Stock Market Development in Africa: do all macroeconomic financial intermediary determinants matter?

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22. November 2010

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Abstract

This study brings light to some financial intermediary development factors that could negate stock market development, as well as those that could improve it. Using a panel of eight countries, from 1989 to 2008, we derive indexes via Principal Component Analysis; based on which panel fixed effect regressions are performed. The principal edge of this work is that, in policy making, not all aspects of financial intermediary development should be prioritized for stock market development.

Keywords: Financial intermediary development, Stock market development, Africa.

1. INTRODUCTION

A great many studies have been carried-out on Stock Market Development(SMD) and economic growth, as well as Financial Intermediary Development(FID) and economic growth. However, for reasons not apparent, little research attention has been placed on the link between financial intermediary development and stock market development. This study aims to:(1) investigate the relationship between a plethora of SMD proxies and FID indicators; (2) discover FID indictors on which SMD could rely ; and (3) present a case for caution in unambiguous assimilation of FID to SMD in the context of sampled countries.

It has been well established for the most part that, improving finance could lead to investment(Ndikumana,2000; Misati and Nyamongo,2010) and growth(Spears, 1992) in Sub-Saharan Africa(SSA). However, research attention has not been focused on the distinction between FID and SMD in this finance role. There has been a general assumption that FID and SMD move hand in glove. More so, the relation between these two factors in finance has not been in research spotlight. First presented by Demirgüç-Kunt and Levine(1993) as a research agenda requiring urgent attention, it will be addressed two years later. Demirgüç-Kunt and Levine(1995), in studying this relationship from indicators of 41 countries; collected between 1986 and 1993, establish that; well development stock markets have highly development financial intermediaries. Their answer to the question as to whether countries with well developed stock markets also have well developed bank and non-bank financial intermediaries is unequivocally "yes" (p.26),. However, it is worthwhile mentioning that, their report is based on correlation analysis(see tables, 15, 16,17,18); and correlation doesn't necessary imply causation. African countries in the study are: South Africa, Nigeria and Zimbabwe; thus just under 10% of sample. Our sample will entirely consist of African countries and will not be limited to correlation analysis.

He and Pardy(1993), via correlation analysis establish that, financial deepening leads to SMD. The limit of this study is its basis on correlation analysis and, as we have pointed out before, correlation is not synonymous to causation. Naceur et al (2007) see with Pardy in confirming financial depth and private credit as determinants of SMD in Middle-Eastern and North Africa region. Catalan et al(2000) using Granger causality show; contractual savings increase the supply of long-term funds and develop capital markets in an economy. Naceur et al(2007) also confirm the positive dimension savings have on financial market improvement. In our study, we shall endeavor to verify if afore findings are typical of the African context.

2. DATA and METHODOLOGY

Indicators are obtained from the latest version(Demirgüç-Kunt and Beck,2009) of Financial Development and Structure Database(Demirgüç-Kunt et al,1999) . S.M.D indicators include: stock market capitalization on GDP-*smktcap*; stock market total value traded on GDP-*stvaltraded*; and stock market turnover ratio on GDP-*stturnover*. F.I.D proxies include: liquid liabilities on GDP-*llgdp*; deposit money bank assets on deposit money plus central bank assets-*dbacba*; private credit by deposit banks on GDP-*pcrdbgdp*; bank deposits on GDP-*bdgdp*; financial system deposit on GDP-*fdgdp*. Due to data unavailability for most counties in the continent, we are bound to limit our study to eight countries over a spell of 20 years; from 1989 to 2008. To prevent regression problems resulting from multicolinearity, we proceed to narrow down our variables into components that reflect a great proportion of initial information, by virtue of correlation and principal component analyses.

2.1 Principal Component Analysis(PCA)

Like Gries et al(2009), via PCA, we are able to reduce the dataset to lower dimensions, while retaining as much information as possible from the original set. Based on initial correlation analysis(see appendix), we club FID variables in two categories(llgdp, dbacba, fdgdp / pcrdbgdp, bdgdp) and narrow them down based on Kaiser 1 criterion(Kaiser, 1960)[2].Upon this process, we derive two principal components or indexes reflecting 95.55% and 89.35% of initial information in respective categories. As for our SMD indicator, the index resulting from PCA yields 86.77% of total initial variation. However, contrary to Gries et al, our first principal components are fully reflective of initial data sets; given their high Eigen values and corresponding variation proportion(see table 1, page 3; Gries et al, 2009). Our results on dataset dimension reduction are summarized on Table I.

Table I: Results of PCA and corresponding indexes

Principal Components	Indexes	Eigen value	PC %	Component Matrix		
				llgdp	dbacba	fdgdp
F.I.D Components	Findex1	2.8664	95.55%	0.578	0.568	0.586
				pcrdgdp	bdgdp	
	Findex2	1.7870	89.35%	0.707	0.707	
				smktcap	stvaltraded	stturnover
S.M.D component	Smdex	2.6030	86.77%	0.573	0.598	0.560

Notes: Findex1 and Findex2 are first principal components of two distinct financial intermediary data sub sets. Smdex is the index for stock market development. PC; denotes, principal component. All three resulting indexes respect Kaiser 1 criterion.

[2] Kaiser 1 criterion stipulates that, Principal components whose Eigen values are above one should be retained.

2.2 Panel unit root tests

In a bid to test stationary properties of our data set, we assume individual unit roots and opt for Im, Pesaran and Shin-IPS(Im et al,2003) panel unit root test because, it is more powerful than Levin, Lin and Chu-LLC(2002) and Fisher tests. We shall not indulge in the mathematics of this test because, it is widely used and constitutes just an exploratory venture of our analysis. However, since testing for stationarity involves autoregression processes, the choice of optimal lags is crucial for quality of results. Thus as shown by Khim and Liew(2004), lag length selection based on Akaike Information Criterion(AIC) and Final Prediction Error(FPE) are best when observations in cross sections are below 60; such is our case; therefore, the criterion justifying our the unit root testing model reflects data structure(goodness of fit) will be AIC. In interpreting our results, we shall put more emphasis on deterministic components that assumes the absence of a trend because, there's loss of power when a time trend is included[3]. Since the IPS test is an average t-test, we also endeavor to show intermediate Augmented Dickey Fuller(ADF) tests; which provide some justification for our choice of panel regression. The spirit behind this disclosure, is also the show the difficulty of performing regression on a countries basis: since presence of unit roots(non stationarity) is object of Findex1 and Findex2; even at first difference series. Consistent with Table II, our results on integration properties reveal all indexes are integrated of order 1:I(1).

[3] In the IPS test, for either level or first difference series, the presence of a 'constant' presents a more powerful test than, in the case where both a 'constant and trend' are considered.

Table II: Intermediate ADF and panel unit root tests

Variables	Level		First difference	
	c	ct	c	ct
Botswana	-1.6893	-1.5637	-3.2059**	-3.1200
Côte d'Ivoire	-0.2497	-0.8858	-4.4172***	-4.2325**
Egypt	-0.9520	-2.9127	-3.5298**	-3.3034*
Mauritius	-2.8216*	-2.4950	-4.5831***	-4.8839***
Nigeria	1.9047	-2.1258	-1.4399	-6.2549***
South Africa	3.0143	-2.4765	-2.2334	-2.6495
Tunisia	-2.3361	-2.5963	-4.6462***	-4.5430**
Zambia	-3.4839**	-3.2954	-5.3218***	-5.0231**
		Panel(IPS test)		
Smdex	1.975	-0.490	-6.263***	-6.144***
	c	ct	c	ct
Botswana	1.7191	0.1451	-2.6326	-3.1858
Côte d'Ivoire	-1.6465	0.0992	-2.8898*	-3.0673
Egypt	-1.8559	-4.3628**	-2.0822	-1.9775
Mauritius	-1.5151	-3.5474*	-3.5503**	-3.4732*
Nigeria	-1.3752	-2.0886	-3.5211**	-3.6064*
South Africa	-1.3312	-3.6757*	-1.8299	-1.7830
Tunisia	-0.5239	-2.6702	-2.7925*	-2.8815
Zambia	0.3115	-0.7997	-4.0509***	-4.1084**
		Panel(IPS test)		
Findex1	2.000	0.036	-4.174***	-2.632***
	c	ct	c	ct
Botswana	0.8332	-0.5061	-2.7235*	-2.8916
Côte d'Ivoire	-2.0464	0.1839	-2.3426	-3.3678*
Egypt	-1.6551	-2.3355	-0.4916	-0.7346
Mauritius	-0.5231	-3.7243**	-3.6391**	-3.4684*
Nigeria	-0.4658	-1.8499	-3.1045**	-3.2844
South Africa	0.9714	-2.3166	-2.1772	-2.2386
Tunisia	-0.6969	-2.6504	-2.8168*	-2.8898
Zambia	0.1638	-1.9951	-1.4355	-1.9903
		Panel(IPS test)		
Findex2	3.102	0.605	-2.462***	-1.378*

*,**,***; denote rejection of null hypothesis(unit root) at 10%, 5% and 1% respectively. 'c-constant; 'ct-constant and trend'. Maximum lags are 2 while, optimal lags are chosen via AIC.

3. EMPIRICAL ANALYSIS

3.1 Model Formulation

Lets consider the following panel:

$$Smdex_{it} = \gamma_{0i} + \gamma_{1i} Findex1_{it} + \gamma_{2i} Findex2_{it} + \varepsilon_{it} \quad \ldots\ldots\ldots\ldots\ldots..(1)$$

With: $i = 1,2,...,8$ countries; over time $t = 1,2,...,20$. We hypothetically state that SMD Index(Smdex) depends on two types of FID indexes(Findex1 and Findex2). Having formulated our model, we shall need to specify it; based on whether there is presence of homoscedasticity/heterscedasticity and fixed/random effects. Such is made possible with the help of Breusch-Pagan and Hausman tests for model specification.

3.2 Model Specification

Table III: Hausman and Breusch-Pagan tests for model specification

Dependent variable (Smdex)	Independent variables(Findex1 and Findex2)
Hausmann Test (H-test)	H_0 : Random Effect H_1: Fixed Effect Chi-square(1) = 14.794[0.000]***
Breusch-Pagan test(B.P-test)	H_0: homoscedasticity H_1: heteroscedasticity Chi-square(2) = 5.698[0.016]**
Model Specification	Panel Generalized Least Squares with Fixed Effect

*,**,**: denote significance at 10%, 5% and 1%. Both tests follow a Chi-square distribution.

As shown on Table III; the use of Ordinary Least Squares(OLS) and regression by Random Effects(R.E) are rejected by B.P-test and H-test respectively. Thus our panel regression will be of Generalized Least Squares(GLS) with Fixed Effect(FE).

3.3 Empirical results

Table IV: Regression by Generalized Least Squares and Least Absolute Deviation

Dep. Vble	GLS with Fixed Effects(FE)			Robust Estimation by LAD[4]		
d_Smdex	Constant	d_Findex1	d_Findex2	Constant	d_Findex1	d_Findex2
Coefficients	0.082**	-0.968*	1.666**	0.046***	-0.729**	1.308**
S.E	0.034	0.502	0.689	0.011	0.360	0.536
Student. T	2.401	-1.926	2.417	3.995	-2.023	2.437
R^2	22%					

*,**,**: denote significance at 10%, 5% and 1%. G.L.S: Generalized Least Squares. LAD: Least Absolute Deviation. All indexes used are in their first difference(d_). R^2: Coefficient of determination. S.E: Standard Error.

Results, following Table IV point to the fact that, with respect to the coefficient of determination, a 1% GDP increase in Findex1, will almost decrease stock market development by a similar percent of GDP(0.97%). Findex2 on its part shows a positive relationship with stock market development (1% increase in Findex2 percent of GDP will increase Smdex by 1.66% of GDP).

In a bid to test robustness of our results we further regress Smdex on Findex1 and Findex2 using Least Absolute Deviations(LAD) because ; (1) our variables at first difference still reveal a few outliers; (2)one of the characteristics of cross sections in our panel is the presence of FE[5]. Robust estimation by LAD confirm our results by GLS. In order to pin-point the role of constituents indexes in the results just obtained, we break down our initial model into two sub-models; thus making sure, variables in three indexes are dissected and elucidated.

[4] Least Absolute Deviations

[5] Suffice to mention that, regression by Least Absolute Deviations(LAD) is robust in the presence of outliers and fixed effects.

3.4 Robustness tests

3.4.1 Model formulation

$$Stvaltraded_{it} = \gamma_{0i} + \gamma_{1i} Findex1_{it} + \gamma_{2i} pcrdbgdp_{it} + \gamma_{3i} bdgdp_{it} + \varepsilon_{it} \quad \ldots\ldots\ldots\ldots(2)$$

$$Stmkcap_{it} = \gamma_{0i} + \gamma_{1i} Findex2_{it} + \gamma_{2i} LLgdp_{it} + \gamma_{3i} dbacba_{it} + \gamma_{4i} fdgdp_{it} + \varepsilon_{it} \quad \ldots..(3)$$

3.4.2 Unit root tests

Table V: Heterogeneous panel unit root tests(IPS test statistics)

	Level		First difference	
Variables	c	ct	c	ct
llgdp	0.212	0.527	-4.283***	-2.767***
dbacba	1.993	0.899	-3.324***	-2.399***
fdgdp	3.287	0.348	-3.897***	-2.382***
pcrdgdp	1.464	-0.304	-2.664***	-1.389*
bdgdp	3.338	0.287	-3.578***	-2.191**
stmkcap	1.702	0.679	-5.133***	-2.810***
stvaltraded	3.073	0.825	-5.232***	-5.732***

*,**,***; denote rejection of null hypothesis(unit root) at 10%, 5% and 1% respectively. 'c-constant; 'ct-constant and trend'. Maximum lags are 2 while optimal lags are chosen via AIC.

3.4.3 Model(s) specification

Table VI: Hausman and Breuch Pagan tests for model specification

Model 2(Dep. Vble: d_stvaltraded)	Model 3(Dep. Vble: d_stmkcap)
Independent variables d_Findex1 d_pcrdgdp, d_bdgdp	Independent variables d_Findex2 d_llgdp ,d_dbacba ,d_fdgdp
B.P: 41.8531*** H: 12.176*** GLS with Fixed Effect	B.P: 4.730** H: 18.141 *** GLS with Fixed Effect

*,**,**: denote significance at 10%, 5% and 1%. Both tests follow a Chi-square distribution. Dep. Vble: Dependent Variable. All indexes used are in their first difference(d_). H: Hausman test. B.P: Breusch-Pagan test.

3.4.4 Panel regressions

Table VII: Panel regression of Model 2

Dep. Vble		Independent Variables		
d_stvaltraded	Constant	d_Findex1	d_pcrdgdp	d_bdgdp
Coefficients	0.009*	-0.271**	1.038***	1.733**
S.E	0.0055	0.131	0.359	0.822
Student-t	1.794	-2.061	2.889	2.107
R^2	37.38%			

*,**,**: denote significance at 10%, 5% and 1%. G.L.S: Generalized Least Squares. LAD: Least Absolute Deviation. All indexes used are in their first difference(d_). R^2: Coefficient of determination. S.E: Standard Error.

Table VIII: Panel regression of Model 3

Dep. Vble		Independent Variables			
d_stmkcap	Constant	d_Findex2	d_llgdp	d_dbacba	d_fdgdp
Coefficients	0.042***	0.380*	1.560*	-1.336**	-2.260**
S.E	0.009	0.204	0.863	0.593	1.109
Student. T	4.430	1.861	1.808	-2.250	-2.038
R^2	21.09%				

*,**,**: denote significance at 10%, 5% and 1%. G.L.S: Generalized Least Squares. LAD: Least Absolute Deviation. All indexes used are in their first difference(d_). R^2: Coefficient of determination. S.E: Standard Error.

3.5 Discussion of Results and Recommendation

Results from our additional robustness check from two sub models confirm signs and significance of coefficients of initial model. Based on our findings: (1) from the first model ,the relationship between FID and SMD is not necessarily positive as hypothesized by literature(Demirgüç-Kunt and Levine, 1993; Naceur et al ,2007); (2) increase in deposit bank assets with respect to central bank assets as well as, increase in financial system deposits have a negative bearing on stock market capitalization; (3) role of financial deepening on African stock market capitalization confirms an earlier work by He and Pardy(1993); (4) private credit and bank deposits(Catalan et al,2000) improve stock value traded.

For sampled countries, we recommend critical analysis to be taken before unambiguously equating all aspects of FID to SMD. Further research could be tilted towards investigating factors that cause some FID indicators to negatively affect SMD.

4. CONCLUSION

With globalization and financial disintermediation, the need for stock markets has been on the rise. Our study presents some evidence on that fact that, contrary to popular sentiments and mainstream literature, certain aspects of financial intermediary development could be detrimental to stock market development. It is our optimism that, this study would provide some basis for in depth research on the link between these two entities of finance.

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Appendix

1. Computation of Stock market Index(Smdex)

Correlation Matrix :

stmktcap	stvaltraded	stturnover	
1.0000	0.8707	0.7050	stmktcap
	1.0000	0.8211	stvaltraded
		1.0000	stturnover

Principal Component Analysis(Analysis of Eigen values from correlation matrix)

Component	Value	Eigen Proportion	Cumulative
1	2.6030	0.8677	0.8677
2	0.2940	0.0980	0.9657
3	0.1029	0.0343	1.0000

Eigen Vectors

Variables	PC1	PC2	PC3
stmktcap	0.573	0.631	0.523
stvaltraded	0.598	0.114	-0.793
stturnover	0.560	-0.767	0.312

2. Computation of first Financial Index (Findex1)

Correlation Matrix

llgdp	dbacba	fdgdp	
1.0000	0.8928	0.9760	llgdp
	1.0000	0.9314	dbacba
		1.0000	fdgdp

Principal Component Analysis(Analysis of Eigen values from correlation matrix)

Component	Value Eigen	Proportion	Cumulative
1	2.8664	0.9555	0.9555
2	0.1149	0.0383	0.9938
3	0.0187	0.0062	1.0000

Eigen Vectors

Variables	PC1	PC2	PC3
llgdp	0.578	0.556	0.598
dbacba	0.568	-0.800	0.194
fdgdp	0.586	0.228	-0.778

3. Computation of second Financial Index (Findex2)

Correlation Matrix

corr(pcrdbgdp, bdgdp) = 0.78699578

Principal Component Analysis(Analysis of Eigen values from correlation matrix)

Component	Value Eigen	Proportion	Cumulative
1	1.7870	0.8935	0.8935
2	0.2130	0.1065	1.0000

Eigen Vectors

Variables	PC1	PC2
pcrdbgdp	0.707	-0.707
bdgdp	0.707	0.707