# Money and Physical Capital Relationship: McKinnon's Complementarity Hypothesis on Turkey's Economy

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*A complementary relationship between money and physical capital, emphasis on liberalization, financial liberalization theory and increased real interest rates will lead to a surge in money demand and investment. In this research paper, the validity of this hypothesis, which is also known as McKinnon's complementarity hypothesis, in terms of financial liberalization policy has been tested empirically to examine the performance, money demand, interest rate and investment size in order to attempt to designate the respective relationship in Turkey. In this study, over the period of 1999Q1-2014Q4 in Turkey, the relationship between money and physical capital for available data is investigated through the BOUND and ARDL test methods. Empirical analysis of the findings suggests that Turkey's economy is based on a limited complementary relationship between money and physical capital.*

***Keywords:*** *financial liberalization, McKinnon's complementarity hypothesis, money and physical capital, Bound test and ARDL method*

***JEF Classification:*** *G32, F38, F40*

## 1. Introduction

1970's financial repression policies presented appropriate policy recommendations for developing countries to achieve high growth rates, simplifying the interest rate by keeping at low levels that increase an investment. This policy was based on Keynesian economic policy, the decline in return on money against demand for real money leads to a change in favor of the demand for real assets and, thereby, the substitution relationship between money and physical capital.

Eric J. Pentecost and Tomoe Moore, (2004) tested the McKinnon's complementarity hypothesis on India over the second half of the 20th century, by using multivariate econometric techniques and found strong support for the hypothesis and it resulted that financial liberalization policies are effective as a mechanism to increase the rate of capital formation in India.

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Developing countries would not have the anticipated results in these types of low interest rate policies due to slow rating of financial markets. McKinnon (1973) and Shaw (1973), in their independent works argued that abandoning the interest rate that have taken up measures to restrict the practice, should be determined under free market conditions and out of the financial liberalization hypothesis. According to this hypothesis, it would encourage financial savings as a result of implementation of the liberalization of the market and would increase real interest rates, along with increasing the amount of resources used for the financing of investment. Thereby, it would be expected to achieve economic growth.

Hafeez et al. (2005) tested the McKinnon and failed to find the evidence of complimentarity between money and capital. Moore (2009) extensively tested the McKinnon's complementarity hypothesis in more than 100 developing countries by using panel cointegration and IV econometric techniques through empirical results and found that a real rate of interest has a positive effect on money and investment; hence McKinnon's investigated hypothesis on the significant financial conditions in the development process is conciliated. Amaira Bouzid (2012) examines empirical analysis concerning McKinnon-Shaw complementarity's hypothesis for Arab countries and found that an increase in the real interest rate would lead to accumulative of the money balances.

In this context, the increase in a real rate of return of money in other words, interest rates, the relationship between money and capital as well as a demand for money will increase demand for real assets and investments, both of which demonstrate a complementary relationship. In the literature, the validity of this hypothesis also named as McKinnon's complementarity hypothesis, the financial pressures and many applications after financial liberalization took place in a sample which has been tested in many countries in line with the experience of working with different analysis methods.

This is the small number of empirical studies that deals with the validity for Turkey's economy hypothesis and limits the validity of a quarter-term data over the period of 1999Q1 - 2014Q4. Demand for money using the ARDL methods seeks to determine the relationship between the volume of investment and interest rates, which will be tested in the context of the article. From this point, our work consists of the following sections: Firstly, in the Introduction, the McKinnon theory and financial liberalization hypothesis gives the main recommendations in accordance with the opinion of Shaw. The 2nd section describes the theoretical background of McKinnon's complementarity hypothesis. Following, the 3rd part of the analysis of the data set used in the empirical analysis is discussed in the methodology section that tests the limits and ARDL method. The results given in section 4, are thereafter evaluated in the 5th section.

## 2. Hypothesis of Financial Liberalization

The prevailing opinions in the economic literature until the early 1970s, a clear inference could not be made about the relationship between the economy and interest rates, but there is a negative relationship between investment and interest rate.

Keynesian theory and its development with the support of low interest rates in emerging countries, investment spending and increase of economic growth yields sophisticated results. Although the empirical results point to different findings on the interest rate, sensitivity of the investment, increase of investment at low interest rates in developing countries have accepted the suggestion that a suitable policy should be executed. At this point, in financial repression policy use, this is the best policy recommendations that can be implemented in order to maintain the low level of real interest rates (Fry, 1989, p.13; Molho, 1986, p. 90).

Tobin (1965) mentioned the portfolios of individuals in an environment remained high as the interest rate will greatly reduce the economy in the capital-labor ratio due to the allocation of money, and the economy reduces the income of the person, even though if there is a full employment level. Financial inducible applications with low interest rates keep the currency unfavorable and produce a result in favor of physical capital that leads to a rise in the capital-labor ratio in one's economy and thus it supports economic growth (Fry, 1989, p.13).

The approach of neoclassical economists on money considers that the decrease in return on money and the financial pressure in developing countries lead to lower economic growth rate. The validity of the assumptions of McKinnon (1973) and Shaw (1973) for developing countries are still under consideration excluding high yielding investments because such applications will create a priority for capital-intensive projects, future savings will be negatively affected and thus savings will be reduced quantitatively and qualitatively.

These movement explanations of 'neoclassical finance theory' and 'financial liberalization theory', a version that has been adapted to the developing countries is in line with the theoretical background of the

constituent descriptions of McKinnon and Shaw and the work they have done in 1973 (Williamson and Mahar, 2002, p.8).

This practice of low interest rates applies to certain sectors of bank credit, inefficient forms of dissemination of credit by providing the scarce credit resources of commercial banks that further create public deficits, while the economies of other financing need moneylender, that is a policy type that is obtained from weak sources such as cooperativeness, known as financial repression (McKinnon, 1973, pp.68-69). Applications that prevent the determination by the market of policy rates "interest checks and capital flows restrictions" as it is implemented in two different areas, including domestic and international (Williamson and Mahar, 2002, p.7).

Accordingly, making arrangements for transactions to be made by some of the state's financial institutions under a certain economy, to have ownership of some banks and applications, such as imposing restrictions on international capital flows is the implementation of repressive policies in that country (Williamson and Mahar, 2002, p.15). McKinnon's (1973) deposit and loan interest rates affect growth through the ceil of savings and can implement the financial repression policy via placing investments, in line with the relationship between money and physical capital, in other words, investments have adequate support to many empirical studies.

We can give examples of these studies by following Fry (1978, 1979), Harris (1979), Khan and Hassan (1998), Laumas (1990), Moore (2009), Pentecost and Moore (2006), Natka (1999), Thornton and Poudyal (1990), Odhiambo (2004), Watson (1992), for the the demand for money in their work across different countries and time zones, however they do not point to a common conclusion about the relationship between investment and profit. From the perspective of the studies investigating the relationship of complementarity for Turkey's economy, Pentecost (2000), indicated the complementary relationship between money and physical capital. Hepsağ (2009) reached a result and provided evidence against this result.

This interaction between different signs of the movement of investment and money demand should be noted that only support the empirical findings contrast with each other because of differing aspects. However, the country is successful in all the ways associated to the liberalization of financial markets as the congregational findings of these studies generally rejected this hypothesis, although the analysis methods used in the study of the period for Turkey's economy and countries experiencing problems in the financial liberalization often it is being said that the applications are accepted.

## 3. Theoretical Framework of McKinnon's Complementarity Hypothesis

According to McKinnon's extra investigational study, deep financial markets in developing countries and the lack of financial intermediation system balance should be deposited before investing their money because of the physical capital amount. In order to finance the investment projects of a company, they are determined by the savings they hold in the form of monetary assets and is considered as a highly decentralized structure because independent savers (McKinnon, 1973, pp.57-58).

According to McKinnon, in developing countries due to those reasons, investors can benefit from the more internal financing facilities (McKinnon, 1973, pp.59-60). In this context, McKinnon accepts the money as a tool for accumulation of capital, and therefore assumes a relationship of complementarity between money and physical capital (McKinnon, 1973, pp.57-61).

Neo-classical money demand function, although not claimed to be complete in substitutability between money and physical capital as McKinnon speaks of the existence of a complementarity relationship between money and capital (McKinnon, 1973, p.59). This complementary relationship, in other words, the increase in the return on investments, the physical capital stems from increasing the required amount of money that will be reflected in the real money stock (McKinnon, 1973, p.60; Shaw, 1973, p.71 cited in Ozsahin, 2011). If a rate of return rises or possession of money declines in the opportunity cost, and if the money would be a more effective means of accumulating value of securities, then the investments will emerge with positive interaction between the consumption of domestic financing and the remainder will be financed by the investors themselves, who can achieve savings by taking the cash and investments.

The relationship of complementarity between money and physical capital can be more easily explained through equations 1 and 2 (McKinnon, 1973, p.59):

$$\frac{M}{P} = (Y, r, d - P^*) \tag{1}$$

$$\frac{I}{Y} = (r, d - P^*) \tag{2}$$

According to the complementarity hypothesis real money demand (*M/*P), real income level (*Y*), real deposit interest rate (*d-P\**), and average real return of capital (*r*) are positively correlated. The average real rate of return of capital (*r*) and real money demand the (*M/*P) means that there is positive relationship between the complementary relationship between money and physical capital. But this relationship refers to only one aspect of the complementarity hypothesis. Also, the ratio of investment's income to the complementary relationships of McKinnon (*I/Y*) and the real rate of return of money's balance should be positively correlated. Thus, bank deposits increase in their rate of real return (*d-P\**) along with real money demand (M/P) that increase the complementarity relations in accordance with the investment ratio which will also increase between the growing demand for real money in investments (*I/Y*) (Pentecost and Moore, 2006).

One of the main problems in testing the complementary relationship is the difficulty in calculating the average yield of the capital in real terms. According to McKinnon (1973), the average real return of capital may be used in the ratio of income instead of investment in order to overcome additional difficulties.

McKinnon's entry-level model cannot borrow to finance the investments of individuals and therefore acts from the point where there is a need to increase their savings before investing. The expansion of credit facilities as a result of financial liberalization eliminates the need for making savings before investments. McKinnon's entry-level model in the context of financial liberalization policies can be rewritten as follows (Pentecost and Moore, 2006):

$$\frac{M}{P} = (Y, \frac{I}{Y}, d - P^*) \tag{3}$$
$$\frac{I}{Y} = (\frac{DC}{Y}, d - P^*) \tag{4}$$

Equations 3 and 4, located in one of the parameters real money demand (*M/P*), real income level (*Y*), ratio of the income of investments (*I/Y*), real interest rates on deposits (*d-P\**), and (*DC/Y*) of the private sector credit to GDP represents the ratio. 'L' is correlated with the demand for money in the process of capital accumulation in the direct model.

According to the partial derivatives of each of the variables in *L*'s equation is a positive value. Especially $\frac{\partial L}{\partial(\frac{I}{Y})}$ is greater than 0 is an indication of a simple complementary relationship between money and physical capital (McKinnon, 1973, p.59).

The neo-classical money demand function does recognize the relationship between money and physical capital substitution. This substitution relationship indicates and carries the meaning that hinders the accumulation of physical capital, the size of the real cash balance and a negative impact on the capital's demand for money as well as increasing the real rate of return. Individuals' increase in capital return rate will move to physical capital that are more profitable than their money and assets and an increase in the real return on possessing money, each Y will run level reducing effect on the demand for physical capital. This situation arises as a result of the substitution relationship between envisioned by the neo-classical monetary approach and capital (McKinnon, 1973, pp.44-45).

## 4. Data Set

Data set is taken as a series on a quarterly analysis that is selected based on econometric models that we developed between a periods of 1999Q1-2014Q4. Analysis of the variables series are collected through Electronic Data Distribution System of Turkey's Central Bank. Eviews 6.1 packages are based on econometric models that we developed using logarithmic transformation analysis and their application are made through the series.

Models in order to investigate the complementary relationship between money and physical capital McKinnon (1973), it can be summarized as following.

$$\frac{M}{P} = (Y, \frac{I}{Y}, d - P^*) \tag{5}$$
$$\frac{I}{Y} = (\frac{DC}{Y}, P^*) \tag{6}$$

Equations 5 and 6 represent (*M/P*) real money demand, (*Y*) real income level, $(\frac{I}{Y})$ the ratio of the income of investments, (*d-P\**) real interest rates on deposits and (*DC/Y*) the GDP ratio of private sector credit.

Demand and real money are used to calculate the consumer price index, the real income. Money supply for the variables of the money demand M2, real GDP values for 1999 with a base price of real income are used.

The expected inflation rate has been increased interest rate for the calculation of real interest rates on deposits. Achieving the expected inflation rate while benefiting from base year 1999 GDP deflator $\frac{X_t - X_{t-1}}{X_{t-1}} \times 100$ and inflation rates are calculated with this formula.

## 5. Methodology

Granger and Newbold (1974) estimated regression models using non-stationary time series and the coefficients obtained from these models and found in conclusion that they reflect the actual signs of the relationships. Thus, it is of great importance that the research data be subjected to a series of stability tests performed using serial analysis. The ADF and PP tests are most frequently used in the literature for testing the presence of unit root in the series and have been used in this paper, for this purpose.

### 5.1. Unit Root Tests

By applying the Dickey and Fuller (1981) procedure, ADF test models are to be estimated in the practice of Equation 7, 8 and 9 as they have been expressed as follows:

$$\Delta Y t = \delta Y_{t-1} + a_i \sum_{i=1}^{m} Y_{t-1} + u_t \tag{7}$$
$$\Delta Y t = \beta 1 + \delta Y_{t-1} + a_i \sum_{i=1}^{m} Y_{t-1} u_t \tag{8}$$
$$\Delta Y t = \beta 1 + \beta 2t + \delta Y t - 1 + a_i \sum_{i=1}^{m} Y_{t-1} + u_t \tag{9}$$

Located in the error term $u_t$ and $Y_{t-1}$ represent the dependent variables' values in the delay period. The presence of a unit root in the ADF test implies that $\delta$'s testing with the calculated values are not equal to zero and reaching this decision implies comparing them with the critical values of McKinnon (Gujarati, 2004, p. 817).

The decision we have reached is to reject the null hypothesis of the calculated values, in other words for the acceptance of the stationary series of the alternative hypotheses must be smaller than the critical statements.

Phillips and Perron unit root test values are to be associated with each of the regression error terms from the equations (autocorrelation). Phillips and Perron's test is a method to correct the heteroscedasticity (1988) that is to be developed in the data. This method can be explained by Equation 10 (Zivot and Wang, 2006):

$$\Delta Y t = \beta' D_t + \pi y_{t-1} + u_t \tag{10}$$

### 5.2. Limit Test Method and ARDL

Long-term variables are tested for the existence of relationships using Engle and Granger (1987) and Johansen cointegration tests. In the study of long-term relationships, the series have a different level of stability and the ARDL limit test is the most appropriate method.

P delay values in the first stage of the limit test Akaike (AIC) vs. Schwarz (SBC) are estimated from the length of the delay suggested by the information criteria. In determining the length of the delay models estimated with the lack of autocorrelation lag issue is of great importance (Pesaran and Shin, 1999, p.373, 386).

The existence of a long term relationship between the variables, the estimated value of statistical regressions, Pesaran. et al (2001) had decided that the results can be compared with the given critical value. It considers two lower and upper critical values including statistical F value calculated etc. The F value is to be greater than the critical upper limit for an inference so that there is a long-term relationship (Pesaran et al., 2001, p. 290).

The limit test findings point to where a long term presence on long- and short-term regression equations is to be obtained with the help of the ARDL method. Long-term conditions created by the appropriate lag length obtained in the test phase boundary of the ARDL model of equality is expressed in

$$Y_t = c_0 + \sum \alpha_i Y_{t-1} + \sum \theta_{2i} \pi_{t-i} + \sum \theta_{3i} \partial_{t-1} + u_t \tag{11}$$

The equation of error correction model to obtain the short-term coefficients of the variables is included in equation 12.

$$\Delta Y_t = \mu + \sum \lambda_i \Delta Y_{t-i} + \sum \omega_i \Delta X_{t-i} + \sum \varphi_i \Delta \pi_{t-i} + \sum \gamma_i \Delta \partial_{t-i} + \vartheta ECM_{t-1} + u_t \qquad (12)$$

Equation 12 is located in front of each variable coefficient, while short-term coefficients of the variables represent the θ term error correction model coefficients.

In addition to the short-term Breusch-Godfrey autocorrelation test for the reliability of the regression estimates, there should also be applied two tests, namely Jarque-Bera normality test and the White heteroscedasticity test.

## 6. Empirical Results

McKinnon suggested to test the complementary relationship between money and physical capital (1973) using Equations 5 and 6 for the stability tests related to the clearly expressed sequence described by Dickey and Fuller's (1981) ADF unit root test and Phillip and Perron's (1988) PP unit root test which were developed and the results are presented in Tables 1 and 2.

*Table 1. ADF and PP Unit Root Test Series*

|  | Results Original Series | | The first difference is received Series | |
|---|---|---|---|---|
|  | ADF | PP | ADF | PP |
| $\frac{M}{P}$ | -1.329 (0.93) | -1.647 (0.75) | -7.108 (0.00) | -7.007 (0.00) |
| $Y$ | -3.139 (0.10) | -6.367 (0.00) | -3.517 (0.00) | -12.7 (0.00) |
| $\frac{I}{Y}$ | -3.476 (0.04) | -3.247 (0.08) | -3.761 (0.00) | -11.24 (0.00) |
| $(d-P*)$ | -3.597 (0.03) | -3.527 (0.04) | -22.97 (0.27) | -12.00 (0.00) |
| $\frac{DC}{Y}$ | -2.403 (0.32) | -2.364 (0.38) | -2.002 (0.39) | -71.40 (0.00) |
| Critical Values | | | | |
| 1% | -4.310 | -4.120 | -3.530 | -3.560 |
| 5% | -3.542 | -3.462 | -2.919 | -2.829 |
| 10% | -3.279 | -3.179 | -2.697 | -2.672 |

According to the findings of Table 1, unit root test results were compiled in order to test the stability of the variables in real income, the ratio of income of investments, real deposit interest rate variables ADF and PP tests according to other works, it seems to be stable in the original level (0). It is understood that real money demand and other variables outside of that private sector credit to GDP ratio are stable in the first difference (I (1)). The results of the unit root tests for the next stage of data at different levels are determined as they have been passed the limit stability test. In addition, after applying the ADF test for unit root test, variables (d-P*) and DC / Y are not integrated at order 1, thus the conditions for the validation of the co-integration are not met. Instead, according to the Phillips-Perron Tests all variables are integrated at order 1. These results signal possible difficulties in the co-integration process.

*Table 2. Recommended appropriate lag lengths by Akaike and Schwarz criteria*

|  | Persistence Model | | | | Persistence and Trendline model | | | |
|---|---|---|---|---|---|---|---|---|
|  | $p$ | $AIC_p$ | $\chi^2(1)$ | $\chi^2(4)$ | $p$ | $AIC_p$ | $\chi^2(1)$ | $\chi^2(4)$ |
| Money Demand Model | 1 | -2.351 | 0.440 (0.50) | 4.865 (0.30) | 1 | -2.344 | 0.759 (0.38) | 4.966 (0.28) |
| Investment Model | 3 | -2.178 | 0.898 (0.34) | 11.91 ((0.06) | 3 | -2.239 | 0.772 (0.37) | 17.01 (0.05) |
|  | Persistence Model | | | | Persistence and Trendline model | | | |
|  | $p$ | $SBC_p$ | $\chi^2(1)$ | $\chi^2(4)$ | $p$ | $SBC_p$ | $\chi^2(1)$ | $\chi^2(4)$ |

| | | | | | | | | |
|---|---|---|---|---|---|---|---|---|
| Money Demand Model | 1 | -2.089 | 0.450 (0.50) | 4.855 (0.30) | 1 | -2.028 | 0.769 (0.38) | 4.976 (0.28) |
| Investment Model | 1 | -1.85 | 0.103 (0.74) | 18.95 (0.05) | 1 | -1.926 | 0.307 (0.57) | 19.85 (0.05) |

**Note:** According to the Akaike and Schwarz criteria selected for the length of the delay. $\chi^2(1)$ and $\chi^2(4)$ give the first and fourth delays of autocorrelation LM test statistics. $\chi^2$ the probability, p values of statistics are shown in parentheses under the LM statistics

Appropriate length of delay that is determined by both the persistence of the money demand equation, and by the persistence-trend model shows the appropriate length of the delay in accordance with the Akaike and Schwarz criteria presented in the findings of Table 2. The length of this delay in model '1' and '4' according to test results, delays in LM is moving autocorrelation problem. Investment equation for the appropriate length of delay according to the Akaike criterion both persistence and constant-trend model suggests Schwarz's delay for the criteria set by a delay of '3'. Simplification of the table for both delay of the numerical size of the model is estimated based on the lags in the investment equation model which has shown that there are very significant differences necessary to take into consideration in order to determine the delay length of the Schwarz's criterion in the next stage, which is essentially taken and passed the limit test at the next lag.

*Table 3. Limits on the Demand for Money and Investment Equations Test Results*

| | **Trend Model** | | | | **Without Trend Model** | | |
|---|---|---|---|---|---|---|---|
| | $p$ | F-iv | F-v | t-v | $p$ | F-iii | t-iii |
| Money Demand Model | 1 | $827^{c}$ | $498^{c}$ | $-2.025^{c}$ | 1 | $607^{c}$ | $-3.085^{c}$ |
| Investment Model | 1 | $0.251^{c}$ | $0.427^{c}$ | $-4.627^{c}$ | 1 | $0.225^{c}$ | $-4.060^{c}$ |

**Note**: Pesaran et al (2001) calculated $^{C}$ values indicate that the value is above the upper limit of 5%.

According to the test results in Table 3 where the limit and money demand models of the F-iii to both types of investment models, for the F-iv, F-v, t-iii and t-v, namely the values of the statistics, Pesaran et al. (2001) stated that for the null hypothesis there is no level relationship model above the 5% of the value given by the upper critical are rejected and the alternative hypothesis is accepted. In this context, both models of the demand for money can be made available to review of the level of investment relations model equation.

Table 4 is located in the appropriate length of the delay proposed for long-term results of parameter estimates obtained by the value of '1' for both models, namely demand of money and the investment model.

*Table 4. Long-Term Coefficient Estimation Results*

| | **Money Demand Model** (Dependent variable: *M/P*) | | | **Investment Model** (Dependent variable: *I/Y* ) | |
|---|---|---|---|---|---|
| | *Y* | *I/Y* | *d − P\** | *DC/Y* | *d − P\** |
| Persistence Model | 3.358*** (4.009) | 1.770* (1.785) | 0.850 (0.934) | 0.125 (1.087) | -0.542** (-1.946) |
| Trendline Model | 1.701* (1.768) | 1.285** (2.179) | .888 (1.537) | 0.197 (1.434) | -0.708*** (-2.652) |

**Note**: *t*-statistics are calculated in parentheses. Level of significance are ***, **, *, namely 1, 5 and 10 %, respectively.

The parameters obtained in the framework of long-term money demand models according to the forecast results from the long-term demand for money show an important positive and statistically significant relationship with income level.

At the same time, positive and significant correlation between the ratios of investment income and the demand for money, shows that increases in the demand for money leads to increase in demand for physical capital. If we look at the results in the framework of an increase of investment in domestic investment model it creates a positive impact on the volume of credit investments. Analysis results are evaluated in terms of the relationship between long-term investments with private investment model, and real deposit rates are negative and statistically significant. It is also be noted that between Money Demand (*M/P*) and variables *Y* and *I/Y* there are positive direct relationships established at a significance level of 10%. Also, research results show an inverse relationship within the investment model between (*I/Y*) and (*d-P\**) at a significance level of 5%. Regarding the relations between Money Demand (*M/P*) and (*d-P\**), and between *I/Y* and *DC/Y*, the validation tests show that there are no relationships between these variables. Results of the validity tests reinforce the stationary tests, presented in Table 1.

Consequently, the investment function is not verified by these findings, according to McKinnon's complementarity hypothesis. Despite the increase in interest rates, the increase in the rate of investment increases the demand for money in investments, contrary to what McKinnon anticipated as an increase. Isik et al. (2005) and Hepsağ (2009) stress that their applications for financial liberalization in market characterized by rising interest rates on private sector investments in Turkey's economy show the exclusionary effect upon these findings. Their results (Isik et al., 2005; Hepsağ, 2009) therefore, present a partial complementarity relationship between money and physical capital in Turkey's economy.

The error correction model results estimated for the acquisition of short-term help the ARDL equation coefficients that are exhibited in Table 5. Table 5's error correction obtained with the help of models of short-term factors are examined when the long-term findings support the short-term model for the demand for money. A positive relationship between the investment rate and real interest rates is determined.

However, unlike the persistence and long-term relationship with money demand models there is a significant trend of real interest rates at a level of significance of 10%. Thereby, it is an important variable in determining the demand for real money that can be made in the short term review contrary to long-term real interest rates on the basis of these findings.

When evaluating short-term factors related to the investment equation in the framework of the model, vector error correction was significant at the 1% level for domestic credit volume and, therefore, it is seen that the function of the amount of credit is an important variable determining investments on the short term. The results obtained in Table 5 are limited in terms of interpretation because of the previous limitations, discovered in earlier stages.

*Table 5. Error Correction Model Results Obtained Coefficients of Short-Term Forecasts*

| | | Money Demand Model | | Investment Model | |
|---|---|---|---|---|---|
| **Persistence Model** | DY | 0.167 (1.566) | D (I/Y)(−1) | 0.139 (1.600) |
| | D(I/Y) | 0.160 (1.569) | D (I/Y)(−2) | -0.219 (-2.153)** |
| | D (d-P*) | 0.132 (1.76)* | D (d-P*) | -0.048 (-0.570) |
| | ECM (−1) | -0.093 (-3.70)*** | D (DC/Y) | 0.526 (5.287)*** |
| | | | ECM (−1) | -0.278 (-4.921)*** |
| **Trend Model** | DY | 0.116 (1.212) | D (I/Y)(−1) | 0.167 (2.018)** |
| | D(I/Y) | 0.149 (1.563) | D (d-P*) | -0.114 (-1.57676) |
| | D (d-P*) | 0.161 (2.163)** | D (DC/Y) | 0.628 (7.315)*** |
| | ECM (−1) | -0.125 (-3.784)*** | ECM (−1) | -0.385 (-5.940)*** |

**Note**: *t*-statistics are calculated in parentheses. Level of significance are ***, **, *, namely 1, 5 and 10 %, respectively.

## 7. Conclusion

### 7.1. Theoretical Contributions

In the financial liberalization theory, an application of this theory for having different rates of growth performance for a country caused a question on neoclassical and endogenous growth theories. Different financial development levels for different countries seems to be the answer cited as a justification neo-classical economic thought for financial markets in relation to the technological changes and financial services innovations brought about by the demands advocated by the driving forces for financial development. The number of financial instruments as a result of rapid growth momentum seen in the financial markets and with the rise in the 1990s of the instrument function is an extension of these developments.

Liberalization of applications follows as a result of increasing interest rates on investments in physical capital, in other words, demand for money will encourage these predictions which are tested by investigating the relationship between interest rates and investment volume. As McKinnon also established the complementarity hypothesis in this study for the relationship between money and physical capital, and to this end we have tried to investigate the test limit and ARDL method for Turkey's economy. Negative and significant relationship between the structures of money demand, according to the analysis result of the estimated money demand equation and the investment rate in a statistically significant and positive interaction of presence are detected. The investment variable in the equation of investment rate and interest rate refers to a substituent relationship rather than complementarity. Based on the results obtained in this direction from the period 1999Q1-2014Q4, there is a limited complementary relationship between money and physical capital in Turkey's economy for the reviewed period.

### 7.2. Suggestions and Limitations

According to the above research findings, one must look further down the development area, by following from the middle-level to the least developed countries for understanding and implementing the complementary theory.

In most developing countries under the disequilibrium interest rate system, a reduction in real deposit rate of interest also declines the money demand which further has an impact on real credit supply and new fixed investment. The central banks of developing countries should concentrate on changing the negative interest rate levels to positive interest rate levels or on developing the positive insurance policy in order to secure the level of investments. The policy makers should boost commodities export and encourage financial institutions to broaden their credit zone for creating export processing and enable the environment to increase export volume. The government should implement policies that are aimed at increasing domestic revenues and eventually reducing reliance on external bailout to support the budget, because this is an important issue for under develop countries to tackle. For a successful policy of financial liberalization, the authorities should ensure that appropriate fiscal and monetary policies are created and implemented to reduce the rate of inflation.

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