

Financial Development and Economic Growth in Kenya: Evidence from the Asymmetric Autoregressive Distributive Lag



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ABSTRACT: Appropriate changes in financial development are largely known to cause growth. Inflation, gross capital formation and government expenditure, believably, succinctly controls the effects and causes long term growth. This paper analyzed this effects for Kenya paying exceptional attention on their asymmetric effects. The most reliable and important results supported that positive asymmetries of financial development increases long run growth unlike the negative with reducing and weak effects. However, in case of financial dynamics and instabilities, economic growth responds negatively with a steep slump to shocks by declining financial development as positive gross capital formation shocks seems to plausibly control such nonlinear dynamics and positively causing growth. Also, sustainable inflation and prudent state expenditure spurs long term growth. Since this growth-finance relationship supports the supply-leading hypothesis, there is need for specific financial development policies which would alongside support sustainable inflation and prudent expenditure if they are to spur real growth. Moreover, the financial risk managers are required to robustly prepare against the negative shocks by finance that have greater degenerating effects than by upturn from the positive shock.

KEYWORDS: financial development, asymmetric effects, long term growth, negative shocks.

1. INTRODUCTION

According to Schumpeter (1911), finance and financial systems enhances long term economic growth conditioned on its level of development. In addition to the pro-growth behavior, financial development is also pro-poverty as its development facilitates the impoverished to grow at parity with the heightening growth. Since his seminal paper, many studies including Gurley and Shaw (1967), Patrick (1966), Jung (1986), Levine and Renelt (1992) and Levine (1999) have advocated for financial developments in order to enhance the intertemporal allotment of resource, smoothen capital accumulation and the distribution, technological inventions and financial diversifications which ultimately induces growth. Effectual financial systems leads the emergence of financial innovation via financial technologies, markets and institutions and, financial diversification (Qamruzzaman & Jianguo, 2018b). If the financial system is well-advanced and sufficiently operating, plausible economic growth would materialize but would be deprived in case of poorly developed. Hermes and Lensink (2003) confides that it would be insensible to delink financial system developments from economic growth and not forgetting they constitutes to economic liberalization. Their development therefore ensures improved risk control, resource accumulation, quality information production and capital resource redistribution while checking over firms and corporate governance and finally circulation of goods and services (Abu-Bader & Abu-Qarn, 2008; Adusei, 2013; Uddin, Sjö, & Shahbaz, 2013).

Effectual financial systems support sound working of the intermediaries via financial risk managements, prudent resource mobilization, technological innovations and spillovers and, identification of appropriate policies that are a potential success points for long term growth. A properly functioning banking sector is therefore vital for economic growth via its externality in upholding financial stability and reducing financial risks as the consumer is serviced with improved quality services. They facilitate resource distributions, investment divergences to avert risks, equitable distribution of liquidity between corporates and private entities, and not forgetting that they translates resources into real investments and savings (Batuo, Mlambo, & Asongu, 2018). Studies have documented that progressive economic growth requires a steadily growing financial institutions, quality and sufficient goods

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and services if to meet high aggregate demand of the market. Qamruzzaman and Jianguo (2018a) adds that financial systems liberalizations fundamentally boost growth, investments and trading activities. Its positive externalities also sustain the inflationary pressure and lowers unemployment.

In developed countries, financial development greatly gives to their growth and thus the need for uninterrupted development of financial systems (Harrison, Sussman, & Zeira, 1999; King & Levine, 1993). Consequently, financial development via innovational externalities provides the sector with new avenues over which growth is contributed. The inventions via financial research emerges fresh financial products, processes and organizations as real time quality market information diffusion emerge to improve the quality of such financial instruments. Financial development is also critical in allowing feasible reaction of the systems to financial market glitches, opportunities and nonlinear information which if a response is delayed, skewed financial operations are inevitable (Merton, 1992; Yusuf, 2009) as the risks are widened in case of inept financial liberalizations policies. Therefore, buffering such risks would need an outstanding financial systems that is plausibly competitive in case of external shocks in the stock markets or financial institutions (Batuo et al., 2018; Hermes & Lensink, 2003).

The underlying extant finance-growth literature supports that the development of financial systems increases growth as among them (Ehigiamusoe, Guptan, & Narayanan, 2019; Sobiech, 2019). This is so because financial development heightens mobilization and accumulation of capital, financial intermediation and, monitoring firms and corporate governance and the overall efficacy of financial systems which increases growth. In case they are well developed and innovated, they heighten the propensity of the savings by households and population at large and thereby expanding the effective utility of financial systems. This therefore quantifies the fact that financial development is the major catalytic agent for any economy to grow (Adusei, 2013; Hermes & Lensink, 2003; Qamruzzaman & Jianguo, 2018b). Further, financial developments provide unceasing processes which induces financial innovations via improving and diversifying of financial products, process and institutions so that the improved scale and quality of financial activities actuates growth. Financial developments also via the emergence of new financial assets and services results to improvement of the banking sector and financial markets which are attached with improved financial processes and products that positively cause growth. According to Schumpeter (1911) and Levine (1997), strong financial systems is a product of appropriately diversified financial assets and comprehensive service coverage, feasible tools for resource mobilization and distribution, sound risk management platforms and prudent corporate governing strategies and management. Therefore, financial development which is congruent with the growth of an economy increases credits growth and other financial assets via emerging and hybrid institutions (i.e., in the micro- and non- financial institutions and stock markets) alongside the formal banking framework (Lawrence, MONI, & EIKHOMUN, 2014). Therefore, their integration ably contributes to the accumulation and circulation of resources while supporting long term growth

In Kenya, where the financial system is believably the most developed in East Africa¹ and among the leading in sub-Saharan Africa, and with an averagely or declining competitive leverage on the global markets is perhaps pointing to the presence of some discrepant development and overtime dynamics. The banking sector is the most domineering in the sector with the sole mandate for governing the money supply, bank reserve rates and liquidities vested in the Central bank of Kenya that institutes and effect policies of the monetary side and therefore, an insight of some of the banking proxies are demonstrated in Figure 1. From the figure, the chronological growth rate by broad money, domestic credit to private sector and total domestic credit are generally sluggishly upward trending as the growth by real interest rates and bank liquid reserves are constantly growing but dynamically around their long run averages. This growth is in most of the parts corresponding to the temporal certainties or dynamics in economic growth and, financial and global crisis due to liberalization since the previous decades. Specifically, broad money and total domestic credit are negatively relating to the long run as the domestic credit by the financial sector is under shadowed by the total credit available for private sector development to the long run. Also, the bank liquid reserves is negligibly increasing for the long run while the seemingly mean reverting real interest rate is volatile and growing at a constant rate around its mean. The

¹ The country's financial system is integrated with feasible systems among them: Banking, Capital Markets, Pension Funds, Insurance, Micro financial institutions, Quasi-Banking developed by the SACCOs, Building Societies, Development Finance Institutions and the informal financial services such as the Rotary Savings and Credit Associations (Nyasha & Odhiambo, 2017; Uddin et al., 2013).

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dynamics by real interest are not farfetched from the unending inflation uncertainties and the continuous banking crisis (e.g., during 1984\89, 92\97, and post-2000) that have crippled financial markets and services. The post 2016 period characterize all the series to be dipping and coinciding the period the interest rate cap legal provision was latterly implemented and is in response to the declining financial development as the lending sector gets strongly hit by the cap effects². According to Government reports 2019 and Economist arguments, the recently effected and down revised interest cap ceilings to only 4% above the central banks rate might unfortunately detriment the domestic private sector developments via other incorporated unconstitutional costs by lenders passed to borrowers to offset the lending risks and instead, it is likely to render the loans costly while it might crowd out the SMEs at the expense of government preference. In addition, the recently widened external credit ceilings by 2.5bn on top of the previous 6bn is likely to gap more the trade deficit to the long run given the continuous underlying macroeconomic disparities.

Several attempts have been made to spur financial development. Among them, the growth of credits to private sector has largely been advocated via supporting feasible money supply and liquidity. Since the SAPs programs of 1993 by the World bank and IMF, there were considerable financial developments. The money supply on average increased by 16.7% (1993-1999) and peaked 42.5% from a low of 36 % in the previous decade. It then declined to below 38% in the 2001\2 fiscal year but peaked again between 2003\2009 due to the stabilizing fiscal and monetary conditions brought by the SAPs programs. It proceedingly dipped around 2010 in response to the discrepancies by the 2008 global financial crisis and the weakened macroeconomic environment due to the protracted electioneering periods that climaxed with the 2007\8 post-election violence. The banks liquid reserve also increased although slightly from approximately 8.9% (1993-1999) on average to below 9.6% in the previous decade and since 2000 it grew on average by 3.9% but with a declining trend. The domestic credit by financial sector with a long run mean of 38.7% but slightly higher than that of money supply with 38.3% are the most volatile activity and negatively correlated implying to the need for active money supply for a vibrant domestic investment. Also, the broad money and credits to private sectors are generally higher and in support of the pretty improved quality of financial sector on pro-growth role of steering funds to private and domestic sector development. The highly rating broad money is suggestively demonstrating that the intermediaries with relatively increased size and leverage are actively intermediating credits to private sector. On the contrast, the real interest has some volatile spikes and is also reflecting to the relatively less stable banks liquid reserve that however is positively supporting large domestic credit to private sector outlays. To the market based developments, the reforms by SAPs which improved the quality and performance of the stock market, also heightened the stock market capitalization from around 11% in the 80s, to trending above 50% in 2006, dropping to below 45% in 2010 (Nyasha & Odhiambo, 2017) and to 25.6% in 2012 and since then, the market value is apparently growing at a declining trend.

In attempts to spur financial development, Kenya, despite liberalizing the interest rates around 1988\92, the desired economic growth was not realized due to the unstable fiscal and monetary conditions. For instance, the 1997 capital market liberalization aimed at loosening ceilings at the money and capital markets, derivatives, direct investment, real estate businesses and provisions of specifications for intermediary investors and commercial banks (Uddin et al., 2013). Still from Figure 1, the greatest dynamics can be seen as from the 90s- that is, all the indicators of financial development started declining since 1990 (except for broad money) and have volatile dips corresponding the years 1997,2007\8, 2013 and 2017 that corroborates to the harmful electioneering periods which have loosened the business environment and destroyed investor confidence. Further, the unfortunate decline which coincided the weakening GDP that recorded an all-time low growth of 2.1% for close to one and half decades coincided with the onset of economic liberalization (Uddin et al., 2013; Wolde-Rufael, 2009). Economic growth since this decade grew poorly than previous.

Further, the unceasing efforts towards development of the financial sector has also been hampered by the budget deficits, weakened business confidence due to political and macroeconomic instabilities, unending global crisis and uncertainties by drought (Hongo et al., 2020). An insight of the aggregated financial development indicator in Figure 2 does not in any way digress with the discrepancies noted in the financial systems. The current year's growth is dynamically growing from the previous, well-pronounced dynamics since 1990 and sluggishly developing growth with synclines as the last anticline proceeds into a continually dipping financial growth. These discrepancies do not deter from the conclusion that the underlying temporal financial

² For further information about the negativities of the interest cap refer to the central bank report titled “*The Impact of Interest Rate Capping on the Kenyan Economy- March 2018*” at www.centralbank.go.ke

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development is nonlinearly growing so that need is raised for specific analysis of the exact growth path and required policies to bring back the growth to normal and spur efficacy in allocation of resources and the expected long term growth.

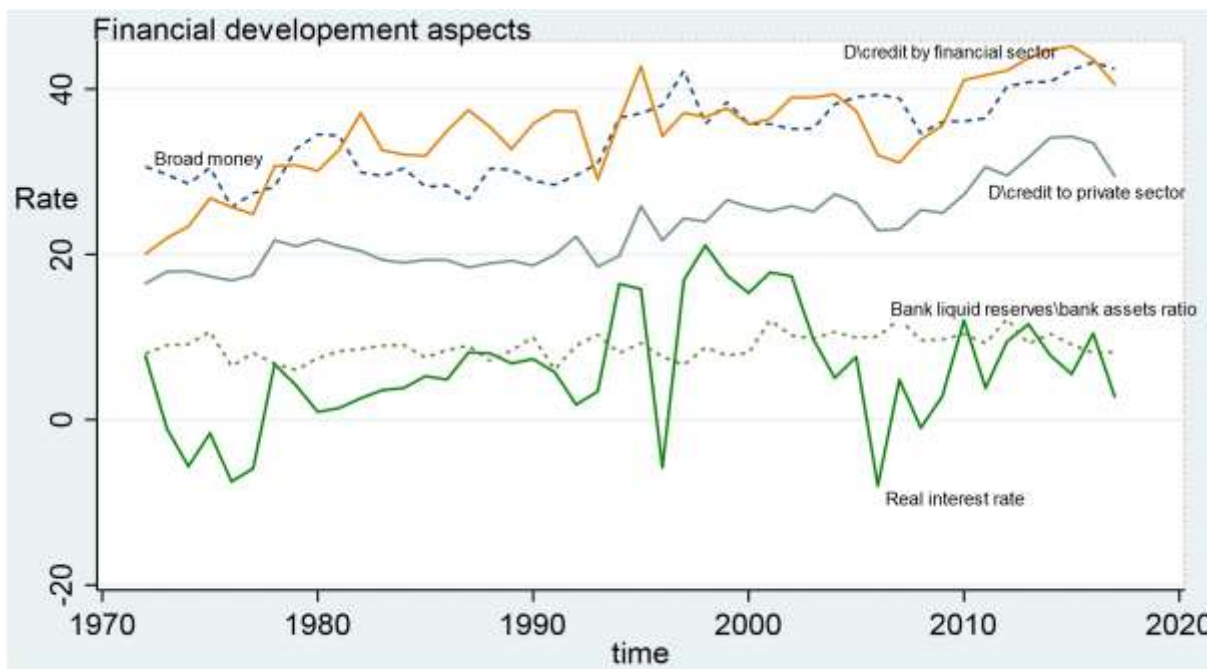


Figure 1. Financial development time plots. Note: D\Credit by financial sector is the domestic credit provided by financial sector and D\Credit to private sector the domestic credit to private sector. All the variables have been weighted as a % of GDP and sourced from both WDI and the KNBS website. See source link in 3.1.

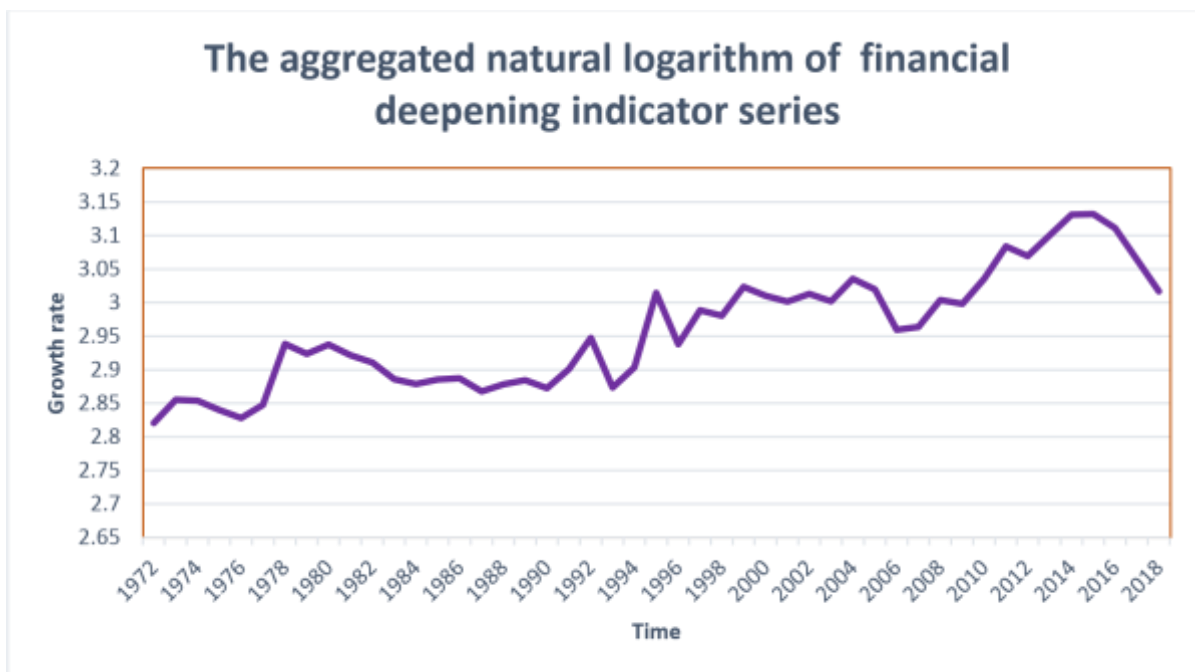


Figure 2. Financial development indicator time plot

Studies have analyzed the nonlinear impacts of finance on growth. Adeniyi, Oyinlola, Omisakin, and Egwaikhide (2015) despite concentrating on the regimes in finance, their investigation overlooked the contribution by their asymmetries. Bara and Mudzingiri (2016) on an endogenous model framework reported indecisive effects that are dependent on the type and form of financial development and which does not deter from concluding that there are underlying financial nonlinearities uncaptured. Similar inference is made from Batuo et al. (2018) investigation which despite concentrating on a rich cross-sectional data, their

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interesting reports that financial instability is heightened by increasing financial development and liberalization while growth differently reduce instabilities, but with greater(lesser) weight in pre-(post-) liberalization periods implying to nonlinearity responses which their study missed to capture. Further, Although Ehigiamusoe et al. (2019) successfully underscored the growth-finance nonlinearities on a panel framework, they nosedived the specific contributions by asymmetric behaviors of finance while the found nonlinearities are inapplicable for country specific policy formulation. At large the results have ineptly been rich and shorthanded in reliable forecasting in case where the temporal nonlinearity has been insignificantly identified.

Still, extant literature to the best of our search for Kenya have negatively underlined the nonlinearities of the finance-growth nexus while those on finance asymmetries are largely missing and despite underscoring the linear relationship, they still reported mixed findings which still disenfranchise specific policy conclusions. For instance, Wolde-Rufael (2009) and Odhiambo (2009b) on Granger causality and the ect techniques besides disregarding nonlinearities they reported mixed findings. Uddin et al. (2013) underscored on the long run cointegration of the finance-growth but missed the important nonlinear responses and not capturing the influence of fiscal policies in financial stability. Nyasha and Odhiambo (2017) despite delving the most neglected direction for longer where the effects of both bank and market based financial advancement are exploited, they still discounted their nonlinearities to growth and missed the controlling effects of the fiscal side. In addition, some of the analysis have mostly based on a single indicator of financial development causing erroneous relationship (results), others have been panel based resulting to generalized results inapplicable for country specific problems (Nawaz, Lahiani, & Roubaud, 2019; Sobiech, 2019), others inappropriately captured nonlinearities' and reported mixed findings. Specifically, there is missing studies incorporating the influence of gross capital formation on finance while to the best of our search and investigation, there still largely missing works on the nonlinear impact of financial development on growth in the country. This is therefore the first study which delves the asymmetric impact of financial development on economic growth in the country given the largely missing policy guidelines of the specific behavior by finance to the uncertainly growing long term growth.

In this faith, the current study fills these gaps by analyzing the impact and relationship of financial development on economic growth based on a nonlinear framework. The framework banked on for this exercise is the asymmetric ARDL chosen over thrice fold criterions. First, above the classical ARDL, its nonlinear specification ably measures the vertical movements in the variable via the decomposition effects of both positive and negative partial shocks unlike other nonlinear techniques- for instance the Markove regression which best capture nonlinearities at switching regimes unlike in vertical dynamics. Second, unlike the probability plots by the regression which does not capture both shocks in the long run, the dynamic multiplier succinctly facilitates the observation of the error correcting term graphically and enshrining the temporal changes of both positive and negative shocks in the regressor adjust towards the long run equilibrium and in response to the most volatile shock. For robustness the model is augmented with some regulatory variables. Gross capital formation is to capture the value added growth effect due to plausible changes in manufacturing, real estate, service industry and transport sectors among others while inflation implores the efficacy of fiscal policies in complementing the growth-finance link. Government expenditure is also incarcerated to determine the prudence of public resource spending by the state in provision of public goods and services while controlling the effects of financial integration.

The investigation is innovatively different in three major ways by design while significantly contributing to the extant literature. First, a multi-faceted financial depth indicator which sufficiently quantifies the level of financial systems in financial development is conceptualized and by the ARDL, both the baseline model and an endogenous format of the model are estimated. Secondly, the found relationship is then confirmed by tracing the causality path by Granger causality analysis and the long level relationship under the error correcting term framework. Thirdly, using the NARDL, two models differentiated by type of the deterministic regressor (i.e., gross capital formation or government expenditure) are estimated to affirm the estimates. In the fourth place, the dynamic multiplier is implored to investigate the spatial temporal response of growth to shocks in finance while confirming the consistency of long run level relationship. The fact that the aftermath results are holistically robust and reliable adds and innovatively strengthens the extant finance-growth literature regarding nonlinearities. Similarly, innovation is heightened when the design by current study honors the necessity to complement the what would be the unreliable and confounding growth-finance linkage in case it was implored exclusively on a bivariate structure. This also chanced the ability to test the hypothesis underlining the fact that capital formation and state expenditure facilitates long term growth.

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The most significant and reliable results corroborate with the supply-leading hypothesis and specifically, the positive shocks of financial development increases long term growth unlike the negative shocks with reducing and weak effects. However, in case of financial dynamics and instabilities, economic growth responds negatively with a steep slump to the shocks by declining financial development. Similarly, the positive gross capital formation shocks and negative government expenditure shocks feasibly complements the stability and positive economic growth. Also, sustainable inflation and prudent state expenditure spurs long term growth and therefore, expenditure, inflation and capital formation are important in complementing the efficacy of the supply-leading hypothesis in Kenya.

The rest of the paper is designed as follows: Proceeding section reviews the literature in brief, section 3 presents the methodology, 4 results that are discussed in section 5. The 6th section concludes and forwards some useful policy guidelines for long term growth.

2. LITERATURE REVIEW

An insight of financial reforms has noted it as a remarkable contributor of financial developments in increasing credits availability and capital accumulations thereby facilitating savings and investments for real growth. According to Levine (1997), financial developments influence economic growth via; capital accumulation and allocation, improved exchange of goods and services, human resource and cooperate governance management, interest rates decontrol, financial risk control, and savings mobilization. The ways also increase the scale and propensity of economic growth.

Pioneer studies dates to Schumpeter (1911) that development of financial instruments improves growth, and to Patrick (1966) in hypothesizing the relationship into three hypotheses; supplyleading, demand-leading and development hypothesis. The former suggests to financial deepening as the root cause of real growth. That is, appropriately designed market systems and financial structures, foster effectual mobilization of the limited resource from savers and transfer to investors for real growth (Levine, Loayza, & Beck, 2000). Then again, the demand-leading theory suggests causality direction to run from growth to financial development. This can be alluded to the passive response of financial deepening to growth. That is, expanding economic growth boosts development of supporting infrastructure which builds the need for new or improved financial services. In the third theory; i.e., the “development stage theory” as also suggested by Patrick (1966) implies to the condition during which supply following theory initially cause growth through new investment and financial opportunities. In the interactive situation, the supply-leading theory gradually diminish as economic growth enhances. Finally, the grown economy channels resources to expand financial institutions, turning the relationship demand-leading with a general economic growth. Since this idea, it remains unsolved as the studies continue to unravel whether financial sector shadows or leads real growth. Many studies have noted either one-way causality (finance-led or demand-led growth), feedback or no causality at all.

Starting with one-way causality; is the finance-led growth in which, developed financial institution spurs real sector growth. The demand-led growth materialize when real growth creates demands for financial services which are quenched through development of new financial institutions Patrick (1966). What follows is an intuition of the studies that have delved the supply- or demand- led growth.

In a study of North African and East Asian finance-growth nexus, Abu-Bader and Abu-Qarn (2008) reveals that financial development significantly cause growth for Morocco, Tunisia, Algeria, and Egypt. However, only Israel significantly perpetuated the growth-led paradigm with weak coefficient. The loose coefficient suggest that the different countries must be bearing different financial structures and are nonlinearly behaving that the study tumbled to capture Odhiambo (2009b) analyzed how the finance-interest rate relationship affected real growth in Kenya based on both error-correcting techniques and endogenous model and reported relatively variegated findings. Using the financial depth model, interest rate liberalization increases financial depth with the magnitude dependent on their efficacy level while by the real growth models, results were not different in any way- that is, financial deepening heightens growth and resulting to the conclusion that there is need for achieving efficacy in financial development via robust and efficient interest reforms. Conversely, Odhiambo (2009a) in Kenya unravels confounding causalities with a dynamic Granger causality technique. Although the supply growth hypothesis is missing, the demand-led is supported. By both results of Odhiambo, the variation in effect and the missing supply-led hypothesis by the latter is linked to the unbecoming model choice so that their technique is apparently inept in properly investigating the underlying chronological

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relation. The results suggesting to the demand-led growth, supports that financial institutions in Kenya are in high demand of institutional development while the variegated results points to the awkward behavior instituted by long run financial instabilities and shocks the study unheeded.

In Nigeria, Adeniyi et al. (2015) on a growth-finance relationship reported some confounding threshold influences of finance-growth nexus in both post- and pre- reform periods. That is, although financial developments have palatable effects on growth, the weights of the coefficients in pre- and post- reform periods are weak and consequentially indifferent as the findings fails to properly address the relevance of SAPs in financial development. From our viewpoint, it is inevitable to delink the mixed results with the inability of properly capturing the nonlinearities using the incorporated polynomial. Nyasha and Odhiambo (2017) using an ARDL framework reported that market-based financial systems to increase real growth unlike bank based systems. Batuo et al. (2018) explored the relationship amidst growth, financial liberalization, their instability and financial developments to address the repercussions of the post-2008 financial crisis for 41 African states and reported significant but interesting findings. Financial instability is positively impacted by both financial development and liberalization while instabilities are greatly reduced by economic growth in pre- than post- liberalization periods and despite their varied and rich dataset, the results still pointed interesting causalities which imply that financial development which has innovated and emerged the financial systems has heightened the level of macroeconomic uncertainties so that financial systems differently responds to specific shocks differently, which is suggestive of the asymmetries that their study disregarded. Bara and Mudzingiri (2016) on a relationship analysis using two proxies of financial development to growth and the ARDL method still reported mixed results. In the short run, growth is positively caused by finance and also by $M2/M1$ in the long run while the banks domestic credit growth is insignificant. Further, we relate the reported mixed impacts to the type of financial proxy adopted as supposedly pointing to missing incorporation of a multi-faceted index that holistically conceptualize the effects of financial systems in development.

In researching how real growth is impacted by remittance inflows on a set of emerged and developing markets, Sobiech (2019), points out that the finance depth indicator positively and consequentially influences real growth for emerging than emerged states. However, the weight is greater in the long- than short- run for developing countries. Musila and Yiheyis (2015) on a Kenyan data found that aggregated trade openness (in)significantly increased (growth) investments, but on using policy induced trade openness, economic growth and investments are negatively impacted. Also, variabilities in trade openness and capital growth Granger cause growth and their study overlooked nonlinearities. While controlling endogeneity, cross-sectional dependence and other data problems with the GMM method, Ehigiamusoe et al. (2019) advanced confounding results on a panel of 125 nations in an exercise to investigate (non)linearity effects. For middle- and high- income states, economic growth enhances financial deepening but for medium and high inflationary states inflation demeans economic growth. However, their interactive variable specification is ineptly capturing the nonlinearities so that the effects of asymmetries are overlooked with a likelihood that the findings would be spurious in country policy specific errands. Adu, Marbuah, and Mensah (2013) on a Ghanaian data explored the influence of financial advancement on growth and reported consistent findings although they were sensitive to the type of financial deepening under consideration. They confirmed the supply-leading hypothesis for total domestic credit and the domestic credit to private sector and unlike for the broad money that is growth-declining. The sensitivity demonstrated by the financial proxies' behavior in this case, we tie to the fact that the financial sector which is differently responding to specific deepening must be differently causing growth and this births to nonlinearities which this study disregarded. The interesting results by the latter study are still confirmed by Adusei (2013) on a similar study case using broad money and domestic credit and, robust techniques-that is, the short term ect, long term based FMOLS and the GMM applied for robustness checkup. Their results strongly supported that financial integration declines growth. They noted, except for the apparently positive but insignificant effect by domestic credit to private sector, the total credit and broad money largely disenfranchise long term growth.

Concerning feedback causality, growth causes financial developments and so does finance to growth. A feedback causality is also noted by the significant error correcting term to both finance and growth in studies by Odhiambo (2009b). The author posits that in Kenya finance-growth sector Granger causes each other although at weak levels. In Egypt and on a VAR model, Abu-Bader and Abu-Qarn (2008) significantly validates that finance-growth Granger causes each other, however with positive externalities. That is, finance causes economic growth in both investments of resources and their efficacy. However, the former and the latter also negatively underscores nonlinearities. Qamruzzaman and Jianguo (2018a) also noted financial innovations to feedback cause with

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economic growth in most of his sample of Asian countries. The no causality relationship is also noted by many studies. This may imply to existing correlation as simply chronological idiosyncrasy. Irrespective of relationship between the two sectors; they however grow divergently, meaning that causality factors to finance are rooted in financial reforms and those to economic growth base on real factors (Graff, 1999). Few researchers like Atindehou, Gueyie, and Amenounve (2005) in SSA with 12-West African states reveals financial intermediaries to inconsequentially impact growth, and thereby concurring Lucas (1988) ideology that linking financial deepening to cause growth might be exaggerated. A similar observation is done by Kar, Nazlıoğlu, and Ağır (2011) for MENA panel composed of 15 states. That is, either way, the finance-real growth causality is inconsequential in all the countries. The author compared this on the idea that, due to varied infrastructural and institutional foundations in this states, they therefore have differently developed financial institutions so that the results render sensitive of the development scale and this corroborate that the behavior by financial integration is not linear.

In sum, the supply-following hypothesis seems largely exploited by a considerable number of studies taking the side. The growth-led finance and feedback causality studies are also imminent. It's worthy noting that different countries have different levels of economic growth that are dynamically changing to coincide the globalization. This clearly indicates the direction of casualty has changed and is either nonlinear or indefinite while the real growth drivers are still assumptive and mystifying. In conjecture, most of the above studies have explicitly (or implicitly) addressed the nexus on a linear format and those that are nonlinearly specifying, have incorrectly explicated the issue while mostly using dummy or squared variable and also, there is still missing asymmetric exercise on this line except for such works of Qamruzzaman and Jianguo (2018a) on a panel encompassing Sri-Lanka, Bangladesh, India and Pakistan. The current paper extends the same and considers the case of a single country- Kenya.

3. EMPIRICAL MODELLING

3.1. Dataset

The variable set comprises of yearly macro-economic data over 45 years since 1972 available at the World Bank websites (<https://data.worldbank.org/>). Gross domestic product, government expenditure, real interest rate, trade openness, broad money, domestic credit, gross capital formation and inflation. GDP is measured in constant US\$, inflation as the annualized percentage of the GDP deflator, real interest as the percentage deviation between lending rate and inflation while domestic credit is in terms of the credit awarded to the private sectors by banks and it is weighted by GDP. Trade openness is aggregated as the cumulative sum of export and imports of goods and services weighted by the GDP and all have been captured in terms of the constant 2010 US\$. Broad money is also weighted by GDP while government expenditure is the GDP weighted final consumption expenditure expressed in constant US\$.

Financial development has been proxied by an aggregated depth component of various indicators of economic growth as demonstrated in extant literature. Hermes and Lensink (2003) opined that it is their relative efficiency towards financial intermediation that forms the selection criterion. Perhaps it is impossible to sufficiently determine the effects of financial development on growth by only considering a single proxy which, in accordance to the related literature, specific proxy has not yet been concurred. In addition, and together with the authors viewpoints, different proxies have been implored and posited both significant and confounding results.

To start with, financial intermediaries have been used because they fundamentally provide plausible risk management tools in the banks, better auditing tools and platforms for resource disbursement for spurring both investment and cooperate governance. In another form, they may be utilized as the proportionate share of the commercial banks assets to the cumulative assets by the central and commercial banks (Adu et al., 2013; Jalil & Feridun, 2011; Uddin et al., 2013). M2 money per GDP has been commended due to its strength to intermediate services and in positively increasing the financial systems leverage in provision of credits (Lawrence et al., 2014; Nawaz et al., 2019) and this is especially when inflation is stable as supported by Levine (1997) in advocacy that, in addition to sufficiently indicate the development level by the intermediaries, they provide useful insights into the trend, limit and efficiency of policies by the central bank authorities. Other researchers have embraced liquid liabilities (M3) due to its critical insights of the relative variations in liquidity over time and in addition, a concoct of both market based and bank based proxies have largely been incorporated (Bara & Mudzingiri, 2016; Nyasha & Odhiambo, 2017).

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It is also worth noting that globalization has greatly altered the drivers of financial development as the way financial systems are now responding to financial development has largely complicated and therefore, a specific proxy has not been destined due to the continually emerging innovations in the development process. Moreover, no singular proxy may sufficiently signpost financial development while pooling together the aforementioned proxies into a common regression would induce multi-collinearity and endogeneity among other data underlying shortcomings which may results to spurious estimations. To condense this, the authors applied the principal component analysis (PCA) on real interest, domestic credit to private sector per GDP, trade openness and broad money per GDP to derive an appropriate financial deepening index.

Money supply and capital accumulation majorly captured by the broad money (BrM), in this study, are included to incarcerate the penetration of monetary input in the finance sectors. Trade openness (TrOp) internments the net effects of global and liberal trade as external shocks for the case of an open market economy where its externalities changes the level of foreign capital inflows and technological spillovers that spurs both financial deepening and growth. It was introduced to incarcerate the effects of globalization to a financial sector that is not only just liberalized but also consequentially domineered by the banking sector. Real interest (RI) is implored to internment the inflationary pressure on financial developments. Domestic credit (DCr) represents the savings to private sectors meant to spur sustainable developments, herein, represents the financial transfers to the private sectors and bridging the gap left by the depositors and investors or M2 and M3 transfers that only captures the transaction proficiencies between the depositors and credit accepting institutions.

Therefore, the variables with the acronyms; DCr, TrOp, BrM and RI and their correlation matrix presented in the top part of Table 1 postulates to some correlation. The negative correlation evident is implied between real interest and trade openness, and trade openness to broad money and domestic credit while it is positive for the case of broad money and real interest and broad money to domestic. Similarly, both strong and loose relationships are obvious and inferencing that if the variables are pooled in a common regression, they would propagate endogeneity and other estimation problems. Therefore, the aggregation index employed as the PCA component applied sufficiently produces an appropriate index which latently but holistically conceptualize the underlying stance of financial development while still preserving the critical information enshrined in the individual variables. The information by the index is far much satisfactory and representative than it would be with an individual indicator. Consequently, basing on the explanatory powers of the component, the first explaining 71% variation is the best component to weight the latent variable which is weighted using the statistics in the 5th column and whose reliability is also corroborated by the significant KMO statistic. The extracted latent variable of financial development is then applied in the proceeding analysis.

Table 1. Correlation matrix and the Principal Component analysis

	RLint	TrdOp	BrdMny	DCrPs
RLint	1			
TrdOp	-0.391	1		
BrdMny	0.342	-0.321	1	
DCrPs	0.461	-0.873	0.794	1
<i>Component</i>	<i>Eigen values</i>	<i>% variance</i>	<i>Cumulative Proportion (%)</i>	<i>weights</i>
1	71.056	73.743	73.743	(1.032) ^{RI}
2	19.543	16.258	90.001	(0.398)TrOp
3	6.574	9.694	99.695	(0.918) ^{BM}
4	2.827	0.305	100.000	(4.753)DCr
<i>Test</i>				
KMO test statistic	0.693			

Note: Numericals in bracket represents the estimated coefficient values of the super-scripted variables; RI for real interest, TrOp for trade openness, BM for broad money and DCr for domestic credit. The Kaiser-Meyer-Olkin test is connoted as KMO.

This paper is objective to sufficiently analyze the impact of financial development on economic growth. Therefore, using solely financial development as the sole indicator of growth is probable to cause misspecification errors and model instabilities. Also,

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only financial deepening may not sufficiently cause the expected growth as it is inept in feasibly complementing growth since the underlying relationship might be disguising. The insufficiently conclusive results may therefore forward infeasible policy inferences. To obtain robust estimates, the authors included government expenditure, gross capital formation and inflation as the control variables (see Table 2 for their description). Inflation therefore captures the efficacy of monetary policies for macro-economic stabilities via the impact on the quality of financial and the goods market components. For instance, the discrepancies on the quasi-money holdings, effects on household consumption and investment via declining interest rates, and the influence on the levels of financial systems for real growth. Capital formation captures the net investments effects by physical capital and assets less the disposal as simply, the net value added on GDP while significantly complementing financial deepening. Government expenditure marshals the impact of spending by the state on the procurement and provisions of public services and goods and whose level of saving investments, resource allotment and disbursement implicitly affects financial deepening. The next sub section describes the model for variable operationalization.

3.2 Methodology

This paper analyses both the symmetric and asymmetric impacts of financial development on economic growth and its Granger causality using inflation, gross capital formation and government expenditure to control the effects. The symmetric part is done using the linear ARDL and to investigate the impact on growth and the relationship between the variables.

On the other hand, the adopted nonlinear ARDL model of Shin, Yu, and Greenwood-Nimmo (2014) aims to facilitate the analysis of the effects of vertical movements in financial development on economic development. This procedure is three wise. First, nonlinear cointegration is tested followed by the NARDL estimation to investigate how the positive (negative) shocks of financial development impact growth and finally, the analysis of the temporal equilibrium adjustment using the dynamic multiplier of growth to finance.

The investigation is innovatively different in three major ways. First, by the ARDL, both a baseline model and an endogenous format of the model and using a parsimoniously ordered lag framework are estimated. The first model analyses the impacts of finance on growth while the lag parsimony model analyses the relationship. Secondly, by the NARDL, two models differentiated by the type of deterministic regressor (i.e., gross capital formation or government expenditure) are estimated to affirm the estimates. Thirdly, the relationship is confirmed by tracing the causality path using Granger causality framework. Therefore, the long run under the error correcting term by ARDL (i.e., the lag parsimony model) and the short run by Granger causality are empirically verified while aiming to address reliability and consistency of the findings.

However, to sufficiently lay the argument of our experiment, we initiate by reconsidering the linear ARDL (u, v) specification (Pesaran, Shin, & Smith, 2001) using a bi-variate outline and composed of difference stationary endogenous and any $I(1)$ or less exogenous variable written as;

$$\Delta y_t = \theta_y y_{t-1} + \theta_x fd_{t-1} + \theta_k k_t + \sum_{i=1}^{u-1} \gamma_i \Delta y_{t-i} + \sum_{i=0}^{v-1} \phi_i \Delta fd_{t-i} + \mu_t \quad [1]$$

where θ_y , θ_x and γ_i , ϕ are the long- and short- run vector matrices of the coefficients, respectively and k_t as the vector of deterministic regressors which may be the exogenous factors like the trend. fd is the financial development and μ_t the error term. The long run relationship is valid for a rejected null hypothesis that jointly $\theta_y = \theta_x = 0$. Accordingly, the calculated statistic by the Wald test is then compared for statistical significance over the F-statistic of Pesaran et al. (2001) table. The bound is an $I(0)$ and $I(1)$ pair implying that the variables are level- and difference- stationary respectively. Hence, y_t and fd_t are uncointegrated if the calculated F-statistics falls below the $I(0)$ limit, inconclusive if between the bounds and cointegrated if the statistic lies outside the $I(1)$ bound.

However, to analyze the finance-growth correlation amongst the variables, equation 1 rewrites in the following matrix framework;

$$L^1 \begin{bmatrix} gdp \\ fd \end{bmatrix}_t = \begin{bmatrix} k_1 \\ k_2 \end{bmatrix} + \begin{bmatrix} gdp \\ fd \end{bmatrix}_{t-1}^T \begin{pmatrix} \gamma_{11} & \gamma_{12} \\ \gamma_{21} & \gamma_{22} \end{pmatrix} + L^1 \sum_{i=1}^{u-1} \begin{bmatrix} k_1 \\ k_2 \end{bmatrix}^T \begin{pmatrix} \theta_{11} & \theta_{12} \\ \theta_{21} & \theta_{22} \end{pmatrix}_{t-i} + ect_{t-1} + \begin{bmatrix} \mu_1 \\ \mu_2 \end{bmatrix}_t \quad [2]$$

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where L is the first lag operator, k_t the constant, T the transpose and μ the error term. θ and γ are the short- and long- run coefficients while ect is the error correcting term. Equation 2 is an endogenous model which measures the linear dynamics between financial development and economic growth. And for sound analysis, the ect_{t-1} term should be negative and significant for cointegration to realize. Also, the θ and γ should be statistically significant at the rule of thumb for a prudent impact while for the joint stability and consistency of the parameters, μ is expected to be homoscedastic, normal and uncorrelated.

Importantly, preference of the model to other multivariate models in this case is thrice fold. First, due to its superiority in small sample data properties and forwarding robust and consistent estimates over other classical cointegration techniques e.g., VECM. Secondly, the Engle Granger (that's residual based) and the Johansen and Juselius techniques (that are based on the maximum likelihood) explicitly are restricted to difference stationary variables and are confided inefficient under I (0). The ARDL counters these defects by testing cointegration irrespective of the order of integration so long as the dataset is less than or I (2) free. Flexibility by the model therefore accounts for such pre-estimation errors better than the classical techniques (Ssali, Du, Mensah, & Hongo, 2019). Thirdly, the technique integrates the equilibrium term into the short run while upholding robustness and superiority. Therefore, both t- and F- statistics are prudently estimated irrespective of whether all or some regressors are endogenous. In addition, and together with the VECM, they all assume parameter rigidities and therefore, freezing the elasticities by the positive and negative shocks. For those estimating the error correcting term, it has been assumed to autocorrect to volatilities at a constant speed (Enders, 2014). Also, due to the many and rapidly emerging financial technologies and finance dynamics, the sector is also believed to have metamorphosed to corroborate the specific demands by globalization and emerging financial market trends. In this case, asymmetric behaviors in the development process are inevitable and implying that in case of any structures towards development of the sector, then, should be policy specific to offset any discrepancies. Similarly, an empirical analysis of such a case that is disregarding such asymmetric discrepancies will probably result to spurious estimations and mirage policy deductions. The linear ARDL described above is therefore inefficient and unreliable under such conditions. The nonlinear format of the same will therefore be appropriate to concurrently track the dynamics and asymmetric movements of finance to growth.

This is the NARDL model structure which utilize the decomposed partial sum of positive and negative squares to investigate the impact and dynamics in the runs. To demonstrate this, we start from the linear version of the long run asymmetries of equation 1 as;

$$y_t = \partial^+ fd_t^+ + \partial^- fd_t^- + e_t \quad [3]$$

where ∂^+ and ∂^- are the long run partial sum of square coefficients linked to the changes in fd and decomposed by the process;

$$fd_t^- = \sum_{j=1}^t \min(\Delta fd_j, 0) \text{ and } fd_t^+ = \sum_{j=1}^t \max(\Delta fd_j, 0) \quad [4]$$

But associated with the following cointegrating long run asymmetric equation;

$$z_t = c + \delta_1^+ y_t^+ + \delta_2^- y_t^- + \theta_1^+ fd_t^+ + \theta_2^- fd_t^- + t + e_t \quad [5]$$

Where the c and t are part of the deterministic regressors while the whole equation is said to be long run cointegrating if z_t is level stationary and hence asymmetrically cointegrated. Irrespective of the cointegration, specification 5 is non-dynamic and unbefitting to capture the dynamics in the finance-growth. To befit this discrepancy, we modify the specification and which is the Shin et al. (2014) model and obtain the following NARDL structure;

$$y_t = \phi y_{t-1} + \theta^+ fd_{t-1}^+ + \theta^- fd_{t-1}^- + \sum_{j=1}^{p-1} \gamma_j \Delta y_{t-j} + \sum_{j=0}^{q-1} (\eta_j^+ \Delta fd_{t-j}^+ + \eta_j^- \Delta fd_{t-j}^-) + \mu_t \quad [6]$$

Where the long run coefficients are $\partial^+ = -\theta^+/\phi$ and $\partial^- = -\theta^-/\phi$. The asymmetric cointegrating relationship is tested based on the F-test bound of Pesaran et al. (2001) or the t-test bound of Banerjee, Dolado, and Mestre (1998) and is significant for a rejected null hypothesis that

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for an F-test or are individually equal to zero for a t-test. The asymmetric short run coefficients are valid for rejected null of the pairwise restriction format that $\eta^+ \neq \eta^-$ or the additive format that $\sum_{j=0}^{p-1} \eta_j^+ = \sum_{j=0}^{q-1} \eta_j^-$. The design implored is that, first, the OLS is applied on equation 6 and proceeded by investigation of long run cointegration and, lastly, testing the validity of short and long run asymmetries.

In the final step, we describe the specification used to analyze the spatial response of economic growth on the asymmetric shocks in the finance sector. This analysis involves exploring how the growth-finance system self-adjusts from an environment characterized by short run and current dynamics and previous equilibrium state to the newly innovated balance. This is the dynamic multiplier effect derived using the following expression;

$$r_f^+ = \sum_{j=1}^f \frac{\partial y_{t+j}}{\partial fd_t^+} \text{ and } r_f^- = \sum_{j=1}^f \frac{\partial y_{t+j}}{\partial fd_t^-}, f=0,1, \dots, \infty \quad [7]$$

where r^- and r^+ represents the long run estimates from fd_t^- and fd_t^+ respectively. f is the lead. Convergence achieves as the leads approach infinity so that for $f \rightarrow \infty$ r_f^- and r_f^+ respectively converges to fd_t^- and fd_t^+ so that the uncertainties in r^- and r^+ therefore are critically informative of the future growth adjustment path.

Generally, extant literature corroborates that in case of the above exercise and without inclusion of the control parameters, the resulting framework would undoubtedly be weak and non-robust with unreliable estimates (Hongo et al., 2020; Lawrence et al., 2014). And, in the real open economy, the growth-finance sector is inevitably prone to various macroeconomic and policy shocks that alters their performance. In this regard, the authors added some control variables to regulate and the impact and relationship of finance to growth. The included inflation variable therefore captures the efficacy of monetary policies on macro-economic stabilities via the impact on the quality of the components such like on real interest rates and regulating economic activities. Capital formation captures the net investments as the net value added on GDP. Government expenditure marshals the influence of outlays by the government on public services and goods while at some point shaping the associated pass through effects on inflation via wage rates and the general investments by the households.

The operationalization of equation 1 and 2 produces baseline results for exploring the long run granger causalities that facilitates identification of the current results with extant literature and for comparison purposes for proceeding asymmetric results. For equation 6, it is regressed yielding two different models on the basis of variable type regarded as the deterministic regressor. The first and second parts of the regressions are done using gross capital formation and government expenditure as their respective fixed regressors. However, importantly, all the variables are first converted into their natural logarithms to cause elasticities and offset fresh data problems like volatile spiking and then a parsimonious model is by default estimated while achieving accuracy and lessening noise in the dynamics. This results are presented in Table 5.

4. RESULTS AND ANALYSIS

The section initiates from the illustrative statistics for GDP and financial development together with the control variables as demonstrated in Table 2.

Table 2. Descriptive statistics

Statistic	GDP	Financial development	Government expenditure	Inflation	Gross capital formation
Mean	9.931	3.314	8.543	0.924	9.353
Std. Dev.	0.429	0.664	0.476	0.324	1.231
Skewness	0.072	-1.382	-0.260	-0.964	-6.159
Kurtosis	2.052	2.069	1.874	4.493	41.03
Jarque-Bera	1.446	2.378	2.645	11.40**	3129**

Note: The variables are in their natural logarithms while the ** is the 5% significance.

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With regard to the growth-finance in Table 2, the main activity is by economic growth evident by its large mean of 9.9 compared to financial development that is however the most volatile activity. In addition, it is negatively skewed and with relatively large kurtosis value compared to GDP and this should be contributing its volatility irrespective of their normal distribution. For the control variables, gross capital formation and government expenditure have the largest mean and seemingly they largely contribute to growth while inflation that is moderately volatile of the three and, together with the disproportionately negatively skewed gross capital formation, they are abnormally distributed. The behavior should be uncertainly affecting financial development and inappropriately controlling the impacts. The volatile behavior should be apparently adding nonlinear behavior which are investigated together with the linearity's.

Therefore, in the proceeding table, displayed are the results of linearity's in the growth-finance influence. This is regarding the first way of analysis where the linear ARDL is expedited based on equation 2 and a controlled framework.

Table 3. Symmetric Impact analysis

D.V (lnGDP)	Coefficient	t-statistic
Short run coefficients		
c	-0.613	-5.947(0.000)
trend	-0.003**	-4.379 (0.001)
$\Delta \ln \text{GDP}(-1)$	0.240**	2.273 (0.029)
$\Delta \ln \text{GCF}(-1)$	-0.281*	-3.212(0.0028)
ECT(-1)	-0.419	-1.502 (0.151)
Long run coefficients		
$\ln \text{FD}$	0.424***	6.060 (0.000)
$\ln \text{Gxp}$	0.087	0.382 (0.704)
$\ln \text{Inf}$	0.089**	2.223 (0.032)
$\ln \text{GCF}$	0.943***	11.33 (0.000)
Bound test		
F-/t-statistics	6.860***F/-5.199***t	-3.96 I(0)/ 4.060 I(1)
Diagnostics tests		
Serial correlation	1.896(0.488)	
Normality	0.133 (0.000)	
ARCH	0.432 (0.837)	
RESET	--	

Note: ***, ** and * denotes to 1,5 and 10% significance level. The statistics in brackets are the respective p-values and the coefficients the respective elasticities to GDP growth. The befitting model was selected based on AIC and is an ARDL (2,0,1,0,0). The joint probability is $P(F(12.76)) = 0.000$, $R^2 = 0.569$ and $K=4$.

Thus, according to Table 3, and starting with the short run coefficients the largest proportion of financial development coefficients are negative and significant to imply that financial development reduces economic growth. With the controls, except for inflation with a positive effect on economic growth, government expenditure and gross capital formation have reducing influence. This implies that as resources are increasingly allocated for both state expenditure and also to capital formation, there is little value added growth and declining or constant productivity. The increased state expenditure which is apparently imprudent in action destabilizes the fiscal side as the dynamics also transit to discrepant the monetary side where the coupled increasing inflation despite causing short term increase in goods market activities, it diminishes real interest rates, short term liquidities, broad money effects and reduces the general efficiency of other financial goods and services. The distressed financial system development in turn awkwardly causes short term growth.

The statistically significant both F-statistic (3.84) and the t-statistics (4.87) means that the variables have long run cointegrating relationship and hence, economic growth auto reverts back to equilibrium at a rate of over 60% after a shock in the finance sector but its negative effects are relatively controlled by the macroeconomic and monetary sides. Therefore, in the long run, although

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financial development (with coefficient -0.45), is insignificant, it is weakly and negatively impacting growth. With the control effects, capital formation and government expenditure have palatable long run effects of increasing growth via a prudent-accountable expenditure and increasingly significant value addition structures.

In the diagnostic section³, the residuals seems correlated that however are demystified by the insignificant ARCH test that they have no clustering volatility, follows normal distribution and the model is sufficiently set. Also, the significantly negatively signed ect^4 term for variable stability corroborates that the variables are stationary and free from high order stationarity, and therefore demystifying the chances for the spurious parameters as would be the case under nonstationary regression. However, this does not seem to corroborate well with the seemingly mixed findings of financial development to growth and the remaining results in the short run which, we inevitably associate with nonlinearities in the financial sector and in the controls. Therefore, the linear results should be inept in explaining the asymmetric effects on growth which are implored as is from the next table.

Thus, according to Table 4 in which the results regards the bound tests for asymmetric cointegrating long run level correlation, the presentation is based on two kinds of models differentiated by means of the type of control variable in the deterministic part.

Table 4. Asymmetric bound testing

Test statistic		significance	K	Critical bounds	
				I(0)	I(1)
F^a -	4.24**	2.5%	4	3.75	4.13
ta -	-3.98**	5%	4	-3.43	-4.60
F^b -	6.22***	1%	4	3.74	5.06
t^b -	-5.14***	1%	4	-3.43	-4.60

Reminder: *, ** and *** denotes to the rejection of the null hypothesis of no long-run level relationship at 10, 5 and 1%, respectively. Superscripts *a* and *b* refers to the model in which the government expenditure and gross capital formation respectively are the fixed regressor.

The statistically significant test statistic hence implies that in both models where expenditure and capital formation are the deterministic, financial development and economic growth and, together with the controls, postulates along run level relationship and which is asymmetrically cointegrating. We implored this effects and presented in the next table.

Table 5a. Asymmetric effects A

D.V(InGDP)	Coefficient	t-statistic
Short run coefficients		
$\Delta \ln \text{GDP}(-1)$	-0.778***	-3.98 (0.001)
$\Delta \ln \text{FD}_{\text{POS}}(-1)$	0.494	1.15 (0.265)
$\Delta \ln \text{FD}_{\text{NEG}}(-1)$	-1.626**	2.22 (0.039)
$\Delta \ln \text{FD}_{\text{NEG}}(-2)$	-1.227**	-1.88 (0.088)
$\Delta \ln \text{GCF}_{\text{POS}}(-1)$	1.053***	3.30 (0.004)
$\Delta \ln \text{GCF}_{\text{NEG}}(-1)$	0.521***	3.21 (0.004)
$\ln \text{GXP}$	0.123*	1.99(0.085)
FPSR	0.755(FD)\1.33(GCF)	
FPLR	5.93**(FD)\8.93*** (GCF)	
Long run coefficients		

³ A point to remind regards the CUSUM(sq) test plots for models in Tables 3,5 and 6 which all implies to models bounded within the 95% confidence intervals. They significantly suggest to stable models, however; this plots have been excluded but are available upon request.

⁴ Importantly to reckon for the entire paper is that based on the significant and negatively signed error correcting terms the variables are stationary and therefore unit root testing was excluded.

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InFD_POS	0.635	1.231 (0.281)
InFD_NEG	-2.090**	4.814(0.041)
InGCF_POS	1.354***	55.79 (0.000)
InGCF_NEG	-0.670***	27.430(0.000)

Diagnostics tests

R ²	0.813
P(joint F-stat)	3.60(0.0003)
Serial correlation	37.82 (0.006)
Normality	1.286 (0.526)
ARCH	5.923(0.149)
RESET	0.132 (0.056)

Note: *, ** and *** denotes to 10, 5 and 1% significance level respectively, government expenditure is the fixed regressor which categorize this as model A, and F_{SSR} and F_{SLR} are the Pesaran2001 F-statistic of short and long run symmetry under the null of symmetric effects.

The results in Table 5a represents when the deterministic regressor is conditioned as the government expenditure. First and foremost, we investigate whether the asymmetries are valid if any sound asymmetric analysis is to be real. Thus, an insight of the short (long) run Wald statistics 2.98(-1.7e⁻¹³) corroborates that the negative and positive shocks of finance are significantly different from each other and existent in both runs. This implies for the need for accounting asymmetries which qualifies the proceeding specification as conceivable and in support of Qamruzzaman and Jianguo (2018b) with significant finance-growth asymmetries.

In this faith, the short run results support that positive shocks by financial development largely decreases economic growth by a rate between 1.2-2.2%. These negative effects are very inertial as the growth-finance detrimental impacts domineers for the entire short run period. The reverse effects are observed for the negative shocks whose impact is mixed on growth. That is, the negative shocks are strongly and positively impacting but with weak inertial negative effect to growth and with an implication that, reducing financial development is beneficial but in the successive year the effect will be to decline economic growth. However, the most significant and persistent financial shock is the positive shock together with its persisting inertia, their impact continually declines short term growth. With regard to the other regulating variables, inflation and government expenditure have significant declining effects to growth while the negative effect by inflation is also continually domineering. Contrary, with gross capital formation, its significantly positively signed to the third lag and implying that it increases growth with the positive effects felt to the third period. The general implication by the controls suggest that in the short run, increased capital formation which grows growth, its productivity and value results to heightened leverage by the state to increase its expenditure on public goods and services that is apparently accompanied with accountability and management of the associated discrepancies. The resulting environment which may be marred with increased consumptive but declining saving investment activities, couples an inflationary backdrop which reduces the positive effects by financial development. The aftermaths holistically decline economic productivity and its development as gross capital formation alone does not sufficiently positive-control its palatable effects to growth for the entire shot run. In addition, the significant error term implies that the growth-finance with the controls self-adjust to correct the discrepancies in the short run with the long run stability achieving approximately a year later. This implies to the stability and existence of the long run growth-finance relationship Therefore, in the long run, the positive(negative) finance shocks which are 2.3(1.4) implies that they both positively affect growth. However, the negative shock is weakly affecting and less volatile than the positive one with an approximately double and strong effect to growth that results to the conclusion that financial development have long run increasing effects on economic growth. By the controls, we have inflation and gross capital formation positively impacting economic growth. This implies that increasing inflation to sustainable levels heightens long run activities in goods market and investment expenditure which supports increasing credit availability and financial activities. This also triggers the increased investment in capital formation that creates supporting structures in both finance and the macroeconomic side as the resulting backdrop is holistically optimum to sustain inflation and grow the economy. In the next table are the results of the model when gross capital formation is conditioned in the deterministic part.

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Table 5b. Asymmetric effects B

D.V(InGDP)	Coefficient	t-statistic
Short run coefficients		
$\Delta \ln \text{GDP}$	-0.305***	5.104 (0.000)
$\Delta \ln \text{FD_POS}(-1)$	0.026*	1.32 (0.056)
$\Delta \ln \text{FD_POS}(-2)$	0.077*	1.12 (0.076)
$\Delta \ln \text{FD_NEG}(-1)$	-0.228	-1.65 (0.115)
$\Delta \ln \text{FD_NEG}(-2)$	0.005**	0.05 (0.959)
$\Delta \ln \text{GXP_POS}(-1)$	-0.027	0.55 (0.589)
$\Delta \ln \text{GXP_POS}(-2)$	-0.137	-1.40 (0.848)
$\Delta \ln \text{GXP_NEG}(-1)$	0.990**	2.77 (0.012)
$\Delta \ln \text{GXP_NEG}(-2)$	0.766**	2.44 (0.025)
$\Delta \ln \text{GXP_NEG}(-3)$	1.208***	3.40 (0.003)
InGCF	0.089***	3.76 (0.001)
FPSR	0.046(FD)\13.39*** (GXP)	
FPLR	22.23*** (FD)\26.33*** (GXP)	
Long run coefficients		
InFD_POS	-0.310	1.374 (0.256)
InFD_NEG	-0.892***	8.462 (0.009)
InGXP_POS	0.965***	30.40 (0.000)
InGXP_NEG	3.483***	13.57(0.002)
Diagnostics		
R ²	0.819	
P(joint F-stat)	3.60(0.0003)	
Serial correlation	22.87(0.243)	
Normality	0.562 (0.755)	
ARCH	2.768 (0.096)	
RESET	2.016(0.152)	

Note: *, ** and *** denotes to 10, 5 and 1% significance level respectively, gross capital formation is the fixed regressor which categorize this as model A, and F_{SSR} and F_{SLR} are the Pesaran2001 F-statistic of short and long run symmetry under the null of symmetric effects.

Therefore, according to Table 5b, the results in both runs and asymmetries does not diverge with those in Table 5a. The significant Wald statistics confirms to significant asymmetries. The short run results support that the positive shocks of financial development have decreasing and inertial effects and which is ranging between -0.6% to -1.7% while the initial weak effects by the negative shocks seems to have decayed. With the expenditure, the domineering impact is the increasing effect. Capital formation is also increasing short run growth. These results imply that in the short run, increased value addition via succinct capital formation polices and reasonable state expenditure polices interactively works to support short run structures of economic activities which boost its growth. However, they inefficiently control the manner in which increasing financial development affects growth. The resulting negative effects to growth by the increasing financial development may be termed as temporary as the growth-finance relationship converges to correct such harmful short run finance dynamics to a stable state at a rate of 41.1%. The proceeding effects after stability is positive as demonstrated in the entire long run period.

Thus, in the long run, the positive shocks by financial development can be seen to increase growth as the effects are significantly and positively controlled by the rising inflation up to sustainable levels which are palatably sustained for the entire long run. These backdrop implies that the raised inflation to optimum levels increases economic activities and reduces unemployment in the goods and labor market as the supporting environment offers a market for financial services that have initially been heightened via high real interest rates, increased domestic credit for private sector development and improved level of goods,

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services and their operationalization by the new skills and technological spillovers from the trade openness side. The holistic environment succinctly spurs economic growth⁵.

Part of the aims to this paper is to find the relationship amongst the variables. That is, how they relate by impacting one another in a fashion that each of the variable is endogenously treated. This is equation 8 for that matter upon which the authors initiated from the testing of long run cointegration as depicted by the results in Table 6.

Table 6. Bound testing under relationship analysis

Model	Statistics		Critical bound		Cointegration Inference
	F	t	I(0)	I(1)	
(1)	6.808***	-6.141***	-3.430	3.520	Present
(2)	7.240***	-6.342***	-4.730	5.760	Present
(3)	4.983***	-4.289***	-2.860	4.490	Present
(4)	3.300	-3.001	-3.430	3.550	Absent
(5)	2.816	-3.943***	-3.430	3.520	Present

Note: *, ** and *** are the 10, 5 and 1% significance. Model (1) to (5) denotes to when the dependent variable is GDP, financial development, inflation, government expenditure and gross capital formation respectively and in their respective logarithm forms.

Thus, according to Table 6, although we infer mixed results the equations by finance and growth supports presence of long run level cointegrating relationship. Inflation as an important regulator in the finance-growth relation is the only depicting significant long run cointegrating relationship unlike the rest of the controlling variables. These is corroborating the idea that the finance-growth relationship and inflation should be Granger causing each other. This scenario is further delved and results presented in Table 7.

Hence, Table 7 depicts results of Granger causality investigated under the error correcting term framework using a lag parsimony model in order to corroborate the objective at this juncture and which is simply to investigate how the variables influence each other and the direction of influence.

Table 7. Granger causality estimates under relationship analysis.

Model	(1)	(2)	(3)	(4)	(5)		
D.V	lnGDP	lnFD	lnINF	lnGXP	lnGCF		
Long run coefficients							
lnGDP	--	-0.279 [-0.750]	5.706 ^a [2.41]		-2.032 [-0.837]	<i>RESET</i>	<i>R</i> ² 0.993
lnFD	0.373 ^a [5.848]	--	6.566 [1.574]		1.504 [1.256]		0.546 0.719
lnINF	0.085 [2.017] ^b	-0.045 [-1.612]	--		0.595 [0.118]		0.998 0.979
lnGXP	-0.026[-0.172]	0.443 ^a [3.100]	-5.415 ^b [-2.21]		-1.01 ^a [-4.84]	Joint	Prob., 0.000
lnGCF	0.905 ^a [12.069]	0.176 ^c [1.871]	-1.528 ^a [-1.712]		--		0.000 0.000
ECT(-1)	-0.560 ^a [-6.142]	-0.591 ^a [-5.243]	-0.754 ^a [-5.391]		-0.213 ^a [-4.114]		0.000

⁵ Analysis of the diagnostics tests confirms to the residuals that are normally distributed, homoscedastic, without ARCH effects and uncorrelated. The model is also well reset and stability by the CUSUM(sq) test confirmed although the plots are available upon request. The results are therefore robust.

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LR	present	present	present	absent	present	Note:
Short run coefficients						Superscripts a, b
0.222 ^a		-0.519 ^a	-8.999 ^a	-0.407 ^a	4.341 ^a	and c denotes to
C	[4.61]	[-6.42]	[4.155]	[-4.41]	[4.969]	1,5 and 10%
	0.251 b	-0.857 ^c	-7.113	0.064	3.578 ^a	significance,
		[-1.707]	[-1.608]	[1.143]	[4.064]	respectively. LR
lnGCF(-1)	0.272 ^a	0.012	0.026	0.007 ^a	-0.307 ^a	implies to the
		[0.169]	[0.467]	[0.371]	[-2.123]	long run
		--	5.746 ^a	--	-0.132 ^a	relationship. The
lnGXP(-1)	--		[-2.724]		[0.364]	numbers in
			4.729 ^a	-0.051	0.328	square brackets
. lnFD(-1)	--	--	[-3.724]	[0.525]	[1.191]	are the t-statistic
Diagnostics tests						while $\chi_{s^2/cor}^2$
$\chi_{s^2/cor}$	1.94	1.485	0.292	0.781 ^c	11.4	denotes to serial
χ_{het}^2	0.030	4.764 ^c	0.052	0.961	3.48	correlation, χ_{het}^2
χ_{norm}^2	142.7 a	0.28	1.058	0.037	0.01	
χ^2	2.83	--	1.757	0.112	0.027	

heteroscedasticity, χ_{norm}^2 normality and χ_{RESET}^2 for RAMSEY reset. Model 2 is done at trend in addition. Model 4, has long run results not estimated due to absent long level relationship

Regarding Table 7, the columns represent to the five models. Since we are to find the relationship between the variables, we prudently constructed using 2 lags by AIC for ease of demonstration. Therefore, the significant and properly signed ect terms suggest that there exist long run and cointegrating relationship in the finance-growth linkage. And, starting with the growth and finance models in the first and second columns, they have confounding causalities as despite being indefinite in the short run, it is negative and insignificant in the long run. Their significant ect terms are correctly signed and together with the diagnostics, they do not corroborate to root cause such confounding causalities. This should be due to the asymmetric behaviors in the growth-finance relationship so that, the granger causality analysis by the symmetric specification is spurious. With the controls, the causality impacts are somehow promising by inflation and capital formation. For instance, inflation is significantly regulating by reducing the financial development, capital formation and expenditure in the short run as gross capital formation is significantly granger caused by finance, growth, inflation and capital formation. This implies the importance of sufficient gross capital formation which, perhaps, develops supporting structures for controlling the macroeconomic discrepancies to financial development. Hence, the need for plausible and feasible policies that ensures proper functioning and implementation of long run gross capital formation programs.

Since, the above relationship is perhaps confounding, we summarize the short run Granger causality but now based on the VAR framework to confirm the direction the variables cause each other in the short run. Results in the next table therefore summarize this.

Table 8. Summary of short run causality

Variable	GDP	FD	INF	GCF	GXP
GDP	-	0.876***	1.568	3.082	6.534***
FD	6.029**	-	3.532	0.934**	4.444
INF	1.772*	1.075*	-	0.005	6.543**
GCF	9.667*	0.174	6.390*	-	18.80***
GXP	49.93**	6.453	1.532	7.545	-

Note: The causality direction is from variable in first column on the null hypothesis of no Granger causality.

Hence, regarding Table 8, we read some significant causalities. With one-way, gross capital formation is Granger causing growth, inflation, and government expenditure. Growth is also causing capital formation while financial development is causing capital

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formation. However, feedback causality is evident between the pairs; capital formation and financial development. The results partially corroborate the significant findings from Table 7 especially the responsive behavior by the capital formation in controlling the growth-finance relationship. This shows why the need to put in place prudent policies for supporting capital formation and financial developments to facilitate sustainable economic development.

The granger causalities by both the error correcting structure and the VAR supports the critical importance of the control effect largely by gross capital formation and inflation on the growth finance development as specific information on the direction of granger causality between finance growth is apparently misplaced. This implies to the likely wrong model choice where the linear ARDL model failed to delineate clearly the path of long run growth-finance relation. The significant symmetric ect term supported that the growth-finance is linearly cointegrating and, however, together with the former discrepancies, it is difficult to trace the specific direction of long run level cointegration, and the type of dominant shock of finance inducing the short run destabilizing dynamics. The asymmetric procedure via the dynamic multiplier in Figures 3 and 4 enable us to observe this effects. The multiplier therefore traces the self-adjustment path by economic growth in response to a unit standard shock in finance. Hence, Figures 3 and 4 supports that the negative shock by finance and the positive shock by capital formation are the most dormant. Thus, economic growth responds with a big slump to reducing financial development and with a steep surge to increasing capital formation with the impact running for the entire short run period to approximately impact by -1.2% and 4.5% respectively. Since, approximately the 8th year, the short run instabilities are corrected as the negative finance shock and positive capital formation shocks levels for the entire period. The results which corroborates the paradox that its less costly to decline than to grow financial developments extends to support the long run asymmetric results in tables 5 that growth increases with increasing financial development. Generally, this analysis puts forward that the long run economic growth responds with steep slump(surge) to reducing financial development (increasing capital formation) so that policy specific fiscal, macroeconomic and monetary policies should be implemented prudently. Similarly, specific risk management preparedness should be inclined to combating future financial uncertainties.

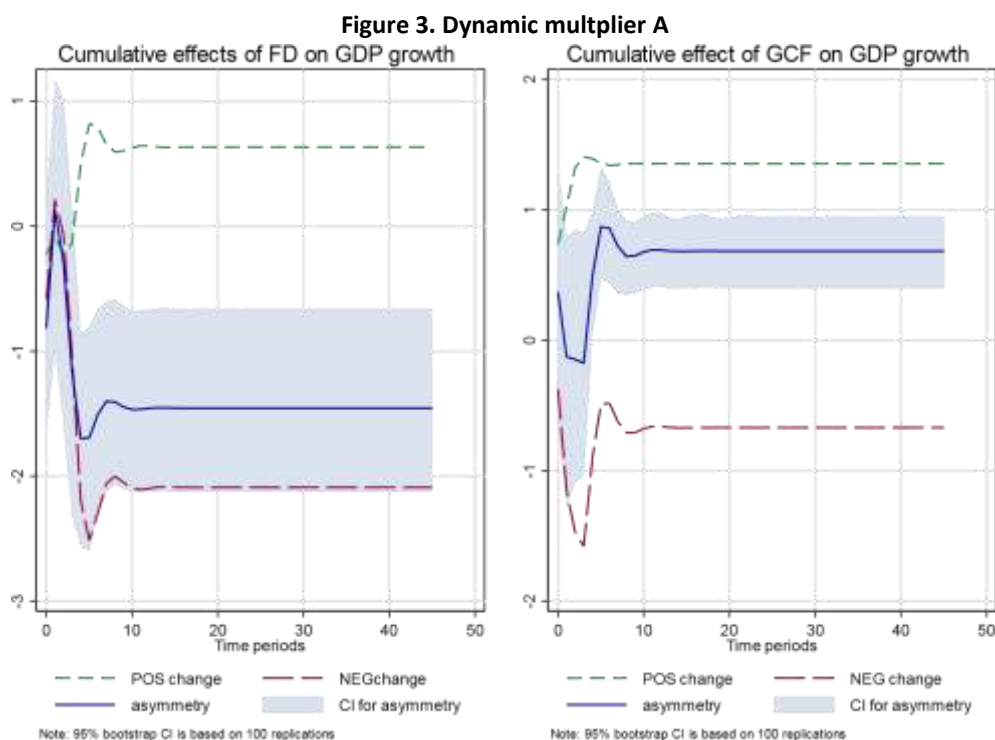
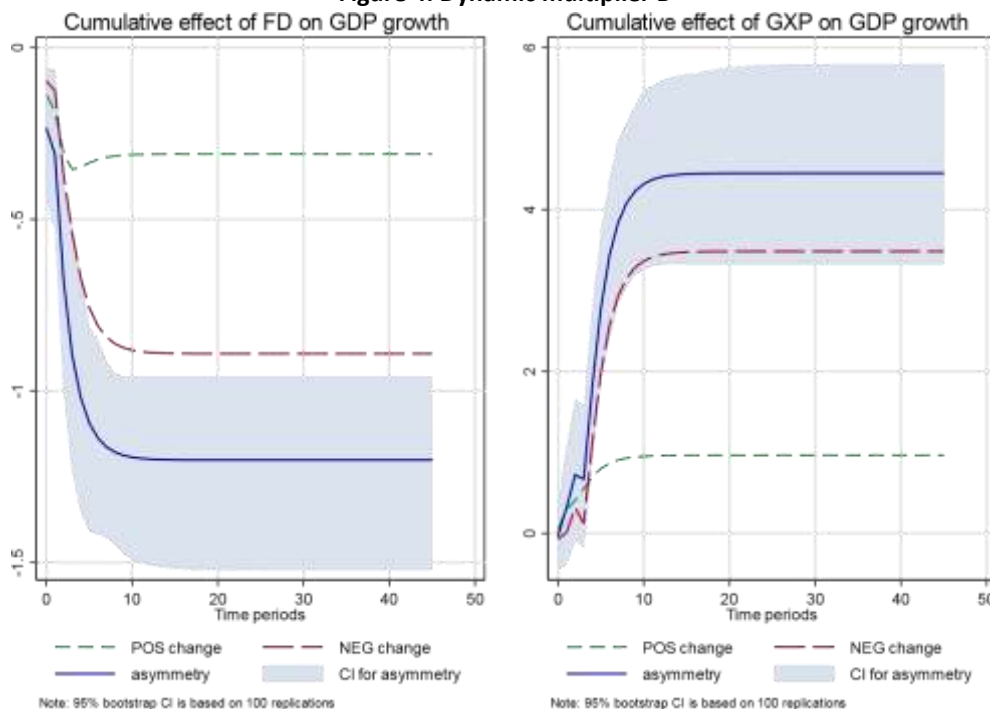


Figure 4. Dynamic multiplier B



5. DISCUSSION

In this exercise, both linear and the asymmetric properties of the growth-finance relationship have been investigated and robustly diagnosed for consistencies. Regarding the linear analysis, financial development has declining effects to short term economic growth with missing significant long run effects and this is attributed to the incorrectly captured asymmetric behaviors. Similarly, the missing finance-growth Granger causalities under both the error correcting term and the VAR structures attributes to the ineptness of these models that only captured the linear at expense of asymmetries. With the controls, inflation increase growth as government expenditure and capital formation unpalatably controls the short run growth path but they positively control their effect which is now increasing long term growth. In the asymmetric section, positive(negative) financial shocks increases (decreases) growth while by the control effects, capital formation, expenditure and inflation are significantly increasing long term growth as short term growth is reduced by inflation but increased by capital formation and government expenditure. Thus the most reliable results are by the asymmetric approach that a further exploration of the error correcting dynamics under the dynamic multiplier confirms that the growth-finance relationship is asymmetric with the most domineering shock to growth as the negative shock by finance when financial development declines than increase and steeply with a surge to an increase in capital formation.

Our results corroborate with the findings in extant literature. We first regard the growth-finance findings. The positive effects of increasing financial development to growth and are in support of the supply-leading hypothesis: Qamruzzaman and Jianguo (2018a) confirmed with these findings that increasing financial developments heightens growth in India, Pakistan, Sri-Lanka and Bangladesh while Arnaboldi and Rossignoli (2016) supported that financial modernizations increases growth via feasible integration of financial systems, goods and services. Sobiech (2019) corroborated that finance positively and consequentially effect growth for emerging than emerged states. For developing countries like the current case, the weight is greater in the longer than short run and this is also supported by the relatively large coefficient by the positive than negative financial shocks. Other studies in this line supports via the effects that appropriately functioning banking system, stock and financial markets, and non-financial institutions facilitate income redistribution for economic activities. Also, credible banking systems which integrates financial systems and investments platforms in turn sufficiently offsets market information skewness and accumulate resources through deposits from creditors and individuals. These resources are then discharged for economic activities as investments by both households and the private sector. Therefore, as resources circulate and accumulate in the economy, growth is realized as financial system develops and increasing the efficacy with which the resources are allotted and improving the quality of services. This arguments largely points to the supply leading hypothesis as in the current study and as in Jalil and Feridun (2011) for

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Pakistan, Adeniyi et al. (2015) for Nigeria and, in Kenya by both Musila and Yiheyis (2015) and Odhiambo (2009b) in Kenya. Nyasha and Odhiambo (2017) supports by their findings that market-based financial systems positively changes real growth while Abu-Bader and Abu-Qarn (2008) revealed that financial development increases growth in Algeria, Morocco, Tunisia, and Egypt. Adu et al. (2013) for Ghana corroborated our findings but with a caution that the positivity's by finance to growth are vastly sensitive to the kind of financial development undertaken and raising the need for specific development to be explored for a specific deepening expectation. The positive effects to growth by financial development are also supported in Pakistan by Nawaz et al. (2019) that the scale of financial development increases with increasing growth that is regulated by stable inflation conditions and also in Zimbabwe where Bara and Mudzingiri (2016) found that feasible broad money activities heightens long term growth unlike the insignificant domestic credit to private sector. Adusei (2013) contradicts the current study and corroborate that financial integration declines long term growth by the disenfranchising effects of the total credit and broad money as the domestic credit to private sector effects are ineptly missing and this, we tie to the fact that internationalization which are tied to final liberalization widens financial instabilities via negative external shock to market capitalization, trade volume ratios and the exchange rates among other general market and or based services as long term growth is weakened.

Further the supply-leading hypothesis is continually supported via the Granger causality effects of financial development to both growth and capital formation. That is, sound financial developments boost growth and provides resources for capital formation which is seen to form the major root cause of macroeconomic developments and this is supported largely in literature: Qamruzzaman and Jianguo (2018a) noted how finance, besides Granger causing growth, they cause each other and in current study, its Granger causing almost all the variables. Batuo et al. (2018) however, supports contrasting findings where financial sector developments are portrayed to have largely mutated to way it affects growth. That is, together with liberalization, financial development tightens instabilities and diminishes long term growth although the apparently heavily obstructed growth by the instabilities in the post-liberalization periods is loosely offsetting them than in the pre-liberalization period. Musila and Yiheyis (2015) also confides in this outcome while Odhiambo (2009b) realized that the growth-finance feedback causality is dominant but with weaker weight. Therefore, financial development is the instrumental driver of financial systems in line with performance of real economy. It is also important to note that the growth-finance relationship together with their controls have been confirmed to significantly auto revert to equilibrium in order to stabilize the volatile shocks in the system. This implies that the plausible effects by financial systems innovatively diffuse and integrates development while heightening the propensity and quality of financial products, institutions and processes in which capital is accumulated and distributed for economic growth. Extant literature also support such diffusion (Bara & Mudzingiri, 2016; Qamruzzaman & Jianguo, 2018b)

With regard to the controls in the system, the positivity's by inflation, capital formation and expenditure is also largely supported in extant literature The general image captured here is that inflation and expenditure that perhaps best fits as short term tools in adjusting the macroeconomic environment induces an almost real time ripple effect in growth. Increased state expenditure that may go by high inflation, for instance, boosts consumption than saving investments activities with generally increased level of economic activities. Capital formation and development that is normally long termed and requires considerably large input outlays, their progression reduces short term growth as GDP channels its resources to their growth and development. Among supporting studies, Odhiambo (2009b) with a similar case reported that sustainable inflation which spurs financial developments increases economic growth. This implies to the idea that relatively high inflation is associated with employment opportunities and attracts income to the households especially in the short run. With increased income and improved living standards they save and invest more while creating the demand for financial services, intermediaries and institutions whose development through technological and innovational inputs induces real growth. Also, Hongo, Li, and Ssali (2019), supported for a similar case that lower inflation supports short run growth as Ehigiamusoe et al. (2019) on inflation stricken economies confided that inflation reduce financial deepening and plummets growth via its negative externalities. For the positive effects of government expenditure there are supporting studies like Dinh Thanh and Canh (2019) on a stratified Chinese economy whereby military spending enhance growth in high than low income regions as the consumption spending via human capital facilitates growth in both regions. However, the effect is negative using the aggregated expenditure component. Contrary, Dzhumashev (2014) reported a negative growth-expenditure impact. Increasing effects to growth by capital formation are also supported by Qamruzzaman and Jianguo (2018b) in Bangladesh, SriLanka, Pakistan and India. Our results also corroborate Bara and Mudzingiri (2016) findings that plausible economic growth ably Granger cause the development of the Zimbabwean financial system, however the long term growth is positively determined by the level and form of financial development implicated.

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In the real context, the results are not farfetched from the significant contribution of the multibillion financial sector in positively growing the country's GDP. The liberalization of the sector since previous periods has consequentially imported new skill and technologies that seems to have revitalized and improved risk management and heightened the quality of services as instabilities to the sector have relatively been offset. This is demonstrated by the increased quality of service provision by the banks than in previous period. Although the investor confidence has been dynamic over the past periods but of late relatively stable, there have also been increasing intensity of domestic and private investors with increased demand for loans and credit from the banks which has been accompanied with some credit policies since a couple of years ago. This has seen the banks implore specific changes towards increasing their liquidity and the volume of credit while increasing the circulation of credits and activities of the intermediaries. However, due to the increasing dynamics, the leverage by financial development in appropriating and intermediating credits, managing the risks and quality service provision has not always been smooth due to the unpredictable short run dynamics from the macroeconomic and political backdrop. For instance, the latest domestic currency devaluation and dynamics in oil prices have had an effect on the real interest rates and the balance of payments as the negative response is evident in the declining financial development by Figures 1 and 2 since around 2016 but have appropriately controlled their shocks in Figure 3 and 4 that greatly slumps both short term growth and its development. The recent interventions by the central bank and fiscal authorities have relatively offset the dynamics as suggested in Figure 3 and 4 that are balanced after around 8 years and together with prudent capital formation, long term growth is likely to be achieved as envisioned in the "Vision 2030" blueprint.

6. CONCLUSION

Appropriate changes in financial development are largely known to cause growth. Inflation, gross capital formation and government expenditure, believably, succinctly controls the effects and causes growth. This paper analyzed this effects for Kenya paying exceptional attention on their asymmetric effects. The most reliable and important results supported that positive shocks of financial development increases long run growth unlike the negative shocks with reducing effects. Also, sustainable inflation, plausible gross capital formation and prudent state expenditure spurs the long term growth. With regard to the shocks, economic growth responds to the negative shocks in financial development with a steep slump and also steeply but with a surge to increasing capital formation shocks

It has been clarified that financial development which improves the level of financial services and goods, heightens credit availability, accumulation and circulation while increasing saving investments and on the other hand, prudently affecting the level of consumption investment and therefore economic activities, generally grows the economy. Similarly, an increasing level of financial goods and services is associated with an increase in economic growth but in case of declining financial deepening's, growth is also declined. This implies that there is need for implementation of specific policies if to achieve the expected long term growth. On the other hand, if inflation is raised to sustainable levels it would facilitate both an efficient financial sector and sustain booming economic activities. Similarly, if government expenditure is prudently executed and credibly managed versus an increasingly feasibly implemented capital formation, increasing economic growth would therefore be achieved. Perhaps what needs to be put in place are the specific policies that would offset(heighten) the declining(improving) financial developments and mitigate the negativities of government expenditures and inflation to growth. Moreover, the risk managers in the sector requires to robustly prepare against the negative shocks which greatly slumps the sector and declines economic growth at large than would be grown.

As put forward, the state which has been in dire necessity of macroeconomic transformations from the originally imperfect, relatively closed and centrally planned economy towards a self-sustaining open market, has in the most contemporary decades increased economic reforms in both infrastructural, institutional and socio-economic spheres (Hongo et al., 2020). Perhaps, this has integrated the temporal dynamics in the macroeconomic environment which together with the continually emerging technologies, they have altered the structure of the economy since recent periods of globalization. This paper negatively underscored this specification: We recommend the reexamination of the current study in account of regimes.

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