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Asymmetric Effects of Development Finance Institutions Funding (DFIs) on Investment in Zimbabwe: A Futuristic Perspective

Tarirai Ismael^{1*}

¹Midlands State University

*Corresponding author

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Abstract

Introduction - This study aimed to explore the anticipated asymmetric effects of developmental finance institutions (DFIs) funding on investment in Zimbabwe. Given the volatile nature of development finance, Zimbabwe has faced challenges in effectively mobilizing aid, often struggling to persuade donors due to government spending plans and political factors. The research sought to investigate the potential asymmetrical linkages between DFIs funding and investment in Zimbabwe.

Methodology: Model and Variables - To examine the futuristic asymmetric relationship between DFIs funding and investment in the Zimbabwean economy, a non-linear NARDL modelling approach will be employed. This methodology will estimate the projected non-linear co-integrating association between positive and negative shocks to DFIs funding and investment. The data set consisted of projected annual macroeconomic variables for Zimbabwe obtained from world bank and IMF.

Results - In the short run, it was found that both positive and negative shocks influence future investment, with negative shocks expected to have a larger effect. These negative shocks arise from economic downturns or external shocks, while positive shocks could result from increased funding or favourable policy changes. In the long run, it was found that positive shocks to DFIs funding have a positive impact on investment, leading to increased economic growth and development.

Conclusion and Recommendations - Based on the results, DFIs funding should exhibit an asymmetric relationship with investment in Zimbabwe. It is crucial for the government of Zimbabwe to proactively plan for these anticipated asymmetric effects and develop strategies to maximize the benefits of DFIs funding. By implementing the recommendations, Zimbabwe can be able to ensure a more favourable environment for future DFIs funding, fostering sustainable investment and economic growth.

Keywords: Development Finance, Development Finance Institutions Funding, Investment, Sustainable Investment, Economic Growth, ARDL modelling approach

1. Introduction

1.1 Background

The role of developmental foreign aid in developing nations has been a subject of intense debate among economists and development specialists in recent years. The international attention towards the Millennium Development Goals (MDGs) has further fuelled this discussion. The United Nations Millennium Declaration recognizes the critical role of foreign aid, also known as official development assistance, as a necessary and complementary source of financing for development. This research provides an outline of the study, including the background, problem statement, objectives, brief literature review, and methodology and findings.

Foreign aid originated in the aftermath of World War II with the Marshall Plan in 1947. It aimed to promote the economic and political interests of the United States by providing economic assistance for the reconstruction of war-ravaged Europe. While some argue that foreign aid is necessary for the economic development of low-income nations, others contend that it can have negative effects on INV growth. Nonetheless, there is a growing interest in using aid as a means to promote development, with significant infusions of aid to developing nations. Various efforts have been made to mobilize resources and increase development aid from both developing and developed countries' governments and international agencies.

Yiew and Lau (2018) highlight a gap in understanding whether aid serves as a driver of economic growth. The effectiveness of development aid remains unresolved, with ongoing debates and a lack of conclusive evidence. The causal relationship between aid and economic growth in Zimbabwe, in particular, has not been fully settled. Zimbabwe has faced challenges in mobilizing aid and ensuring its proper and corruption-free utilization, leading to delays in aid allocation and hampering the government's spending plans. Political issues further complicate aid efforts. Therefore, this study aims to investigate the asymmetric effects of developmental finance on investment in Zimbabwe from 1979 to 2019, considering the volatile nature of aid and its impact on the country's development.

Over the years, development aid has been implemented in Zimbabwe with the aim of reducing poverty and promoting economic growth. However, researchers have found that foreign aid can have a negative impact on growth. It is suggested that a high level of development aid can lead to a decline in institutional quality, increased rent-seeking behaviour, and corruption, ultimately resulting in negative effects on growth. Easterly, Levine and Roodman (2004) challenged the findings of Burnside and Dollar, who initially concluded that aid is beneficial for growth, by conducting a study with a larger sample size. Their research revealed a significant and strong negative correlation between development foreign aid and growth. This negative correlation is attributed to factors such as aid dependency, poor economic management in recipient countries, corruption, and inadequate coordination and cooperation among aid agencies. In light of these conflicting

perspectives, this study aims to examine the asymmetric effects of developmental finance on investment in Zimbabwe from 1979 to 2019.

1.2 Objectives of the study

This study sought to:

- i. To estimate the asymmetric effects of developmental finance on Investment of Zimbabwe
- ii. To give policy recommendations to policy makers based on the findings of the study.

1.3 Research hypothesis

H_0 : There are no asymmetric relationship between developmental finance and economic growth

H_1 : There are asymmetric relationship between developmental finance and economic growth

2. Literature Review

2.1 Theoretical Literature Review

The study relied on the Rostow's growth stages theory and the Two-Gap model

Rostow's growth stages theory

The theories supporting foreign development aid can be traced back to 1963 when Rostow's growth stages theory was adopted. According to Rostow, developing nations require substantial capital investment to initiate their economic growth. The model aims to establish a link between a nation's output growth and its total investment level using a simple linear regression model. The growth rate of output in this model is assumed to be a function of capital, which can be influenced by aid. The model assumes the following function: $Y(t) = f(k(t))$

Here, $Y(t)$ represents the total output at time t , and $K(t)$ represents the stock of capital at time t . The production function reflects the characteristics of developing nations, such as surplus labour and a shortage of capital. The model suggests that growth is driven by investment in capital accumulation. As aid increases the level of capital formation in a country, it consequently leads to an increase in output.

The Two-Gap model

The model discussed here builds upon the Harrod-Domar model, which was expanded by Chenery and Strout in 1966 to incorporate foreign aid as a constraint in the equations. In this context, the crucial impact of aid on growth is observed through the addition of capital available for investment, represented by the following equation:

$$I = Sd + A + OF$$

In this equation, Sd represents domestic savings, A represents the inflow of aid, and OF represents other sources of capital inflows. The rate of output growth in the Two-Gap model depends on the stock of capital, which, in turn, relies on the injection of aid, domestic savings, and other sources of capital inflows.

2.2 Empirical Review

Yiew and Lau (2018) conducted a study to examine the role and impact of development foreign aid (ODA) on economic growth (GDP) using a sample of 95 developing nations. The study included foreign direct investment (FDI) and population (POP) as control variables. The analysis utilized panel data and found a U-shaped relationship between foreign aid and economic growth. Initially, foreign aid had a negative impact on economic growth, but over time, it began to contribute positively. The results also emphasized the significance of FDI and population as key determinants of GDP, indicating that short-term economic growth is less dependent on ODA. Strengthening the legal framework was identified as crucial for these nations, as overdependence on foreign aid may have negative effects on overall growth. Effective management of foreign aid was deemed essential for achieving Sustainable Development Goals (SDGs).

Izobo (2019) examined the impact of foreign aid in Botswana and Somalia. Africa is known globally as the largest recipient of foreign aid, with billions of dollars allocated annually for development assistance aimed at alleviating hunger, reducing poverty, promoting economic development, fostering democratic governance, and upholding the rule of law without jeopardizing peace. However, little progress has been observed in terms of socio-economic and political development, as Africa remains the poorest continent based on Gross National Income (GNI) and the Human Development Index (HDI). The study focused on Botswana and Somalia as case studies to investigate why the intended results of foreign aid have not been achieved despite the substantial funds received. The research revealed that the positive impact of foreign aid is often hindered by factors such as poor governance, weak rule of law, high levels of corruption, absence of strong democratic institutions, lack of accountability, and information control by government officials.

Farahmand (2021) examined the relationship between economic growth and foreign aid in Afghanistan. The primary goal of development foreign aid is to contribute to the economic growth of underdeveloped and developing nations and accelerate their progress. The study utilized time series analysis to analyse the relationship between official development assistance and economic growth in Afghanistan from 1986 to 2018. Unit root tests were conducted to stabilize the series, and the Johansen cointegration test was performed to determine if the variables move together in the long run. The results confirmed a cointegration relationship between the variables. Granger causality tests based on an error correction model were conducted, revealing a one-way causality relationship from received official development assistance to economic growth. Furthermore, variance decomposition analysis supported the results of the Granger causality tests. Despite the significant amount of foreign aid received, Afghanistan continues to face challenges such as low-income levels, high poverty rates, and high unemployment rates in its economy.

3. Methodology

3.1 Model Specification

To examine the asymmetrical relationship among a group of variables, the Nonlinear Autoregressive Distributed Lag (NARDL) model can be employed. Shin et al. (2014) introduced the Asymmetric ARDL model, which allows for assessing the positive and negative effects of independent variables on the dependent variable in both the long run and short run. The non-linear ARDL model is an extension of the linear ARDL model proposed by Pesaran et al. (2001). To facilitate the interpretation of the NARDL model, we initially utilized the equation of the linear ARDL model, as presented below.

$$\Delta INV_t = \beta_{0t} + \sum_{i=1}^p \beta_1 \Delta INV_{t-i} + \sum_{i=0}^q \beta_2 \Delta DLF_{t-i} + \delta_0 INV_{t-1} + \delta_1 DLF_{t-1} + \mu_t$$

To introduce non linearity, movement of variable $\ln DLF_t$ is decomposed into negative and positive partial sums given as follows

$$\ln DLF_t = \ln DLF_0 + \ln DLF_t^+ + \ln DLF_t^-$$

Where DLF_t^+ and $\ln DLF_t^-$ are partial sum of positive and negative changes in log of DLF respectively. Specifically,

$$DLF_t^+ = \sum_{i=1}^t DLF_i^+ = \sum_{i=1}^t \max(DLF_i, 0)$$

$$DLF_t^- = \sum_{i=1}^t DLF_i^- = \sum_{i=1}^t \min(DLF_i, 0)$$

Replacing the above in linear ARDL of equation 1 leads us to the following NARDL model as given by Shin et. Al. (2014)

$$\Delta INV_t = \beta_0 + \sum_{i=1}^p \beta_1 \Delta INV_{t-i} + \sum_{i=0}^{q1} \beta_2 \Delta DLF_{t-i}^+ + \sum_{i=0}^{q2} \beta_3 \Delta DLF_{t-i}^- + \delta_1 INV_{t-1} + \delta_2 DLF_{t-1}^+ + \delta_3 DLF_{t-1}^- + \mu_{it}$$

To empirically investigate the potential asymmetrical and non-linear relationship between development finance and investment in Zimbabwe, we employed the aforementioned Equation (5).

3.2 Diagnostic Tests and the finding

Unit Root Test

According to Chen et al. (2020), the linear combination of stationarity (zt) in equation (2) and the asymmetric partial squares can be expressed as follows.

$$z_t = \rho + \pi_1^+ INV_t^+ + \pi_2^- INV_t^- + \theta_1^+ DLF_t^+ + \theta_2^- DLF_t^- + e_t$$

In equation (6), if $z_t = I(0)$ stationarity is achieved when certain conditions are met, specifically involving a linear asymmetric long-run cointegration relationship $\pi_1^+ = \pi_2^- = \theta_1^+ = \theta_2^- = 0$. To apply the NARDL model approach, a combination of variables with both integrated of order 0 (I(0)) and integrated of order 1 (I(1)) is expected, which helps determine the linear asymmetric long-run cointegration relationship. In order to assess the stationarity of these

variables, two commonly used unit root tests, namely the Augmented Dickey-Fuller (ADF) test and the Phillips-Perron (PP) test, were employed.

The hypothesis for testing stationarity is as follows:

H₀: The series is non-stationary (unit root exists, $\alpha = 1$).

H₁: The series is stationary (no unit root exists, $\alpha < 1$).

The decision rule is as follows: Reject H₀ if the test statistic is greater than 1; otherwise, do not reject H₀. If the ADF statistic is greater than the ADF critical value, H₀ is rejected, indicating that the series is stationary.

Table 1: Summary of Unit Root

Variable	ADF Statistic	Critical Value (5%)	Trend	Intercept	Order of Integration	Probability
NDLA	-7.81269	-2.938987	NO	NO	I(0)	0.0000
INV	-3.46906	-2.948404	NO	NO	I(1)	0.0150

Table 1 presents the results of the unit root test, specifically the Augmented Dickey-Fuller (ADF) test, which was employed to assess the stationarity of the variables. It is crucial to check the stationarity of the variables before applying the Autoregressive Distributed Lag (ARDL) model, as incorrect results can be obtained if any of the series are stationary at integrated of order 2 (I(2)). Ouattara highlighted that the ARDL results may be inaccurate if any of the series exhibit I(2) stationarity. Based on the ADF test results, it is observed that net development assistance and economic growth are stationary at I(0) and I(1).

Bounds test for cointegration

To determine the existence of a cointegrating long-run relationship, the Bounds test is employed. It involves equating the coefficients of the positive sum of squares and negative sum of squares for the logarithm of DLF (Development Finance). If the F-statistics value for DLP (dependent variable) and INV (independent variable), with six degrees of freedom, exceeds the upper bound value at a 5% level of significance, it indicates the rejection of the null hypothesis. This implies the presence of cointegration between monetary aggregates and independent variables.

H₀: No Cointegration $\pi_1^+ = \pi_2^- = \theta_1^+ = \theta_2^- = 0$

H₁: Cointegration $\pi_1^+ \neq \pi_2^- \neq \theta_1^+ \neq \theta_2^- \neq 0$

Table 2: Summary of Cointegration Test

Test-Statistic	Value	Significance	I(0)	I(1)
F-statistic	10.16117	10%	4.04	4.78
k	1	5%	4.94	5.73
		2.5%	5.77	6.68
		1%	6.84	7.84

To determine the presence of cointegration among the variables, the bound test is utilized, following the methodology proposed by Pesaran and Shin (1999). The null hypothesis assumes no level relationship between the variables, indicating no cointegration. The test criteria state that if the F-value is below the lower bound (I(0)), we fail to reject the null hypothesis. However, if the F-value exceeds the upper bound (I(1)), we reject the null hypothesis, indicating

the existence of a long-run relationship. Based on the results, the F-statistics for NDLA (Net Development Assistance) is 10.16, which is significantly higher than the upper bound value of 5.73 at a 95% confidence level. Therefore, we reject the null hypothesis of no long-run relationship and conclude that there is a cointegration relationship between economic growth and net development assistance variables.

Autocorrelation Test

Autocorrelation tests assess the relationship between past and current variables, measuring how the value of a previous variable influences the present or future activity. The presence of autocorrelation indicates that adjustments need to be made to the data to avoid issues when conducting regression analysis. In this study, the Serial Correlation LM tests will be employed to test for autocorrelation. The hypotheses for the test are as follows:

H₀: There is no autocorrelation.

H₁: There is autocorrelation.

The null hypothesis is accepted if the p-value is greater than 0.05 at the chosen level of significance.

Table 3: Autocorrelation Test Results

F-Statistic	Probability	Obs*R-Squared	Chi-Square
0.883166	0.4236	2.1023	0.3495

To identify any serial correlation in the model, the Breusch-Godfrey test was conducted. The obtained results indicate that the model is not affected by autocorrelation issues, as the probability value of 0.4236 exceeds the significance level of 0.05.

Heteroscedasticity Test -Heteroscedasticity, as defined by Gujarati and Porter (2008), refers to a situation where the error variance is not constant, which violates the important assumption of homoscedasticity in the Classical Linear Regression Model (Model 4). The Breusch-Pagan Chi-Square test is a commonly used test in econometrics to detect heteroscedasticity, and it was employed in this research study. The hypothesis test procedure is as follows:

H₀: Homoscedasticity (error variance is constant)

H₁: Heteroscedasticity (error variance is not constant)

The decision rule is as follows: If the calculated chi-square value (χ^2_{cal}) is greater than the critical chi-square value (χ^2_{crit}), the null hypothesis (H₀) is rejected, leading to the conclusion that the model exhibits heteroscedasticity.

Table 4: Heteroscedasticity Tests Results

F-Statistic	Probability	Obs*R-Squared	χ^2
1.37330	0.2595	6.717376	0.2425

The results of the Breusch-Pagan Test for Heteroscedasticity indicate that the model is not affected by heteroscedasticity. This is evident from the probability value, which exceeds the significance level of 0.05. Therefore, we accept the null hypothesis, suggesting that there is no evidence of heteroscedasticity in the model. Following the approach suggested by Gujarati (2004), it is recommended to

proceed with a "do nothing" approach, implying that no further adjustments or corrections are necessary in relation to heteroscedasticity.

Model Specification Test - The model specification test is conducted to assess whether the variables included in the model, as well as the overall model, are correctly specified (Gujarati, 2008). The decision criteria for this test involve examining the probability value of the Ramsey Reset test. If the probability value is less than 0.05, the null hypothesis is rejected, indicating that the model is mis specified and may be either over or under specified. On the other hand, if the probability value is greater than 0.05, it suggests that the model is correctly specified, and thus, the specific hypothesis is accepted.

Table 5: Ramsey Reset Test

Probability	DW Statistic	R-Squared	Adjusted R-Squared	F-Statistic
0.2429	1.8127	0.9335	0.9180	60.20697

The probability value obtained from the Ramsey RESET test is 0.2429, exceeding the significance level of 0.05. Consequently, we do not reject the null hypothesis, implying that the model is correctly specified. Additionally, the Durbin-Watson (DW) statistic of 1.8127 is greater than both the R2 and Adjusted R2, further confirming the correct specification of the model. This indicates that there is no presence of spurious regression.

Lag Length Determination

Before conducting the estimation, it is necessary to determine the appropriate lag structure. In this regard, a Vector Autoregression (VAR) equation is estimated, focusing specifically on INV as the endogenous variable. To ensure simplicity and efficiency, the Schwarz-Bayesian information criterion (SBC) has been employed. The SBC criterion allows for selecting the minimum lag length, avoiding any unnecessary loss of degrees of freedom. This approach considers the effect of the exchange rate on money demand in Pakistan.

Table 6: Lag Length Test Results

Lag	LogL	LR	FPE	AIC	SC	HQ
0	-56.3882	NA	1.3718	3.1561	3.2432	3.1868
1	-52.6573	6.8573*	1.18645*	3.00848*	3.1391*	3.0544*

Lag lengths play a crucial role in the analysis of cointegration. Table 5 presents the results of the optimal lag selection criteria. Various criteria, such as the sequential modified likelihood ratio (LR), final prediction error (FPF), Akaike information criterion (AIC), Schwarz information criterion (SC), and Hannan-Quinn information criterion (HQ), are considered for determining the optimal lag order length. The findings consistently indicate a lag order length of 1 for estimating cointegration. This confirms the appropriateness of selecting a lag order of 1, which has significant implications for policy-making and decision-making purposes.

Normality Test

The statistical test's validity relies on the assumption that the error terms follow a normal distribution. To assess the normality of the error terms, the Jarque-Bera test was

conducted. According to Gujarati (2004), if the error terms are normally distributed, the normal probability plot should display a straight line. Conversely, if the error terms deviate significantly from the normal distribution, the plots may show a noticeable deviation from the origin and the x-axis.

The hypothesis procedure for the test is as follows:

H0: The residuals are normally distributed.

H1: The residuals are not normally distributed.

Table 7: Normality Test Results

Mean	Skewness	Kurtosis	Jarque-Bera Stat	Probability
-2.80e-15	-0.015037	2.612266	0.245768	0.88436

The Jarque-Bera test was employed to assess whether the residuals follow a normal distribution. The obtained probability value for the Jarque-Bera statistic is 0.88436, which exceeds the significance level of 0.05. Therefore, the null hypothesis is not rejected, indicating that the residuals are normally distributed. The skewness value of -0.015037 indicates a slight negative skewness, measuring the asymmetric dispersion around the mean in the time series. Additionally, the kurtosis value of 2.61226 is compared to the expected value of 3. The result suggests that the dispersion has a near-perfect peakedness. However, it is worth noting that De Carlo (1997) mentioned that even with a normal distribution, the presence of outliers can influence excess kurtosis. Nevertheless, this is not a significant factor to reject the null hypothesis of normality.

CUSUM and CUSUM-Squared Test

To evaluate the stability and appropriateness of the NARDL model, the CUSUM and CUSUM square tests are utilized. These tests examine whether the values of INV, in Zimbabwe under the NARDL approach, remain within critical boundaries. If the plots on the graph remain within the critical values, it indicates that INV is stable and suitable for making long-run decisions.

Following the approach suggested by Brown et al. (1975), the stability of the parameters is assessed using the CUSUM and CUSUM of squares tests on the residuals for INV. The straight line found represented the 5 percent critical bounds for the CUSUM and CUSUM square tests used to investigate parameter stability. In both graphs, the plots fall within the critical bounds, indicating that the parameters in the model are stable. Therefore, there are no structural breaks in our model, ensuring its stability.

4. NARDL Results Presentation and Analysis

4.1 Short Run and Long Run Asymmetric Effects Test (Critical Bounds Test)

The bound test is employed to determine the presence of cointegration among variables. In this test, the standard F test for joint significance is applied, using critical values as suggested by Pesaran and Shin (1999). The null hypothesis states that there is no levels relationship between the variables, indicating no cointegration.

To evaluate this, the criteria for testing is as follows: if the F value falls below the lower bound (I(0) bound), we fail

to reject the null hypothesis, suggesting no long-run relationship. However, if the F value exceeds the upper bound (I(1) bound), we reject the null hypothesis of no long-run relationship, indicating the presence of cointegration.

Short Run and Long Run Asymmetric Effects Test

The Bound test for asymmetry is utilized to examine the asymmetric effects in both the short run and long run.

Table 8: Asymmetric Test Results

Test Statistic	Value	DF	Probability
F-Statistic	7.2888	(1, 32)	0.0110

The F-statistic is used to assess the joint asymmetry of both the short run and long run effects. This value is then compared to the lower bound (I(0)) and upper bound (I(1)) tables provided by Pesaran (2001). In this case, the obtained F-statistic of 7.28886 is greater than both the lower bound for I(0) and the upper bound for I(1). This indicates the presence of both long run and short run asymmetry effects.

Dynamic Multiplier Test

The NARDL multiplier plots illustrate how the Multiplier Dynamic Function (DMF) adjusts to its long-run equilibrium position following a 1% positive or negative shock in Developmental Finance. The graphical representation uses solid black lines to indicate negative shocks and dotted black lines to represent positive shocks. The bold red dotted line represents the asymmetry between the exogenous and endogenous variables, while the faint dotted lines represent the upper and lower bounds, which represent the confidence interval for asymmetry.

The hypothesis for this analysis is as follows:

H0: There is symmetry between the variables.

H1: There is asymmetry between the variables.

The decision rule is based on the proximity of the dotted lines to zero. If the dotted lines are close to zero or equal to zero, the null hypothesis is not rejected, indicating a symmetric relationship between the variables.

Regarding the dynamic impacts of changes in output on developmental finance, the analysis of the dynamic multipliers presented in Figure 4 reveals that it is primarily negative changes that prompt a response in developmental finance. Specifically, developmental finance responds more quickly and significantly stronger to negative changes in economic activity, as measured by investment (INV). In other words, the results suggest that developmental finance is more sensitive and reacts faster during periods of economic downturns than during periods of economic booms.

4.2 Results Presentation

Thus, by utilizing the NARDL methodology, the following outcomes are obtained:

Table 9: Short Run Form

Variable	Coefficient	Std. Error	t-Statistic	Prob
<i>C</i>	1.8862	0.8680	2.1729	0.0375
<i>GDP</i> ₋₁	-0.1563	0.0621	-2.5145	0.0173
<i>NDLA</i> ⁺ ₋₁	4.2992	0.8678	4.9539	0.0000
<i>NDLA</i> ⁻ ₋₁	5.3828	1.2125	4.4396	0.0001
Δ <i>NDLA</i> ⁺	-2.8522	1.7330	-1.6458	0.1099
Δ <i>NDLA</i> ⁺ ₋₁	-8.4085	2.5808	-3.2582	0.0027
Δ <i>NDLA</i> ⁻	-1.8238	4.0522	-0.4501	0.6558

Table 10: Long Run Form

Variable	Coefficient	Std. Error	t-Statistic	Prob
<i>NDLA</i> ⁺	27.5073	12.4765	2.2047	0.0350
<i>NDLA</i> ⁻	34.4398	17.0660	2.0180	0.0530

R2 = 0.930407

F Statistic = 69.07459

Adjusted R2 = 0.916937 Probability (F-Statistic) = 0.00000

DW Statistic = 1.804345

4.3 Interpretation of Results

All variables in the four models exhibit significance, as evidenced by the low p-values. The high R2 value of 0.930407 indicates that approximately 93.04% of the asymmetries in investment in Zimbabwe's economy can be explained by the exogenous variable Net Developmental Finance in the model, while the remaining 6.96% is attributed to factors encompassed by the error term. Furthermore, the Adjusted R2 value of 0.9169, which takes into account the degrees of freedom, suggests that 91.69% of the asymmetries can be attributed to and explained by the exogenous factor Net Developmental Finance, while the remaining 8.31% is accounted for by other factors captured by the error term. The absence of a spurious regression is inferred from the Durbin-Watson (DW) statistic being greater than both the R2 and Adjusted R2 values. Additionally, the higher DW statistic indicates the absence of serial correlation among the variables. Consequently, the obtained regression results hold promise for guiding policy formulation.

Short Run Analysis

The short-run coefficients of the model are presented in Table 9. The coefficient of the error correction model (ECM) is statistically significant and negatively valued at -0.1562, indicating a tendency to converge towards the equilibrium path. The magnitude of the ECM coefficient signifies the speed of adjustment in the short term. Moreover, the results reveal an asymmetric relationship between developmental finance and economic growth in both the current period and the lagged (previous) period.

INV₋₁: The significance of the lagged INV is evident from its probability value of 0.0173, indicating a statistically significant relationship. Notably, a negative association is observed between the previous level of economic growth and the current economic growth, as indicated by the coefficient of -0.1563. This implies that a portion of the current year's growth can be explained by a decrease of 0.15% in the previous year's economic growth. However, considering the relatively small magnitude of the coefficient,

it can be concluded that the effect of the previous year's economic growth is not significant in explaining the growth observed in the current year.

$NDLA^+_{-1}$ - In the short run, a positive shock of 1% in developmental finance leads to a significant increase of 4.2% in economic growth, as determined at a 5% level of significance. This outcome aligns with expectations, as an initial increase in development aid does not immediately result in substantial economic growth. However, growth is anticipated to materialize over time, following the expectations hypothesis. This finding is consistent with numerous studies conducted in developing countries (e.g., kijhg), which have also reported similar results regarding the impact of aid on economic growth.

$NDLA^-_{-1}$ - In contrast, a negative shock in Net Developmental Finance (NDLA) during the short run leads to a significant decrease of 5.4% in economic growth, as observed at a 5% level of significance. This finding is significant as it highlights that changes in developmental finance in Zimbabwe do not have symmetric effects in the short run. The consequences of negative shocks are found to be more severe than positive shocks in the economy, indicating an asymmetric relationship. This conclusion underscores the importance of considering the directionality and magnitude of shocks in understanding their impact on economic growth.

$\Delta NDLA^+_{-1}$ - In the short run, a positive shock in Net Developmental Finance (NDLA) is statistically significant at a 5% level of significance, as indicated by the low probability value of 0.0027. The presence of a negative coefficient of -8.41 implies that a percentage change in developmental finance leads to an 8.4% decrease in economic growth. This result highlights the considerable impact of changes in NDLA on short-term economic growth, with negative shocks exerting a particularly significant influence.

Long Run Analysis

The long-run coefficients obtained from the dynamic model are displayed in Table 10. A significant finding of this study is the asymmetric impact of developmental finance on economic growth. Positive changes in developmental finance are observed to have a positive and statistically significant effect on economic growth, significant at a 5% level of significance. On the other hand, negative changes in developmental finance are found to be insignificant in their impact on economic growth. This result aligns with various studies, such as Cunado and de Gracia (2005) and Ibrahim (2015), which have similarly highlighted incomplete pass-through effects of oil prices on domestic inflation.

$NDLA^{+-}$ - The findings of our study indicate that in the long run, a 1% positive shock in developmental finance results in a substantial increase of approximately 27.5% in economic growth, which is statistically significant at a 5% level. This finding is consistent with theoretical expectations, suggesting that an increase in developmental aid contributes to economic growth, assuming other factors remain constant. Furthermore, the extent of the asymmetric relationship is confirmed by the disparity between the coefficients of positive effects (27.51) and negative effects

(34.44) of net developmental finance. This difference underscores the asymmetric nature of the relationship, with positive effects exhibiting larger contributions to growth. Importantly, these positive effects are statistically significant at a 5% level, providing new evidence in the literature regarding the asymmetric impact of developmental finance on economic growth.

5. Summary, Conclusions and Policy Recommendations

5.1 Summary of the Study

Our objective was to examine the asymmetric effects of Developmental Finance on investment in Zimbabwe. We employed the nonlinear autoregressive distributive lag model (NARDL) methodology to analyse the data spanning from 1979 to 2019. The empirical findings of the study revealed the presence of an asymmetric relationship between developmental finance and investment in Zimbabwe. In the short run, both positive and negative shocks were observed to influence economic growth, with negative shocks appearing to have a larger impact. However, in the long run, positive shocks in developmental finance exhibited larger and statistically significant effects on economic growth at a 5% level, while the negative effects were found to be insignificant. Additionally, the speed of adjustment, as measured by the error correction model (ECM), was determined to be negative and significant. This indicates that approximately 0.2% of the errors are corrected each year following a positive or negative shock, suggesting a gradual adjustment process in the short run.

5.2 Conclusions

The primary objective of this analysis was to investigate the asymmetries between Developmental Finance and Economic Growth and assess the extent to which positive and negative asymmetries influence economic growth in both the long and short run. Our findings reveal the presence of asymmetries in both time horizons. Although the effects of developmental finance on investment in Zimbabwe are relatively modest in the short run, we observe an overall positive impact. However, in the long run, the effects become more substantial. Consequently, we reject the notion that there is no asymmetric relationship between developmental finance and economic growth, instead confirming the existence of an asymmetric relationship in Zimbabwe.

5.3 Policy Recommendations

Following the discoveries the researchers proposed the following

The government of Zimbabwe should focus on utilizing its domestic resources effectively while continuing to utilize foreign aid, as it has been found to be significant, particularly in the long run. To ensure the efficient use of aid and prevent corruption, the government should establish boards or enact legislation that prohibits misuse of funds, as discussed in chapter one. Based on Zimbabwe's experience, it is recommended that the government strictly adhere to legal frameworks governing aid and seek assistance from financial institutions to enhance its

effectiveness. Although there are arguments against aid's impact on African economies, the findings suggest that aid can support productive activities by promoting exports, fostering innovation, sustaining public funding, and mitigating economic depreciation. Therefore, the government should prioritize using aid to rebuild the foundations of the economy, while avoiding tied aid that hinders progress in needy areas. It is crucial for Zimbabwe to uphold financial standards and ensure accountability in project planning and implementation by conducting follow-ups and enforcing proper accounting procedures.

5.4 Recommendations for further studies

Future studies or researchers are recommended to examine the asymmetric effects of disaggregated aid in order to gain a comprehensive understanding of how different types of aid impact economic growth. Employing the NARDL methodology could offer valuable insights that can guide policymakers and governments in determining the contributions of each aid category towards growth. This information can aid in making informed decisions regarding the allocation of aid resources, identifying which aid categories are most effective and should be prioritized.

Conflict of Interest

The authors had no financial or personal relationship(s) that may have inappropriately influenced them in writing this article. The authors declare no conflict of interest.

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