# Stock Exchange Development and Economic Growth in Sub-Saharan Africa

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**Abstract**

This paper analyzes the relationship between financial market development and economic growth in Sub-Saharan Africa (SSA). Although the existing literature suggests there is a positive and strong correlation between financial markets and economic growth, a clear causal link that would promote better policy decision-making is still vague. We perform a vector autoregressive (VAR) analysis by employing the GMM-VAR estimator for dynamic panel models. Our results suggest that financial markets in SSA can significantly influence GDP growth, but not vice versa. This finding is supportive of the opinion that emerging financial markets had played an important role in economic development.

**Key words:** economic growth, financial market, sub-Saharan Africa, dynamic panel model, GMM-VAR estimator.

**JEL classification:** O10 ; O16; O55

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**Abstract**

Over the last three decades, many countries in Sub-Saharan Africa (SSA) embraced the structural adjustment programs (SAPs) suggested by the World Bank and the International Monetary Fund. As a part of SAPs, many African countries began to reform their financial sectors and some countries established stock exchanges or expanded their existing ones. This paper analyzes the relationship between financial market development and economic growth in SSA. Motivated by the presence of incidental parameter and ambiguous causal direction between economic growth and financial development in the literature, we proposes to use the GMM-VAR approach to account for possible incidental variable bias associated with dynamic panel models. We construct a dynamic panel model to study 12 SSA countries over years 2000-2006. Our results suggest strong evidence of unidirectional causal link from stock markets development to economic growth. This finding is supportive of the opinion that emerging financial markets had played an important role in economic development. A useful implication of our study for policy makers in developing countries is that since stock market has played a critical role in boosting economic growth, fostering a well-functioning stock markets should be high on these countries' agenda.

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# 1 Introduction

Over the last three decades, several countries in Sub-Saharan Africa (SSA) embraced the structural adjustment programs (SAPs) suggested by the World Bank and the International Monetary Fund (IMF). SAPs entail three main transitions: (1) from state control to market-led development; (2) from authoritarianism to rule of law, and (3) from central control to constitutionalism (Sunstein, 1991). The transitions are interrelated and form the main pillars of a market economy to promote growth in SSA. As a part of SAPs, many African countries began to reform their financial sectors and some countries established stock exchanges or expanded their existing ones.

The role financial liberalization plays in African growth has attracted much attention of economists and policy makers, and the number of literature on empirical analyses of relationship between economic growth and financial development has grown persistently in the past two decades. We refer interested readers to Levine (1997, 2005) and Ajakaiye and Tarp (2012) for comprehensive surveys of recent developments in the field. Although most existing literature suggests strong and positive correlation between development of financial markets and overall economic growth, the evidence on direction of causal effects is still limited and mixed. This empirical ambiguity underlying finance-growth consensus is well documented by Andersen et al. (2012) and Harris (2012), arguing that current studies are still far from reaching an agreement on the direction of causal links. On the other hand, through the lens of government in developing countries, an adequately rigorous understanding of the causal links is critical for promoting better policy decision-making, especially in sequencing policies to promote economic growth driven by a developed financial sector.

Since the history of financial systems of African countries is relatively short, studies that explore the relationship between financial market development and economic growth typically rely on a panel with small number of cross-section units or time periods. Though there are numerous empirical papers attempting to seek correlation/association between developments of financial markets and overall economic growth in SSA, we note that most of them fail to take into account the panel nature of the data used in the analysis. This

oversight may lead to inconsistent estimation results, owing to the so called incidental parameter problem (Lancaster, 2000) in dynamic panel models. This limitation motivates the current study, which aims to provide robust analysis for the underlying finance-growth link by incorporating incidental parameter into a dynamic panel framework with recent data.

In particular, we investigate the causal relationship between stock exchange development and economic growth with recent data from SSA countries by applying an approach for panels with small number of cross-sectional units or time periods to tackle the incidental parameter problem. This paper makes two primary contributions to the literature: 1) we recognize the dynamic nature of the panel data and propose to use the GMM-VAR estimator to analyze finance-growth relationship in SSA countries; 2) using a recent panel of SSA countries we find strong evidence of unidirectional causal link from stock markets development to economic growth. This finding supports the argument that emerging financial markets have played an important role in economic development, at least for SSA countries.

The remainder of this paper is organized as follows. Section 2 reviews some literature that is most related to our study. Section 3 discusses the modeling framework of dynamic panel which we use to tackle the incidental parameter problem and identify the relationship between economic growth and financial development. Section 4 presents the data used in the analysis and empirical findings. The last section concludes.

## 2 Related literature

The causal relationship between economic growth and financial development has attracted the attention of a number of researchers and policy makers. For general overviews of the relevant studies, see e.g. Levine (1997, 2005), Andersen et al. (2012), Harris (2012), Murinde (2012), Pradhan et al. (2014) and Valickova et al. (2014). Although much efforts have been devoted to the field, there is still little consensus among the existing research as to the direction of causal link between finance and economic growth. This is well

documented by some recent studies focused on SSA countries. For instance, Akinlo and Egbetunde (2010) apply the vector error correction model (VECM) to study ten SSA countries and find that finance Granger causes growth in Nigeria, Congo Republic and Central African Republic (CAR) and bidirectional causal link is present in Kenya and South Africa during 1980 to 2005, while Ahmed (2010) using the same method demonstrates a two-way causality between finance and economic growth in CAR over 1976 to 2005. Enisan and Olufisayo (2009), also relying on VECM method, find that stock market development Granger causes economic growth in South Africa and unidirectional causality from growth to finance in Kenya, but find little evidence of causal link in either direction in Nigeria. Furthermore, Hassan et al. (2011) propose multivariate VAR models to explore this problem and suggest two-way causality in Algeria, Egypt, Morocco and Tunisia, whereas Abu-Bader and Abu-Qarn (2008a) use a similar approach and only find unidirectional causality from finance to economic growth in these states. Due to the space limit we do not attempt to list all inconsistencies in the literature, and would refer interested readers to Murinde (2012) for an excellent overview of recent studies.

From the small sample of examples mentioned above, it is clear that studies that cover largely identical regions and periods have arrived at different conclusions. There are at least two reasons that may have contributed to the inconsistency in terms of causal directions: measures of financial indicator and the models under consideration. First of all, there is no consensus on how to construct valid and convincing proxy measures of financial development based on the data available from different sources (King and Levine, 1993; Beck et al., 2000a; Chuah and Thai, 2004; Wolde-Rufael, 2009; Pradhan et al., 2013; among others). It is well known that empirical results are subject to the choices of measures and may produce different findings even when the same model is used. Secondly, inconsistencies may also arise due to model misspecification. As noted by Murinde (2012), most papers employ VAR or VECM to examine finance-growth relationship in SSA countries. Causal inference based on these models, however, needs to address unit root and cointegration among the covariates to avoid inconsistency. As a result, validity of causal inference is questionable if these typical relations in time series are not properly accounted for.

Recent studies also show evidence of threshold effect with large panels that include both developed and developing countries. In an influential paper by Calderón and Liu (2003) with a pooled data of 109 developing and developed countries from 1960 to 1994, they find financial deepening contributes more to the underlying causal relationship in the developing countries than in the industrial countries. This indicates that a threshold effect may exist in the finance-growth relationship. Law and Singh (2014) develop a threshold panel model to estimate this relationship with 87 developed and developing countries. They show that financial development may contribute to growth only up to a certain threshold. This nonlinear relationship is also supported by a number of studies including Deidda and Fattouh (2002), Rioja and Valev (2004), Ergungor (2008), and Arcand et al. (2012). Though a large body of studies do not have a consensus on the causal direction, most of them find a positive and statistically significant relationship between growth and finance.

Although the finance-growth problem in SSA has received relatively less attention than other regions in the literature, it is certainly of great importance to policy makers, and more work is needed as most existing research is still ambiguous in terms of the causal link in this region (Abu-Bader and Abu-Qarn, 2008a,b; Azman-Saini et al., 2010; Lee and Chang, 2009; Odhiambo, 2009; Wolde-Rufael, 2009; among others). In the current study we attempt to provide further empirical evidence on this debatable problem by using a more recent sample of Sub-Saharan African countries since the financial liberation.

# 3 Dynamic panel model

As discussed above, the existing literature suggests possible correlation between development of financial markets and overall economic growth. This link, however, is generally not causal, especially in cross-sectional studies. Investigations based on time series employ the concept of Granger causality to aid in establishing causal relationship. For the current study on African countries, since their history of financial system is relatively short, we rely on a panel of fourteen countries to explore the relationship between financial mar-

ket development and economic growth. This approach has been utilized in a number of existent works. To fully understand the dynamic interactions between financial market development and economic growth, vector autoregressive regression (VAR) method is employed. A typical VAR involves regressing a vector of potentially endogenous variables on a vector of lagged dependent variables and other control variables that are assumed to be exogenous in the system. The system can then be estimated using the conventional linear regression method.

To the best of our knowledge, Beck et al. (2000b) (henceforth BLL) first propose the use of panel GMM estimator to explore the relationship between economic growth and financial markets. However, most of the previous literature fails to take into account the panel nature of the data used in the analysis. Generally speaking, the panel GMM estimator has three advantages that improves upon previous cross-sectional studies. The first advantage of using a panel is the ability to harness the time and cross-sectional variations in the data. For example, BLL construct a panel that is averaged over seven 5-year periods for 77 countries over the period 1960-1995. One limitation of their model is that it may not precisely assess the finance growth link if the 5-year period is not a sufficient proxy for long-run relationship. Our panel improves upon BLL in not averaging over time, reflecting the fact that African financial markets has just developed in the past two decades.

The second advantage of using a panel is that it can remove the unobserved country fixed effect that may be correlated with the explanatory covariates, and avoid inconsistent estimation or the so called incidental parameter problem. The incidental parameter problem typically arises from the individual fixed effects which increases with the number of cross-sectional unit in a panel data. For static models, the individual effects can be removed by first differencing or de-meaning within each unit. However, they remain in the system after these transformations in a dynamic model for panel data. To see this, let us first look at a dynamic model with one single dependent variable for simplicity. Assume that there are $N$ cross-sectional units observed over $T$ periods. Let $i$ index the cross-sectional observations and $t$ the time periods. We first consider the following linear

dynamic model:

$$(3.1) \qquad y_{it} = \alpha y_{it-1} + x'_{it}\beta + \gamma_i + u_{it},$$

where $y_{it}$ and $y_{it-1}$ are the dependent variable and its one-period lag, $x_{it}$ is a set of explanatory variables, $\alpha$ and $\beta = (\beta_1, \beta_2, \ldots, \beta_k)'$ are the coefficients of the linear projections of $y_{it}$ on $y_{it-1}$ and $x_{it}$, $\gamma_i$ is an unobservable time-invariant individual effect, and $u_{it}$ is an idiosyncratic error term. The typical first differencing yields:

$$(3.2) \qquad y_{it} - y_{it-1} = \alpha(y_{it-1} - y_{it-2}) + (x_{it} - x_{it-1})'\beta + (u_{it} - u_{it-1}).$$

Although the individual effect has been removed, the simple OLS estimate is inconsistent due to the remaining correlation between $y_{it-1}$ and $u_{it-1}$ on the right-hand side, unless $\alpha = 0$. Hence, this presence of correlation and the resulting inconsistency is referred as incidental parameter problem in a panel dynamic setup. For a general overview of the recent development of dynamic panel modeling with incidental parameters, see Moon et al. (2013). There are generally two approaches to tackle the incidental parameter problem. One approach is to use a transformed maximum likelihood estimator that places distributional assumptions on the individual effects and the error terms. In addition, assumptions on the initial conditions are required to satisfy the distributional assumptions. Although fully asymptotically efficient if the models are correctly specified, the MLE approach is sensitive to model specification and distributional assumptions, especially for panels with small number of cross-sectional units or time periods. Due to this key limitation that is particularly severe for the panel data considered in this study, we do not consider the MLE in our investigation.

The third advantage of using a panel is that it allows the use of instruments for endogenous covariates and thereby offers more accurate estimation of finance growth link. Instead of fully distributional parameterization of the model, a second remedy for the incidental parameter problem, which resorts to orthogonality conditions, has been proposed in the literature. Anderson and Hsiao (1981) notes that because $y_{it-2}$ or $(y_{it-2} - y_{it-3})$ are

correlated with $(y_{it-1} - y_{it-2})$ but are uncorrelated with $(u_{it} - u_{it-1})$, they can be used, as an instrument for $(y_{it-1} - y_{it-2})$, to estimate $\alpha$ and $\beta$ by the instrumental variable (IV) method. When $y_{it-2}$ is used as an instrument, the minimum number of time periods is two, while at least three time periods is required if $(y_{it-2} - y_{it-3})$ are used as an instrument. Thus this approach can be used with short panels. In addition, no initial conditions are required for this IV approach.

It has been noted in the literature that quantities other than $y_{it-2}$ or $(y_{it-2} - y_{it-3})$ can be used as instruments as well. Arellano and Bond (1991) suggest that all $y_{it-2-j}$, $j = 0, 1, \ldots$, satisfy the moment conditions $E[y_{it-2-j}(y_{it-1} - y_{it-2})] \neq 0$ and $E[y_{it-2-j}(u_{it} - u_{it-1})] = 0$. Therefore, they are all legitimate instruments for $(y_{it-1} - y_{it-2})$. Letting $\triangle = 1 - L$, where $L$ denotes the lag operator and $q_{it} = (y_{i0}, y_{i1}, ..., y_{it-2}, x_i')$, where $x_i' = (x_{i1}', ..., x_{iT}')$. We have

$$E(q_{it} \triangle u_{it}) = 0, \quad t = 2, ..., T. \tag{3.3}$$

Stacking the $(T-1)$ first-differenced equations in matrix form, we have

$$\triangle Y_i = \alpha \triangle Y_{i-1} + \triangle X_i' \beta + \triangle u_{i,} \quad i = 1, ..., N. \tag{3.4}$$

where $\triangle y_i$, $\triangle y_{i-1}$[1] and $\triangle u_i$ are $(T-1)$ dimensional vectors of the form $(y_{i2} - y_{i1}, \ldots, y_{iT} - y_{iT-1})'$, $(y_{i1} - y_{i0}, \ldots, y_{iT-1} - y_{iT-2})'$, $(u_{i2} - u_{i1}, \ldots, u_{iT} - u_{iT-1})'$ respectively, and $\triangle x_i$ is the $(T-1) \times K$ matrix of $(x_{i2} - x_{i1}, \ldots, x_{iT} - x_{iT-1})'$. This is a system of equations consisting of $T(T-1)(K+1/2)$ orthogonality conditions. Arellano and Bond (1991) suggest a generalized method of moments (GMM) estimator for this model, in which the optimal weighting matrix is taken as the inverse of a consistent estimate of the covariance matrix of the errors. Since the number of moment conditions is generally greater than $(K+1)$, the model is over-identified. (For details on dynamic panel models, see, e.g., Chapter 5 of Hsiao, 2003).

[1] Ahn and Schmidt (1995) note that the homoscedasticity conditions on the errors provide additional moment conditions. These extra moments conditions are not used in the current study as higher order moments can be sensitive to outlying observations, especially when the sample size is small.

Lastly because the causal relationship between the financial market development and economic growth may run into either direction, the GMM-VAR estimator for dynamic panel models proposed by Holtz-Eakin et al. (1988) is employed to explore the causal direction(s) in our analysis. The dependent variables include per capita GDP and indicators of financial market development for each country-year.

# 4 Estimation and empirical results

## 4.1 Data

This subsection briefly describes the primary variables and their sources used in this analysis. The panel dataset, collected and pooled from various sources, includes annual observations from 2000 to 2006 for 12 SSA countries, most of which contain major stock markets in the Sub-Saharan area. We summarize in Table 1a an overview of opening dates and number of listed companies of stock exchange markets in SSA countries, most of which emerged in the past two decades.

*Table 1a* — Overview of Emerging Financial Markets in Sub-Saharan Africa (SSA)

| Countries | Stock exchange markets | Openning date | Listings |
|---|---|---|---|
| Botswana | Botswana Stock Exchange (BSE) | 1989 (1995)* | 44 |
| Cote d'lvoire | Bourse Rï¿œgionale des Valeurs Mobiliï¿œres SA (BRVM) | 1998 | 39 |
| Ghana | Ghana Stock Exchange (GSE) | 1991 | 34 |
| Kenya | Nairobi Securities Exchange (NSE) | 1954 (1988) | 60 |
| Mauritus | Stock Exchange of Mauritus | 1989 | 88 |
| Namibia | Namibian Stock Exchange (NSX) | 1992 | 34 |
| Nigeria | Nigerian Stock Exchange (NSE) | 1960 (1999) | 223 |
| Swaziland | Swaziland Stock Exchange (SSX) | 1990 | 10 |
| Tanzania | Dar es Salaam Stock Exchange (DSE) | 1996 | 17 |
| Uganda | Uganda Securities Exchange (USE) | 1997 | 17 |
| Zambia | Lusaka Stock Exchange (LuSE) | 1994 | 16 |
| Zimbabwe | Zimbabwe Stock Exchange (ZSE) | 1993 | 81 |

*Source*: Official stock exchanges websites.

* Bracket denotes an expansion date of the stock market.

In Table 1b we present descriptive statistics for the variables under consideration in our models. Since one of the most common indicator of economic growth in literature is gross

domestic product (GDP) per capita, we assess economic growth by annual growth rate of GDP per capita in dollar values collected from IMF (2006). Two market relevant variables, market capitalization and market liquidity, were acquired from the reports submitted by the stock exchanges. They were estimated as total value of listed companies and total value of stocks traded over GDP, respectively. We use the annual growth rate of market capitalization as a measure of financial market growth in the model. For the main analyses presented below, we will focus on the interaction between growth of GDP and market capitalization. In Figure 1 we provide time-series plots of 12 SSA countries' annual growth of GDP and financial market. Though Figure 1 may seem rough at first glance, it indeed conveys important information that GDP and financial market do not always grow together in most SSA countries.

*Table 1b* — Descriptive Statistics

| Variables | Unit of measurement | Mean | Std. dev. | Max | Min |
|---|---|---|---|---|---|
| GDP per capita | U.S. dollars | 1475.59 | 1679.59 | 6756.44 | 224.71 |
| Market Capitalization | % of GDP | 24.52 | 58.42 | 530.02 | 0.54 |
| Liquidity | % of GDP | 40.05 | 30.109 | 114 | 2 |
| Saving Rate | % of GDP | 18.87 | 13.55 | 56.60 | 0.60 |
| Foreign Direct Investment | Millions in U.S. dollars | 332.3 | 690.52 | 5445 | -50 |
| Political Rights | Degree of improvement | 3.99 | 1.87 | 7 | 1 |
| Civil Liberties | Degree of improvement | 3.75 | 1.33 | 6 | 1 |

*Countries:* Botswana, Cote d'Ivoire, Ghana, Kenya, Mauritus, Namibia, Nigeria, Swaziland, Tanzania, Uganda, Zambia, Zimbabwe. (Number of countries: N = 12; Years T =2000 - 2006.)

We consider foreign direct investment (FDI) as a key variable that may play an influential role in economic growth, therefore it is taken into account in our analysis. Data on FDI in dollar values came from the *World Investment Report* of 2007 released by the United Nations conference on Trade and Development (UNCTAD). It should be noted that many existing studies suggest saving rate is an essential component for the development of stock exchange market, thus in the model we employ the data on saving rate from the *African Development Indicators* of 2007 provided by the World Bank.

Since in developing countries political climate is an important factor that may affect economy dramatically, we obtain data on political rights and civil liberties from Freedom House[2], such that we can explore whether and how they may exert influences on the

[2] http://freedomhouse.org/report/freedom-world/freedom-world-2015#.Vk-P5fmrSUl

growth of economy and stock exchange market. The scoring approach to both variables is quite straightforward. For example, a score of 1 in political rights means citizens in a country enjoy complete political freedom, while a score of 7 means complete dictatorship. Similarly, civil liberties is also defined using the same scoring approach by an 1 to 7 scale.

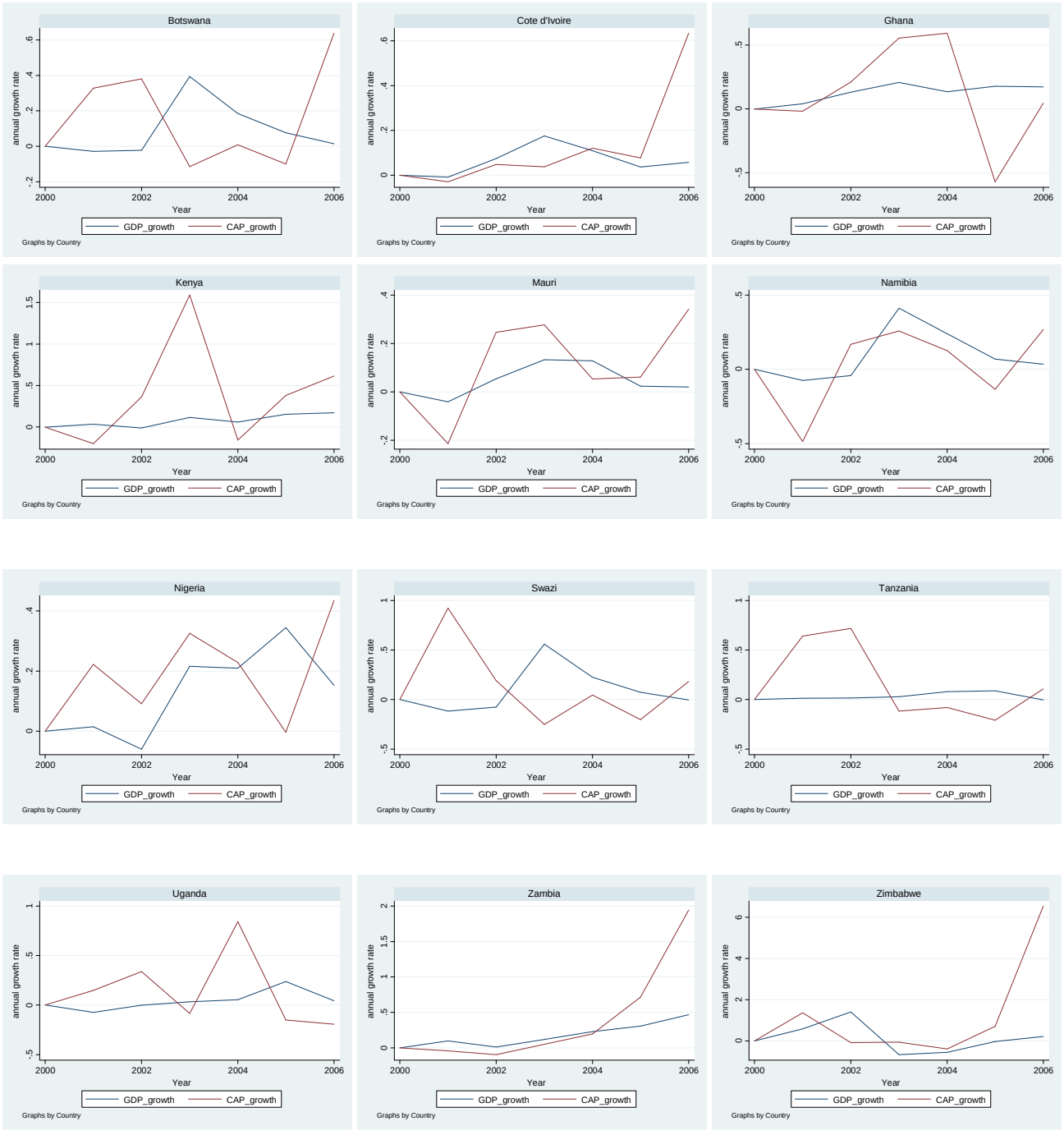


**Figure 1.** Annual Growth Rate of GDP and Financial Market in SSA Countries (2000-2006)

### 4.2 Panel model estimation and empirical results

Our data cover 12 countries for the period 2000-2006 for a total of 84 observations. The VAR model on economic growth and financial market development is given by the following equations:

$$gGDP_{it} = \alpha_{11} gGDP_{it-1} + \alpha_{12} gMKTCAP_{it-1} + \alpha_{13} Liquidity_{it-1} + x_{it}^{'}\beta_1 + \gamma_{1i} + u_{it}, \tag{3.1}$$

$$gMKTCAP_{it} = \alpha_{21} gGDP_{it-1} + \alpha_{22} gMKTCAP_{it-1} + \alpha_{23} Liquidity_{it-1} + x_{it}^{'}\beta_2 + \gamma_{2i} + \epsilon_{it}, \tag{3.2}$$

$$Liquidity_{it} = \alpha_{31} gGDP_{it-1} + \alpha_{32} gMKTCAP_{it-1} + \alpha_{33} Liquidity_{it-1} + x_{it}^{'}\beta_3 + \gamma_{3i} + v_{it}, \tag{3.3}$$

where $gGDP_{it}$ is the annual growth of GDP per capita, $gMKTCAP_{it}$ and $Liquidity_{it}$ are the indicators of market capitalization growth and liquidity, $x_{it}$ is a vector of explanatory variables including saving rate, foreign direct investment, indicators for political rights and civil rights, and a set of yearly dummies. The VAR-GMM estimator for dynamic panel models of Holtz-Eakin et al. (1988) is used in the estimation, in which the instrumental variables include lagged independent variables, and lagged differenced dependent variables as discussed in section 2.

For the sake of comparison with alternative specifications, below we first report estimation results based on a simple panel VAR model, without accounting for the incidental parameter bias. Table 2 contains the panel VAR results on GDP and stock market development indicators that suggest liquidity plays little role in economic development and financial markets, hence it is excluded from our following models.[3] Our model then consists of a bivariate dynamic VAR system with two dependent variables: GDP growth and growth of MKTCAP. Note also that in this preliminary analysis, growth of MKTCAP has a significant effect on GDP growth at the 1 percent significance level, and we shall return to this point in the following models.

[3]The GMM-VAR estimate also reports little statistical significance of liquidity. To save space, results on this variable are not reported; they are available from the authors upon request.

Table 3 presents the results of fixed-effect panel VAR model (columns 1 and 2) and GMM-VAR model (columns 3 and 4). Columns 1 and 2 show that the results are consistent with the VAR models reported in Table 2; the coefficient of growth of MKTCAP still remains significant, while GDP growth appears to have little effect on growth of MKTCAP. Since this model do not take into account potential incidental parameter bias, we then estimate the models using GMM-VAR estimator for dynamic panels.

*Table 2*— Panel VAR Model

| | (1) | (2) | (3) |
|---|---|---|---|
| Dependent variable | $gGDP_{it}$ | $gMKTCAP_{it}$ | $Liquidity_{it}$ |
| $gGDP_{it-1}$ | -0.000044 | 0.000089 | 3.8357*** |
| | (0.00033) | (0.01168) | (1.3633) |
| $gMKTCAP_{it-1}$ | 0.2505*** | 0.4169 | 0.3642 |
| | (0.8212) | (0.2862) | (0.8956) |
| $Liquidity_{it-1}$ | 0.00094 | 0.03378 | 0.773*** |
| | (0.1125) | (0.03922) | (0.1126) |
| $FDI_{it}$ | -0.000029 | -0.00022 | -0.000269 |
| | (0.000051) | (0.000177) | (0.00048) |
| Saving $Rate_{it}$ | 0.00546 | 0.010434 | -0.00448 |
| | (0.0037) | (0.01306) | (0.02806) |
| Political $Rights_{it}$ | -0.0091 | -0.04748 | 0.15709 |
| | (0.0408) | (0.14238) | (0.45522) |
| Civil $Liberties_{it}$ | 0.00377 | 0.17288 | 0.0847 |
| | (0.06233) | (0.2173) | (0.6666) |
| Year 3 | 0.02492 | -0.15949 | -1.6898 |
| | (0.09781) | (0.34095) | (1.0952) |
| Year 4 | 0.04606 | -0.14188 | 0.70034 |
| | (0.09786) | (0.34115) | (1.105) |
| Year 5 | 0.00706 | -0.1424 | -2.5257** |
| | (0.09884) | (0.3445) | (1.1185) |
| Year 6 | 0.0828 | -0.11116 | -0.70449 |
| | (0.09887) | (0.3446) | (1.0970) |
| Year 7 | 0.09708 | 0.8958** | -1.0866 |
| | (0.10224) | (0.3564) | (1.1308) |
| Observations | 84 | 84 | 84 |

*Notes:* Standard errors are in brackets under coefficients.
*, ** and *** denote 10%, 5% an 1% significant levels.

Again, the results of GMM-VAR model indicate strong effect of growth of MKTCAP on GDP growth; at the same time, GDP growth has little effects on stock market growth. Although the coefficient for the growth of MKTCAP on GDP growth remains virtually identical, its statistical significance decreases from 1% to 10%, a marginally significant level. The qualitatively similar results from these specifications therefore provide credible evidence to the argument that financial markets promotes economic growth, but not vice versa.

*Table 3* — Fixed-effect Panel VAR Model and GMM-VAR Model

| | (1) | (2) | (3) | (4) |
|---|---|---|---|---|
| Dependent variable | $gGDP_{it}$ | $gMKTCAP_{it}$ | $gGDP_{it}$ | $gMKTCAP_{it}$ |
| $gGDP_{it-1}$ | -0.00255 | -0.254 | 0.01650 | 0.1442 |
| | (0.1284) | (0.436) | (0.0804) | (0.2168) |
| $gMKTCAP_{it-1}$ | 0.2665*** | 0.47698* | 0.265* | 0.390* |
| | (0.0829) | (0.281) | (0.1586) | (0.2215) |
| $FDI_{it-1}$ | 0.00016 | -0.00024 | 0.000088 | 0.00048 |
| | (0.00017) | (0.00059) | 0.00018 | (0.00068) |
| Saving $Rate_{it-1}$ | 0.01291 | -0.0226 | 0.0126 | -0.0115 |
| | (0.0079) | (0.0268) | (0.015) | (0.024) |
| Political $Rights_{it-1}$ | 0.03845 | 0.2593 | 0.0922 | 0.946 |
| | (0.06835) | (0.2322) | (0.0779) | (0.538)* |
| Civil $Liberties_{it-1}$ | -0.1252* | 0.1548 | -0.205 | -0.1685 |
| | (0.0718) | (0.2442) | (0.1492) | (0.2333) |
| Growth $MKTCAP_{it-1}$ | 0.0166 | 0.0732 | 0.0237 | 0.0639 |
| | (0.0131) | (0.0445) | (0.0157) | (0.064) |
| Year 2 | | | 0.0097 | -0.7601 |
| | | | (0.069) | (0.462)* |
| Year 3 | 0.02347 | -0.1761 | 0.0399 | -0.878 |
| | (0.0996) | 0.3386 | (0.074) | 0.541 |
| Year 4 | 0.06216 | -0.0764 | 0.0950 | -0.7477 |
| | (0.1018) | (0.3458) | (0.1014) | (0.4206)* |
| Year 5 | -0.03217 | -0.1798 | -0.0096 | -0.7642 |
| | (0.1064) | (0.3614) | (0.0754) | (0.418)* |
| Year 6 | -0.03699 | -0.1998 | -0.0293 | -0.8777 |
| | (-0.106) | (0.3611) | (0.0487) | (0.2871)*** |
| Year 7 | -0.01061 | 0.7686** | | |
| | (0.1048) | (0.356) | | |
| Observations | 84 | 84 | 84 | 84 |

*Notes:* Standard errors are in brackets under coefficients of column 1 and 2.
Robust standard errors are in brackets under coefficients of column 3 and 4.
*, ** and *** denote 10%, 5% an 1% significant levels.

# 5 Concluding remark

Motivated by the presence of incidental parameter and ambiguous causal direction between economic growth and financial development in the literature, this paper proposes to use the GMM-VAR approach of Holtz-Eakin et al. (1988) to account for possible in-

cidental variable bias associated with dynamic panel models. We construct a dynamic panel model to study 12 Sub-Saharan countries over years 2000-2006. We find strong evidence of unidirectional causal link from stock markets development to economic growth. Our findings support the results of Pradhan et al. (2013), Kolapo and Adaramola (2012), Enisan and Olufisayo (2009), among many others. A useful implication of our study for policy makers in developing countries is that since stock market has played a critical role in boosting economic growth, fostering a well-functioning stock markets should be high on these countries' agenda.

Finally, we want to point out some questions that are not fully answered by our study. For example, it is desirable to know how the microstructure of financial markets affects economic growth. In particular, an ideal study would consider how the stock markets, banks and various financial intermediaries interact with each other and identify the extent to which these interactions may exert an influence on SSA economies. Another interesting and open question relates to the aftermath of financial crisis in 2008. Understanding how the financial sector of an economy responds to exogenous negative shocks is of great importance, whereas literature on designing plausible policies for financial markets to resist shocks in SSA countries remains silent so far, which is in sharp contrast to numerous studies of industrial countries. We expect to see more endeavors are devoted to this area in the near future.

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