

A COMPARATIVE STUDY FOR OPPORTUNITY COST OF HOLDING MONEY BETWEEN SELECTED DEVELOPING AND DEVELOPED COUNTRIES

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Abstract

This paper searches an appropriate proxy for opportunity cost of holding money. We apply a balance panel data for selected developed and developing countries during the period of 1990-2008. Three models have been estimated for each group of the countries. Both random and fixed effect models have been applied. The results show that inflation rate is a good proxy for opportunity cost of holding money in the developing countries. This fact is probably the caused of inefficiency in financial markets. However, for developed countries both inflation rate and interest rate should apply as opportunity cost of holding money. When interest rate is a good proxy for opportunity cost of holding money and bonds, we can conclude that there is a competitive market in the financial market. On the other hand, we can consider the inflation rate as a proxy for durable goods and foreign currency.

JEL classification: E41, E58

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1. Introduction

The demand for money is a basic concept in macroeconomics. This considers the tendency of people for maintaining money. The demand for money function indicates the variables that affect on the demand for money such as interest rate, income, wealth and so on. Macroeconomic analysis show that certain demand for money characteristics could influence monetary policies such as the interest elasticity of the demand for money and the stability of the demand for money Hosseini and Bakhshi (2006). Hence, many researches in this domain in confident countries have

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been done. Since, this fact affects monetary policies then we need to understand of the detail of the demand for money.

In macroeconomics literature the demand for money focuses on two subjects: speculative demand and opportunity cost of holding money. Usually, opportunity cost is more important. Mostafavi and Yavari (2005). The aim of this paper is to find a good proxy for opportunity cost of holding money. The researches in this way show that a good variable for opportunity cost of holding money depends on financial market development. The structure of financial market in the developed and the developing countries is different for this reason we search the proxies according to these countries. We apply three models for two type's countries: a model by interest rate, other model by inflation rate and another model by both variables.

In this domain have been applied many works particularly in developed countries. In general these studies have focused on the determinants of the demand for money and the stability of the demand for money. Pardhan and Subramaniam (2003) have considered the reforms in financial market in India and have shown that deregulation and reform in financial market affect the stability of the demand of money. Budina et al (2006) indicate that in Romania a good proxy for opportunity cost of holding money is inflation rate, because financial markets in this country are inefficiency. The results show that in Romania inflation rate is a monetary phenomenon. Samimi and Elmi (2006) show that a good proxy for opportunity cost of holding money is inflation rate in Iran. They represent different reasons: inefficiency in financial market, determination of interest rate by policymakers and fixation of interest rate. Bahramshah et al (2009) revealed that stock price has a considerable substitution effect on the demand for money in long run.

2. The theoretical basis in the demand for money

The main question is: why people prefer to hold money rather than other assets? The first theory on money is quantity theory of money that is presented by Fischer. Fischer in his equation has studied the speed of money. The Cambridge economists focus on the main role of money namely the preservation of value. Cambridge monetarists consider the volume of money as a function of income level. Marshall (1926) and Pigou (1917) mention the motivation of holding money. They believe that currency has international acceptability. Hence they have introduced the interest rate and wealth in the demand for money function. Keynes believes that the demand for money has three motivations: transaction, precautionary and speculative. Branson (1979) says "speculative demand component inversely related to the interest rate and transactions demand positively related to income and inversely related to the interest rate. As a results the suggests the following formula:

$$\frac{M}{P} = m = m(r, y) \approx l(r) + k(y)$$

where $\frac{M}{P}$ is real demand for money r stands for interest rate and y shows real income. $\frac{\partial m}{\partial r}$ is negative and $\frac{\partial m}{\partial y}$ is positive".

Consumers and producers in their beehives consider the real interest rate ($r - \dot{P}$) instead of nominal interest rate. In this way the inflation rate introduces in the demand function for money. The change in price level affect on purchasing power of money namely increasing price level decrease purchasing power of money "so that an increase in the expected rate of inflation should cause a shift out of money and bonds and into consumer durables" Branson (1979). The rate of inflation is the rate of return on speculative demand for money. Hence we can denote the demand for money as the following:

$$\frac{M}{P} = m = m(y, r, \dot{p})$$

where \dot{P} usually considers for the proportional rate of change of prices. By increasing real income causes increase the demand for money and also increasing r and \dot{P} decrease the demand for money Branson (1979).

Friedman argues that money is as a consumable good for consumers. Likewise, the demand for a good depends on total income, price of good, price of substitute good, taste and so on, the demand for money also depends on wealth, the rate of return for money, price and return of other goods, preference and taste of consumers. Friedman considers some variables in the demand for money namely: permanent income, current income and wealth.

Usually, in the developing countries, inflation rate stands for opportunity cost rather than interest rate. Because of different reasons: 1) in developing countries financial markets aren't developed 2) in these countries the interest rate is fixed and determined by the central bank. Johnston (1984) says that increasing price level raises government expenditures then GDP would increase and as a result the demand for money would increase. Johnston (1984) concludes that if expenditure changes are more than income, then output and the demand for money would increase.

3. Methodology

In order to estimate the parameters of demand for money we introduce three models as the following:

$$\ln(M_t) - \ln(P_t) = \alpha_0 + \alpha_1 \ln(\text{RGDP})_t + \alpha_2 (\text{INF})_t + U_t \quad (\text{I})$$

$$\ln(M_t) - \ln(P_t) = \alpha_0 + \alpha_1 \ln(\text{RGDP})_t + \alpha_2 \ln R_t + U_t \quad (\text{II})$$

$$\ln(M_t) - \ln(P_t) = \alpha_0 + \alpha_1 \ln(\text{RGDP})_t + \alpha_2 \ln R_t + \alpha_3 \ln(\text{INF})_t + U_t \quad (\text{III})$$

where M stands for nominal money (namely M_t), P represents the consumer price index, RGDP is real gross domestic product, R shows interest rate, INF stands for inflation rate. All variables have calculated as their logarithm value expect inflation. Correspond of other works we apply the variables on logarithm.

Dependent variable

In this research the dependent variable is money. For money we chose M1, as this variable has been applied in the many studies. For the normalization of M1 in the different countries we divide M1 on the consumer price index.

Income

In the demand for money income, wealth, expected income and expenditure gross national stand for a proxy as scale variable. Some economists such as Friedman believe that the wealth is more than permanent income and permanent income is more than current income. (Haris 1985). Since the calculation of wealth is difficult we would replace GDP instead of it.

Opportunity cost of holding money

We show usually the opportunity cost of holding money by three variables: rate of return of money, inflation rate and return rate of financial assets. In this paper we have applied inflation rate and interest rate as opportunity cost of holding money:

$$(M/P) = f(y, \text{inf}, \text{ir})$$

The source of variables are WDI(2009) and IFS. We divided the countries in two groups: developing countries and developed countries. Developing countries are Iran, Egypt, Tunisia, Honduras, Brazil, Ocarina, Namibia, and Fuji. Developed countries are Canada, Denmark, Malta, Sowed, Holland, Japan, USA and Australia.

Model

The recent authors in this topic have focused on time series models. But panel data model has many advantages in comparison to time series and cross sectional data. Therefore in this paper we apply panel data model. In this methodology there are some models: pooled regression, fixed effects, random effects and seemingly unrelated regression model.

In pooled data model we should say that there is not any difference between the intercept and slop coefficient in the regressions. Therefore we stack the data and apply OLS. Such as alternative we can apply panel data model in which there is the difference between intercept in the regressions. In fixed effect models the intercept

between the individual is difference and in random effects model this intercept is random.

F has carried out test for choosing panel data model and pooled regression. If we reject H_0 we can conclude that the characteristics of countries are difference and we should apply panel data model. Another test is Hausman (1978) test that we apply for differentiation between fixed effects model and random effects model. If we reject H_0 we should apply fixed effects model.

4. Results

We estimate three models of demand for money for two groups of countries. We consider the effect of inflation and interest rate separately and together. We have estimated different models during the period of 1990-2008.

Table 1. Estimation of the first model (by inflation rate)

variables	Pooled regression	Fixed effects	Random effects
Intercept	-0.3496 (-0.21)	-2.983 (-1.11)	-3.8225 (-1.32)
Log(GDP)	0.8364*** (13.48)	0.9352*** (9.111)	0.9839*** (9.12)
Log (INF)	-0.4003** (-2.43)	-0.123** (-2.67)	-0.225*** (-3.13)
R ²	0.984	0.984	0.56
F	4602.75	85332.58	94.71

The numbers in parentheses are t-statistic. *, **, *** indicate that the coefficients are significant in 10%, 5% and 1% level of confidence respectively

Table 2. Estimation of the second model (by interest rate)

variables	Pooled regression	Fixed effects	Random effects
intercept	-2.675 (-1.49)	1.493 (0.62)	0.768 (0.26)
Log (GDP)	0.95*** (14.38)	0.778*** (8.57)	0.810*** (7.46)
Log (I)	-0.868*** (-8.11)	-0.1766*** (-7.94)	-0.217*** (-5.79)
R ²	0.993	0.99	0.494
F	1225.97	234974.2	76.4194

The numbers in parentheses are t-statistic. *,**,*** indicate that the coefficients are significant respectively in 10%, 5% and 1% level

Table 3. Estimation of the third model (by interest rate and inflation rate)

variables	Pooled regression	Fixed effects	Random effects
intercept	-0.852 (-0.54)	3.806 (1.58)	0.555 (0.19)
Log (GDP)	0.853*** (14.49)	0.678*** (7.42)	0.821*** (7.71)
Log (I)	-0.251** (-2.12)	-0.171** (-2.37)	-0.231*** (-4.28)
Log (INF)	-0.202 (-1.08)	-0.08** (-2.37)	-0.074 (-0.99)
R ²	0.988	0.99	0.66
F	3922.	188203.6	90.61

The numbers in parentheses are t-statistic. *,**,*** indicate that the coefficients are significant respectively in 10%, 5% and 1% level

Now we should chose most appropriate model among these three results. The F test shows the difference or indifference between individual effects. We have calculated the F test for three models. The results show that H_0 hypothesis reject and this means that there is a significant difference between the individual of models. The Hausman test shows that for three model we should apply the fixed effects model. The Bartlet, Leven and Brown tests show that there is a heteroskedasticity problem and as a result we should apply GLS model.

Table 4. F, Hausman, and Heteroskedasticity tests

statistics	First model	Second model	Third model
F	10.92	8.82	19.908
Hausman	54	23	41
Bartlet	132.62	94.28	128.99
Leven	12.86	15.49	11.62
Brown	5.08	4.98	5.98

The tables 1, 2 and 3 show that we should apply the fixed effects model. Because the R square is high magnitude and so the coefficients are significant. In

table 1 the coefficient of income is 0.93 and positive, this means one percent increase in income causes 0.94 percent increasing in the demand for money. The coefficient of inflation rate is negative and shows that increase in inflation rate causes decreasing the demand for money. Table 2 shows that one percent increase in income rise 0.77 percent in demand for money. Table 3 shows that income has a positive effect on demand for money and inflation rate has a negative effect on demand for money. These results show that in developed countries in the function of demand for money interest rate and inflation rate are significant. Therefore, according to Gujarati (2003) because of a good result and a high R square we can conclude that this model is appropriate for developed countries.

5. The results for developing countries

Table 5. Estimation of the first model (by inflation rate)

variables	Pooled regression	Fixed effects	Random effects
Intercept	-10.261*** (-3.78)	-13.053*** (-6.81)	-12.94*** (-6.19)
Log(GDP)	1.239*** (11.21)	1.39*** (17.88)	1.39*** (18.06)
Log (INF)	0.424** (2.49)	-0.05*** (-2.82)	-0.05*** (-2.82)
R ²	0.479	0.99	0.71
F	74.51	3841.771	205.651

The numbers in parentheses are t-statistic. *,**,*** indicate that the coefficients are significant respectively in 10%, 5% and 1% level

Table 6. Estimation of the second model (by interest rate)

variables	Pooled regression	Fixed effects	Random effects
intercept	-12.49*** (-17.21)	-7.036*** (-6.71)	-12.57*** (-5.77)
Log (GDP)	1.39*** (52.75)	1.149*** (27.42)	1.37*** (17.23)
Log (I)	-0.253** (-2.63)	-0.037 (-1.65)	-0.058** (-2.14)
R ²	0.99	0.99	0.71
F	57332.42	103177	196.788

The numbers in parentheses are t-statistic. *,**,*** indicate that the coefficients are significant respectively in 10%, 5% and 1% level

Table 7. Estimation of the third model (by interest rate and inflation rate)

variables	Pooled regression	Fixed effects	Random effects
intercept	-16.82** (-14.051)	-12.503*** (-6.28)	-12.26*** (-6.18)
Log (GDP)	1.55*** (33.44)	0.678*** (7.42)	1.36*** (17.59)
Log (R)	-0.997*** (-4.72)	1.37*** (17.07)	-0.0014 (-0.036)
Log (INF)	0.77*** (5.01)	-0.56** (-2.31)	-0.053** (-2.081)
R ²	0.99	0.99	0.71
F	8572.659	3448.375	13.23

The numbers in parentheses are t-statistic. *, **, *** indicate that the coefficients are significant respectively in 10%, 5% and 1% level

Table 8. F, Hausman, and Heteroskedasticity tests

statistics	First model	Second model	Third model
F	11.35	9.93	8.87
Hausman	48.62	32	12.23
Bartlet	77.76	143.46	36.18
Leven	8.93	6.64	3.49
Brown	6.99	1.99	2.86

According to table 8 we have applied GLS estimator. The explanatory variables have explained 99 percent of the dependent variable in three models. The results in table 5 the variables are significant and consistent with the theoretical basis. In table 5 income has a positive effect on the demand for money this mean one percent increase in income will rise 1.4 percent demand for money. But interest rate has a negative effect on demand for money. The results of table 6 show that income has a positive and significant effect on the demand for money, but the coefficient of interest rate is negative and significant. The results of table 7 are similar to table 5 and 6, but the coefficient of inflation rate is negative and this means by increasing inflation rate demand for money will decrease. Therefore, in developed countries inflation rate is important in the demand for money.

6. Conclusion

The aim of paper is the study of effective factors on demand for money in the both developed and developing countries. Hence, we have applied three econometric models for two groups of countries. Our models are panel data for two groups of

countries over the period of 1990-2008. In developed countries we have considered interest rate and inflation rate as opportunity cost for money. The results show that because of developed and competitive financial markets in these countries interest rate is a good proxy for stock market and inflation rate is a good one for durable goods, therefore both two variables are opportunity cost for money but in two different market. Interest elasticity in these countries is about two times greater than inflation elasticity. This fact shows that in developed countries interest rate is more important. We can conclude that in these countries durable goods are as consumable goods and not as substitute for money. This issue shows the importance of financial markets in developed countries.

In these countries income elasticity of money is about 0.7. Goldfeld (1973) shows the same results for developed countries. This fact indicates that increasing income rise demand for money and this reality is consistent with the theoretical basis.

In developed countries inflation rate is a better proxy for money opportunity cost of holding money. But we should consider that interest rate is little effective in these countries. This result shows inefficiency and underdevelopment of financial markets in these countries. In these countries the market of durable goods are for speculative demand. In these countries the durable good market does a role for preservation of money stock. Hence, we should conclude that in developing countries real interest rate coefficient is negative. About income elasticity we have a positive effect but the amount of this coefficient is different form Goldfeld (1973) it is 1.4. Inefficiency in financial market in developing countries could increase the elasticity of income. We would suggest both interest and inflation rate for modeling of demand for money for developed countries and inflation rate for developing countries.

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