



BI Norwegian Business School - campus Oslo

GRA 19502

Master Thesis

Component of continuous assessment: Forprosjekt, Thesis
MSc

besvarelse

Start: 01.12.2016 09.00

Finish: 16.01.2017 12.00

Which macroeconomic variables best associate with stock market returns in sub-Saharan Africa?

Hand-in date:
16.01.2016

Campus:
BI Oslo

Examination code and name:
GRA 19502 Master Thesis Preliminary

Supervisor:
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Programme:
Master of Science in Business, Major Finance
Master of Science in Financial Economics

Content

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Introduction

Aim of the study

Which macroeconomic variables best associate with stock market returns in sub-Saharan Africa (SSA)? And are there trends in these variables? Solid theoretical and empirical papers have shown a linkage between economic growth and financial development, however the literature focusing specifically on the relationship between stock markets performance and economic growth is infrequent. The goal is to better understand these financial markets that are gaining traction in the community of investors, be it institutional or private, looking to diversify their portfolios. The effects of volatility on the returns of emerging markets has already been researched extensively whereas the macroeconomic aspects that could be linked to returns in these types of economies have been less popular. To this extent, the paper will attempt to identify the most relevant macroeconomic determinants that could explain returns in SSA. More specifically, we will try and determine which macroeconomic drivers directly contribute to affect stock market prices in our selected emerging market portfolio of SSA nations. Evidently, these markets are sensitive to macroeconomic fundamentals; the research by Credit Suisse on Emerging markets, that is transcribed in some of their yearbooks (2010 and 2014) is indicative of a relationship between markets and macro-economy. Further, our paper takes a look at macroeconomic drivers of financial development. Looking at reports from the International Monetary Fund (IMF) on the subject of financial development in Sub-Saharan African provides us with a good overview of potential candidates for our analysis.

Motivation

African stock markets have been growing at a considerable rate over the past years and investors are taking notice. There are now 29 exchanges on the African continent giving markets participants other possibilities in terms of diversification of portfolio and investment opportunities. Accordingly, there is an increasing interest in return on investments from these markets and research shows that tried and tested asset pricing models used in developed markets seem to fail in explaining returns or are incomplete for emerging markets. Thus, our hope is that through the

use of macroeconomic drivers we will be able to observe an association between the variables that will shed light on to neglected stock returns determinants.

Literature review

Emerging and developing markets tend to be characterized by high volatility in asset returns and illiquidity when compared to developed markets. As such an important part of the literature is focused on volatility and liquidity to explain the expected returns.

The study by De Santis and Imrohoroğlu (1997) looks mainly at the dynamics of market volatility, and their findings indicate that emerging markets are unconditionally more volatile than developed markets but also that they are more susceptible to surprises with respect to publicly available information. Moreover, the authors observe through two different models capturing degrees of market integration, that the relationship between expected return and market volatility is often negative. These findings are rather peculiar because the CAPM, for instance, anticipates a positive relationship between volatility (a measure of risk) and return. Building on this, other papers such as the one written by Aggarwal, Inclan, and Leal (1999) analyse the changes in volatility through what could be described as an event study. They discover that volatility in emerging markets is mainly explained by local political, social and economic variables.

In yet another paper that looks at the behaviour of stock returns in African markets, Alagidede and Panagiotidis (2009) arrived to conclusions that are contrary to that predicted by widely used asset pricing models, they find that the efficient market hypothesis (EMH) does not hold in Africa's largest markets. They argue that since EMH does not hold, markets are more predictable. Moreover there is evidence showing that conditional asset pricing models fail to accurately predict returns in emerging markets (Harvey, 1995). As such, they offer a possible explanation for excess returns other than volatility which they relate to the low liquidity of African markets. The evidence found in the literature seems to point towards the failure of asset pricing models and their ability to price assets correctly; returns in emerging and developing markets behave differently from what the existing models and theories predict.

Given these observations, macroeconomic factors in sub-Saharan economies will be tested in our paper to highlight their possible relevance with regards to stock market returns. The relationship between economic indicators and stock market returns has been researched and findings suggest that they are significant to market performance, particularly in developed markets. For the purpose of this master thesis such indicators will be tested as to uncover the type of relationship that exist between them and the SSA markets. In the IMF paper Mlachila, Jidoud, Newiak, Radzewicz-Bak, and Takebe (2016) provide an outline of the financial development promoting economic growth within the Sub-Saharan region. The part of the paper that is of value to us is the analysis that focuses on macroeconomic impact on financial development and its drivers. The authors select four drivers of financial development that have been identified in previous literature such as Boyd, Levine, and Smith's inflation (Mlachila et al., 2016). Inflation is viewed by the authors as a proxy for macroeconomic stability. The other three drivers highlighted by the IMF paper are International Trade Integration, International Financial Integration and Country Risk. Looking at these, investigations will be conducted to help us define the drivers' ability to influence the financial markets, and more specifically equity returns. However, it is important to note that even though there is an apparent relationship between the two, Schwert (1989) argues through his findings that there is strong evidence in support of financial asset volatility being a predictor of future macroeconomic volatility. Meaning that the interpretation of causality between the two needs to be done cautiously when drawing conclusions from our analysis. Supporting the findings of Schwert (1989) is Credit Suisse's Yearbook from 2010 where economic growth, proxied by GDP, and its relation to stock returns reveal puzzling results. After reviewing Credit Suisse's Yearbook 2010, we have discovered how the GDP has performed as a macroeconomic explanatory variable for stock returns in different markets around the world. Dimson, Marsh, Staunton, and Wilmot (2010) find that historic GDP per capita tends to have a negative correlation with stock returns, while using stock market performance as an indicator positively describes the expected future GDP in economies. In the same Yearbook (2010), the authors observe that when applying GDP per capita as a macroeconomic determinant for stock returns, growth in the economy itself does not necessarily correspond to a growth in stock returns from investments in emerging markets. Further, they explain that note that there are several observations that weakens the

belief of the association between GDP and stock-market returns. One of which is that a growth in a real economy is not the same as a growth in stock-market for that same economy. An economy can grow in terms of wealth because of the growth in real activity. Enterprises contribute partially to growth in real GDP in emerging market economies by increasing for example the labour activity, import and export and thus consumption. However, this does not imply growth in stock market returns. Another observation reveals that the link between economic growth and stock-market performance has shown to be statistically weak and that there is no clear relationship between these variables in the long run.

Consequently, the difficulty lies in choosing the correct indicators of return so that our research is of some relevance.

Theory

In discussing market returns and macroeconomic factors of economies, certain aspects need to be defined.

All securities present on the market have a value, a price, on which their return is dependent. Based on Arrow (1953) notion of “state prices” Duffie (2003) defines a security’s implied value as the weighted sum of its future cash flows. Going further, we know that practitioners and academics alike favour the enterprise discounted cash flow (DCF) model for valuing companies. This model requires discounting the free cash flow of a company’s operations at the weighted average cost of capital (WACC) (Koller, Goedhart, Wessels, Schwimmer, & Manoury, 2015).

DCF model

Value formula:
$$V_0 = \frac{FCF_1}{WACC}$$

where

V_0 : Company Value at $t=0$

FCF_1 : Future cash flows

WACC: weighted average cost of capital

$$WACC = \frac{D}{V}k_d(1 - T_m) + \frac{E}{V}k_e$$

where

D/V: target level of debt to enterprise value using market based values

E/V: target level of equity to enterprise value using market based values

k_d : cost of debt

k_e : cost of equity

T_m : company's marginal income tax rate

The value formula is highly dependent on the future cash flows and WACC of the company. Both these factors can be influenced by swings in economic variables which in turn would affect enterprise value and thereby security returns. This goes to show that there exists a link between macroeconomic variables and stock markets.

The idea in this paper is to use macroeconomic drivers of financial development because there is theoretical support for a relationship between financial development and economic growth. McKinnon's (1974) work reviewed in the International Journal (1974) looked at this particular relationship and concluded that pursuing financial development encourages economic growth, and this idea was also shared by others such as Shaw (1973). Additionally academics such as Fry (1978) did empirical tests on "models of finance in economic development", a theory put forth by the previously mentioned authors McKinnon and Shaw. Applying his analysis to seven less developed Asian countries (Burma, India, Malaysia, Philippines, Singapore, Taiwan and Korea) Fry finds evidence supporting the theory that financial development has an impact on economic growth. In more recent work by Enisan and Olufisayo (2009), an investigation is conducted on the long run relationship between stock markets and economic growth in seven African countries. Their findings indicate that there is a relationship between cause and effect for stock markets and economic growth. The question remains as to whether this linkage can be found in sub-Saharan Africa.

Data and Methodology

Data

Depending on availability of the data our empirical analysis will be based on the following countries:

Angola, Benin, Botswana, Burkina Faso, Central African Republic, Comoros, Republic of Congo, Côte d’Ivoire, Ethiopia, Gabon, The Gambia, Ghana, Guinea, Guinea-Bissau, Kenya, Liberia, Madagascar, Malawi, Mali, Mauritius, Niger, Nigeria, Rwanda, São Tomé and Príncipe, Senegal, Seychelles, Sierra Leone, South Africa, Swaziland, Tanzania, Togo, Uganda, Zambia, and Zimbabwe.

Which according to the IMF constitutes sub-Saharan Africa (*Sub-Saharan Africa: Time for a Policy Reset*, 2016). Most of the macroeconomic data will be taken from databases of the World Bank and International Monetary Fund as shown in *table 1*. An additional driver that would be interesting to look at is Foreign Direct Investment because “the behaviour of the stock market play important roles in FDI”(de Mendonça, 2004).

As for the data on stock market returns we will rely on closing prices of stock market indices on n entities across T periods, we will be dealing with panel data. Where n refers to the number of SSA nations and T to the number of time periods. Some of the markets that will be observed lack data prior to the early 90’s, for instance we know that the S&P/IFCG Emerging Markets Composite appeared in 1985. The missing data for x amount of entities for y time periods means that our panel data will be unbalance.

Table 1. Drivers and Impediments of Financial Development: Data Sources and Description

Variable	Description	Source
Financial development index	Combination of financial institution and market sub-indices along the dimension of financial depth, access and efficiency. Both the market and institutions indices are equally weighted for the overall index (Mlachila et al., 2016, p. 4)	Sahay and others (2015b)

Capital account openness	Sum of international assets and liabilities as a share of GDP, indicating the country's de facto degree of capital account openness	IMF WEO database
Trade openness index	Sum of exports and imports of goods and services as a share of GDP	IMF WEO database
Real GDP per capita		IMF WEO database
Inflation	Annual inflation rate	IMF WEO database
ICRG country risk rating	International Country Risk Guide country risk rating, which covers political, financial, and economic risks	PRS Group
Institutional quality index	The index consists of 21 categories and is constructed mainly based on the WEF's Executive Opinion Survey, which captures the opinions of over 14,000 business leaders in 144 economies	Global Competitiveness Index Pillar 1 (Institution) by the World Economic Forum (WEF)

Note. Reprinted from *Financial Development in Sub-Saharan Africa – Promoting Inclusive and Sustainable Growth* (p. 54), by Mlachila et al. , 2016 by International Monetary Fund, Publication Services.

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Methodology

To observe the explanatory power of our selected variables we will conduct a multiple regression analysis. The data will contain cross-sectional and time series elements of our variables, where the challenge will be finding the appropriate explanatory variables that provides us with significant association with stock returns. Due to lack of data in time for some entities, we know that the descriptive data will be derived from an unbalanced panel data.

Since our research is based on a panel data, we will begin by controlling for omitted variables by testing for fixed effects that vary across entities (1.1) but are constant over time. We will then control for time-fixed effects (1.2) to test for omitted variables that are constant across entities, but differ over time. Both applications will be combined (1.3) in our regression model to better estimate the relationship between the explanatory variables and stock returns across time and nations.

$$\begin{aligned}
 (1.1) \quad Y_{it} &= \beta_0 + \beta_1 X_{it} + \beta_2 Z_i + u_{it} \\
 &\rightarrow \alpha_i = \beta_0 + \beta_2 Z_i \\
 &\rightarrow Y_{it} = \beta_1 X_{it} + \alpha_i + u_{it}
 \end{aligned}$$

The first regression above consists of an unobservable Z_i that varies across nations, but does not vary over time. The goal is to observe β_1 - effect on Y of X, when holding Z constant. Defining α_i equation allows Z_i to be intercepts for each nation, hence the last equation becomes the fixed effect regression model where the α_i equations are specific to each nation's fixed effects.

$$(1.2) \quad Y_{it} = \beta_1 X_{it} + \lambda_t + u_{it}$$

Similar to (1.1) we do the same re-modelling of the first regression and denote λ_t as the time fixed effect. Looking to observe β_1 - effect on Y of X when holding the unobservable variable, denoted Q_t in this instance, constant. Q_t varies over time but constant across nations.

$$(1.3) \quad Y_{it} = \beta_1 X_{it} + \alpha_i + \lambda_t + u_{it}$$

This equation combines the re-modelling of (1.1) and (1.2)

To be able to check for random effects that are significant in our panel data, we will conduct a Durbin-Wu-Hausman test (2.0) to check for endogeneity (measurement error) and better distinguish between random and fixed effect.

$$(2.0) \quad Y_{it} = \beta X_{it} + \alpha + u_{it} + \varepsilon_{it}$$

According to Baltagi (2008) cross sectional dependence is a problem in macro panels with long time series. To manage this problem, our paper will test for cross-

sectional dependence to check whether the residuals are correlated across nations using Breusch-Pagan Lagrange Multiplier test of independence.

$$(3.0) \quad \hat{u}^2 = \gamma_0 + \gamma_1 x + v.$$

For each chosen variable that are shown to be significant for the dependent variable, we will also test for predictive content by using the Granger causality test (4.0-4.1). This will be done to see if our explanatory variables actually are significant determinants for expected future stock returns, hence significant macroeconomic determinants for stock returns.

$$(4.0) \quad x_t = \sum_{j=1}^m a_j x_{t-j} + \sum_{j=1}^m b_j y_{t-j} + \varepsilon_t,$$

$$(4.1) \quad y_t = \sum_{j=1}^m c_j x_{t-j} + \sum_{j=1}^m d_j y_{t-j} + \eta_t,$$

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