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Performance of domestic investment in Tanzania: an empirical analysis over the 1980-2020 period

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Abstract

Although domestic investment is a key component of economic growth, its growth has been insignificant in recent years. This study employs an error correction model to analyze the factors affecting domestic investment in Tanzania using time-series data recorded in the 1980-2020 period. These factors include money supply, interest rate, savings rate, and government expenditure. The regression results show that the effect of government expenditure on economic growth is insignificant while money supply, interest rate, and savings rate have a significant impact on economic growth. These findings imply that policies regulating interest rates, savings rates, and money supply are necessary to accelerate financial intermediation and mobilize domestic savings, thereby improving domestic investment. Furthermore, this study recommends encouraging investment incentives and establishing vibrant investment promotion agencies.

Keywords: Domestic investment, Domestic saving, Economic growth, Government expenditure

1. Introduction

This study addresses and analyzes the factors affecting domestic investment in Tanzania. Domestic investment is a volatile macroeconomic variable that is crucial to a country's economic growth and poverty reduction. Since the 1980s, Tanzania has been implementing numerous trade and fiscal policy reforms to promote domestic investment and increase export activities that support the adjustment of external trade imbalances. However, despite these policy reforms, Tanzania experienced a high unemployment rate and low level of investment due to low savings (Grenier *et al.,* 1998).

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Investment is generally made up of four large sectors: private domestic investment, public domestic investment, foreign direct investment, and portfolio investment. Private domestic investment refers to the combination of gross fixed capital formation and the net changes in an individual's inventory level, while public investment is the government's and public enterprise's investment in social and economic infrastructure, real estate, and tangible assets. Foreign investment in a tangible asset is defined as foreign direct investment (FDI). Meanwhile, it is called a portfolio investment in the form of shares, bonds, and securities (Bakare, 2011). Investment plays an important role in economic growth and poverty reduction since it facilitates capital accumulation. The government expenditure on education, health, infrastructure, and housing positively affects domestic investment and economic growth. Meanwhile, private investment may attract technology, create employment, facilitate the application of new production means, and enhance productivity by incentivizing competition among businesses within the economy (White, 2005).

Investment affects economic growth in two ways. Firstly, investment goods demand contributes to the total aggregated demand of the economy. Thus, increasing investment demand will stimulate investment goods production, consequently leading to higher economic growth and development. Secondly, capital formation can improve production capacity since it aids the economy in increasing production. Furthermore, investment in new plants and machinery raises productivity by introducing new technology, leading to faster economic growth (Ipumbu and Kadhikwa, 1999).

Between 2000 and 2014, Tanzania was one of the countries with the strongest growth rates among the non-oil producers in sub-Saharan Africa. During that period, Tanzania's yearly real GDP growth rate was 6.6% on average, reaching 7.2% in 2014. However, its GDP per capita remains below average, where the agriculture sector (which accounts for most of the labor force) recorded unimpressive levels of investment expenditure (TIC, 2018). Studies indicate that if Africa is to make significant progress in reducing poverty and unemployment, average growth rates of at least 7% must be sustained in the medium to long term, translating to a required investment rate of 25% of Tanzania's GDP or more (Clarke and Hill, 2013).

Although domestic investment has increased in Tanzania, it has remained stagnant in recent years. According to the International Monetary Fund, from 2013 to 2017, domestic investment grew at an average of 31% of the gross domestic product (GDP). Generally, domestic investment has been fluctuating over time. For example, Tanzania reached the highest domestic investment growth at 35.5% in 1980 and recorded the lowest in 2002 with 13.19% of GDP.

The main objective of this study is to empirically analyze the main factors that affected domestic investment in Tanzania from 1980 to 2020. Specifically, the study sought to assess the effects of money supply, interest rate, saving rate, and government expenditure on domestic investment.

This study proposes some prospects the government can consider accelerating domestic investment in Tanzania. Based on the findings of this study, policymakers can articulate ways to influence domestic investment, thus making reasonable decisions with proper information. Policies that can control interest rates, saving rates, and money supply are indeed called for improving domestic investment. Policymakers should create an enabling environment to encourage private domestic investments.

The structure of this study is organized into five sections as follows. Section 1 covers introduction. Section 2 reviews the literature. Sections 3, 4, and 5 discuss methodology, research results, and conclusion.

2. Literature review

Domestic investment opportunities are not a rare occurrence in Tanzania. Aside from being peaceful and politically stable, Tanzania has abundant natural resources and occupies a strategic geographical location in the Eastern and Central African regions that is convenient for trade and investments (TIC, 2018). Details on investment opportunities, incentives, and business environment, among other information on both foreign and domestic investments, can be easily accessed through the Tanzania Investment Centre. As of 2021, the value of registered investments, both domestic and foreign, into Tanzania stood at 3,749.5 million USD (URT, 2022). Furthermore, the construction of non-residence buildings occupied a lion's share of the value of the registered investments that amounted to 1,318.3 million USD (URT, 2022). In the same year, financial services and tourism ranked second and third with a registered value of investments of 574.4 and 354.1 million USD, respectively (URT, 2022).

Scholars draw different conclusions on the factors affecting domestic investment from many empirical analyses. Using data collected from 21 developing countries during the 1971-1980 period, the study of real financial assets revealed a positive correlation between interest rates growth and financial assets. Some researchers believe that interest rates have no impact on investment. The causal relationship between interest rates and investment was tested using the VAR model. The results showed that investment depended on the macroeconomic level of demand rather than interest rates. According to the analysis of three West Germany rate hikes from 1960 to 1978, the effect of interest rates on investment in two periods differed due to the difference in policies.

Scholars investigated the relationship between nominal interest rate and investment; the findings revealed that interest rate and investment were positively correlated in the long run. However, it was observed that despite affecting investment, the interest rate's impact was relatively weak. Greene and Villanueva (1991) examined the factors affecting private investment in 23 less developing countries from 1975 to 1987 and found that real interest rates negatively impacted private investment.

Private domestic investment data in Tanzania is sparse and is usually not sufficient, making the task of analyzing the performance of domestic enterprises and assessing FDI's impact on

the Tanzanian economy highly challenging. The comparison of foreign and domestic firms in terms of investment activity, productivity, firm size, and trade patterns is supported by the dataset's characteristics. Furthermore, the dataset offers possibilities to investigate whether the presence of FDI in Tanzania positively affects the host economy and, if that is the case, through which channels said FDI tends to spill over (UNIDO, 2014).

Hyder and Ahmad (2003) examined the slowdown in private investment in Pakistan. They found that higher real interest rates reduced private investment. Majed and Ahmad (2010) employed a cointegration technique to investigate the impacts of interest rates on Jordan's investment activities between 1990 and 2005. The study found that the real interest rate negatively impacted its investment. If the real interest rate rises by 1%, the investment level will reduce by 44%. Ndikumana's (2000) study on financial determinants of sub-Saharan countries' domestic investment in Africa implied a negative correlation between deposit interest rate and private investment growth. If the interest rate plummets too deep, regardless of whether it is positive or negative, it will discourage money deposits from financially abled persons to financial institutions. In layman's terms, a decrease in the level of savings also leads to a reduction in the level of investment.

Tanzania's small- and medium-sized enterprises usually struggle to achieve affordable long-term finance. In addition, debt financing with its short maturity may cause problems for start-ups that might substantially contribute to domestic investment in Tanzania (Tjom and Ahmad 2019). The controversy over whether government expenditure on private investment is crowding-out or crowding-in has led to an increasing interest in examining the relationship between government expenditure and private investment among economists. In the Nigerian economy, the public sector (embodied by the government) and the private sector coexist, each playing a role in improving economic growth. As a result, some researchers advocated using government expenditure to enhance private investment (Gatawa and Bello, 2011).

Government expenditure is considered a factor that increases productivity. However, in some scenarios, the financing of government spending can impede a country's development. To finance public expenses, borrowing is a common solution. With borrowing, the government competes for capital with private investors, which might crowd out private investment and initialize the foreign debt burden (World Bank, 1991). It is reported that improved government expenditure on physical infrastructure development and education results in economic growth. Opposed to this, government spending more on foreign debt servicing, government consumption, and cost on public order and security, salaries, and allowances adversely influence economic growth.

Muthui *et al.* (2013) investigate the relationship between average public expenditure and potential economic growth and find that they are linked in the long-term. Besides, the net impact of potential growth on the future stream of government budget balances is determined by political will and the prioritization of key sectors of the economy.

These findings posit that increased economic growth would differ quite considerably across sectors, and the expected economic growth predominantly depends on the efficiency of scaled-up expenditure.

A study by Magnus and George in (2010) suggests that the degree of openness of the economy is negatively related to investment, while inflation is positively related to investment. In a related topic, Ahmad (2009) used a cointegration approach to investigate the dynamics of domestic investment in the large-scale manufacturing sector in Pakistan. This research shows that government development expenditure enhances domestic investment. In other words, public non-development expenditure reduces domestic investment. A study in Kenya by Olweny and Chiluwe (2012) has evaluated the effect of money supply on private sector investment in the long run. This study concludes that money supply has a positive effect on private sector investment, which means that the increase in money supply subsequently leads to increased investment. The reduction of money supply will assist in the cutback of private sector investment.

Mudlin and Batu (2016) revealed that national income, public investment, and exchange rate are critical to the performance of private investment. Other significant determinants of private investment are interest rates, inflation rates, and money supply. Another study by Mnali (2008) about investment climate and opportunities in Tanzania confirms that domestic savings is fundamental in encouraging domestic investment.

In contrast with a closed economy whose investment is entirely dependent on a domestic savings pool, an open economy such as South Africa may accept a temporary account deficit to finance an investment that exceeds its national reserves through foreign capital (Gauma and Bonga, 2016). A study that analyzed the relationship between government spending and investment revealed a positive causation, with the former affecting the latter. Furthermore, it found that economic growth was stimulated by investment.

3. Methodology

3.1 Model specification

The model that is applied in this study that captures variables as specified hereunder:

$$DI_t = \beta_0 + \beta_1 MS + \beta_2 IR + \beta_3 SR + \beta_4 EXP + \mu_t \quad (1)$$

where DI is domestic investment, MS is money supply, IR is the interest rate, SR is savings rate, EXP is government expenditure, and μ_t is the error term.

Since all the variables presented in Equation (1) call for time series data, the equation is transformed into a natural logarithm. Moreover, the use of natural logarithm normalizes equation 1 and removes non-linearity. Thus, the model is specified as follows:

$$lnDI_t = \beta_0 + \beta_1 lnMS_t + \beta_2 lnIR_t + \beta_3 lnSR_t + \beta_4 lnEXP_t + \mu_t \,. \quad (2)$$

3.2 Data sources

This study uses secondary time series data retrieved from 1980 to 2020. The period is chosen because the Tanzanian economy has gradually changed from a state-controlled market economy to a competitive market economy, and hence, fluctuations in investment growth have been observed. This study used data obtained from the Central Bank of Tanzania (BoT), the Ministry of Finance, the National Bureau of Statistics (NBS), the Tanzania Investment Centre (TIC), and various Tanzanian economic survey data.

3.3 Description of variables presented in the model

The description of the variables is shown in Table 1.

Table 1. Description of variables

Variables	Description
Domestic investment (DI)	Domestic investment is a dependent variable expressed as a percentage of domestic product growth. It was measured using the value of financial assets in real terms.
Money supply (MS)	Money supply is an independent variable measured using the narrow definition of money (M1). It was obtained by adding up currency in circulation (CC) and demand deposits (DD) held by commercial banks in Tanzania under the review period of the study. It is hypothesized to have a negative impact on domestic investment.
Interest rate (IR)	Interest rate, an independent variable, is measured using the nominal interest rate. It was calculated as the percentage change in the price of loan from financial institutions for the period covered by the study. It is hypothesized to have a negative impact on domestic investment.
Saving rate (SR)	The saving rate is the percentage of gross domestic product and is measured using total domestic savings made in Tanzania. It was calculated by adding up total domestic savings made by individuals and companies (private savings) and government (public savings) for a review period covered by the study. It is hypothesized to have a positive impact on domestic investment.
Expenditure by the government (EXP)	Government expenditure is expressed as the percentage of national income (GDP). It was calculated by dividing the total government expenditure under the review period by national income times a hundred. It is hypothesized to have a positive impact on domestic investment.

Source: Author's compilation

3.3 Diagnostic tests

Before actual estimation, various tests are conducted to examine the nature of the collected data. These included the following tests.

Unit root test

Some macroeconomic time series variables are not stationary, and if they are not, they may result in spurious regression. The results from regression using nonstationary data do not

make sense. To overcome this challenge, this study applies a unit root test to examine whether the variables are stationary or otherwise. The augmented Dick-Fuller (ADF) and Phillips-Perron tests are employed to test for unit root.

Cointegration test

Cointegration of variables occurs when two or more variables have a long-run relationship between them. If two variables, dependent and independent, are individually non-stationary but their residual is stationary, such variables are cointegrated. Thus, the Engle-Granger two-step procedure is used to check whether the variables are cointegrated. Generally, Engle-Granger is regarded as a convincing and confirmatory test for the existence of cointegration.

Error correction model estimate

According to Granger (1986), an error correction model can best present any cointegrated variables. The lagged residuals obtained from an underlying cointegrating relationship are added to the original vector of cointegrating stationary variables. Application of the error correction model becomes possible only when the series are integrated in the same order.

Other tests were also carried out besides the aforementioned tests that were applied to test for the validity of the collected data. These included the Ramsey RESET test is applied to test for error model specification error, the Durbin-Watson (DW) test is applied to test for autocorrelation, the HET test is conducted to test for heteroscedasticity, the Breusch-Pagan test is applied to test for serial correlation and variance inflation factor (VIF) test is used to test for the presence of multicollinearity.

4. Results and discussion

4.1 Descriptive statistics

To understand the properties of each variable, it is very important to generate descriptive statistics before making further analysis to understand how variables behave. Table 2 presents summary statistics of each variable.

Table 2. Descriptive statistics

Variables	Number of observations	Mean	Std. Dev.	Min	Max
DI	40	25.930	6.741	13.190	35.521
MS	40	21.268	12.506	-10.600	51.300
IR	40	18.877	7.223	8.750	35.950
SR	40	18.205	7.113	7.100	33.500
EXP	40	19.428	6.026	10.050	31.400

Source: Author's calculation

Table 2 provides descriptive statistics of the individual sample series. The average value of domestic investment is 25.930, with a standard deviation of 6.741 and minimum and maximum values of 13.19 and 35.521, respectively. In addition, government expenditure has

the lowest standard deviation of 6.026 compared to the other variables. It has a minimum value of 10.05 and a maximum value of 31.4.

4.2 Normality test

Skewness and Kurtosis tests are applied to test for the normality of each variable, as shown in Table 3. After the normality test was conducted at the variable level, the results show that all variables are normally distributed. Besides that, the probabilities of variables are greater than 0.05 except for money supply, implying a normal distribution of the rest of the variables.

Table 3. Normality test results

Variables	Observations	PR(Skewness)	Pr(Kurtosis)	Adjusted Chi2(2)	Prob>Chi2
lnDI	40	0.029	0.778	4.800	0.091
lnMS	40	0.005	0.080	9.080	0.011
lnIR	40	0.712	0.568	0.470	0.792
lnSR	40	0.442	0.419	1.320	0.518
lnEXP	40	0.936	0.115	2.670	0.263

Source: Author's calculation

4.3 Correlation analysis

Correlation analysis intends to measure the relationship between individual variables in the model. Conducting correlation analysis is regarded as an early stage of testing the presence of multicollinearity among the variables. A positive sign indicates a positive relationship, meaning that the variables will move in the same direction, while a negative sign indicates an inverse relationship. The closer the absolute value of the variable to the unit, the stronger their relationship and vice versa. Table 4 presents the correlation matrix of variables.

Table 4. Correlation matrix

	DI	MS	IR	SR	EXP
DI	1.000				
MS	0.230	1.000			
IR	-0.123	0.172	1.000		
SR	0.437	0.435	0.291	1.000	
EXP	0.439	-0.088	-0.740	-0.294	1.000

Source: Author's calculation

Table 4 shows both negative and positive relationships among variables. The interest rate is negatively correlated to domestic investment; domestic investment declines as the interest rate rises and vice versa, while the rest of the variables are positively correlated with the dependent variable (domestic investment). For example, the correlation coefficient between domestic

investment (DI) and money supply (MS) is 0.230. This indicates that domestic investment will shift in the same direction as the money supply by 0.230. A strong correlation between interest rate and government expenditure does exist and is indicated by a correlation coefficient of 0.740.

4.4 Unit root test

Time series data are always non-stationary. To use time series data in a model, variables must be stationary. The unit root test is used to determine the stationarity of variables. Stationarity analysis is used to investigate the null hypothesis, which claims that all variables are non-stationary, against the alternative hypothesis, which claims that all variables are stationary at the level variables. To test the stationarity of the variables, the study applies both the ADF and Phillips-Perron unit root tests. If time series data have a unit root, it implies that the variables are not stationary, and the absence of a unit root means the variables are stationary. Table 5 provides the results for the unit root test at the level of the variable.

Table 5. Unit root test (variable level)

Variables	Augmented Dickey-Fuller		Phillips-Perron	
	Test statistics	Critical value at 5%	Test statistics	Critical value at 5%
lnDI	-1.787	-2.972	-2.016	-2.972
lnMS	-3.798	-2.978	-3.858	-2.978
lnIR	-1.915	-2.972	-1.971	-2.972
lnSR	-1.856	-2.972	-2.141	-2.972
lnEXP	-1.945	-2.972	-2.081	-2.972

Source: Author's calculation

As in Table 5, both the ADF and the Phillips-Perron tests conclude that only money supply (MS) has a computed absolute value of test statistic greater than the absolute critical value at 5% and, therefore, is stationary, while the rest of the other variables are not stationary because their test statistics in absolute value were less than the critical values at 5%.

Since the variables are non-stationary, they need to be made stationary by differentiating the variables. The results of the different variables are presented in Table 6.

Table 6. Results for unit root test (first difference)

Variables	Augmented Dickey-Fuller		Phillips-Perron	
	Test statistics	Critical value at 5%	Test statistics	Critical value at 5%
DlnDI	-5.315	-2.975	-5.351	-2.975
DlnMS	-8.891	-2.983	-9.810	-2.983
DlnIR	-5.283	-2.975	-5.388	-2.975
DlnSR	-4.677	-2.975	-4.609	-2.975
DlnEXP	-4.575	-2.975	-4.559	-2.975

Source: Author's calculation

At first difference, the ADF unit root test shows that all variables are stationary since their test statistics in absolute terms are greater than the critical values at 5%, as presented in Table 6. Furthermore, also at the first difference, the Phillip-Perron unit root test provides the same conclusion that all variables are stationary as their test statistics in absolute terms are greater than the critical values at 5% in absolute terms. At the same level of difference, both ADF and Phillips-Perron unit root tests reject the null hypothesis that claims that all variables are non-stationary since all variables were statistically significant at 5%.

4.5 Cointegration test

Engle and Granger (1987) found that two or more variables that have a long-term relationship are cointegrated. This happens once the dependent and independent variables are each non-stationary, but their residuals are. Therefore, the cointegration of variables is tested using Johansen's cointegration test. This test also identifies the nature of their combination. A linear combination may exist between two time-series variables integrating into order I(1), which can, in turn, be integrated into order zero, I(0) (Angle and Granger, 1987). The results of the cointegration test are presented in Table 7.

Table 7. Johansen test for cointegration

Maximum rank	Eigenvalue	Trace statistic	5% critical value
0	.	87.181	68.520
1	0.731	39.964*	47.210
2	0.388	22.276	29.680
3	0.340	7.330	15.410
4	0.158	1.235	3.760s

Notes: Number of observations = 38, Lags = 2.

Source: Author's calculation

Johansen's test for cointegration reveals that there is cointegration, and there is only one maximum rank of this cointegration. This is because the first significant value is less than the critical value at 5% and was found at a maximum rank of one. This suggests that there was one cointegrating equation for which a run of an error correction model (ECM) was called for.

4.6 Error correction model

The ECM for the study followed the Engle-Granger two-step procedure because there was only one cointegrating vector. A regression at the level of variables is run using the ordinary least squares method to obtain the residual for a long-run relationship or an equilibrium error (Green, 2002; Gujarati, 2004). The regression results are presented in Table 7.

Table 8. Unit root test for residual long-run relationship

	Augmented Dickey-Fuller		Phillips-Perron	
Residual	**Test statistics**	**Critical value at 5%**	**Test statistics**	**Critical value at 5%**
Res (ECT)	-6.325	-2.983	-6.417	-2.983

Source: Author's calculation

Table 8 shows that cointegration exists and the error correction term (ECT) or residual is stationary because the absolute values of both ADF and Phillips-Perron unit root tests are greater than the critical values at 5%. This implies that a linear combination of the variables in the model poses a long-term or equilibrium relationship among them. Due to the cointegration, it is necessary to run an ECM to check for the short-run relationship of the variables influencing domestic investment. The results of the ECM are presented in Table 9.

Table 9. Results of the error correction model

Variables	Coefficient	Std. Error	t-value	Probability of t-value
DlnMS_2	0.066	0.037	1.78	0.087
DlnIR_1	-0.461	0.184	-2.51	0.019
DlnSR_3	0.307	0.096	3.19	0.004
Res_1	-0.858	0.288	2.98	0.006
Constant	0.000	0.022	0.02	0.988

Source: Author's calculation

Table 8 shows that the model is highly significant in the short-run as the F-statistic test has a probability value of 0.001 while the coefficient of determination (R-squared) is 0.552, which signifies that domestic investment has been explained by the independent variables in the model by 55%.

The second lag of money supply (DlnMS_2) is statistically significant at 10% with 0.087 as the probability of the t-value. As expected, the money supply has a positive sign, implying a positive relationship with domestic investment. Therefore, this study rejects the hypothesis that claims that money supply has a negative effect on domestic investment. This means that if other factors are held constant, a 1% change in money supply in the previous period would cause domestic investment to change by 0.066 or 6.6% in the next period.

Interest rate (DlnIR_1) at first lag is statistically significant with 0.019 as the probability of t-value. Interest rate (lR) has a negative sign, as expected, which shows an inverse relationship with domestic investment. The third lag of savings rate (DlnSR_3) is statistically significant at 5% because it has a p-value of 0.004. As expected, the savings rate has a positive sign, which shows a negative relationship with domestic investment. Under the ceteris paribus assumption, a 1% change in the savings rate in the previous period increases domestic investment by 0.307 or 30.7%. The results further show that the coefficient of the error correction term carried its

expected sign. The coefficient of the error correction term has a negative sign, implying that domestic investment converges to its long-run equilibrium as time goes on. The coefficient of error correction term shows that the adjustment rate towards equilibrium, in the long run, is about 86%, which is a relatively high adjustment rate.

5. Conclusion

This study analyzes the factors affecting domestic investment in Tanzania over the 1980-2020 period because there have been frequent fluctuations in domestic investment in Tanzania, similar to the case of many developing economies. Variables that affect domestic investment in Tanzania are empirically analyzed. Before regression, pre-estimation tests are performed using different tests. A normality test is conducted to test if the variables are normally distributed, and the results show all variables to be normally distributed. Data for the variables are further transformed into natural logarithms to make time-series data more stable. Both ADF and the Phillips-Perron tests are used to test for the variables' stationarity (unit root). The tests reveal that at the variable level, only the money supply is stationary (had no unit root). Then, the variables are different to solve the problem of unit root, and at the difference level, all variables become stationary. Finally, an ECM was estimated, and the findings were statistically significant.

The findings suggest that efforts to encourage domestic investment are indeed called for. Tanzania needs to initiate powerful policies and strategies that can boost domestic investment. The government needs to improve the environment for financial intermediation and domestic savings mobilization, which are crucial for stimulating domestic investment. Furthermore, the government needs to provide incentives to domestic investors as one of the strategies to improve the business climate domestically. These incentives may include but are not limited to reducing corporate tax rates, tax holidays, and easy access to loans. Besides, the government should remove unnecessary trade restrictions that hamper investment, including bureaucracies in starting a business.

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Appendices

Appendix 1. General ECM estimation results

dfflndi	Coef.	Std. Err.	t	p> abs.t	[95% conf. Interval]	
dfflndi						
L1.	0.215	0.253	0.850	0.417	-0.357	0.787
L2.	-0.256	0.261	-0.980	0.352	-0.846	0.334
L3.	0.024	0.266	0.090	0.931	-0.577	0.625
Dfflnms						
--..	-0.026	0.062	-0.42	0.685	-0.167	0.114
L1.	0.051	0.769	0.66	0.525	-0.123	0.225
L2.	0.064	0.106	0.60	0.562	-0.177	0.305
L3.	0.010	0.117	0.86	0.414	-0.164	0.364
dfflnir						
--.	0.389	0.400	0.970	0.356	-0.516	1.294
L1.	-0.788	0.428	-1.840	0.099	-1.757	0.181
L2.	0.274	0.356	0.770	0.461	-0.531	1.080
L3.	-0.047	0.315	-0.150	0.884	-0.760	0.665
dfflnsr						
--.	0.190	0.154	1.240	0.247	-0.158	0.539
L1.	0.154	0.174	0.890	0.398	-0.239	0.548
L2.	-0.319	0.292	-1.090	0.303	-0.981	0.342
L3.	0.290	0.182	1.590	0.146	-0.122	0.701
dfflnexp						
--.	0.192	0.255	0.750	0.471	-0.385	0.769
L1.	0.242	0.256	0.950	0.369	-0.337	0.821
L2.	-0.242	0.245	-0.990	0.350	-0.797	0.313
L3.	0.098	0.301	0.330	0.752	-0.583	0.780
err						
L1.						
-cons	0.219	0.036	0.600	0.564	-0.061	0.104

Source: Author's calculation

Appendix 2. Multicollinearity test results

Variable	VIF	1/VIF
dfflnir		
L1.	1.33	0.751
err		
L1.	1.24	0.806
dfflnms		
L2.	1.07	0.935
dfflnsr		
L3.	1.05	0.948
--.	1.04	0.963
Mean VIF	1.15	

Source: Author's calculation

Appendix 3. Breusch-Godfery LM test for autocorrelation results

Lags (p)	Chi2	Df	Prob >Chi2
	0.401	1	0.527

H0: no serial correction

Source: Author's calculation