On The Stability of Money Demand in Saudi Arabia

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Introduction

- Analyzing the behavior of money demand has been one of the substantial subject in both theoretical and empirical research.
- This is mainly due to the role of money in the economy, especially in the implementation of monetary policy.
- Central banks have used money demand to control inflation through the appropriate adjustment of money supply.
- Hence, it is important to maintain a stable money demand function to fight inflationary pressures.

Introduction

- Likewise, it is crucial to identify the source of money demand instability.
- Some of these sources as pointed out by existing literature include:
  - Financial innovations.
  - Output uncertainty.
  - Shifts in exchange rate regime.
  - Misspecification of money demand function.
  - Data frequency.
  - Econometric issues.
- Therefore, it is essential to investigate properly the stability of money demand to avoid bias results.

Motivation

- To provide monetary policymakers a clear indication about the money growth targeting.
- To fill out the gap in the literature focusing on Saudi Arabia.
- Recent research paper by Banafea (2014) documents evidence in favor of instability of Saudi money demand function over long run.

Objective

- Examining the relationship between money demand and its determinants.
- Assessing the stability of money demand function over long run in Saudi Arabia.

Money Demand Theories

- Classical Quantity Theory
- Keynesian Theory
- Friedman's Theory

Classical Quantity Theory

- It points out to the direct and proportional relationship between the quantity of money and price level.
  - Fisher Equation of Exchange Rate
    - Money is a medium of exchange.

$$MV = PT$$

Since it is hard to measure the number of transaction T, economists use output (income) instead of the number of transactions.

$$MV = PY$$

V is assumed to be constant in short run.

- Interest rates have no effect on demand for money.

Keynesian Theory

- It points out to the motivation of holding money:
  - Money is a medium of exchange to facilitate transactions.
    - Positive relationship between income and money demand because an increase in income and expenditures requires people to hold more money.
  - Precautionary motive for unexpected events.
    - Positive relationship between precautionary money demand and income.
  - Speculative motive or liquidity preference; money functions as a store of wealth.
    - People can store wealth in either money or bonds. In other words, people prefer holding bonds with higher interest rate rather than money.
    - Negative relationship between interest rate and holding money.

Keynesian Theory

- Based on the Keynesian theory, the money demand function can be represented as follows:

$$m^d \equiv \left(\frac{m}{p}\right) = f\left(\underset{+}{Y}, \underset{-}{I}\right)$$

- where m^d denotes money demand while m, p, Y, and I denote the money supply, price level, real output, and nominal interest rate respectively.

Friedman'sTheory

- Money is a function of wealth and expected returns of other assents relative to the expected return on money.

$$m^d \equiv (\frac{m}{p}) = f(Y_p, i_s^e - i_m, i_b^e - i_m, \pi^e - i_m)$$

- where m^d denotes money demand while m, p, and Y_p denote the money supply, price level, and permanent income, respectively
- There is positive relationship between money demand and permanent income and negative relationship between money demand and expected returns on assets.
- Friedman assumed that the expected return on money depends on the interest payments on checkable deposits and services provided by banks on deposits.
    - changes in interest rates have little or no effect on the money demand $\rightarrow$ money demand is stable and not affected by interest rate.

Literature Review

- There is extensive literature examining money demand for advanced and less advanced countries.
- Sriram (2000) and Banafea (2012) provide comprehensive literature review on money demand.
- Despite the large share of empirical studies on money demand, Saudi Arabia's share is scarce.

Literature Review on Saudi Arabia

Paper	Measure of Money	Data Frequencies	Determinants	Cointegration Test	Stability Test
Alkaswani & Al-Towaijri (1999)	M1	1977-1997. Q	Non-Oil GDP, inflation, interest rate, and nominal exchange rate	Johansen and Juselius (1991)	No
Herb (2004) for GCC area	M1	1979-2000. A	Real Consumption or Real GDP, interest rate, and nominal exchange rate	Pedroni (2001)	No
Lee et al. (2008) for GCC	M1	1979-2000. A	Real Consumption or Real GDP, interest rate, and nominal exchange rate	Larsson et al. (2001)	No
Bahmani (2008) for 11 Countries	M2	1971-2004. A	GDP, inflation rate, nominal effective exchange rate,	Persaran et al. (2001)	CUSUM & CUSUMSQ
Abdulkheir (2013)	M2	1987-2007. A	GDP, interest rate, inflation, and real exchange rate	Johansen and Juselius (1991)	No
Hamdi et al. (2015) for GCC area	M2	1980-2011. Q	Non-oil GDP, interest rate, and nominal exchange rate	Pedroni (2001)	No
Banafea	M1	1980 -2012. A	GDP and interest rate	Gregory and Hansen (1996)	Hansen (1992), Andrews (1993), and Andrews & Ploberger (1994).

Drawbacks of Literature on Saudi Arabia

- Most studies
  - Employ annual data rather than quarterly data.
  - Interpret the existence of cointegration relationship as a sign of stability.
  - Do not assess the stability of money demand.
- Some studies like Bahmani (2008) applied old stability tests rather than employing new stability tests.

Money Demand Framework

- It is common in practice in modeling demand for money to assume that both real output and nominal interest rate as main factors determining the demand for money in any economy.
- Hence, the general form representing long run demand for money can be specified as follows:

$$m^d \equiv (\frac{m}{p}) = f(\underset{+}{Y}, \underset{-}{I}) \tag{1}$$

- where m^d denotes money demand while Y and I denote the real output, and nominal interest rate respectively.

Money Demand Function

- Other studies incorporate exchange rate as an additional determinants of money demand over long run.
- Mundell (1963) was the first to include exchange rate into money demand function.
  - However, he does not provide any reason for the inclusion of exchange rate.
- This in turn encourages some researchers to provide intuitive explanations for inserting the exchange rate variable into money demand function.

Money Demand Function

- Bahmani-Oskooee and Pourheydarian (1990) argue that
  - the demand for money fluctuates based on the public's expectations.

Money Demand Function

- Therefore, we augmented the money demand function with nominal exchange rate because
  - Saudi Arabia adopts a fixed exchange rate regime.
  - Therefore, any depreciation of the US dollar would impact automatically the Saudi Riyal.

Money Demand Function

- Hence, the money demand function augmented with exchange rate as follows:

$$m^d \equiv (\frac{m}{p}) = f(\underset{+}{Y}, \underset{-}{I}, \underset{+/-}{NEER}) \tag{2}$$

- which in turn can be written as:

$$m^d = \alpha + \beta Y_t + \gamma I_t + \delta NEER_t + \varepsilon_t \tag{3}$$

- Based on economic theory, we expect $\beta > 0$ and $\gamma < 0$ while δ might be positive or negative as suggested by Bahmani-Oskooee and Pourheydarian (1990).

Data

- Quarterly data from 1993:Q1 to 2015:Q3
  - Broad money supply (M3).
  - Industrial Production as proxy for GDP.
  - Consumer Price Index.
  - Nominal Effective Exchange Rate.
  - The 3-month US Libor interest rate.
- Data Sources:
  - SAMA, St. Louis FRED, IFS-IMF
- All variables transformed into log form with exception to the interest rate.

Empirical Methodology

- Unit Root Tests.
- Cointegration Tests.
- Stability Tests.
- Long Run Relationship Estimation.

Unit Root Tests

- To ensure the stationarity of the economic variables, we apply the common unit root tests:
  - Augmented Dickey–Fuller (1979).
  - Phillip Perron (1988).
  - Kwiatkowski, Phillips, Schmidt and Shin (1992).
  - Elliot, Rothenberg and Stock (1996).
- All tests confirm the nonstationarity of the economic variables in their levels, and stationary when we take the first difference of these variables.

Cointegration Tests

- Since the economic variables are integrated of order one or $I(1)$, then it is essential to check whether these variables are cointegrated or not as suggested by Engle and Granger (1987).
- To do so, we apply the popular tests of Johansen and Juselius (1990) for multiple cointegration relationships.
- All tests confirm the existence of a cointegration relationship among our economic variables.

Stability Tests

- Before interpreting the parameter estimates of the long-run relationship between money demand and its determinants, it is crucial to test that whether these estimates are stable during long run or not.

$$m^d = \alpha + \beta Y_t + \gamma I_t + \delta NEER_t + \varepsilon_t$$

- To do so, we apply a series of stability tests:
  - Hansen (1992), Andrews (1993), and Andrews & Ploberger (1994).
  - The null hypothesis for all tests is the stability of parameter estimates.

Stability Tests

Table : Structural Break Tests

Hansen Tests			
	Lc	MeanF	Sup F
Test statistics	0.74	7.40	17.31
P-value	(0.10)	(0.13)	(0.10)
Andrews & Ploberger Tests			
	Ave F	Exp F	Sup F
Test statistics	7.95	6.65	19.15
P-value	(0.18)	(0.06)	(0.07)

- All test statistics show evidence supporting the existence of a stable money demand over long run at 5% significance level.

Stability Tests

- Our evidence contradicts the findings of Banafea (2014) and this might be due to several factors:
  - Money demand specification.
  - Data frequency.
  - Different measures of output and money supply.
  - Financial sector exposure is limited in Saudi Arabia.
  - The ratio of broad money supply to GDP is about 74.2% in 2015.
    - Russia 63.8%, Mexico 53.2%, Turkey 63.1%, Oman 56.1%, India 79.2%.

Stability Tests

- The government plays an important role in stabilizing money demand during unexpected geopolitical and economic events.
- Maintaining a stable Exchange rate policy since 1986 is an indicator for money demand stability.
  - This in turn reflects maintaining stable economic policies.
- The government did not crowd out the private sectors in borrowing money from financial sectors.

Parameter Estimates of Long Run Relationship

$$m^d = \alpha + \beta Y_t + \gamma I_t + \delta NEER_t + \varepsilon_t$$

Table : Parameter Estimates of the Cointegration Relationship

Parameter	α	β	γ	δ
Estimates	0.01	2.47**	-0.15**	-0.50
t-statistics	(0.0003)	(5.81)	(-9.92)	(-1.12)
** denotes the 5% significance level.				

Policy Implications

- Maintaining a stable money demand would:
- enable monetary policymakers to maintain stable nominal exchange rate through adjusting money growth.
- be essential in forecasting the movements of nominal exchange rate.

$$e_t = \alpha + \beta(m_t - m_t^*) + \phi(y_t - y_t^*) + e_t$$

Conclusion

- We find evidence suggesting the stability of money demand function over long run.
- We find evidence in line with economic theory expectation:
  - Positive relationship between money demand and output.
  - Negative relationship between money demand and nominal interest rate.
- For future research,
  - Examining other factors that may impact money demand in Saudi Arabia.
  - Applying nonlinear econometric techniques in analyzing the behavior of money demand in Saudi Arabia.

Questions

Q & A

Thank You!