

INTERNATIONAL FINANCIAL CRISIS AND MONEY DEMAND IN AUSTRALIA: ARDL APPROACH

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Abstract :

his paper has investigated the money demand for Australia economy in 1974 -2007 and the affects of financial crisis on money demand and its changes on real income, inflation and exchange rate. Also this studies the trend of changes in money demand stability and the other variables via Auto Regressive Distributed Lag (ARDL) and Error Correction Method (ECM) in dynamic analysis. The coefficient of Gross Domestic Production (GDP) is positive and significantly more than 1. Inflation rate variable is negative expectedly. The significant positive coefficient related to the last financial crisis demonstrates that the money demand will increase. Of course, the short-run affect is negligible and its affects become obvious in long-run.

Key Words: money demand, international financial crisis, Auto Regressive Distributed Lag (ARDL), Error Correction Method (ECM).

JEL Classification: E41, C32, C22

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1- Introduction

Knowledge and recognition about the factors affecting money demand can help the policy makers to making decision more convenient. Price stability, economic growth, full employment, bank interest rate, exchange rate and balance in payment are the most important goals in money policies decision making. Central bank in every country as a money policy maker performs the mentioned policies. Accurate recognition of money demand function is essential for general macroeconomic procedure, economic policy making and macroeconomic policies effectiveness. Money demand function as an important variable in major macroeconomic theories is always subjected to discuss. The finding results in developed countries demonstrate that money demand is function of the kinds of interest rates, income and exchange rate, but in developing ones, due to inconvenient financial market, inflation rate beside real income, exchange and interest rate play role as determinant factors of money demand.

Financial crisis affect money market via exchange and interest rate. In this paper, the affects of two recent great crises on money demand function in Australia are studied. One is the great East-South Asia crisis in last 1990s which initiated via foreign investment markets and the other is current crisis which overcomes the world economy.

Financial crises can affect money demand by decreasing oil price and finally change in national income. Also recent crisis can influence money demand via change in interest rate and making budget deficit leading inflation. One of the ways of financial crisis effectiveness on the countries economy is exchange rate (the linkage between country economy and world economy). In this study, it has been tried to analyze the affect of recent crises on the money demand in Australia via new brand econometric methods.

2- Theoretical base

2-1 international financial crisis

Generally, financial crisis is the position that the currency value decreases or the international reserves diminish severely or both of them. Financial crisis can be led of the disturbance in a financial sector and it transfers to the other parts due to the linkage between financial and real economic sector. Portfolio market crisis, balance payment, bank and insurance company bankruptcy, severe changes in exchange rate and decrease in currency value are some crises in this financial field. Perhaps it would be better to define financial crisis as a self-fulfilling or communicative disturbance in financial system function. Probably the resource of self-fulfilling disturbance would be the imperfection in country economic basics.

In done researches have often mentioned money and bank crises or the combination of both as a financial crisis. Also in some others, decreasing rate the currency value is considered as a determinant index of financial crisis. In this condition, economic agents occasionally transform their assets from currency into other forms and it leads to make financial crisis. Government increases money supply via printing money or tax rate for eliminating the budget deficit and financing itself or decreases the currency value via expanding the export, so investors try to transform their pecuniary possession from currency into other forms. In the other side, decrease in currency value is made by market pressure for increasing in exchange rate, because country can't or don't want tolerate the warranty cost of its currency. In a case, central bank has to sale current money instead of foreign reserves for keeping below ceiling exchange rate. If central bank misses all foreign reserves, the government must allow floating the exchange rate (decreasing the money value). So the internal goods and services become cheaper than the external ones. Decreasing the money value led of speculative expansion, can be the reason of inflation and failure in internal and external financial market. In given circumstances, this crisis moves to other financial references due to the relation between markets.

One example of a currency crisis occurred in Russia in 1998 and led to the devaluation of the ruble and the default on public and private debt. Currency crises such as Russia's are often thought to emerge from a variety of economic conditions, such as large deficits and low foreign reserves. They sometimes appear to be triggered by similar crises nearby, although the spillover from these contagious crises does not infect all neighboring economies— only those vulnerable to a crisis themselves.

World economy has ever experienced different crises which have influenced economic indexes such as money demand. In this paper, it is represented the affects of two recent great crises on the money demand function. One is the great East-South Asia crisis in last 1990s which initiated via foreign investment markets and the other is current crisis which begun since 2006 by exploding the settlement bubble in America and on 2007 this transferred to financial sector and grew severely and then climaxed by bank bankruptcy in financial markets and now has pervaded to real economic sector. Instability in exchange market is led of crisis entrance.

By falling the exchange market and distrust to it, consumers have decreased their expenditures for purchasing constant goods especially automobile and settlement and also loaning process has became less and consumers and investors have missed their hope (it means if they loan, they can't repay it.). So automobile and settlement which are constant and

sensitive to interest rate, have involved further by crisis. Fear and distrust to credit markets (from both investor side and banks side) and market stagnation from banks side and pervading the crisis into credits market cause to less efficiency of money policies in order to motivate the demand.

Allen N. Berger and Christa H.S. Bouwman have studied the behavior of bank liquidity creation around five financial crises in the U.S. from 1984 to 2008 by using a recently-developed comprehensive measure of aggregate liquidity creation by banks. They then examine the effect of bank capital on a bank's competitive position, profitability, and stock return performance around these crises. We also create two "fake" crises to explore bank behavior in "normal" times.

They have reached five conclusions based on our analysis of the behavior of bank liquidity creation around financial crises.

- First, there seems to have been a significant build-up or drop-off of "abnormal" liquidity creation before each crisis, where "abnormal" is defined relative to a time trend and seasonal factors.

- Second, banking and market-related crises differ in two important ways. The banking crises were preceded by positive abnormal liquidity creation by banks, while the market-related crises were generally preceded by negative abnormal liquidity creation. In addition, the crises themselves seemed to alter the trajectory of aggregate liquidity creation during banking crises but not during market-related crises.

- Third, liquidity creation has both decreased during crises (e.g., the 1990-1992 credit crunches) and increased during crises (e.g., the 1998 Russian debt crisis / LTCM bailout). Thus, liquidity creation likely both exacerbated and ameliorated the effects of crises.

- Fourth, off-balance sheet illiquid guarantees (primarily loan commitments) moved more than semi-liquid assets (primarily mortgages) and illiquid assets (primarily business loans) during banking crises.

- Fifth, because the subprime lending crisis was preceded by a dramatic build-up of positive abnormal liquidity creation, their analysis hints at the possibility that while financial fragility may be needed to create liquidity, "too much" liquidity creation may also lead to financial fragility.

2-2 Money demand

Demand for money arises from medium of exchange and store of value functions. Because people need money to smooth transactions, they hold it for future needs. Money as a medium

of exchange is a facilitator of transactions and hence an essential lubricant to the mechanism of exchange. In fact these two roles of money are interrelated. Unless money is a store of value, it cannot be a medium of exchange and vice versa. However, the transaction demand is more fundamental. There are other assets besides money that are competing and even better stores of value but no better medium of exchange. In developing countries, though, money's store of value role is particularly significant. Money generally serves as the unit of account and the standard of deferred payment because it is convenient as well as efficient. However, the medium-of-account role is not logically tied to the medium of exchange (Wicksell 1906).

Keynes in *The General Theory of Employment, Interest, and Money* (1936) identified three motives for holding money: the transaction motive, the precautionary motive, and the speculative motive. The transaction motive and precautionary motive relate to money's role as the medium of exchange, whereas the speculative motive relates to money's role as a store of value. The transaction motive arises for exchanging money for goods and services, as it is extremely unlikely to have double coincidence of "wants," especially in a modern economy. It may not be possible for me to exchange a few pages of my research paper for a meal in a restaurant because my "want" and the "want" of the restaurant owner need not coincide. Holding money involves a trade-off between forgoing the interest that can accumulate with savings and bearing the inconvenience of not holding money for transaction purposes. People may hold money to meet future payments, which are uncertain; this is the precautionary motive for holding money (see Whalen 1966). Money is also held for speculative purposes, that is, to avoid the risk inherent in other assets, which may pay higher returns (see Tobin 1958).

Demand for money varies between developed and developing countries because the former have relatively advanced financial systems, states of technology, and degrees of enforceability of contracts. The volume of transactions also influences demand for money. In less developed countries cash is used more often for transactions; in more developed nations the use of credit cards reduces the demand for cash.

There are several economic variables that affect the demand for money, including gross domestic product (GDP), interest rates, inflation rates, financial innovations in the economy, degree of monetization in the economy, exchange rates, structure and level of external trade, and so on. Various theories explain the relationships between these variables and money. The original quantity theory of money (Fisher 1911) was followed by the Keynesian theory of liquidity preference (Keynes 1936) and later by more modern variants of both (Friedman

1956; Tobin 1956, 1958; Baumol 1952). The Keynesian approach makes interest rate an explicit determinant of the demand for money.

Although money demand function have ever been studied in various aspects, but all of them believe that real optimum money volume has reverse relation to output rate of assets and direct relation to income. But, practically the patterns are different in applying the opportunity cost variable and scale.

3- Literature review

Many researches have yet been done in evaluating the money demand function in developing and developed countries including Australia. In this part, it is tried to mention some of them.

Bahmani and Wang (2007) have employed CUSUM and CUSUMSQ test in conjunction with cointegration analysis to show that both M1 and M2 are cointegrated with their determinants. The results of stability tests reveal that while M1 money demand in China is stable, there is some doubt about stability of M2 money demand.

Rao and Kumar (2006) have done an empirical work on the demand for money for Fiji. They have used structural breaks in the cointegrating equation, within the Gregory and Hansen framework, and found that there is a cointegrating relationship between real narrow money, real income and the nominal rate of interest in all the three types of their models.

Erbykal et al. (2008) have studied whether the currency substitution, which occurred in the 1980's reversed with the "Program for Transition to a Strong Economy" that was applied after the February 2001 crisis in Australia. For determining de-dollarization, they estimated an M2 money demand function using the bound test developed by Pesaran et al. (2001) with the monthly data spans from 2001:05 to 2006:12. The test results show that de-dollarization has occurred in the Turkish economy in the 2001-2006 period.

Bahmani Oskooee and Chi Wing Ng (2002) have examined the long-run demand for money of Hong Kong using the autoregressive distributed lag (ARDL) cointegration procedure on quarterly data over the period 1985Q1-1999Q4. Estimation results suggest that HK\$M2 is cointegrated with its determinants. In addition, the CUSUM and CUSUMSQ tests confirm the stability of the money demand function.

McNown (1992) found that long-run stationary of the demand function for M2 (but not for M1) require inclusion of the effective exchange rate for the period starting with the floating of the US dollar.

Hafer and Jansen (1991) studied the money demand in United States and determined that whether in fact that there exists a cointegration relationship between certain combinations of real money balances, real income and interest rate.

4- Model variables introduction

In this part, the model variables which have been used for empirical study of money demand function in Australia are introduced. Every econometric model has some variables classifying into two groups: dependent and independent. There isn't any determine definition for independent variable, real money demand, without any ambiguous that any one accept it. This variable usually got by dividing money volume (M_1) or currency volume (M_2) on a price index. In this study, the expanded and adjusted definition of money (M_2) included M_1 and quasi money is used.

Dependent variables of money demand function classified into two categories: scale and opportunity variable. About the scale variable, income level is applied for indicating the transaction volume in economy; therefore, it has an important role in the study of transaction theories of money demand. Approximately all researchers implied that usage of wealth variable is better than constant income and constant income is better than current income in making stable money demand function. Because wealth empirical determination is not feasible, so gross domestic production (GDP) is substituted instead of it. According to Australia economy and researches experiences, finally usage of GDP with constant price seems convenient. And about opportunity cost variables, this variable includes interest and inflation rate theoretically and practically. According to Australia economy specifications, using from suitable proxies such as interest and inflation rate as opportunity cost variables seems persuasive. Also exchange rate can be used as possession and suitable substitute for internal money based on researches done on the relation between money demand and exchange rate; whereas the opportunity cost of money keeping is determined by profit which is led of its rate increase. In the done researches about evaluation of money demand function for Australia, reached to different results related to effectiveness exchange rate on the money demand.

5- Theoretical pattern

In this segment, an evaluating model for the money demand function and some methods for estimation and analysis are proposed.

5-1 Designing the money demand model for Australia

Since 1930s various views for money demand are mentioned that formed the theoretical base of empirical studies in this field. Based on these theoretical views, several variables determined money demand function for each one. The most important ones include wealth, income, output rate of money keeping to keeping other possessions like bond, constant

commodities and ground. (Ericson, 1998; Siddiki, 2000). Often in the macroeconomic literatures which discussed money demand, the real money demand is a function of macroeconomic variables such as real income, profit rate, inflation rate, and exchange rate and so on. So the money demand function is defined as following:

$$LM_t = \alpha_0 + \sum_{j=1}^p \alpha_j LM_{t-j} + \sum_{j=0}^{q_1} \beta_{1j} LP_{t-j} + \sum_{j=0}^{q_2} \beta_{2j} LY_{t-j} + \sum_{j=0}^{q_3} \beta_{3j} LR_{t-j} + \sum_{j=0}^{q_4} \beta_{4j} LE_{t-j} + \beta_5 DU + \beta_6 DD + \beta_7 DG + \varepsilon_t$$

While LM is logarithm of currency adjusted by consumer price index, LP logarithm of inflation rate, LY logarithm of official market exchange rate, ε_t is residual. Three other variables are interred into this model. DG is dummy variable which is related to critical years after war and its value for interval 1981 to 1989 is 1 and for others is 0. DU is dummy variable for East- South Asia crisis which its value for interval 1998 to 2008 is 1 and for others is 0 and the last one is DD which indicates the recent crisis and its value for 2006 and 2007 is 1 and for others is 0.

The goal of entering two last variables into model is analyzing the affects of two mentioned crises on the money demand and its relation with gross domestic production, inflation, profit rate and exchange rate.

5-2 Data

The applied data in this study are including: logarithm of adjusted currency variable, logarithm of inflation rate, logarithm of gross domestic production, logarithm of exchange rate and three-month interest rate. Whole data are gotten from Central Bank of Australia. The study period is 1973-2007.

6- Empirical results

This study has tried to study the relation between the affective and important variables on money demand and the affects of financial crises on them via short-run and long-run analysis in Australia. ARDL for long-run analysis, ECM for short-run and VDCF for analysis the dynamic interaction affects which led of chocks in pattern. One of the most important advantages of ARDL is that this method can be used without considering being variables stationary or nonstationary. It means that it is not necessary to classify variables into correlated ones with degree 0 or 1. The investigation the existence of equilibrium long-run relation between money variables is based on ARDL method and the analysis of long-run coefficients are done by this method too. The maximum time lag is determined by researcher according to the number of observations. In this study, Schwarz-Bayesian scale (SBC) is utilized for determination the optimum lag. For surveying the long-run relation between

variables, we can use t statistics. In this method, hypothesis zero implies on the existence the long-run relation between variables. Because the constraint of tendency of short-run dynamic relation into long-run equilibration is that sum of coefficients would be less than 1. For testing this one, digit 1 is subtracted from sum of lag coefficients of dependent variable and divided to sum of such coefficients deviation. If $|t|$ would be less than critical value of Banerjee, Dolado & Master, the hypothesis zero is rejected and it means that there is a long-run relation between variables. According to earned values for t in this paper, hypothesis zero isn't accepted, so there is a long-run relation between variables.

Table1. the findings of estimation of money demand function ARDL (1,0,1,0,0,0,0,1)

t statistic	coefficient	variable
17.93*	0.782	LM(-1)
2.6*	0.251	LY
-5.29*	-0.633	LP
4.84*	0.596	LP(-1)
-3.53*	-0.395	LR
2.64*	0.032	LE
-1.73**	-0.024	DD
2.425*	0.043	DU
-0.873	-0.013	DG
-1.665	-0.024	DG(-1)
-0.617	-0.293	C
$R^2=0.993$	DW=2.09	F=349.8

* Significant at 5% level of confidence ** significant at 10% level of confidence

Whole tables, SC, RESET, NOR and H which indicates serial correlation, functional form of pattern ,being normality and variance scedasticity, respectively, confirm the estimated pattern. Beside, Ramsey test implicated pattern correctness. The obtained findings of estimating the long-run money demand related to ARDL (1, 0, 1, 0, 0, 0, 0, 1) for rest of real money are reported in table 2. As can see, all explanatory variables have expected sign.

Table2. The estimation of long-run money demand function coefficients

statistic	coefficient	variable
2.55*	1.15	LY
-1.93**	-0.16	LP
-3.37*	-1.81	LR
2.34*	0.147	LE
-1.72**	-0.111	DD
2.61*	0.201	DU
-2.36*	-0.173	DG
-0.607	-1.348	C

* Significant at 5% level of confidence ** significant at 10% level of confidence

The calculation findings show that long-run income elasticity of money demand is 1.15, with other word, 1% increases (decreases) in gross domestic production increases (decreases) money demand 1.15%. Income elasticity of money demand is positive, and it is compatible with economic theories. Error correction method is estimated for making a link between short-run vibrations and long-run equilibrium. As stated before, in error correction method, the difference values of variables with lagged distributive terms namely error correction term in long-run relation and difference values of independent variable are considered. The results of estimating the error correction method related to ARDL (1, 0, 1, 0, 0, 0, 0, 1) are reported in table 3.

Table3. Estimation of ECM model of money demand function

statistic	coefficient	variable
2.6*	0.25	dLY
-5.3*	-0.63	dLP
-3.5*	-0.39	dLR
2.64*	0.032	dLE
-1.74**	-0.024	dDD
2.42*	0.44	dDU
-0.87	-0.013	dDG
-0.62	-0.29	dC
-4.9*	-0.22	ecm(-1)
$R^2=0.89$	DW=2.08	F= 23.42

*significant at 5% level of confidence ** significant at 10% level of confidence

The ECM coefficient indicates that how many percents of short-run inequality for getting to long-run equilibrium must be adjusted in each period to return the money demand into own long-run trend. ECM is 0.22 in this model; it means that in each period 22% of inequality of money demand is adjusted and became near to long-run trend.

The results of variance analysis (VDCF) for real demand of money in a 30-year period is represented in table 4. As finding show, inconsistency share of variable of real demand of money for short-run is 82.28%, for middle-run 64.75% and for long-run 56.16%. Gross domestic production variable in short-run is 11.43%, in middle-run 20.05% and for long-run 22.44%. The inconsistency share of other variables in convincing the rest of real demand of money are represented in table 4. By comparing the inconsistency share of two dummy variables related to last crisis, we can said that 2006 financial crisis has more effect on money demand than the other one specially in long-run.

Table4. The findings of analysis of variance for money demand variable

horizon	M	Y	P	R	E	DD	DU	D57
	1	0	0	0	0	0	0	0
1	0.953	0.0327	0.00123	0.000828	0.00076	0.00181	0.00736	0.00165
3	0.816	0.1212	0.00839	0.0023	0.0009	0.00751	0.04089	0.00235
5	0.705	0.1831	0.0187	0.0024	0.00066	0.01271	0.07509	0.00155
The average of 5 periods	0.8228	0.1143	0.0092	0.0019	0.0008	0.0074	0.0410	0.0020
7	0.628	0.2198	0.03	0.002	0.001577	0.017	0.09939	0.00118
9	0.576	0.2412	0.04156	0.00172	0.003261	0.02056	0.1143	0.00109
11	0.539	0.2533	0.0532	0.00154	0.00506	0.02353	0.1227	0.00101
13	0.513	0.2594	0.0651	0.001486	0.006653	0.02602	0.1267	0.00095
15	0.495	0.261	0.0768	0.001487	0.007908	0.02804	0.128	0.00101
The average of 15 periods	0.6475	0.2005	0.0367	0.0018	0.0033	0.0173	0.0909	0.0014
16	0.488	0.2606	0.0825	0.001495	0.00841	0.02886	0.1279	0.00111
18	0.479	0.258	0.0934	0.001512	0.009171	0.03012	0.1267	0.00153
20	0.474	0.2539	0.1028	0.001517	0.009628	0.03084	0.1247	0.00226
22	0.472	0.2493	0.1105	0.001504	0.009812	0.03101	0.1225	0.00329
24	0.472	0.2451	0.1159	0.001473	0.009767	0.03067	0.1204	0.00456
26	0.4732	0.2418	0.119	0.001429	0.00955	0.02994	0.1189	0.006
28	0.4749	0.2398	0.12	0.001376	0.009223	0.02892	0.1181	0.00751
30	0.4766	0.239	0.1194	0.001321	0.008841	0.02774	0.1179	0.009
The average of 30 periods	0.5616	0.2244	0.0726	0.0016	0.0063	0.0236	0.1065	0.0029

7- Conclusion

The calculation results indicates that long-run income elasticity of money demand are larger than 1, with other word, 1% increase in gross domestic production leads to 1.15% increase in money demand. Its sign is positive and this confirms the economic theories.

The estimated coefficient of exchange rate has negative sign and significant; it means that in Australia economy there is a reverse relation between money demand and exchange rate variable. So the substitution effect of exchange rate in economic literature is confirmed. If the

increase of exchange rate would be expected, people increase the demand for foreign money for preventing of decrease in purchase power of money and it leads to decrease in domestic money.

The comparison between short-run and long-run relations shows that long-run elasticities are larger than short-run ones due to more time for adjusting to long-run equilibrium. Beside, in long-run relation on money demand, income elasticity is larger than 1 which is according to findings of developing countries.

The coefficient of dummy variable (DD) which is significant in short and long-run only 10% level of confidence, indicates that small effect of east- south crisis of Asia on money demand in Australia, but DU which is significant in short and long-run, shows that last financial crisis has effect on money demand of Australia .the positive coefficient of this variable indicates that by appearing the recession in market due to high uncertainty and risk, the consumption expenditures decreases and in this condition money instead of other wealth is stored. Therefore demand for money increases; of course its effect on short-run is negligible and its effect will appear in long-run.

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