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Full Length Research Paper

Stock Market Performance and Economic Growth in Morocco

Joerg Wild[1] and Hind Lebdaoui[2]

[1]Shanghai University of Finance and Economics, School of Finance, Shanghai, China joerg.wild@gmail.com
[2]Shanghai University of Finance and Economics, School of Finance, Shanghai, China hind.encg@gmail.com

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This paper explores the relationship between stock market development and economic growth in Morocco for the period from 2000 to 2013 on quarterly basis. As proxies for stock market development, we choose the Morocco All Shares Index (MASI), market liquidity, market capitalization and a principal component analysis based stock market development index. After testing for cointegration, the dynamic interactions between GDP growth and stock market development are investigated using both vector error correction model (VECM) and Granger-causality techniques. The results show that long run association exists between stock market development and economic growth, and unidirectional Granger-causalities running from MASI, traded volume and stock market index to the real GDP exist, but no evidence is confirmed for a Granger-causality from the capitalization to the real GDP. The VECM revealed the presence of adjustment mechanisms for the stock market in the long run; deviations from the equilibrium are corrected in the case of market capitalization and the stock market development composite at 1.2% and 0.4% on a yearly basis. The results provide evidence of the demand-following hypothesis and suggest the presence of threshold level before a positive interaction between the real and financial sectors takes effect.

Keywords: Morocco, stock market, economic growth, Granger-causality, cointegration, VECM.

INTRODUCTION

Established in 1929, the Casablanca Stock Exchange is one of the oldest exchanges in Africa; it was the second exchange after the Johannesburg stock market was established in 1887 and is the first in the Maghreb region. Major reforms providing an improved legal framework for a growing number of domestic investors took place in 1967; in 1993 reforms were undertaken to refine investor protection, promote transparency and electronic trading was introduced. Those reforms culminated in 1997 by the launch of Maroclear, the clearing house of Casablanca Stock Exchange. An indicator of the success of aforementioned reforms can be found in the market capitalization rate: The ratio of stock market capitalization to GDP jumped from 23.8% in 2002 to 86.1% in 2006. As of 2012, CSA was Africa's stock market number four

Corresponding author Email: joerg.wild@gmail.com

when it comes to value traded in USD and market capitalization.

As far as economic growth is concerned, Morocco has weathered the social unrest in the Middle East surprisingly well compared to other countries in North Africa. Over the period of 1980 until 2010, Morocco's growth averaged roughly 4%, compared to 3.5% of other emerging markets and developing economies. However, in the beginning of 2008, growth of the Moroccan economy began to decelerate, which, among other reasons, can be attributed to onset of the global financial crisis and the subsequent contagion of important trade partners in Europe such as France. A recent study by the International Monetary Fund (IMF) suggests that economic growth over the period 1980-2010 has been mainly driven by capital accumulation on the supply side, which underlines the importance of the stock market as primary source for capital accumulation for economic growth. According to this study, capital accumulation was close to 45% form 1980 to 2010; labor has been the second largest contributor to growth at 40%. Human capital and total factor productivity accounted together for less than 15%. (Furceri et al., 2013)

Adding to the previous literature, the most prevalent empirical models are employed to explain the nexus between the economic performance and stock market activity. The following Section summarizes existing literature linking financial performance with economic development, while emphasizing on emerging markets and on growth literature in general. Section 2 presents the data set in a first step and then the methodologies used to process the data, which are namely the augmented Dickey-Fuller test, Phillips-Perron test, Johansen-Juselius test for cointegration, the VCEM and Granger-causality test. We conclude our research and summarize our findings in Section 5.

Literature Review

Research on the relationship between economic growth and stock market development goes back at least until the beginning of the last century, when Schumpeter (1911) was one of the first academics to study the effects of the financial market on the growth and growth on the financial markets by demonstrating the productivity- and growth-enhancing effects of well-functioning stock markets. The importance of capital stock, as can be proxied by the stock market to stimulate economic growth was further analyzed by by Harrod (1939) and Domar (1946) who independently developed the seminal Harrod-Domar growth model, which was a precursor to the exogenous growth model pioneered by Solow (1956).

Gurley and Shaw (1955) are among the first to postulate that economic development involves financial institution and the financial system as well. They argue that conventional theories of income, interest, and money had given insufficient attention to important reciprocal relationships between real development and financial development. Patrick (1966) identifies two phenomena that influence financial development of underdeveloped countries: The *demand-following* and *supply-leading* hypothesis. In his "Stage of Development Hypothesis", Patrick postulates that supply-leading financial institutions facilitate the transformation of an economy, whereas the demand-following phenomenon arises naturally as a byproduct of any growing industry. According to Patrick, *supply-leading* has two functions: to transfer resources from traditional, non-growth sectors to modern sectors, and to promote entrepreneurial responses in these modern sectors. It corresponds to the Schumpeterian concept of innovation financing. A discussion of Patrick's compelling analysis can be found in Calderon and Liu (2002).

The indicator for the level of financial development used were the size of the formal financial intermediary sector relative to GDP, the importance of banks relative to the central bank, the percentage o credit allocate to private firms, and the ratio of credit issued to private firms to GDP.

McKinnon (1973) and Shaw (1973) found that financial deepening is significantly correlated with GDP growth. The transition works by mitigating financial restrictions ("financial repression", i.e. low or negative real interest rates) and thereby allowing market forces to determine real interest rates, which were supposed to stimulate savings; artificial ceilings on interest rate discourage certain otherwise economically sensible projects, which, in turn, stimulates GDP growth. The *McKinnon-Shaw hypothesis* led to extensive research on financial liberalization that gave rise to many applications in emerging and developing countries.

Using 80 countries over a period of 26 years, King and Levine (1993) found that indicators of the level of financial development are strongly and robustly correlated with growth and the rate of physical capital accumulation. The indicator for the level of financial development used were the size of the formal financial intermediary sector relative to GDP, the importance of banks relative to the central bank, the percentage o credit allocate to private firms, and the ratio of credit issued to private firms to GDP. They further conclude that the predetermined components of these financial development indicators allow to significantly predict future economic growth, physical capital accumulation, and economic efficiency improvements. Using the framework of endogenous technological change, they proposed a Schumpeterian vision of development by incorporating key roles for financial intermediaries, namely the entrepreneurial selection and the financing of investments that lead to innovation.

Levine and Zervos (1996) argued that not only can a well-established stock market mobilize capital and

diversify risks between market agents, but also it is able to provide different types of financial services than financial intermediaries to stimulate economic growth. Even after controlling for many factors associated with growth, stock market liquidity and banking development are both positively and robustly correlated with current and subsequent growth rates. They find no support for the contentions that market liquidity and internationalization lead to increased volatility and lower the saving rate or impede future growth through this channel.

As far as the African continent is concerned, Akinlo and Egbetunde (2010) used an error correction model (VECM) to conclude that financial development is cointegrated with economic growth for sub-Saharan countries from 1980 to 2005, and detected long run cointegrating relationship among the series for all the 10 countries under investigation. Applying Granger-causality testing, they moreover found that financial development contributes to economic growth in 9 out of 10 countries, with 5 countries even demonstrating a bidirectional causality and Zambia being the only country where economic growth stimulates the financial sector and not vice versa. The policy advice is to intensify efforts to create economic growth before developing the financial industry.

A study by Ben Naceur et al. (2008) for the MENA region over the period of 1979 – 2005 found empirical evidence that stock market liberalization has an immediate negative impact on stock market development but this impact turns positive and significant in the long run. Moreover, the study finds no positive effect of liberalization on the short term or long term growth. The findings of their study cannot directly be compared with the single-country studies, moreover, their object of research was market liberalization and not market development as in our case.

For the case of Ghana, Osei (2006) demonstrated, that the stock market performance Granger-causes economic growth. As most studies, the study did not find a reverse causality. Low levels of income - as evidenced in most developing economies - was seen as a possible explanation for the absence of this reverse causality. Employing an autoregressive distributed lag (ARDL) approach, Kargbo and Adamu (2009) find a unique cointegrating relationship between GDP growth and financial development in Sierra Leone for the period 1970-2008. The results suggest that financial development exerts a positive and statistically significant effect on economic growth and investment is an important channel through which financial development feeds economic growth.

Kolapo et al. (2012) studied the Nigerian capital market for the period of 1990 to 2010. Johansen test results reveal cointegrating relationship between economic growth and stock market performance. Granger-tests showed bidirectional causality for GDP growth and transaction value, and, surprisingly, a unidirectional causality form market capitalization to GDP.

Osuala et al. (2013) also finds a cointegration between economic growth and stock market performance. In the long run, market turnover and capitalization had been found to Granger-cause economic performance, in the short run however, no such relationship could be established. Unlike many studies covering emerging markets, the impact of the stock market on economic growth was found to be negative and non-significant at 5% level. This idiosyncrasy was attributed to unethical behavior of market participants in Nigeria; policy advice given was therefore more concerned with strengthening of regulatory authorities and surveillance.

No previous studies exist to assess the relationship between the Moroccan stock market and economic growth; we shall hence close this gap by providing evidence in the form of cointegration analysis and causality tests to determine if and to what extent the Casablanca Stock Exchange CSE and the economy influence each other. Moreover, principal component analysis is used to generate a global proxy for the stock market development of Morocco.

DATA AND METHODOLOGY

Data

The data set of this study consists of 56 quarterly observations covering the period from the 1st quarter of 2000 up to the 4th quarter of 2013. Quarterly data is employed as more refined results are expected as compared to low frequency, yearly data. We deflate stock market development proxies by end of year consumer price indices (CPI). The variables used are introduced as follows:

Economic Performance (GDP) The economic performance is captured by the per capita real GDP data on quarterly basis and is sourced form the Morocco Bureau of Statistics. Growth is defined as the change in the per capital GDP levels over the studied period.

Morocco All Share Index (MASI) The Casablanca stock market computes two major indices to track the performance of the listed companies: MASI (Morocco All Share Index) and MADEX (Most Active Shares Index). We opt for MASI as a proxy of Casablanca stock market because its represents the performance of all listed shared, whereas the MADEX is limited to the most actively traded companies. The MASI is a free-float, capitalization-weighted index and is considered the major stock market index in the Maghreb region. The MASI has a base value of 1000 as of December 31, 1991. Data was sourced from Casablanca stock market.

Market Capitalization Ratio (CAPGDP) The CAPGDP is calculated as the value of listed shares divided by GDP, it represents the market capitalization as

Table 1. Descriptive statistics

	GDP	CAPGDP	VOLGDP	MASI	SMDI
Mean	137372	1.794	0.109	7883.068	0.001
Maximum	182271	4.205	0.601	14684.130	4.386
Minimum	95870	0.335	0.011	2941.260	-1.821
Std. dev.	25283.7	1.049	0.094	3687.656	1.468
Median	136956.5	1.656	0.079	8673.490	-0.177
Skewness	0.089	0.484	2.760	0.069	0.710
Kurtosis	1.784	2.235	14.296	1.455	2.797

Total number of observations 56. GDP: real gross domestic product of Morocco in MAD million, MASI: Morocco All Shares Index, VOLGDP: traded volume to GDP, ‘ CAPGDP: market capitalization to GDP and SMDI: the principal component analysis index.

Table 2. Results of ADF and PP tests

Variables	Order	ADF	PP	decision
GDP	Level	-0.045	0.489	I(1)
	1st difference	-12.969***	-15.677***	
MASI	Level	-0.979	-1.128	I(1)
	1st difference	-5.557***	-5.624***	
CAPGDP	Level	-1.353	-1.673	I(1)
	1st difference	-5.704***	-5.751***	
VOLGDP	Level	-4.619***	-4.604***	I(0)
	1st difference	-11.529***	-14.794***	
CMD	Level	-1.478	-4.504	I(1)
	1st difference	-8.559***	-70.971***	

Total number of observations 56. GDP: real gross domestic product of Morocco in MAD million, MASI: Morocco All Shares Index, VOLGDP: traded volume to GDP, CAPGDP: market capitalization to GDP.

percentage of the GDP. The assumption behind this measure is that overall market size is positively correlated with the ability to mobilize capital and diversify risk on the economy. The data was obtained from Casablanca Stock Market.

Market Liquidity (VOLGDP) The VOLGDP is measured as the average of the total value of shares traded on the stock market exchange ratio divided by the GDP (value traded divided by GDP). The total value traded ratio measures the organized trading of firm equity as a share of national output and therefore should positively reflect liquidity on an economy-wide basis. Then the liquidity ratio complements the market capitalization ratio but does not depend on it, since a large market may be accompanied with low trading level. Data was obtained from Casablanca Stock Market.

Stock Market Development Index (SMDI) The SMDI captures three aspects of the stock market: Size (CAPGDP), activity (MASI), and structure (VOLGDP). The first principal component used to generate this index is a linear combination of the financial development variables and maximizes the variance among all linear combinations, it therefore accounts for as much variation in the data as possible.

In this case, $SMDI_1$ is defined trough coefficients $e_{11}, e_{12,}, e_{13}$ ... , e_{1p} of the first component in such a way that its variance is maximized, subject to the constraint that the sum of the squared coefficients is equal to one. This constraint is required so that a unique answer is obtained.

This is to say, $e_{11}, e_{12,}$, e_{13} ... , e_{1p} are selected while $SMDI_1$ is maximized:

$$var(SMDI_1) = \sum_{k=1}^{p}\sum_{k=1}^{p} e_{1k}e_{1l}\,\sigma_{kl} = e_1^{'}\sum e_1$$

Subject to the constraint that:

$$e_1^{'}e_1 = \sum_{j=1}^{p} e_{1j}^2$$

In the case of the first principal component, for example, the constraint becomes The Principal component technique aims to explain the variance covariance structure of the data trough some linear combinations of the original variables of the financial

Table 3. Johansen Juselius cointegration test: GDP and CAPGDP

Variables	Maximum rank	LL	Eigenvalue	Trace statistic
GDP & CAPGDP [a]	1	-1271.8	0.26	2.08*
GDP & MASI [a]	1	-848.9	0.46	2.86*
GDP & SMDII [b]	1	-496.6	0.45	2.72*

* denotes significance at 5%. The critical value 3.84. The lag one is selected following AIC, LR and SBIC criteria. [a] The lag three is selected following AIC and LR criteria, SBIC suggested the lag one. [b] The lag four is selected following AIC and LR criteria, SBIC suggested the lag three.

Table 4. Vector error correction model estimation results

Models	Variables	Coefficients	Variables	Coefficients
I.	**y= GDP**		**y= CAPGDP Capitalization**	
Coint. eq. 1	CAPGDP	-41640.56**		
	ECT	-0.0021055	ECT	0.003**
	LD.GDP	-0.5757506***	LD.GDP	-0.0000377
	L2D.GDP	-0.3040747**	L2D.GDP	-0.0000175
	L3D.GDP	-0.4240044***	L3D.GDP	-0.0000236
	LD.CAPGDP	198.0014	LD.CAPGDP	0.2909683**
	L2D.CAPGDP	-234.076	L2D.CAPGDP	0.0347151
	L3D.CAPGDP	277.0757	L3D.CAPGDP	0.2959982**
	C	0.0125902	C	6.760474**
II.	y= GDP		y= MASI	
Coint. eq. 2	MASI	-13.95***		
	ECT	-0.0074518	ECT	0.0046594
	LD.GDP	-0.6229299***	LD.GDP	0.0082112
	L2D.GDP	-0.3182814**	L2D.GDP	-0.015435
	L3D.GDP	-0.3917438***	L3D.GDP	-0.0466951
	LD.MASI	0.5017482	LD. MASI	0.2160068
	L2D. MASI	-0.4051232	L2D. MASI	0.1947075
	L3D. MASI	-0.7047351*	L3D. MASI	0.097235
	C	1091.874	C	1746.241
III.	y = GDP		y = SMDI	
Coint. eq. 3	SMDI	-68888.95**		
	ECT	-0.0020642	ECT	0.001*
	LD.GDP	-0.5890154***	LD.GDP	9.42E-06
	L2D.GDP	-0.2943123**	L2D.GDP	5.52E-06
	L3D.GDP	-0.3839524***	L3D.GDP	-0.000043
	LD.SMDI	-788.7467	LD.SMDI	0.0183883
	L2D.SMDI	-64.31415	L2D.SMDI	0.3932254***
	L3D.SMDI	604.9503	L3D.SMDI	-0.1104605
	C	0.0065769	C	4.83025

Total number of observations 56. GDP: real gross domestic product of Morocco in MAD million, MASI: Morocco All Shares Index, CAPGDP: market capitalization to GDP, SMDI: the stock market development Index.

sector.:

$e_1^{'}e_1 = \sum_{j=1}^{p} e_{1j}^2$=1

The principal components analysis is used instead of a simple sum to form the composite variable $SMDI_1$

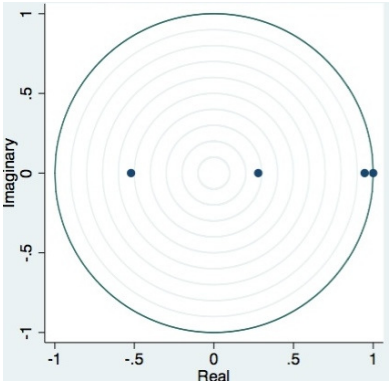

Figure 1: Stability of MASI VECM estimates

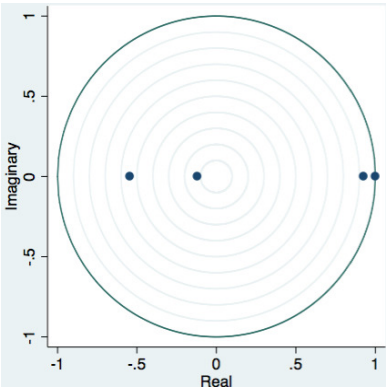

Figure 2: stability of SMDI VECM estimates

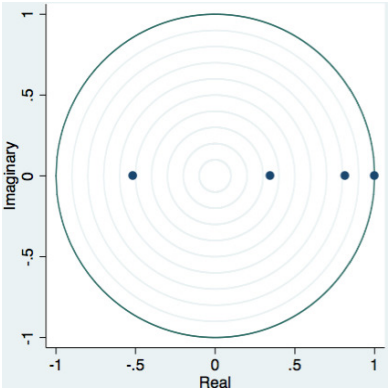

Figure 3: stability of CAPGDP VEC

Table 5. Lag length selection of financial development series

lag	LL	LR	FPE	AIC	HQIC	SBIC
0	-866.717		9.60E+08	34.8687	34.9415	35.0599
1	-26.8106	1679.8	6.70E-06	2.27242	2.70929*	3.41964*
2	-17.9242	17.773	0.000011	2.71697	3.44508	4.62899
3	11.4559	58.76	7.70E-06	2.34176	3.36112	5.0186
4	38.4142	53.917*	6.40E-06*	2.06343*	3.37403	5.50507

Log Likelihood function (LL), likelihood ratio (LR), final prediction error (FPE), Akaike's information criterion (AIC), Schwarz's Bayesian information criterion (SBIC), and the Hannan and Quinn information criterion (HQIC)

because the later assumes an equal importance on the outcome. Using the principal component analysis enables us to obtain weights for each of the variables in the index and use them to generate a composite value for each observation.

Therefore, the $SMDI_1$ is expected to reflect the financial sector development. Mavrotas and Son (2006), Bandiera et al. (2000) and Demetriades and A. Hussein (1995) to name few used the principal component analysis to assess the development of the financial system.

Table 1 reports descriptive statistics of GDP and the proxies of stock market development.

METHODOLOGY

The framework of vector autoregressive model (VAR) is used in this study to analyze the effects of stock market on GDP growth and vice versa. The following model is estimated in order to test the causal relationships between the variables.

$$GDP = f(MASI, CAPGDP, VOLGDP, SMDI)$$

In order to test the model, separate regression for each of the explaining variables as well a regression including all explanatory variables are shown to give a first impression of the suitability of the model.

Unit Root Test In order to test for unit roots, augmented Dickey-Fuller and the Phillips-Perron tests are used. These results will provide information, whether the data can be used for subsequent analysis, or otherwise has to undergo some adjustments. Usual modifications include using the first, second or higher order difference or transforming the data by using logarithm, until the data is stationary. The augmented Dickey-Fuller test is performed in the following three forms:

$$\Delta x_t = \gamma x_{t-1} + \sum_{i=1}^{m} \delta_i \Delta x_{t-1} + \varepsilon_t$$

$$\Delta x_t = \alpha + \gamma x_{t-1} + \sum_{i=1}^{m} \delta_i \Delta x_{t-1} + \varepsilon_t$$

$$\Delta x_t = \alpha + \beta_t t + \gamma x_{t-1} + \sum_{i=1}^{m} \delta_i \Delta x_{t-1} + \varepsilon_t$$

where $\Delta x_t = x_t - \Delta x_{t-1}$ and ε_t is a pure white noise error term and m is the maximum length of the lagged variable, which is determined by Schwarz information criterion

Table 6. Pairwise Granger-causality test results

From	To	F-stat	Prob.
D.CAPGDP	D.GDP	1.2433	0.3125
D.GDP	D.CAPGDP	1.5558	0.2099
	No Granger-causality between economic growth and market capitalization		
D.MASI	D.GDP	1.9761	0.121
D.GDP	D.MASI	3.4308**	0.0192
	Unidirectional Granger-causality from the economic growth to Index		
D.VOLGDP	D.GDP	1.1222	0.3634
D.GDP	D.VOLGDP	7.1632**	0.0116
	Unidirectional Granger-causality from economic growth to the traded volume		
D.SMDI	D.GDP	1.0142	0.4148
D.GDP	D.SMDI	3.278**	0.0232
	Unidirectional causality from the economic growth to the financial development		

Total number of observations: 56. GDP: real gross domestic product of Morocco in MAD million, MASI: Morocco All Shares Index, VOLGDP: traded volume to GDP, CAPGDP: market capitalization to GDP, and SMDI: principal component composite of the stock market development.

(SIC). The object there is to make the residuals in the aforementioned equation purely random. The null hypothesis is that γ, the coefficient of x_{t-1} is zero ($H_0\ \gamma = 0$), which is equivalent to variable x_t being nonstationary. The alternative hypothesis (H_1) of stationarity is that $\gamma < 0$.

In order to confirm the ADF test results, the unit root test devised by Phillips and Perron (1988) is applied. One of the advantages of the PP test is that it is non-parametric, i.e. it is independent of a (selected) level of serial correlation. Whilst it builds on the same test scheme as the ADF, the PP test makes a non-parametric correction to the t-test statistic. As the PP test doesn't perform well in any sample size other than very large, which may be the case in this study, *in dubio* we will decide according to ADF test results. Davidson (2004) provide detailed reasoning why the PP test performs poorly in finite samples compared to the ADF test.

Johansen-Juselius Cointegration Test The cointegration level determined by ADF and PP tests allows us to check for the existence of the long run relationship between our variables using the cointegration test. It consists of checking the cointegration relation among variables while avoiding spurious results in case data are non-stationary. One of the main advantages of the Johansen and Juselius (1990) maximum likelihood method over other cointegration tests is that it can check for more than one existing cointegrating (i.e. long run) relationships among the variables. If the cointegration analysis indicates that there is a cointegrating vector, we infer that the tested series will not drift apart in the long-term, and will revert to equilibrium levels following any short-term drift that may take place. In the context of this study, the null hypothesis is that no cointegration relation exists between stock market performance and economic growth and rejecting the null allows us to infere that both indicators are interrelated with each other in the long run.

Johansen and Juselius (1990) propose two test statistics to check the number of cointegrated vectors, the maximum eigenvalue (λ_{max}) statistics and the trace (λ_{trace}). The likelihood ratio statistic (λ_{trace}), the trace test is:

$$\lambda_{trace}(r) = -T \sum_{i=r+1}^{p} \ln(1-\hat{\lambda}_i)$$

where $\hat{\lambda}_i$ is the largest possible value of the eigenvalue computed from the estimated Π matrix, the rank are may take values like 0,1,2…,p-1.

Alternatively, Johansen's (λ_{max}), the maximum eigenvalue statistic is:

$$\lambda_{max}(r, r+1) = -T \ln(1-\hat{\lambda}_{r+1})$$

In both cases, with (λ_{max}) or (λ_{trace}), the test postulates a null hypothesis of *r* co-integrated vectors against the alternative of *(r+1)* cointegrated vectors.

Vector Error Correction Model If a cointegration relationship is established using the above method, the construction of a vector error correction model (VECM) to model dynamic relationship is possible and residuals from the vectors (lagged one period) are included in the dynamic VECM system. The cointegration term is known as the error correction term since the deviation from long

run equilibrium is corrected gradually through a series of partial short run adjustments. The purpose of dynamic specification of the VECM is to allow the deletion of the insignificant variables, while retaining the error correction term that will be corrected in the short run following adjustment dynamics. The size of the error correction term indicates the speed of adjustment of any disequilibrium towards a long run equilibrium state.

$$X_t = \beta_0 + \sum_{i}^{n} \beta_1 \Delta X_{t-1} + \sum_{i}^{n} \beta_2 \Delta Y_{t-1} + \sum_{i}^{n} \beta_3 \Delta Z_{t-1} + \lambda EC_{t-1} + \varepsilon_t$$

Where Δ is the first difference operator, EC_{t-1} is the error correction term lagged one period, α_2 is the short run coefficient of the error correction term ($-1 < \alpha_2 < 0$), ε_t is the white noise term.

Granger-Causality Test Granger-causality analysis (Granger 1987) is carried out in order to assess the potential predictability power of the stock market for the economic performance and vice versa. If *X* Granger-causes Y, X value can be predicted from the past values (lagged) *X* and *Y* and not from *X* values alone. According to Mahdavi & Sohrabian (1989), we test the following equation:

$$X_t = \alpha_0 + \sum_{i=1}^{n} \alpha_i \, y_{t-i} + \sum_{j=1}^{m} \beta_j \, x_{t-j} + \mu_t$$

$$Y_t = \alpha_0 + \sum_{i=1}^{n} \beta_i \, x_{t-i} + \sum_{j=1}^{m} \alpha_j \, y_{t-j} + \varepsilon_t$$

In this stage, we check the direction of causality between stock market performance and economic growth. If lagged values of the variable *X* do significantly explain the variable *Y* in the presence of the lagged values of *Y*, then we say that "*X* does Granger-cause *Y*". The F-statistic is used to check for the significance of the coefficients.

Empirical Analysis

Unit root tests

Although we are ultimately concerned with characterizing the relationship between economic growth and stock market performance, we initially focus on the behavior of individual series to check for the stationarity of all series and whether they are subject to permanent changes in their level, in order to avoid spurious regression.

The integration order of the series under investigation is tested using both ADF and PP tests. Table 2 illustrates the results of unit root tests and shows that variables namely capitalization, index and stock market development composite are stationary after the 1st level of difference and hence integrated of order one or I(1). Therefore, the null hypothesis of unit root existence is rejected after the first level of difference at 1% suggesting the presence of a cointegrating relationship among the selected variables. The next step checks for the existence of a potential stationary linear combinations between the economic growth in real terms and stock market development variables: Market capitalization, MASI and SMDI. The only stationary variable at level is VOLGDP, therefore, no cointegration relationship can be verified between the GDP, I(1) and VOLGDP, I(0).

Cointegration test

Before running the Johansen-Juselius cointegration test, we define the optimal time lags to be included in the cointegration analysis, which are specified for each estimation in order to get more accurate results, the likelihood ratio test criterion, Akaike information criterion, and Schwarz information criterion are utilized for this purpose. The trace statistics reported in Table 3 suggest the presence of a long run cointegrating relationship between economic growth and each of the stock market development metrics at the 5% significance level excluding VOLGDP, though the direction of these relations is yet to be determined by Granger-causality test.

VECM

Table 4 shows three interesting facts about the estimated relationship between the stock market development and economic growth. The coefficients in the cointegrating equation give the estimated long run relationship among the variables, whereas the coefficient of the error correction term ECT in the VECM estimation shows how deviations from the long run equilibrium affect changes in the variable in the next quarter; the other coefficients provide estimation of short run association between the economic growth and each proxy of the financial market development.

In the first model, a negative long run association appears to exist between the stock market capitalization and economic growth: When CAPGDP increases by one unit, the GDP decreases by 41,641 units (in thousand MAD) as result. In the short run though, no significant relationship could be established, as seen by a lack of significance of the lagged coefficients LD.CAPGDP to L3D.CAPGDP.

As far as the market index is concerned, results of the estimated vector error correction model II showed that an increase of MASI by 1 unit causes a short run decrease of economic growth by 0.7 units at 10 % significance level.

The cointegration estimation showed a negative association between GDP and MASI, hence, in the long

run, an increase of one unit in the index induces a decrease of 13.95 units of the GDP at 1% statistical level. While the Moroccan global SMDI composite does not have significant effect on the economic growth in the short run, evidence of a significant long run negative relationship is found because an increase of 1% in the stock market composite decreases the GDP by 41,425 units at 5% significance level.

As for the adjustment mechanism toward equilibrium in case of deviation, it is only in the case of the financial development composite and capitalization models where an adjustment mechanism toward the equilibrium level takes place at a rate of less than 0.1% per quarter. This implies that once the deviation from the long run equilibrium takes place in market capitalization and stock market development index models, an adjustment process will be initiated to restore the equilibrium condition by correcting the disequilibrium by approximately 0.0039 and 0.001 units for each quarter in each respective equation, I and III.

The coefficients of the lagged variables *y* positively influence the CAPGDP and the SMDI regressions but lack of statistical significance in the MASI regression, however, the lagged values of the GDP show statistical significance thereby confirming the dynamic behavior of the GDP models, while in growth models, where the GDP is regressed on the stock market index (*y=GDP*), no such statistical significance was observed.

In general, these results confirm the Johansen-cointegration test findings of the existence of a long run relationship between the real economy and the stock market development. The goodness of fit of each model, represented by R^2 are high enough to accept our models findings. The cointegrating equations are evaluated by generating their *in-simple values*, furthermore, we account for the stability condition of the eigenvalue in our estimated VECM. The results show that specifications of all of the three estimated VEC models impose a unit modulus and therefore the eigenvalues meet the stability condition. The results are shown in Figures 1, 2 and 3.

Granger-Causality Test

To examine the causal relationships and directions of causality between the real GDP and considered proxies of the stock market development, we run Granger-causality tests. It is important to notice that Granger causality is not necessarily a traditional causality; if both *X* and *Y* are driven by a third process, one would still reject the null hypothesis of Granger-causality.

Based on a combined VAR model, a maximum lag of 4 is selected according to the likelihood ratio (LR), final prediction error (FPE), Akaike's information criterion (AIC) as reported in Table 5.

The results of Granger-causality tests estimated based on stationary series as presented in Table 6 confirm indeed the findings of the cointegration analysis. No evidence is found of Granger-causality from the financial sector to the economic growth in Morocco in any of the four pair-wise models; nevertheless, predictability is running from the real to the financial sector metrics, as MASI does Granger-cause economic growth at the 5% significance level, and in the same manner, the VOLGDP does Granger-cause GDP at 10% statistical significance. As far as the principal component analysis based stock market development composite is concerned, a Granger-causality running from the composite to the economic growth is estimated. When it comes to stock market size, no evidence of long run Granger-causality is found.

CONCLUSION

We investigated the causal relationship between stock market and economic growth of Morocco using quarterly observations and different proxies that capture activity, size, and value are used, as well as a principal component analysis based composite of the stock market development which ensures consistency of our results. The results of the Johansen-Juselius cointegration test present evidence of a long run relationship between economic growth and the MASI, capitalization or the principal component proxy of stock market development.

As far as the result of the VECM are concerned, none of the coefficients of the short run regressions in all three models are significant, which implies that there is no evidence of a quarter-to-quarter influence of the real activity on the stock market size, except in the case of MASI, where realized MASI levels negatively impact economic growth after three quarters and an increase of a unit in the MASI decreases the economic growth by 0.7 units three quarters later. In the long run, the GDP responds negatively to an increase in the market capitalization, the MASI as well as the stock market development composite. Deviations from the equilibrium are only corrected in the case of market capitalization and the stock market development composite at yearly 1.2% and 0.4%, respectively. In summary, economic growth reacts with some delay to changes in the stock market development.

Accordingly, the ability of stock market development to stimulate economic growth could not be verified in the case of Morocco, thus, the hypothesis of Morck et al. (2000) and Levine (2003) of the financial sector impeding growth in the long run is rejected. If the MASI is increasing, economic growth is decreasing, which may be explained by the fact that high stock prices exclude certain strata from participating in the financial development. Another explanation is that high stock prices do not necessarily boost economic growth since high stock prices only translate into a positive effect for the companies if they issue new equity and increase their capital base, which may not be warranted in an emerging

economy such as Morocco. Both channels of translation would present evidence of the hypothesis of Demirgüç-Kunt and Levine (1996): The increased rate of return in investment accompanied by higher saving rates as consequence of the substitution effects, undermines economic growth. Relatively low trading volumes result in higher risk taking, and increase transaction costs. We believe that the described negative relationship between economic growth and stock market performance is due to a threshold effect and that financial development therefore is supposed to reach a certain level before it is able to spur economic growth, hence it is essential to encourage investors to participate in the stock market.

The results of Granger-causality test indicate a unidirectional causal relationship from economic growth to MASI and traded volume, in other words, the economic growth has predictive power upon the two stock market metrics traded volume and MASI, which is confirmed by the principal component analysis based composite; however our results show no support for any causal relationship between economic growth and stock market size as represented by the market capitalization as well as no significant Granger-causality was found from stock market development variables - namely capitalization, traded volume and MASI - to economic growth. Consequently, there is some evidence of the demand-following hypothesis, but no support was found for the supply-leading hypothesis.

Despite the onset of the financial crisis in late 2007, market activity in Casablanca only started to slow down in 2009, which stands in stark contrast to the slump experienced by many emerging markets of the region; this may be regarded as an indicator of stability, trust, and attractiveness of the stock market. Although the Moroccan stock market has been developing during the last few years, this growth should be accompanied by a qualitative improvement of the market place in order to influence the economic growth in the long term. More efficient regulation and monitoring aiming at improving transparency and effectiveness of the stock market can be considered means to achieve this goal.

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