rates charged on bank loans and paid on bank deposits are, thus, pivotal to the expansion of the money stock."

There are significant implications of endogeneity of money. As indicated by Pollin (1991), the Post Keynesian view rejects many models of macroeconomic activity-new classical, neoclassical Keynesian and monetarist- which argues that money supply has influential effects. It suggests that central bank interventions aimed at controlling the money supply and the credit supply are not as effective as argued in the literature.

This important theory has been analyzed empirically by many studies like Howells and Hussein (1998), Shanmugam et al. (2003) and Panagopoulos and Spiliotis (2008) for different countries. All of the studies in the literature implement Granger causality or cointegration tests to examine endogeneity of money. But these methods are only approximate tests of endogeneity of money. Instead of testing endogeneity in the statistical sense, all of these methods analyze whether there is a causality relationship between money and another variable

or whether two variables move together over time. As a result, all of these methods are indirect tests of endogeneity of money supply. In this paper, using the vast literature on endogeneity in the econometric theory literature, we propose and implement a direct test of endogeneity, C statistic, which directly tests whether money supply is endogenous or not.

The implementation of the C statistic and Granger Causality methods indicate the following results about the endogeneity of money in GCC countries. First of all, the C statistic method presents that for all GCC countries there is bidirectional contemporaneous relationship between bank credit and money. Also, there exist bidirectional contemporaneous relationship between GDP and money. This results are robust for all alternative monetary specifications and money multipliers. As a result, the endogeneity test supports the structuralist and liquidity preference views for all countries except Bahrain. For Bahrain the structuralist view of endogenous money supply is presented. Second, the Granger causality relationship differs significantly among GCC countries. The structuralist view is supported for Oman and Qatar. The Granger causality tests support the liquidity preference for Saudi Arabia and UAE. There is no causality relationship between bank credit and M2 in Bahrain and Kuwait. Finally, we conclude that the C statistic and Granger causality tests present significantly different results and the Granger causality test undermines empirical evidence about endogeneity of money.

This paper makes the following contributions to the empirical literature about endogeneity of money. First of all, we present and implement an alternative methodology to test the endogenous money supply hypothesis. Second, this paper is the first study that investigates the endogenous money hypothesis for GCC countries. The results of the empirical analysis also provide insights for policy implications especially optimal monetary policy and exchange rate policy alternatives monetary union of GCC countries. Under flexible exchange rate regime, targeting monetary aggregates is a viable option for monetary policy. This empirical analysis is in line with the Post-Keynesian theoretical argument and provide evidence that money is endogenous in these countries. Consequently, the Monetarist approach based on the idea that “inflation is always and everywhere a monetary phenomenon.” is not valid in these countries. Thus, the GCC countries should not conduct monetary policy which targets monetary aggregates after unification.

The rest of the paper is organized as the following. Section 2 describes the theoretical arguments of the endogeneity of money hypothesis. Section 3 explains the econometric methodology implemented in this paper. Section 4 outlines the dataset. Sections 5 presents the economic characteristics of the GCC countries. Section 6 illustrates the empirical results of the analysis of the contemporaneous and dynamic relationships respectively. Finally, section 7 concludes.

2 Theoretical background

Post Keynesians have developed the view that pressures emerging endogenously within financial markets are the basic determinant both of fluctuations in money supply growth and

of credit availability. The orthodox monetary approach presents a direct contradiction to the endogenous money hypothesis.

Many central bank (CB) practitioners indicated that their practical experiences are in contrast with the orthodox approach of the monetarists. King (1994) indicates that " In the United Kingdom, money is endogenous ... broad money is created by the banking system." Also, Goodhart (1994) mentions that " All most all those who have worked in a CB believe that (the monetarist) view is totally mistaken." Thus, the Post Keynesian approach of money supply endogeneity has many anecdotal evidence besides empirical evidence. The empirical evidence needs to be extended especially for developing countries.

Pollin (1991) presents that there are actually two distinct theories of money supply endogeneity, accommodative and structural, within the Post Keynesian tradition. Both approaches start from the idea that money supply growth and credit availability are determined by demand-side pressures within the financial markets. But, the two fundamental approaches diverge in the idea of how and where do banks obtain the needed additional reserves once they have extended more credit, creating deposits in the process? (Pollin, 1991). The accommodative perspective argues that central banks must accommodate the needs of banks when they need additional reserves. Whereas, the structural perspective argues that the necessary additional reserves, though not necessarily the whole needed amount, are generated within the financial structure itself through innovative management practices. Shanmugam et al. (2003), present that the money supply endogeneity views are generally divided into three: the accommodationist view, the structuralist view and the liquidity preference view.

2.1 The accommodationist view

The accommodationist view argues that aggregate demand needs expressed through demand for credits cause a passive response of the financial institutions and authorities (Panagopoulos and Spiliotis, 2008). As Holmes (1969) mentions "banks extend credit, creating deposits in the process, and look for reserves later." In other words, banks set their loan rates as a mark-up over the overnight interest rates determined by the CB and attempt to meet all demand for bank loans. Short-term demand for banks loans are determined by working capital finances needs of firms (Moore, 1989). This implies that money supply (M1, M2) is determined by the demand for bank loans (bank credit, BC). It is also preseted that CB accommodates the bank demand for reserves and currency, to fulfill its responsibility of preserving the liquidity of the financial system. This indicates that monetary base (MB) is determined by bank credit. In other words, the money supply curve becomes horizontal at the level of interest rate exogenously determined by the central bank.

On the relationship between money and income, Kaldor and Trevithick (1981) indicate that there is a two-way (feedback) link between the two variables. Changes in money income affects the demand for bank credits which causes a change in money growth. Simultaneously, bank credits create deposits which are used to finance additional aggregate demand.

2.2 The structuralist view

Compared to the accommodationist view, the structuralist approach argues that the CB is also a significant factor since it can restrict accommodation of reserve needs and restrict credit expansion. Wray (1992) argues that the increase in new financial services show that central banks impose monetary restrictions on commercial banks. Minsky (1986) indicates that these new financial services caused by reserve restrictions both increase the interest rate and also affected positively by the increase in the interest rate. As presented by Palley (1996), rather than fully accommodating the demand for reserves, the CB will only partially accommodate the reserve needs thus causing an increase in the interest rates. As a result, the CB can alter the amount of bank credits. In statistical terms, this implies that monetary base (MB) can cause bank credit (BC). Thus, there is a two-way relationship between BC and MB.

The structuralist approach also mentions that the money multiplier (MM) will cause changes in bank credit. This is a result of the mechanism of liability management by banks to obtain the cheapest source of funding. Liability management allows banks to partly overcome reserve constraints imposed by the CB. Pollin (1996) indicates that liability management will not be adequate to supply all the reserves needed which will cause an increase in the interest rates in the financial sector. Since it is accepted that BC affects MB and MM, there is a feedback relation between BC and MM under the structuralist view.

Regarding the money income relationship, there is a two-way relationship. Because under the structuralist view the CB can affect the supply of credit thus aggregate demand.

2.3 The liquidity preference view

The liquidity preference view accepts the core arguments of the money endogeneity theory. But the liquidity preference theorists do not agree with these arguments which suggest that excess supply of money can never occur because the money demand and supply functions are identical. Howells (1995) argues that economic units have different liquidity p about the amount of money that they wish to hold. Thus, this demand function of money might not be identical and that can cause a restriction on bank lending.

As a result, the liquidity preference view implies a bidirectional relationship between bank credit (BC) and monetary aggregates (M1, M2). Also, a feedback mechanism exists between BC and money multiplier (MM). Finally, as mentioned by Panagopoulos and Spiliotis (2008), a feedback relationship between income (GDP) and money (M1, M2) can be inferred. The loans are demand driven as indicated by the endogenous money hypothesis Also, when people have p in holding wealth, they rearrange their portfolios accordingly and this causes changes in output.

2.4 Empirical hypotheses

The alternative money endogeneity views explained above indicates the following hypotheses that can be investigated empirically. The accommodationist view argues that there is a unidirectional relationship from bank credit (BC) to the monetary base (MB) and the monetary aggregates (M1,M2). Moreover, the relationship between money income (GDP) and monetary aggregates, (M1,M2) is bidirectional.

The structuralist view proposes a mixed empirical model with accommodationist view and the monetarist approach. Specifically, a feedback (bidirectional) relationship is proposed between monetary base (MB) and bank credit (BC) also between money multiplier (MM) and and bank credit (BC). The structuralist view agrees with the accommodationist view on the relationship between income and monetary aggregates which implied a bidirectional relationship between income (GDP) and monetary aggregates (M1,M2).

The liquidity preference view supports the idea of a bidirectional relationship between bank credit (BC) and monetary aggregates (M1, M2). Also, a feedback mechanism exists between BC and money multiplier (MM), and a feedback relationship between income (GDP) and money (M1, M2) can be inferred from the liquidity preference. The empirical hypotheses indicated by the three alternative views are summarized below.

Accommodationist	Structuralist	Liquidity preference
LBC$\Rightarrow$LMB, LM1	LBC$\Longleftrightarrow$LMB, LMM1	LBC$\Longleftrightarrow$LM1, LM2
LBC$\Rightarrow$LM2	LBC$\Longleftrightarrow$LMM2	LBC$\Longleftrightarrow$LMM1, LMM2
LGDP$\Longleftrightarrow$LM1,LM2	LGDP$\Longleftrightarrow$LM1,LM2	LGDP$\Longleftrightarrow$LM1,LM2

Notes: Definition of Variables: LBC = log-level of total bank credits; LMB = log-level of monetary base; LM1 = log-level of the M1 money supply; LM2 = log-level of the M2 money supply; LMM1= log-level of theM1 money multiplier; LMM2= log-level of the M2 money multiplier; LGDP = log-level of nominal GDP (money income); $\Rightarrow$Denotes unidirectional causality from left to right;$\Longleftrightarrow$ denotes bidirectional causality.

3 Econometric methodology

Previous empirical studies on the endogeneity of money implement different causality techniques (Granger causality tests, cointegration and error correction models etc.). All of these methods test the causality between bank credit and different monetary aggregates from a time series perspective. In other words, the relationship between lagged values of bank credit and money is analyzed. But, the contemporaneous relationship between bank credit and monetary aggregates is not investigated in the endogeneity of money literature. Although the quantity theory of money indicates a contemporaneous relationship and theoretical studies of endogeneity of money do not restrict the relationship to only lagged values of bank credit, the contemporaneous relationship is neglected in the literature. This is mainly caused by the fact that there are many different methods of time-series econometrics to test causality between lagged values of variables.

These methods have several significant limitations. First of all, the results highly depend on lag selection. Second, in some cases (like cointegration tests), they only measure whether two variables move together over time. Thus, they do not directly test causality but they are only approximate tests of relationships. Third, the causality tests do not present the sign of the correlation between two variables. In other words, whether the relationship is negative or positive can not be identified by the causality tests. Finally and most importantly, they do not investigate contemporaneous relationship between variables and limited to causality between

a variable and lagged values of other variables. To address this issues, we propose the following direct test of endogeneity of money.

3.1 Endogeneity test of contemporaneous relationship

In the econometric theory literature, endogeneity is explained as the case when the independent variable is correlated with the error term in a regression model. From an econometric theory perspective, the existing causality studies do not make a clear distinction between exogeneity and causality. Thus, the presence of causal relationship from bank credit to money supply is neither necessary nor a sufficient condition for testing the endogenous money hypothesis. As recommended by Baum et. al. (2007), we propose a test of overidentifying restrictions, C statistic, to test the endogenous money hypothesis.

As shown in Hayashi (2000), a regressor is endogenous if it is not predetermined (i.e., not orthogonal to the error term), that is, if it does not satisfy the orthogonality condition. Following this argument, we test whether money is endogenous using the C statistic (also known as difference-in-Sargan statistic). Under the null hypothesis that the specified endogenous regressors can actually be treated as exogenous, the test statistic is distributed as chi-squared with degrees of freedom equal to the number of regressors tested. The endogeneity test is defined as the difference of two Sargan-Hansen statistics: one for the equation with the smaller set of instruments, where the suspect regressor(s) are treated as endogenous, and one for the equation with the larger set of instruments, where the suspect regressors are treated as exogenous. Also like the C statistic, the estimated covariance matrix used guarantees a nonnegative test statistic. Under conditional homoskedasticity, this endogeneity test statistic is numerically equal to a Hausman test statistic; see Hayashi (2000).

Specifically, the C statistic endogeneity test of money can be represented by the following steps:

1) Estimate the linear equation in which bank credit is the dependent variable and monetary aggregates is the explanatory variable using Instrumental Variables (IV) regression methods. The linear equation is defined as,

$$LBC_t = \beta_0 + \beta_1 LM2_t + \varepsilon_t \qquad (1)$$

This equation is estimated because by definition of endogeneity, the test is defined for the explanatory variables. If money (for example LM2) is endogenous then the coefficient of LBC_t , in the following regression is significant and there is a contemporaneous two-way (feedback) relationship between the two variables.

$$LM2_t = \gamma_0 + \gamma_1 LBC_t + \varsigma_t \qquad (2)$$

We implemented the 2SLS methodology to carry out the IV estimation and endogeneity tests.

To conduct IV methodology, valid instruments for $LM2_t$ should be determined. Usually lagged values of the dependent variables can be used in IV regressions. The validity of the

instruments can be tested using the Sargan (1958) statistic. To be able to conduct a robust IV regression, it is also essential to test that we are using all possible instruments in other words whether there are any redundant instruments. To be able to test that all of the instruments are needed (valid) we need to implement the underidentification test of Anderson (1951). The underidentification test is an LM test of whether the equation is identified, i.e., that the excluded instruments are relevant, meaning correlated with the endogenous regressors.

The instruments that we use do not cast considerable doubts: the Anderson (1951)'s underidentification statistic shows that the model is identified, that is to say that, as expected, instruments are "relevant" in the sense that they are correlated with (assumed) endogenous regressors. The Sargan (1958)- Hansen (1982)'s J statistic for overidentifying restrictions does not reject the null hypothesis that our instruments are uncorrelated with the error term (and that excluded instruments are correctly excluded from the estimated equation).

2) After the IV regression, the C statistic should be calculated using the IV regression results. Under the null hypothesis that the specified endogenous regressors can actually be treated as exogenous, the test statistic is distributed as chi-squared with degrees of freedom equal to the number of regressors tested. Thus, if we reject the null hypothesis than the test concludes that the regressor, money, is endogenous.

3.2 Empirical tests of alternative monetary endogeneity views

As explained in section 2, the money supply endogeneity views are generally divided into three: the accommodationist view, the structuralist view and the liquidity preference view. All of these views have separate empirical hypotheses that should be tested using IV with 2SLS.

The endogeneity of money under the accommodationist view indicates the following system of contemporaneous regression equations. After selecting the valid instruments, we estimate the coefficients of the following equation and implement endogeneity tests for monetary aggregates.

$$LBC = \beta_0 + \beta_1(LMB, LM1, LM2) \qquad (3)$$

We implement the endogeneity test for (LMB,LM1,LM2) and if the endogeneity test rejects the null hypothesis of exogeneity then we conclude that monetary aggregates are endogenous. The accommodationist view argues that the relationship between LBC and money is unidirectional and is from LBC to money. Thus, the coefficient of money in equation 3 should be insignificant. Otherwise we conclude that the accommodationist view is not valid and the structuralist and liquidity preference arguments are verified.

The structuralist and liquidity preference views also indicate that there are bidirectional relationships between the money multipliers. So, endogeneity of LMM1and LMM2 should be analyzed by estimating the equation,

$$LBC = \beta_0 + \beta_1(LMM1, LMM2) \qquad (4)$$

and conducting endogeneity tests for LMM1and LMM2.

Both the structuralist and liquidity preference views argue that money multipliers are endogenous and also there is a bidirectional relationship. Thus, to be able to validate these views, exogeneity of LMM1and LMM2 should be rejected by the endogeneity test and the coefficient of money in equation 4 should be significant.

Finally, all of the money supply endogeneity views indicate that there is a bidirectional relationship between money income, LGDP, and monetary aggregates, LM1,LM2. To investigate the argument the following equation should be estimated,

$$LGDP = \beta_0 + \beta_1(LM1, LM2) \tag{5}$$

To have a bidirectional relationship between LGDP and monetary aggregates, exogeneity of LM1and LM2 should be rejected by the endogeneity test and the coefficient of money in equation 5 should be significant.

As a result, the proposed IV test of endogeneity of money can be summarized as the following

Step I: Determine the valid instrumental variables

⇓

Step II: Run the IV regression with the instruments (2SLS or GMM)

⇓

Step III: Check the validity of the instruments using Sargan-Hansen and underidentification tests

⇓

Step III: Conduct the C-statistic endogeneity tests and determine whether money is endogenous

⇓

Step IV: Determine which monetary endogeneity view is valid by analyzing the coefficients of the IV regression results and the endogeneity tests

3.3 Time-series tests

To be able to present the differences between the time-series methods (Granger causality, cointegration etc.) and the proposed IV method, we implement Granger causality tests to all GCC countries. As in Shanmugam et al. (2003), we first test for unit roots using the Phillips-Perron test (Phillips and Perron, 1988). This test is implemented because it is designed to ensure that serial correlation does bot affect the asymptotic distributions. Also, it is shown that the Phillips-Perron test has more power than the augmented Dickey-Fuller test. (Davidson and McKinnon, 1993). The optimal length of the unit root test is determined by the Newey-West method.

As used in the majority of empirical studies about endogeneity of money (Shanmugam et al. (2003), Vera (2001)) we implement the standart Granger causality test model. The Akaike Information Criterion (AIC) is used to determine the optimal lag length.

4 Data

We use monthly, quarterly and annual data. Most of the studies in the literature use quarterly data. Variables are:

• Nominal gross domestic product (GDP)

• Monetary base (MB) : Reserve money in the IFS

• Narrow and broad money aggregates (M1 and M2): M1 is money in the IFS and M2 is money plus quasi money.

• Total bank credit (BC)

• Money multipliers: MM1 = M1/MB , MM2 = M2/MB

All variables are expressed in logarithms: LMB, LM1, LM2, LMM1, LMM2, LGDP and LBC.

5 Characteristics of the GCC countries

The Gulf Cooperation Council (GCC) countries include: Bahrain, Kuwait, Qatar, Oman, Saudi Arabia and the United Arab Emirates (UAE). In this section we provide a brief description of the GCC countries and provide our motivation to investigate the endogeneity of money in these countries. As stated in Hebous (2006), the GCC aims at supporting the economic integration among its six members since its establishment in 1981. The GCC formed a customs union in 2003 and the GCC members agreed on launching a common currency by 2010 at the Muscat summit in December 2001.

Even though joining a monetary unions has many benefits like promoting trade, reducing country risk and lowering transaction costs, there are major shortcomings for the member country. One of the major costs is that a member country loses its ability to conduct a national monetary policy that best fits its economic conditions. Hebous (2006) argues that although the GCC states have similar economic structures, share a common language and cultural similarities, there are significant challenges of the monetary union. To name a few, the choice of the future exchange rate regime and the convergence criteria might cause serious problem for the union.

(Table I about here.)

Table I displays the main economic indicators of the GCC states. The GDP for the GCC members as a whole is about 1023 billion US dollars in 2009. Additionally, when the GCC union is established, it will be the largest monetary union after the Euro Area. The total GDP of GCC increased from 3.4 % of EU GDP to 8 % in 2008. GDP varies significantly among these countries. For example, Saudi Arabia is the biggest economy with a GDP of 469.43 billion which constitutes 43.74 percent of the GCC GDP. The second largest economy is UAE with a 24.43 percent share in the total GDP for all members, while the smallest economy is

Bahrain (1.98) percent. The GDP growth rates are relatively high in the GCC region, for example 10 and 9.4 percent in Kuwait and Qatar respectively. Saudi Arabia is the largest country with 67/3 % of all 37 million GCC population. All GCC countries are oil-dependent economies. The share of oil production in GDP is highest in Qatar (60.8 percent) and lowest in Bahrain (28.5percent).

The rate of inflation significantly varies among the member states and the average inflation rate of the GCC region as a whole is relatively low (5.76 percent). The percentage of government expenditure in GDP is similar in most of the states except for Saudi Arabia where 23.29 percent of GDP is government expenditures.

To sum up, the GCC countries have many economic similarities and differences. All GCC states are open and highly oil-dependent economies which implement a fixed exchange rate regime pegged to the US dollar. The member states are integrated at many levels with the establishment of a customs union in 2003 and the agreement to introduce a single currency by 2010. For a successful implementation of the monetary union the dynamics behind the monetary systems of each countries should be understood. Specifically, endogeneity of money should be investigated thoroughly in the GCC countries since monetary policy implications highly depend on the supply mechanisms of money.

6 Empirical results

Our empirical results are not displayed by school of thought, but by the methodology and tests of relationship. In other words, tables II-V present the analysis of contemporaneous relationships and display the results of IV regressions and C-statistic endogeneity tests for all GCC countries. Tables VI and VII conduct the time-series analysis and show the unit root tests and Granger Causality test respectively.

6.1 Contemporaneous relationship (IV regressions)

Table II presents the IV regression results of LMB, LM2 and LMM2 for all GCC countries. LM1 and LMM1 are also used but the results are very similar thus we do not present those results for the sake of compactness. Table II displays the IV regression results of equations [eq:accom] and [eq:liquidity]. The instruments used for the estimations are displayed in the notes of Table II. For all of the countries and for all variables the Sargan-Hansen statistics method accepts the null hypothesis that the instruments are valid. The underidentification test in all but one regression reject the null hypothesis that there are redundant variables. As a result, we can safely claim that the instruments used in the analysis are valid and our IV results do not suffer from any biases.

After verifying that our IV results are valid, we proceed with the analysis of the coefficients. Table II presents that for all of the GCC countries the coefficient of the monetary aggregates (LMB, LM2, LMM2), \beta_{1}, is significant. Except for LMB of Kuwait and LMM2 of Qatar, the signs of \beta_{1} are positive as expected and as indicated by endogeneity of money hypotheses. Table III displays the endogeneity tests of alternative monetary aggregates and money multipliers. The null hypothesis of the C-statistics of endogeneity is that the

variables is exogenous. Thus, the endogeneity of money hypothesis is accepted if we reject the null hypothesis. When we analyze the p-values of endogeneity tests, we reject the null hypothesis (and accept endogeneity of monetary aggregates and multipliers) for all countries and all variables except for LM2 of Oman, LM1 of Qatar and LM2 of UAE. As a result, analysis of Tables II and III indicate a bidirectional relationship between bank credit and monetary aggregates and multipliers. These results are in line with the structuralist and liquidity preference views and do not empirically validate the the accommodationist view.

(Tables II and III about here.)

The endogeneity of money theory also implies a bidirectional relationship between money income (GDP) and monetary aggregates (M1, M2). Tables IV and V analyze this relation. Table IV presents that for all of the GCC countries the coefficient of the monetary aggregates (LM1, LM2), \beta_{1}, is significant. Except for LM1 and LM2 of Kuwait the signs of \beta_{1} are positive as expected and as indicated by endogeneity of money hypotheses. Table V displays the endogeneity tests of alternative monetary aggregates. The null hypothesis of the C-statistics of endogeneity is that the variables is exogenous. Thus, the endogeneity of money hypothesis is accepted if we reject the null hypothesis. When we analyze the p-values of endogeneity tests, we reject the null hypothesis (and accept endogeneity of monetary aggregates and multipliers) for all countries. As a result, analysis of tables IV and table V indicate a bidirectional relationship between money income and monetary aggregates. These results are in line with all views of the endogeneity of money hypothesis.

(Tables IV and V about here.)

Implementing the proposed endogeneity test for GCC countries conclude that money is endogenous in GCC countries and the structuralist and liquidity preference views are empirically supported.

6.2 Time series causality tests

Previous empirical studies of the endogeneity of money theory make use of time series causality tests like Granger causality and cointegration. To make the comparison between the contemporaneous relationship presented in section 6.1, we implement the the standart Granger causality tests like Howells and Hussein (1998), Vera (2001) and Shanmugam et al. (2003).

The method has two stages. The Granger causality tests require stationarity of the variables (Granger, 1969). We test the log levels and log differences of all variables for stationarity using Phillips-Perron test. The results of the Phillips-Perron unit root tests are tabulated in Table VI. The tests show that the null hypothesis of a unit root can not be rejected for all the variables at log level. This indicates that the variables are nonstationarity at levels. The tests below each variable presents the unit root test results for log differences of variables. The null hypothesis can be rejected at 1 percent significance level when all variables are differenced

once which indicates that the variables are stationary in first difference and Granger causality tests can be implemented using first differences of variables.

(Table VI about here.)

As in Vera (2001) and Shanmugam et al. (2003), we implement the Granger causality tests using the first differences of logarithm of variables to investigate the bidirectional causality between monetary aggregates, bank credit and money income (GDP) indicated by the endogeneity of money theory. The results from the Granger causality tests between bank credit, the monetary aggregates, money multipliers and GDP are shown in Table VII. The first column contains the explanatory and dependent variables in each test and its results. A sign of \rightarrow means that the left-hand side variable Granger-causes the right-hand side variable. The other columns present the F-statistic and optimal lag length indicated by AIC for each country.

(Table VII about here.)

The main finding of Table VII is that causality differs among countries. For example. There is bidirectional relationship between bank credit (DLBC) and money (DLM2) for Oman and Qatar since the null hypothesis that there is no causality is rejected for both variables. But for Saudi Arabia and UAE the causality is unidirectional and bank credit causes M2. For Bahrain and Kuwait the causality is from M2 to bank credit. As a result, for Oman, Qatar, Saudi Arabia and UAE we find evidence that supports the endogeneity of money theory. For Saudi Arabia and UAE the causality tests support the accommodationist view and for the Oman and Qatar the liquidity preference view is supported. For the relationship between GDP and money, the bidirectional relationship only exists for Oman and Qatar.

Granger causality tests in Table VII is conducted only using the optimal lag determined by the AIC. Since different lag structures might result in different test statistics, the causality results might vary. Table VII is presented to compare the results of the IV methodology and the Granger causality technique. Finally, we conclude that the results of both tests differ significantly. The lag selection significantly alters the time series methodology and a contemporaneous relationship between monetary aggregates, bank credit and income is overlooked in the time series investigations implemented in previous studies. The empirical results of our paper indicate that the empirical evidence about endogeneity of money actually might be stronger but it is not represented in the literature because the contemporaneous relationship is not investigated. Most studies follow a times series approach and focus on relation between money and lagged values of bank credit which might undermine endogeneity of money.

7 Conclusion

In this paper, we propose a direct test for endogenous money theory and provide empirical evidence for the theory from the GCC countries. Even though the endogeneity of money has significant policy implications and has manifest importance to understand the mechanism behind monetary policy and macroeconomic dynamics, there is surprisingly little empirical

evidence especially about developing countries. Our results suggest that the lack of empirical evidence might be caused by the fact that previous studies ignore the contemporaneous relationship between bank credit and monetary aggregates. Previous studies focus on time series analysis of variables and that might undermine endogeneity of money since time series methodology by definition highly depends on lag selection. The IV methodology we propose directly test the endogeneity of money.

There are two main results of our study. First of all, the IV methodology significantly indicates that money is endogenous in all GCC countries. Second, Granger causality tests suggest that money is not endogenous in Bahrain and Kuwait. Also, the structure of the relation between bank credit and money is different as in Saudi Arabia and UAE the correlation is unidirectional and in Oman and Qatar it is bidirectional. As a result, we conclude that ignoring the contemporaneous relationship might significantly alter the analysis of endogeneity and undermine endogeneity of money in a country. As a result, this paper contributes to the literature of endogeneity of money in two ways. First, we propose a direct test of endogeneity of money which depends on the contemporaneous relationship. Second, we provide empirical evidence that confirms the endogeneity of money theory from the GCC countries which does not exist in the literature. Our results have significant policy implications since the GCC countries will form a monetary union and understanding the mechanism of money generation has apparent importance to conduct an effective monetary policy in a monetary union. This empirical analysis is in line with the Post-Keynesian theoretical argument and provide evidence that money is endogenous in these countries. The results indicate that the GCC countries should not use monetary aggregates as targets for monetary policy after unification.

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Table I

Main Economic Indicators in the GCC in 2006

	Bahrain	Kuveyt	Oman	Qatar	Saudia Arabia	United Arab Emirates
Inflation	2.01	3.08	3.2	11.83	2.21	12.73
GDP (billion$) (1)	21.24	158.09	59.95	102.3	469.43	262.15
GDP share in the GCC GDP (percent)	1.98	14.73	5.58	9.53	43.74	24.43
GDP annual growth (percent)	7.03	9.97	6.27	9.4	5.31	8.91
Share of total imports and exports in GDP	173.6	85	111	109	107	184
Petroleum production/GDP	28.5	59.3	51.3	60.8	55.1	38.7
Oil Export/Aggregate Exports	79.2	94.5	75.9	47.5	88	46.7
Oil Revenue Government Revenue	85.2	91.1	74.1	60.0	76.2	77
Central government Non oil fiscal balance (in percent of non oil gdp) (2)	-33.9	-55.1	-42.8	-24.6	-60.8	-28.4
Central government fiscal balance (in percent of GDP) (2)	8	26.9	22.6	12.2	33.0	21.7
Share in the GCC Petroleum Production**	1.2	15.3	4.1	6.3	58.2	16.1
Share in the GCC Petroleum Reserves**	n.a	14.7	3.9	6.7	58.4	1.6
Share in the GCC Natural Gas Production**	5.0	5.1	10.2	26.8	31.5	21.4
Share in the GCC Natural Gas Reserves**	0.2	4.2	2.3	60.6	17.4	15.3
Population	0.779	3.443	2.769	1.098	24.897	4.764

(Mill)

Data Source:

(1) World Economic Outlook , October,2009

(2) IMF Regional Economic Outlook (Middle East and Central Asia), October 2009

(3) Web pages of the Central Banks

(4) BP http://www.bp.com historical data , 2007.

Notes: ** Bahrein is not available in the BP. GCC Outlook June 2008 presents share of Bahrain as %1.2.

Table II

IV regression results all countries dependent variable: credit, independent variable: monetary aggregates

Country		β_0	β_1	Sargan Statistic	Underidentification Test	Number of Observations
Bahrain	LMB	-16.53 (13.57)**	1.91 (29.79)**	0.06 P-value=0.97	252.2 P-value=0.00	360
	LM2	-20.04 (13.18)**	1.9 (26.19)**	0.06 P-value=0.97	233.1 P-value=0.00	360
	LMM2	-1,319.57 (0.13)	710.44 (0.13)	0.004 P-value=0.99	0.02 P-value=0.99	360
Kuwait	LMB	1.97 (63.79)**	-17.48 (28.84)**	1.01 P-value=0.78	468.8 P-value=0.00	523
	LM2	-13.78 (50.96)**	1.6 (129.25)**	0.05 P-value=0.83	518.8 P-value=0.00	532
	LMM2	0.92 (0.68)	9.37 (14.86)**	0.01 P-value=0.98	152.8 P-value=0.00	532
Oman	LMB	-8.6 (14.76)**	1.51 (49.72)**	0.02 P-value=0.99	410.4 P-value=0.00	433
	LM2	-2.94 (9.43)**	1.13 (74.73)**	1.11 P-value=0.58	432.6 P-value=0.00	433
	LMM2	14 (68.02)**	4.5 (31.53)**	2.3 P-value=0.32	291.2 P-value=0.00	433
	LMB	-4.37 (6.58)**	1.29 (42.21)**	2.93 P-value=0.23	273.5 P-value=0.00	326

Qatar	LM2	-5.44	1.22	2.84	401	413
		(22.80)**	(119.77)**	P-value=0.42	P-value=0.00	
	LMM2	48.05	-11.8	2.17	36.9	310
		(11.15)**	(5.66)**	P-value=0.34	P-value=0.00	
	LMB	-29.76	2.23	1.94	188.9	247
		(13.63)**	(25.38)**	P-value=0.16	P-value=0.00	
Saudi Arabia	LM2	-16.35	1.59	1.17	202	247
		(11.33)**	(29.11)**	P-value=0.28	P-value=0.00	
	LMM2	17.1	5.55	0.04	198.6	247
		(57.03)**	(28.79)**	P-value=0.85	P-value=0.00	
	LMB	2.53	0.95	1.64	365.6	373
		(7.35)**	(65.02)**	P-value=0.2	P-value=0.00	
UAE	LM2	0.87	1.03	0.76	177.2	386
		(1.22)	(36.12)**	P-value=0.38	P-value=0.00	
	LMM2	30.94	-3.84	0.05	164.4	386
		(58.44)**	(11.52)**	P-value=0.82	P-value=0.00	

Notes: * significant at 5%; ** significant at 1%. When the p-value is larger than 0.05 then we accept the null hypothesis of the Sargan statistic that the that the instruments are uncorrelated with the error term.

Instruments: Bahrain: 1,2,3 lags of LBC for 1,2,3,4 lags of LBC; Kuwait: For LM2 and LMM2 2 and 3 lag of LM2 used. For LMM1 3,4 lags of LBC; Oman: 1,2, 3 lags of LM2; Qatar: LBClag2 LBClag3 LBClag4 used for MB. 2,3,4 lag of LM1 for LM1 and LMM1 and LMM2. 1,2,3,4 lag of LBC for LM2; Saudi Arabia: LBClag3LBClag4 used for LMB; UAE:1,2,3 lags ofLBC.

Table III

Endogeneity tests for all countries (Credit and Monetary Aggregates)

	Bahrain	Kuwait	Oman	Qatar	Saudi Arabia	UAE
LMB	293.8	508.9	254.9	313.1	188.8	80.3
	P-value = 0.00	P-value = 0.00	P-value = 0.00	P-value = 0.00	P-value = 0.00	P-value = 0.00
LM1	285.158	492	78.8	0.6	174.4	23.7
	P-value = 0.00	P-value = 0.00	P-value = 0.00	P-value = 0.44	P-value = 0.00	P-value = 0.00
LM2	303.6	46.55	0.15	386.4	176.8	1.28
	P-value = 0.00	P-value = 0.00	P-value = 0.7	P-value = 0.00	P-value = 0.00	P-value = 0.26
LMM1	333.9	412.4	381	264.7	186.9	78.4
	P-value = 0.00	P-value = 0.00	P-value = 0.00	P-value = 0.00	P-value = 0.00	P-value = 0.00
LMM2	274.9	503.2	335.2	223.6	178.9	25.5
	P-value = 0.00	P-value = 0.00	P-value = 0.00	P-value = 0.00	P-value = 0.00	P-value = 0.00

Notes: When the p-value is smaller than 0.05 then we reject the null hypothesis of the exogeneity test that the dependent variable is exogeneous. Thus, smaller p-values show that the analyzed variables are endogenous.

Table IV

IV regression results All countries dependent variable: GDP, independent variable: monetary aggregates

Country		β_0	β_1	Sargan Statistic	Underidentification Test	Number of Observations
Bahrain	LM1	20.14	0.26	0.18	23.8	124
		(17.38)**	(4.42)**	P-value=0.91	P-value=0.00	
	LM2	20.44	0.23	0.19	21.76	124
		(18.43)**	(4.35)**	P-value=0.91	P-value=0.00	
	Instruments: 2,3,4 lag of LGDP used.					
Kuwait	LM1	36.15	-0.53	1.19	38.1	167
		(22.36)**	(6.67)**	P-value=0.28	P-value=0.00	
	LM2	34.87	-0.44	0.47	40.3	167
		(24.97)**	(6.81)**	P-value=0.23	P-value=0.00	
	Instruments: 3,4 lag of LGDP used.					
Oman	LM1	11.732	0.665	0.82	89.1	128
		(14.96)**	(16.77)**	P-value=0.66	P-value=0.00	
	LM2	14.700	0.489	0.98	100.2	128
		(30.54)**	(21.16)**	P-value=0.61	P-value=0.00	
	Notes: Instruments: 2,3,4 lag of LGDP used. * significant at 5%; ** significant at 1%					
Qatar	LM1	9.770	0.696	0.81	33.8	139
		(4.26)**	(6.67)**	P-value=0.67	P-value=0.00	
	LM2	17.779	0.319	1.05	63.5	160
		(24.19)**	(9.84)**	P-value=0.31	P-value=0.00	
	Instruments: 2,3,4 lag of LGDP used for LM1. 3,3 lag of LGDP for LM2					

	LM1	19.840	0.248	3.5	124.8	141
		(42.77)**	(13.44)**	P-value=0.06	P-value=0.00	
Saudi Arabia	LM2	20.355	0.223	4.76	121.3	141
		(45.48)**	(12.77)**	P-value=0.03	P-value=0.00	
	Instruments: 3,4 lag of LCPI used.					
UAE	LM1	16.583	0.380	0.18	108.6	132
		(42.55)**	(22.97)**	P-value=0.91	P-value=0.00	
	LM2	15.916	0.387	0.45	93.7	136
		(27.15)**	(16.39)**	P-value=0.80	P-value=0.00	
	Instruments: 2, 3,4 lag of LGDP used.					

Notes: * significant at 5%; ** significant at 1%. When the p-value is smaller than 0.05 then we reject the null hypothesis of the exogeneity test that the dependent variable is exogeneous. Thus, smaller p-values show that the analyzed variables are endogenous.

Table V

Endogeneity tests for all countries (GDP (Nominal Income) and Monetary Aggregates)

	Bahrain	Kuwait	Oman	Qatar	Saudi Arabia	UAE
LM1	19.7	59.8	144.6	121.6	16.5	95.9
	P-value = 0.00	P-value = 0.00	P-value = 0.00	P-value = 0.00	P-value = 0.00	P-value = 0.00
LM2	19.6	59	109.7	116.1	3.5	112.1
	P-value = 0.00	P-value = 0.00	P-value = 0.00	P-value = 0.00	P-value = 0.06	P-value = 0.00

Notes: When the p-value is smaller than 0.05 then we reject the null hypothesis of the exogeneity test that the dependent variable is exogeneous. Thus, smaller p-values show that the analyzed variables are endogenous.. Compared to previous studies monthly data is used.

Table VI

Unit Root Tests Phillips Perron

	Bahrain		Kuwait		Oman		Qatar		Saudi Arabia		UAE	
Variable	Test Statistic	Lag	Test Statistic	Lag	Test Statistic	Lag	Test Statistic	Lag	Test Statistic	Lag	Test Statistic	Lag
LBC	-2.52	5	1.67	15	-3*	0	-1.17	3	-1.01	6	-3.34**	13
DLBC	19.3**	6	-25.6**	11	-25.81	8	-21.91**	5	-8.51**	5	-15.39**	11
LMB	-0.83	4	-1.32	5	-2.44	15	-1.04	6	-2.33	9	-1.61	5
DLMB	-27.6**	1	-27.44**	0	-36.7**	2	-15.51**	8	-28.04**	11	-22.91**	3
LM1	-0.3	14	-0.63	4	-3.28*	1	2.15	8	-2.17	12	-0.09	8
DLM1	-29.3**	4	-24.87**	5	-24.1**	7	-17.97**	2	-27.09**	13	-19.98**	7
LM2	-1.47	10	-1.36	166	-2.42	2	-1.48	3	-2.34	14	-0.38	10
DLM2	-30.56**	1	-56.56**	469	-21.71**	5	-22.36**	6	-28.14**	15	-20.87**	10
LMM1	-8.6**	12	-0.05**	4	-4.36**	7	-3.16*	3	-0.85	5	-3.76**	0
DLMM1	-34.9**	9	-27.2**	4	-43**	14	-19.76**	8	-32.22**	3	-26.28**	10

LMM2	-3.95**	10	-5.24**	22	-1.82	12	-3.85**	3	-0.59	3	-3.02*	3
DLMM2	-33.5**	7	-42.25**	91	-43.88**	14	-18.22	13	-31.06**	0	-27.19**	9
LGDP	-1.26	9	-0.91	2	-1.3	9	-1.3	9	-2.35	9	-2.19	7
DLGDP	-12.53**	9	-13.39**	2	-12.63**	8	-13.67**	8	-13.96**	9	-12.52**	7

Notes: * significant at 5%; ** significant at 1%. Newey West lags. The LGDP variable is quarterly.

Table VII

Standard Granger causality tests as in Malaysia (2003) paper

	Bahrain		Kuwait		Oman		Qatar		Saudi Arabia		UAE	
Variable	Test Statistic	Lag[a]	Test Statistic	Lag[a]	Test Statistic	Lag[a]	Test Statistic	Lag[a]	Test Statistic	Lag[a]	Test Statistic	Lag[a]
DLBC → DLM2	0.87	14	0.04	4	1.71	12	1.94	6	2.85	5	4.64	3
	(0.59)		(1)		(0.06)*		(0.07)*		(0.02)**		(0.00)***	
DLM2 → DLBC	4.21	14	3.24	4	3.03	12	6.07	6	0.86	5	0.46	3
	(0.00)***		(0.02)**		(0.00)***		(0.00)***		(0.51)		(0.71)	
DLBC →DLMB	0.27	3	0.08	4	0.75	13	1.4	8	2.35	12	5.86	1
	(0.84)		(1)		(0.79)		(0.2)		(0.01)*		(0.02)**	
DLMB → DLBC	0.44	3	1.26	4	0.67	13	0.83	8	1.66	12	5.98	1
	(0.72)		(0.29)		(0.8)		(0.58)		(0.08)		(0.01)*	
DLBC → DLM1	2.63	5	2.07	12	1.53	13	0.9	1	1.81	13	1.62	12
	(0.02)**		(0.01)***		(0.1)*		(0.34)		(0.04)**		(0.09)*	
DLM1 → DLBC	1.91	5	0.79	12	1.09	13	0.11	1	1.52	13	4.64	12

	(0.09)*		(0.68)		(0.37)		(0.74)		(0.11)		(0.00)***	
DLBC →DLMM1	1.74	8	1.55	4	0.00	1	1.25	1	1.59	13	4.34	1
	(0.09)*		(0.19)		(0.98)		(0.27)		(0.09)*		(0.04)**	
DLMM1→ DLBC	0.53	8	0.24	4	0.43	1	0.5	1	1.57	13	1.27	1
	(0.84)		(0.92)		(0.51)		(0.48)		(0.09)*		(0.26)	
DLBC →DLMM2	1.07	10	0.54	4	0.8	12	1.05	1	2.85	5	4.64	3
	(0.38)		(0.71)		(0.65)		(0.31)		(0.02)**		(0.00)***	
DLMM2→ DLBC	0.79	10	0.08	4	1.23	12	0.18	1	0.86	5	0.46	3
	(0.64)		(0.99)		(0.26)		(0.67)		(0.51)		(0.71)	
DLGDP→ DLM1	4.2	4	2.96	12	2.99	4	2.27	4	6.12	7	1.3	12
	(0.00)***		(0.00)***		(0.02)**		(0.07)*		(0.00)***		(0.24)	
DLM1 → DLGDP	2.19	4	1.97	12	1.14	4	1.46	4	2.06	7	1.26	12
	(0.09)*		(0.03)**		(0.34)		(0.22)		(0.05)**		(0.26)	
DLGDP→ DLM2	4.76	4	2.67	9	5.85	4	3.58	8	5.8	8	2.49	5
	(0.00)***		(0.00)***		(0.00)***		(0.00)***		(0.00)***		(0.04)**	
DLM2 → DLGDP	1.22	4	0.76	9	2.25	4	1.77	8	1.19	8	0.81	5

	(0.31)	(0.66)	(0.07)*	(0.09)*	(0.31)	(0.55)

Notes: [a] Optimal lag length based on AIC. *significant at 10%; ** significant at 5%; *** significant at 1%. The LGDP variable is quarterly. P-values in parantheses.

Referee's Appendix:

Detailed Regression Results for Each Country:

Table A.I

IV regression results Bahrain dependent variable: credit, independent variable: monetary aggregates

	β_0	β_1	Sargan Statistic	Underidentification Test	Number of Observations
LMB	-16.53 (13.57)**	1.91 (29.79)**	0.06 P-value=0.97	252.2 P-value=0.00	360
LM1	-19.59 (16.30)**	2.00 (32.75)**	0.02 P-value=0.99	264.8 P-value=0.00	360
LM2	-20.04 (13.18)**	1.9 (26.19)**	0.06 P-value=0.97	233.1 P-value=0.00	360
LMM1	44.28 (8.06)**	-39.45 (4.47)**	0.28 P-value=0.87	18.95 P-value=0.00	360
LMM2	-1,319.57 (0.13)	710.44 (0.13)	0.004 P-value=0.99	0.02 P-value=0.99	360

Notes: Instruments: 1,2,3 lags of LBC. * significant at 5%; ** significant at 1%

Table A.II

IV regression results Kuwait dependent variable: credit, independent variable: monetary aggregates

	β_0	β_1	Sargan Statistic	Underidentification Test	Number of Observations
LMB	1.97 (63.79)**	-17.48 (28.84)**	1.01 P-value=0.78	468.8 P-value=0.00	523

LM1	-18.75	1.96	1.94	489.5	519
	(44.07)**	(93.81)**	P-value=0.82	P-value=0.00	
LM2	-13.78	1.6	0.05	518.8	532
	(50.96)**	(129.25)**	P-value=0.83	P-value=0.00	
LMM1	-100.27	158.98	0.2	0.8	521
	(0.74)	(0.89)	P-value=0.65	P-value=0.67	
LMM2	0.92	9.37	0.01	152.8	532
	(0.68)	(14.86)**	P-value=0.98	P-value=0.00	

Notes: Instruments: 1,2,3,4 lags of LBC. For LM2 and LMM2 2 and 3 lag of LM2 used. For LMM1 3,4 lags of LBC.
* significant at 5%; ** significant at 1%

Table A.III

IV regression results Oman dependent variable: credit, independent variable: monetary aggregates

	β_0	β_1	Sargan Statistic	Underidentification Test	Number of Observations
LMB	-8.6	1.51	0.02	410.4	433
	(14.76)**	(49.72)**	P-value=0.99	P-value=0.00	
LM1	-7	1.39	0.74	423.9	433
	(17.21)**	(67.32)**	P-value=0.69	P-value=0.00	
LM2	-2.94	1.13	1.11	432.6	433
	(9.43)**	(74.73)**	P-value=0.58	P-value=0.00	
LMM1	13.1	17.97	3.05	61.98	433
	(15.72)**	(8.85)**	P-value=0.22	P-value=0.00	
LMM2	14	4.5	2.3	291.2	433
	(68.02)**	(31.53)**	P-value=0.32	P-value=0.00	

Notes: Instruments: 1,2, 3 lags of LM2 used. * significant at 5%; ** significant at 1%

Table A.IV

IV regression results Qatar dependent variable: credit, independent variable: monetary aggregates

	β_0	β_1	Sargan Statistic	Underidentification Test	Number of Observations
LMB	-4.37	1.29	2.93	273.5	326
	(6.58)**	(42.21)**	P-value=0.23	P-value=0.00	
LM1	2.39	0.94	0.64	307.3	310
	(3.01)**	(26.83)**	P-value=0.73	P-value=0.00	
LM2	-5.44	1.22	2.84	401	413
	(22.80)**	(119.77)**	P-value=0.42	P-value=0.00	
LMM1	10.81	17.1	0.09	11.4	310
	(2.62)**	(3.13)**	P-value=0.96	P-value=0.01	
LMM2	48.05	-11.8	2.17	36.9	310
	(11.15)**	(5.66)**	P-value=0.34	P-value=0.00	

Notes: Instruments: LBClag2 LBClag3 LBClag4 used for MB. 2,3,4 lag of LM1 for LM1 and LMM1 and LMM2. 1,2,3,4 lag of LBC for LM2. * significant at 5%; ** significant at 1%

Table A.V

IV regression results Saudi Arabia dependent variable: credit, independent variable: monetary aggregates

	β_0	β_1	Sargan Statistic	Underidentification Test	Number of Observations
LMB	-29.76	2.23	1.94	188.9	247
	(13.63)**	(25.38)**	P-value=0.16	P-value=0.00	
LM1	-18.64	1.72	0.96	203.6	247
	(12.50)**	(29.71)**	P-value=0.33	P-value=0.00	
LM2	-16.35	1.59	1.17	202	247

	(11.33)**	(29.11)**	P-value=0.28	P-value=0.00	
LMM1	18.83	7.46	1.07	187.2	247
	(70.99)**	(26.09)**	P-value=0.3	P-value=0.00	
LMM2	17.1	5.55	0.04	198.6	247
	(57.03)**	(28.79)**	P-value=0.85	P-value=0.00	

Notes: Instruments: LBClag3 LBClag4 used for LMB. * significant at 5%; ** significant at 1%

Table A.VI

IV regression results UAE dependent variable: credit, independent variable: monetary aggregates

	β_0	β_1	Sargan Statistic	Underidentification Test	Number of Observations
LMB	2.53	0.95	1.64	365.6	373
	(7.35)**	(65.02)**	P-value=0.2	P-value=0.00	
LM1	3.77	0.89	0.04	139	373
	(5.78)**	(32.36)**	P-value=0.85	P-value=0.00	
LM2	0.87	1.03	0.76	177.2	386
	(1.22)	(36.12)**	P-value=0.38	P-value=0.00	
LMM1	27.26	-9.9	1.63	30.79	373
	(64.17)**	(5.76)**	P-value=0.2	P-value=0.00	
LMM2	30.94	-3.84	0.05	164.4	386
	(58.44)**	(11.52)**	P-value=0.82	P-value=0.00	

Notes: Instruments: LM2lag4 LM1lag4 used for LMB. 5 and 6 lag of log petrolium production used for other variables. * significant at 5%; ** significant at 1%

Table A.VII

IV regression results Bahrain dependent variable: GDP, independent variable: monetary aggregates

	β_0	β_1	Sargan Statistic	Underidentification Test	Number of Observations
LM1	20.140	0.262	0.18	23.8	124
	(17.38)**	(4.42)**	P-value=0.91	P-value=0.00	
LM2	20.442	0.231	0.19	21.76	124
	(18.43)**	(4.35)**	P-value=0.91	P-value=0.00	

Notes: Instruments: 2,3,4 lag of LGDP used. * significant at 5%; ** significant at 1%

Table A.VIII

IV regression results Kuwait dependent variable: GDP, independent variable: monetary aggregates

	β_0	β_1	Sargan Statistic	Underidentification Test	Number of Observations
LM1	36.148	-0.528	1.19	38.1	167
	(22.36)**	(6.67)**	P-value=0.28	P-value=0.00	
LM2	34.867	-0.435	0.47	40.3	167
	(24.97)**	(6.81)**	P-value=0.23	P-value=0.00	

Notes: Instruments: 3,4 lag of LGDP used. * significant at 5%; ** significant at 1%

Table A.IX

IV regression results Oman dependent variable: GDP, independent variable: monetary aggregates

	β_0	β_1	Sargan Statistic	Underidentification Test	Number of Observations
LM1	11.732	0.665	0.82	89.1	128
	(14.96)**	(16.77)**	P-value=0.66	P-value=0.00	
LM2	14.700	0.489	0.98	100.2	128
	(30.54)**	(21.16)**	P-value=0.61	P-value=0.00	

Notes: Instruments: 2,3,4 lag of LGDP used. * significant at 5%; ** significant at 1%

Table A.X

IV regression results Qatar dependent variable: GDP, independent variable: monetary aggregates

	β_0	β_1	Sargan Statistic	Underidentification Test	Number of Observations
LM1	9.770	0.696	0.81	33.8	139
	(4.26)**	(6.67)**	P-value=0.67	P-value=0.00	
LM2	17.779	0.319	1.05	63.5	160
	(24.19)**	(9.84)**	P-value=0.31	P-value=0.00	

Notes: Instruments: 2,3,4 lag of LGDP used for LM1. 3,3 lag of LGDP for LM2 * significant at 5%; ** significant at 1%

Table A.XI

IV regression results Saudi Arabia dependent variable: GDP, independent variable: monetary aggregates

	β0	β1	Sargan Statistic	Underidentification Test	Number of Observations
LM1	19.840	0.248	3.5	124.8	141
	(42.77)**	(13.44)**	P-value=0.06	P-value=0.00	
LM2	20.355	0.223	4.76	121.3	141
	(45.48)**	(12.77)**	P-value=0.03	P-value=0.00	

Notes: Instruments: 3,4 lag of LCPI used. * significant at 5%; ** significant at 1%

Table A.XII

IV regression results UAE dependent variable: GDP, independent variable: monetary aggregates

	β_0	β_1	Sargan Statistic	Underidentification Test	Number of Observations
LM1	16.583	0.380	0.18	108.6	132
	(42.55)**	(22.97)**	P-value=0.91	P-value=0.00	
LM2	15.916	0.387	0.45	93.7	136
	(27.15)**	(16.39)**	P-value=0.80	P-value=0.00	

Notes: Instruments: 2, 3,4 lag of LGDP used. * significant at 5%; ** significant at 1%