Size and Liquidity Effects in Sub Saharan African stock markets

Bruce Hearn*

School of Management, University of Leicester and King's College London

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This study contrasts the effectiveness of a Capital Asset Pricing Model (CAPM) augmented with size and recently developed Liu (2006) liquidity factors against the Fama and French (1993) size and book to market value factors. The application of time varying parameter techniques enables a greater understanding of the dynamics of liquidity within a unique sample of Sub Saharan African stocks. The evidence suggests that with the exceptions of Ghanaian and Kenyan markets the Fama and French factors retain their explanatory power in explaining the cross section of stock returns. Time varying liquidity beta profiles indicate that the financial sectors of Namibia, Zambia and Mauritius have been affected by the 2008 global financial crisis, while Botswana and Kenya are unscathed.

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* Corresponding author: School of Management, University of Leicester, Ken Edwards Building, Leicester. UK. LE1 7RH. Tel: 44(0)116 252 5520. Email: bruce.hearn@kcl.ac.uk

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1. INTRODUCTION

The application of standard asset pricing theory dictates that expected stock returns are related cross-sectionally to returns sensitivities to state variables that are themselves linked to investors overall welfare (Pastor and Stambaugh 2003). Assets whose lowest returns accompany unfavourable shifts in that welfare must compensate investors for the loss of value while holding the asset. While Fama and French (1993) proposed that variations in size as well as differences between accounting book to market value of stocks across a universe of stocks as state variables there is considerable recent evidence that liquidity is also such a state variable (Liu 2006; Pastor and Stambaugh 2003; Martinez et al. 2005) that must be accounted for in pricing models. The presence of size effects is likely especially in smaller Sub Saharan African (SSA) stock markets where the majority of listings arise either from occasional listings of major multinational enterprises (MNEs) or from indigenous small and medium enterprises (SMEs). This dispersion in types of firm listing is also likely to lead to considerable differences between value and growth stocks, the difference between the two categories of stock being their relative price-to-book ratio, with the former having low and the latter high values (Fama and French 1993). Equally this dispersion in listed firms infers that there are likely to be considerable differences in liquidity within and between markets although this should not conflict with the size effect owing to the strong liquidity preferences of investors which is well documented in the African emerging market region (Hearn 2009a and Hearn and Piesse 2010). Consequently this empirical study investigates whether size, book to market value and liquidity effects are priced. As such I ask whether differences in cross sectional expected returns can be better explained by fluctuations in aggregate market size and liquidity effects as opposed to size and book to market factors alone.

African financial markets have been at the forefront of the continents development policy due to their potential role as a source of sustainable finance supporting industrial development and economic growth (Harsch 2003). This has taken form in promoting regional integration in an effort to competitively attract an increasing share of global portfolio investment and capital flows. Consequently integration is envisaged as being centred on regional "hub" markets such as Kenya (East) and South Africa (Southern) although initiatives have stalled in North Africa due to a lack of political will as well as the dominance of banking relationship finance and in West Africa over disagreement centred on proposed wider macroeconomic and financial integration and differences arising from incompatible Francophone and Anglophone legal and accounting systems. International awareness of SSA regional financial markets has been enhanced from the inclusion of many in prestigious MSCI, Standard & Poors and FTSE ranges of benchmark indices providing much needed marketing exposure to global portfolio managers. More recently the establishment of Sub Saharan regional funds by Russia's Renaissance Capital (Renaissance Capital website 2009) and South Africa's Nedbank (Nedbank website 2009) have provided useful benchmarks with which investment managers can assess investment performance. Consequently I am motivated in the application of this study to focus on the equity markets within the SSA region.

Liquidity as a concept is very hard to define largely because its representative characteristics transcend a number of transactional properties of markets including tightness, depth, resiliency (Lesmond 2005) and information (O'Hara 2003). The literature has traditionally been limited in only employing constructs capturing only one dimension of a multidimensional phenomenon. This typically centres on variants of the bid-ask spread (quoted or effective) in Amihud and Mendelsen (1986), the turnover measure of Datar et al. (1998), or measures relating to the price impact arising from traded volume such as Amihud (2002) and Pastor and Stambaugh (2003). However there is very little published research concerning measures capturing the trading speed dimension of liquidity, defined as the ability to transact large quantities quickly with little price impact (Liu 2006 and Pastor and Stambaugh 2003). Furthermore there are serious concerns over existing one-dimensional constructs ability to fully capture liquidity risk and over their inaccurate estimation of the dimension they are intended to model. Serious concerns over the limitations of any one-dimensional measure to capture liquidity effectively have been cited by Pastor and Stambaugh (2003) and Amihud (2002) within the context of price-impact measures. Equally deficiencies in the application of the bid-ask spread construct have been highlighted in Lee (1993) where evidence reveals that many large trades occur outside the bid-ask spread while many small trades are undertaken within it leading to potential bias. There is evidence that this is a particularly prevalent problem in the smaller African markets, such as Ghana (Akotey 2008), Uganda and Mozambique (Oliveira 2007). Further concerns over the application of one-dimensional measures focus on their being undefined in the presence of extremes of illiquidity as is a frequent occurrence in emerging markets (Lesmond 2005). A more recent measure developed in

Liu (2006) captures the trading speed dimension of liquidity which is defined as the standardized turnover-adjusted number of zero trading volumes over the past twelve months. It is multi-dimensional in nature, capturing effects relating to trading speed, trading quantity and trading cost, with an emphasis on trading speed, outlined as the continuity of trading and the potential delay in executing an order (Liu 2006). An additional benefit from the use of this measure arises from its measurement robustness in the presence of significant illiquidity (Liu 2006) although this has only been studied within the context of the developed market of the New York Stock Exchange. The considerable dispersion of extremes of liquidity in SSA markets and where there are greater variations in the times between order submission and execution, i.e. trading speeds, justifies the use of the Liu (2006) measure.

The literature concerning the inclusion of liquidity as a priced state variable within a valuation framework is very recent. Pastor and Stambaugh (2003) find strong evidence from US stock data that market-wide liquidity is a priced state variable and that the liquidity premium should be positive. The study applied the innovations of a price impact measure of liquidity to sort stocks within a universe into decile portfolios with the market aggregate premium being formed in the difference between returns of the highest and lowest liquidity deciles. The explanatory power arising from inclusion of the liquidity factor were studied through the contrast of a four factor capital asset pricing model (CAPM) including market, size, price-to-book value and the new liquidity factor against the Fama and French (1993) three factor model and the CAPM. Stocks with higher sensitivity to aggregate liquidity stocks compensate investors with higher expected returns. Evidence is also found that small stocks have greater sensitivities to liquidity innovations than large stocks. Pastor and Stambaugh (2003) note that intuitively it could be expected that small and illiquid stocks are those most affected by market aggregate drops in liquidity thereby precipitating investors to "flee" to assets with higher liquidity. However their findings also show that size and liquidity are not the sole determinants of liquidity betas. This finding is reinforced by the argument explaining why stocks with a high liquidity beta are not necessarily illiquid. Investor preferences when there are market aggregate falls in liquidity are also likely to focus on rival bonds markets. In order to increase portfolio holdings in bonds investors may seek to sell liquid stocks in order to save on transactions costs. Consequently in this scenario the price reaction to aggregate liquidity changes is stronger for more liquid stocks. Equally prices of liquid stocks could have greater sensitivity to aggregate liquidity shocks if such stocks are held in greater proportions within the portfolios of liquidity-conscious investors. This is a particularly pertinent argument in the case of Africa's emerging markets where a severe lack of liquidity caused the demise of prominent investment funds such as the Morgan Stanley Africa Fund in 2002 (Telegraph 2009). As such Pastor and Stambaugh (2003) find little basis for liquidity betas to bear a simple relation to stock size and liquidity. Liu (2006) builds on this background in first using a new liquidity construct to estimate stock liquidity and then including this factor within a two factor augmented capital asset

pricing model (CAPM). While the additional liquidity factor offers strong performance in explaining the cross section of US stock returns the findings are in contradiction to the earlier findings of Pastor and Stambaugh as the liquidity premium solely subsumes the documented anomalies such as size and the book-to-market effects from Fama and French (1993). The applied literature using these liquidity measures has grown recently with studies relating to the four largest and most active markets in Africa, namely Egypt, Morocco, Kenya and South Africa alongside London and Paris (Hearn and Piesse 2010a), the West African markets of BRVM[1] (Cote d'Ivoire), Ghana and Nigeria alongside Tunisia, Morocco, London and Paris (Hearn and Piesse 2010b) and the East African markets of Uganda, Tanzania and Kenya alongside London and South Africa (Hearn 2009). These studies found evidence supporting the continued use of both size and liquidity factors in valuation. While investors would still require compensation from holding small size stocks owing to their additional risks as envisaged in Fama and French (1993) and while these stocks will likely be illiquid, the liquidity and size effects will be largely uncorrelated due to investors motivated to the most liquid stocks in the presence of uncertainty. I justify the use of both size and liquidity factors due to African emerging markets having well documented dispersions in both size and liquidity while investors, conscious of liquidity, are likely to invest in liquid stocks inferring a lack of correlation between size and liquidity effects. As such a three factor augmented CAPM model would build on the original work of Fama and French (1993), having found evidence of the existence of effects due to size and differences between value and growth stocks, known as the price-to-book effect, across the cross section of returns within the market universe. Consequently I retain the size factor alongside the new liquidity factor following Martinez et al (2005) and Hearn and Piesse (2009, 2010b). Furthermore I contrast the performance of this size-liquidity three factor model against that of the well documented size – price-to-book value model of Fama and French (1993) in the unique context of the Sub Saharan African emerging market region.

The majority of the valuation literature concerns the implementation of pricing models that assume a time invariant relationship in the systemic (market) risk of an asset. However over the last fifteen years a separate literature concerning the time varying nature of systemic risk has evolved from an increasing concerns of the violation of assumptions inherent in the linear model such as normality, identity and independence of stock returns (Grout and Zalewska 2006). Pettengill et al (1995) studied the relationship between risk and return in "up" as opposed to "down" markets while Bekeart and Harvey (1995) undertook a similar study using Markov-switching regressions across a broad sample of emerging markets to examine differences between periods of integration with world market and segmentation. Brooks et al (1998) used time varying

[1] BRVM refers to the West African stock exchange, Bourse Regionale des Valeurs Mobilieres, centred in Abidjan, Cote d'Ivoire acting as a regional stock exchange for member states of the Union Monétaire et Économique de l'Afrique de l'Ouest (UMEAO) including Cote d'Ivoire, Benin, Togo, Burkina Faso, Mali, Niger, Senegal and Guinea-Bissau.

techniques based on the Kalman-filter approach and applied to Australian industry portfolios finding that these techniques produced improved in and out of sample performances than other econometric techniques. Grout and Zalewska (2006) find that the use of Kalman filter methods is preferable to Markov-switching regressions owing to their not having to define the exact point of the switch (Grout and Zalewska 2006). Instead any changes in the time path of betas can be assessed through the study of regression results which is particularly relevant in the modelling of liquidity effects as these are prone to considerable fluctuation within emerging markets. In the light of this evidence I use time varying techniques employing the Kalman filter framework following Brooks et al (1998).

In this study I find evidence that size and liquidity factors are both significant in explaining the cross section of returns and with the prominent exceptions of Nigeria and Zambia outperform the Fama and French (1993) size and book to market factors while both models outperform the traditional CAPM. However the linear CAPM as well as its time-varying analogue have questionable performance in the presence of extreme illiquidity as is the case in markets such as Ghana, BRVM, Botswana and Zambia. While the severity of price-rigidity motivates the omission of the very small markets of Mozambique, Swaziland, Malawi, Tanzania and Uganda from inclusion in the study the evidence from the highly illiquid markets of BRVM, Ghana, Mauritius, Botswana and Namibia is that returns are overwhelmingly driven by the liquidity factor. However the severity of illiquidity in these markets provides an indication of considerable segmentation both on an intra and inter market basis. The practical implications of this are in the highly variable cost of equity estimates arising from the linear time invariant models while the evidence would suggest that the time varying model provides a considerable improvement. Costs of equity are highest for the markets of Nigeria and Zambia, the former having a wide intra-market dispersion of liquidity and cost of equity between industrial sectors and the latter being small and extremely illiquid, followed by Mauritius and Kenya and then Ghana, BRVM, Namibia and Botswana. The latter two markets while being very small benefit from proximity to South Africa in having sophisticated trading systems and high levels of corporate governance and transparency. These results support the continued use of the risk-return paradigm in valuation while finding it is limited in successful application to larger and more liquid stocks in the presence of extremes of size and illiquidity that are common in smaller emerging markets.

The paper is structured as follows. Section 2 reviews the institutional features of SSA equity markets while section 3 outlines data sources before introducing the liquidity measures and their construction and finally descriptive statistics. Section 4 outlines the two modelling approaches used: the size and liquidity augmented CAPM and its time varying parameter analogue. Section 5 discusses the empirical results. The final section concludes and makes some comments on development policy that follows from the evidence presented in the paper.

2. SUB SAHARAN EQUITY MARKETS AND LIQUIDITY MEASUREMENT

(i). Sub Saharan African securities markets

The main features of African securities markets are documented in Hearn and Piesse (2005, 2009a) with those of East Africa the focus of Hearn (2009) and West Africa the focus of Hearn and Piesse (2010b).

West Africa

The West African region is dominated by three principal markets, namely Nigeria and the much smaller BRVM (Bourse Regionale des Valeurs Mobilieres in Cote d'Ivoire) and Ghana. A fledgling exchange was created in Cape Verde Islands (Bolsa de Valores de Cabo Verde, or BVC) in December 2005 and while a Francophone central African exchange was created in Cameroon in December 2002 it's first of three listings took place in 2008. Trading and capitalization profiles of all exchanges are typically highly skewed with the financials sector accounting for over 61% of capitalization in Ghana and Nigeria, while Sonatel, the Senegalese Telecommunications company alone accounting for 48.18% of capitalization and 53.90% of trade value in BRVM (see Table 1). Trading in all West African markets is now undertaken via electronic systems five days per week, with call auctions in the smaller Cape Verdean and Cameroonian markets and continuous auctions in those of Nigeria and Ghana (see Table 2). The BRVM operates a call auction with a short period of continuous trading from 10-00am to 10-30am and acting as a regional exchange has had limited success in attracting listings from other UMEAO member states. Order flow precipitated from across the wider Francophone community is minimal with that from Mali accounting for only 2% of the total traded value on exchange, which itself is overwhelmingly dominated by a handful of individual investors (Table 3) reinforcing the notion that the exchange acts to further concentrate wealth in the hands of local elites rather than act as a redistribution mechanism to enforce high governance standards by diversified ownership (Lavelle 2001). However the issues relating to the SSA regions smallest markets which have particularly severe illiquidity are exemplified by Cape Verde, in Table 3, where the mean annual times between order submission to trade matching and execution was as high as 19 days in 2008. Portuguese based banks account for much of the tiny institutional order flow while non-resident expatriate remissions account for the overwhelming majority of individual order flow. However the exchange has undergone considerable modernisation with the inception of an electronic quote driven system, incorporating a sequence of call auctions, to maximise price discovery (BVC website 2009)

Tables 1, 2 and 3

East Africa

The East African region is dominated by the Nairobi stock exchange (NSE) which was incorporated in 1954 (NSE website 2009). Trading is conducted via an exchange floor-based electronic continuous auction from 9-00am to 15-00pm daily (see Table 2) with order flow being precipitated to floor based representatives for trade execution by a small network of licensed brokers (NSE website, 2009). Tanzania has recently migrated trading from open outcry to a floor-based electronic continuous auction system, Dar Automated Trading Electronic System, while proposals are currently being considered for Uganda to follow suit (NSE website 2009). The Kenyan market has a less skewed profile compared to it's smaller neighbours with 51 listings and capitalization spread between financial (42.03%), communications (19.62%), consumer non-cyclical (18.04%) and industrial (8.08%) sectors. This is in contrast to Uganda where Uganda Clays Ltd alone accounts for 48.84% of capitalization of the nine local listings and in Tanzania where the largest stock accounts for 33.82% of capitalization and 32.59% of traded value (see Table 1). The Nairobi market is now the largest market in the East African Community (EAC) and is central to the proposed regional integration initiative (NSE website 2009) with it's existing central depository (CSD) to extend services across the wider East African region. However it is necessary to initiate broader macroeconomic integration within the East African Community in order to mitigate the potentially serious foreign exposure risks that would be imposed on the CSD in a region that has experienced considerable recent macroeconomic volatility (Hearn 2009).

Southern Africa

Southern Africa's equity markets are largely dominated by their giant neighbour, South Africa, either directly through extensive secondary listings, as in Namibia where over 67% of listings are dual listed, or through the listing of local firms that have a South African partner as a majority shareholder, as with Cervejas de Mocambique/ SAB Miller in Mozambique (Hearn and Piesse 2009b) or the majority of listings on the fledgling Malawi stock exchange (Malawi stock exchange website 2009). The markets commonly have highly skewed profiles with financial sector stocks accounting for 83.06%, 70.60%, 47.58% and 43.74% of capitalization in Botswana, Malawi, Namibia and Zambia respectively (see Table 1). Mauritius is the sole exception with 95.07% capitalization concentrated in the consumer non-cyclical sector (Table 1). Trading in Swaziland and Malawi is conducted using a manual call auction, where prices are called and orders recorded on chalk-boards, while a similar electronic system is in operation in Botswana (Table 2). Zambia operates an electronic continuous auction alongside Mauritius, while Namibia is the only market to have fully integrated with South Africa in sharing the Johannesburg Stock Exchange (JSE)- Shares Electronically Traded System (SETS). Mozambique also operates a form of continuous auction on Tuesdays, Thursdays and Fridays (Hearn and Piesse 2009b) although activity is minimal, reflected in periods of up to 20 days between order submission and matching or trade execution, resulting in the largest bid-ask spread in the continent (see Table 3). All markets, except Swaziland and

Mozambique, have introduced development boards which with the exception of Mauritius, have had little effect in attracting more listings. This has resulted in the secondary listing of several overseas mining firms in Botswana and Namibia that are primarily motivated to achieve a degree of indigenisation while exploiting local natural resources as opposed to genuine need to raise capital (Hearn and Piesse 2009a). The Lusaka stock exchange (LuSE) in Zambia has introduced a quoted board where local firms can achieve the prestige of affiliation with the local exchange while avoiding the significant costs arising from adherence to regulatory and governance regimes (LuSE website 2009). However the government maintains significant indirect influence over the market. This is through control of one of the three stockbrokers as well as with civil service pension funds commonly acting as underwriter to new stock issues that are themselves achieved from the restructuring and resale, or privatization, of former state owned assets which is undertaken by the government controlled Zambian Privatization Agency and Zambian Investment Holdings Company.

(ii). Liquidity constructs

The Bid Ask spread

The Bid Ask spread and commission cost: The data on the end of month bid and ask quotes were collected from Datastream. The bid-ask spread is calculated using the average of the available monthly quotes and incorporates at a minimum a single month's quote for that month. The average bid-ask spread spanning the month is used for the estimate of the spread. This procedure minimizes outlier problems and averages out the recording of either highs or lows in quotes resulting from monthly sampling. Following Lesmond (2005) bid-ask spreads that exceed 80% are trimmed as these are potentially errors. The monthly quoted spread is defined as:

$$Quoted\ spread_M = 1/2\left[\left(\frac{Ask_M - Bid_M}{Ask_M + Bid_M)/2}\right) + \left(\frac{Ask_{M-1} - Bid_{M-1}}{Ask_{M-1} + Bid_{M-1})/2}\right)\right] \quad (1)$$

Liu (2006) measure

Daily price and volume data are collected from Datastream. The measure is derived from the recent work of Liu (2006) and is defined as LM_x which is the standardized turnover-adjusted number of zero daily trading volumes over the prior x months (x = 1, 6, 12) i.e.

$$LM_x = \left[(\text{Number of zero daily volumes in prior x months}) + \frac{1/\text{x month turnover}}{\text{Deflator}}\right] * \frac{21x}{NoTD} \quad (2)$$

where x month turnover is the turnover over the prior x months, calculated as the sum of the daily turnover over the prior x months, daily turnover is the ratio of the number of shares traded on a day to the number of shares outstanding at the end of the day, NoTD is the total number of trading days in the market over the prior x months, and deflator is chosen such that,

$$0 < \frac{1}{\text{x month turnover}} < 1 \qquad (3)$$
$$\text{Deflator}$$

for all sample stocks[2]. Given the turnover adjustment (the second term in brackets in first expression), two stocks with the same integer number of zero daily trading volumes can be distinguished: the one with the larger turnover is more liquid. As such the turnover adjustment acts as a tie-breaker when sorting stocks based on the number of zero daily trading volumes over the prior x months. Because the number of trading days can vary from 15 to 23, multiplication by the factor (21x/ NoTD) standardizes the number of trading days in a month to 21 which makes the liquidity measure comparable over time. LM1 can be interpreted as the turnover-adjusted number of zero daily trading volumes over the prior 21 trading days, which is the approximate average number of trading days in a month. The liquidity measure, LM_x is calculated at the end of each month for each individual stock based on daily data. Daily data is available for all markets across entire sample period.

(iii). Data: Sources

Daily stock closing, bid and ask prices, total number of shares outstanding, traded volumes, dividend per share in local currency and converted into UK£ were obtained for Kenya from Datastream. These variables were sourced from both Bloomberg and the national stock exchanges for Uganda, Tanzania, Mauritius, Zambia, Botswana, Malawi, Mozambique, Namibia, Swaziland, Cape Verde Islands, Nigeria, Ghana and BRVM. These data formed the basis of calculation of the daily return variance, or volatility, market capitalization, defined as total number of shares outstanding multiplied by daily closing price, and various liquidity constructs. The total returns series for each stock were sourced direct from Datastream for Kenya while they had to be constructed for all other SSA markets using the procedures employed by Standard & Poors in assuming reinvestment of dividends and taking account of stock splits, rights issues and other corporate actions affecting a stocks intrinsic value. Exchange rate and UK- Gilt/Treasury yield data are sourced from Datastream. The one-month UK-Gilt/Treasury Bill yield rate represents the risk free rate although this is adjusted to take account of monthly excess returns as opposed to the quoted equivalent annualised rates. The conversion of the total returns series and prices into sterling and the use of UK - Gilt/Treasury yield rate assumes long term parity between individual domestic currencies and sterling. In many cases companies were deleted from sample owing to either data inconsistencies or the lack of availability of certain variables that rendered the generation of total returns impossible. Nigeria is one example where there are 234 listings yet 60 of these do not have data and a further 45 firms are missing one critical determinant needed for the generation of total returns indices. Consequently the sample size for Nigeria is 129 firms.

[2] In line with Liu (2006) a deflator of 1,000 is used in constructing estimates for LM1

(iv). Data: Summary statistics

The skewed nature of SSA equity markets in terms of trading activity and capitalization is highlighted in Table 4. This contrasts the mean cross section values for daily percentage zero returns, stock prices, traded volumes, market capitalization and bid-ask spreads for the component firms within the African markets. At this stage the extremely small and highly illiquid markets of Mozambique, Swaziland, Cape Verde, Malawi, Uganda and Tanzania are omitted from further consideration given the severity of aggregate price-rigidity in these markets. The remaining markets of BRVM, Ghana, Nigeria, Mauritius, Botswana, Kenya, Namibia and Zambia are sub-divided into an aggregate overall market measure and separately into major component industries that account for the majority of trading activity and market capitalization, as shown in Table 1. There is clear evidence of size effects in all markets, with the considerable variation of mean cross sectional capitalizations both between industries and between industries and the overall market. Similarly the bid-ask spread, representing liquidity, decreases as mean cross sectional firm size increases indicating the association between size and liquidity. The percentage of zero daily returns variable, another measure of liquidity, in line with the general trend of bid-ask spreads, also exhibits considerable variation between industries and between these and the aggregate market. However the greatest degree of illiquidity that is fairly consistent across all groupings of firms is in Botswana, Namibia, Zambia, BRVM and Ghana. Ghana has a percentage daily zero returns of over 84% for the overall market that decreases to a mere 82.75% for the financial sector, while Zambia has a value of 92.63% for aggregate market dropping to 88.80% for the consumer non-cyclical sector. Similarly Botswana drops from 93.29% for the aggregate market to 92.39% for the financial sector. The BRVM and Namibia are the most illiquid markets with the former being 92.84% for the overall market and 86.33% for communications sector which is the largest and most actively traded industrial sector, and the latter being over 92% for aggregate local market demonstrating the severe price rigidity present in these markets in contrast to an overall value of 59.76% which is representative of the very large number of secondary listed, mostly South African, stocks.

Table 4

3. EMPIRICAL MODELS

This section considers two conditional modelling strategies, namely the three-factor linear CAPM and its time varying parameter counterpart.

(i). Size and Liquidity Augmented CAPM

The standard Fama and French (1993) model augments the traditional CAPM with size (SMB) and price to book value (PBV) returns-based factors that proxy the hypothesized underlying state

variables. Therefore, the expected excess returns on a portfolio p of emerging market stocks can be written as

$$E(r_{pt}) - r_{ft} = \beta_p [E(r_{mt}) - r_{ft}] + s_i E(SMB) + h_i (PBV) \quad (4)$$

The equilibrium relation of the three factor model is stated in terms of expected returns. In order to test the model with historical data, it is necessary to transform (6) to the following estimating equation:

$$r_{it} - r_{ft} = \alpha_i + \beta_i (r_{mt} - r_{ft}) + s_i SMB_t + h_i PBV_t + \varepsilon_{it} \quad (5)$$

where the variables are described above and ε_{it} is an independently identically distributed (iid) disturbance term. Furthermore and following in the spirit of the above Fama and French model I augment the one-factor CAPM with size (SMB) and liquidity (ILLIQ) factors in order to create a size-liquidity three factor model in line with Shum and Tang (2005) and Martinez et al (2005). Therefore, the expected excess returns on a portfolio p of emerging market stocks can be written as

$$E(r_{pt}) - r_{ft} = \beta_p [E(r_{mt}) - r_{ft}] + s_i E(SMB) + h_i (LLIQ) \quad (6)$$

In line with the above this can be transformed in order to test historical data into the following equation:

$$r_{it} - r_{ft} = \alpha_i + \beta_i (r_{mt} - r_{ft}) + s_i SMB_t + h_i ILLIQ_t + \varepsilon_{it} \quad (7)$$

where the variables are described above and ε_{it} is an independently identically distributed (iid) disturbance term. The model is estimated on a time series basis using standard Ordinary Least Squares (OLS) techniques, as opposed to the Fama and Macbeth (1973) rolling cross section approach, with the expectation that the Jensen alpha, or regression intercept, should not be statistically different from zero given the theoretical relationship between an individual portfolios expected returns and those of the market (Markowitz 1959). However Scholes and Williams (1977) provide evidence against the employment of standard OLS techniques with findings that beta estimations are biased downwards for securities infrequently trading and upwards for those traded more often. Dimson (1979) builds on this evidence in the inefficiency of beta estimation in thinly traded stocks and proposes a correction technique based on the aggregation of betas from lagged and leading regression coefficients. Dimson and Marsh (1983) propose a second correction technique which uses a trade-to-trade method measuring and matching returns between individual stocks or portfolios and the market index between the times of the last trades in successive months. I justify the use of standard OLS techniques here in order to closely follow the literature of Pastor and Stambaugh (2003), Liu (2006) and Martinez (2005) who use these techniques extensively in their studies involving multifactor CAPM models capturing liquidity effects. However the limitations of standard OLS techniques must be taken into account when they are applied to the very illiquid markets typical of emerging market regions such as Sub Saharan Africa.

(ii). Time varying parameter CAPM model

Following Brooks et al (1998) the time varying parameter analogue of the linear CAPM employs the Kalman filter and relies on the notion of "state space" in estimating the conditional constant term and market beta of the multifactor analogue of CAPM. This is represented by an observation, or measurement/signal, equation and a transition, or state, equation, that in combination express the structure and dynamics of a time varying system. A state space model is specified where an observation at time t is a linear combination of a set of variables, known as state variables, which compose the state vector at time t. Assuming the number of state variables is m and the (m x 1) vector is θ_t then the observation equation can be represented by:

$$y_t = z_t\theta_t + \mu_t, \qquad \mu_t \sim N(0,\sigma_\mu^2) \tag{8}$$

where z_t is assumed to be known (m x 1) vector, and μ_t is the observation error. The disturbance μ_t is assumed to be normally distributed with zero mean. The set of state variables is defined from the minimum set of information from past and present data and future values of time series are completely determined by the present values of the state variables, known as the Markov property. The state space model incorporates unobserved variables within, and estimates them alongside the observable model, in imposing a time varying structure of the CAPM beta. The conditional betas are estimated using the following observation, or signal equation:

$$R_{it} = \alpha_t + \beta_{it}^{Kalman} R_{Mt} + s_i^{Kalman} SMB + h_i^{Kalman} ILLIQ + \varepsilon_t, \quad \varepsilon_t \sim N(0,\Omega) \tag{9}$$

where R_{it} and R_{Mt} are the excess returns of individual portfolio and market portfolios at time t and ε_t is disturbance term. The exact form of the related transition equation depends on the form of stochastic process the betas are assumed to follow and in this case a simple random walk process is imposed as outlined in Brooks et al (2000). The transition equation is defined:

$$\alpha_{it}^{Kalman} = \alpha_{it-1}^{Kalman} + \eta_{\alpha t,} \quad \eta_{\alpha t} \sim N(0,Q) \tag{10}$$

$$\beta_{it}^{Kalman} = \beta_{it-1}^{Kalman} + \eta_{\beta t,} \quad \eta_{\beta t} \sim N(0,Q) \tag{11}$$

$$s_{it}^{Kalman} = s_{it-1}^{Kalman} + \eta_{st,} \quad \eta_{st} \sim N(0,Q) \tag{12}$$

$$h_{it}^{Kalman} = h_{it-1}^{Kalman} + \eta_{ht,} \quad \eta_{ht} \sim N(0,Q) \tag{13}$$

Together equations 9 and the combination of 10 to 13 constitute a Kalman filter state space model. However a set of prior conditional values are necessary for the Kalman filter to forecast the future value and is expressed as:

$$\alpha_0^{Kalman} \sim N(\alpha_0^{Kalman}, P_0) \tag{14}$$

$$\beta_0^{Kalman} \sim N(\beta_0^{Kalman}, P_0) \tag{15}$$

$$s_0^{Kalman} \sim N(s_0^{Kalman}, P_0) \tag{16}$$

$$h_0^{Kalman} \sim N(h_0^{Kalman}, P_0) \quad (17)$$

Brooks et al (1998) cite that this technique uses the first two observations to establish the prior conditions and then recursively estimates the entire series providing conditional estimates of $\beta_{it}^{Kalman}, s_{it}^{Kalman}, h_{it}^{Kalman}$ and α_{it}^{Kalman}.

4. RESULTS

(i). Summary statistics relating to size-liquidity sorted portfolios

The dispersion of stocks on a market by market basis between the nine size-illiquidity sorted portfolios is given in Table 5. These have been generated for the markets of Nigeria, Zambia, Botswana, Mauritius (Main Board), Namibia (Local market), Kenya, and the two largest and most actively traded sectors of BRVM (Communications and Consumer non-cyclical) and Ghana (Financials and Consumer non-cyclical). Although this introduces potential bias arising from stock selection in the latter two highly illiquid markets it also removes the overwhelming majority of completely inactive stocks that are segmented from both the local exchange and the market universe used in this study. There is a relatively even dispersion of stocks across all size-illiquidity sorted portfolios with the prominent exceptions of Namibia and Botswana, where stocks of the former are centred solely in low illiquidity portfolios for each of the three size categories, and stocks of the latter are evenly dispersed across only the three large size portfolios. Nigeria is also an exception where twice the number of stocks are located in the three small size portfolios compared to the three large size portfolios. Equally higher numbers of stocks are located between either high or low illiquidity portfolios with noticeably few in medium bracket.

Table 5

Descriptive statistics for all nine size-illiquidity factor sorted portfolios and the zero-cost SMB and ILLIQ portfolios are in Tables 5 and 6. Table 5 shows that the average mean returns increase considerably from large to small size stock portfolios. This is also reflected in the measure of volatility, where standard deviations increase dramatically from larger size firm to smaller size firm portfolios. Average returns in small size stock portfolios tend to be more risky than in larger stock portfolios, but also have higher potential returns. However the negative value of the mean of the Price to Book value (PBV) and Illiquidity factors in Table 6 indicates the likelihood of a reverse price-to-book value effect from that in Fama and French (1993) and illiquidity effects in Martinez et al (2005) where returns steadily decrease as either price-to-book value or illiquidity of stocks increases. Although there is little difference between the low and high liquidity portfolio means across the various sample group market variables, there is an increase in volatility from high illiquidity to low illiquidity stock portfolios. This result is expected given that the often severe

illiquidity inhibits the adjustment of prices and returns in reaction to the impact of sudden erratic order flow on stock prices.

Table 6 also demonstrates the high degree of non-normality in the average overall market series, and particularly high excess kurtosis values are shown for Nigeria (41.423), Zambia (36.094), Ghana (62.273), BRVM (65.831) and Botswana (75.074). Equally these markets are highly skewed. However this situation is somewhat reversed when considering only the individual industries, where the two largest and most actively traded are considered, in these markets where there is a considerable decrease in levels of skewness and kurtosis and returns show greater normality in their distribution. The evidence in Table 6 shows that there is some correlation between the SMB, ILLIQ and Market valuation factors for the SSA market universe which would question the effectiveness of these returns-based factors in representing the underlying state variables they are designed to proxy. It should be noted that these differences do indicate that the implicit assumption of integration on either an intra or inter market basis is tenuous at best. However the lack of viable alternative methodologies and the ease of application merit the continued use of this methodology in this study.

Table 6

(ii). Performance of traditional CAPM against three-factor CAPM

Table 7 reports the results from the grouped pooled regression on all nine size-price-to-book value and size-illiquidity sorted portfolios for the SSA market universe. The results of the former are detailed in panel A while the latter are in panel B. The addition of the addition factors in both cases to the traditional CAPM results in increased explanatory power and a general reduction in the statistical significance of Jensen alpha, α_p, terms, which is in line with theory (Sharpe 1964; Linter 1965) where jensen alpha terms are expected in time series CAPM regressions are expected to not be statistically different from zero in perfectly integrated markets. However the explanatory power is marginally better when the size and price-to-book value factors are used as opposed to the size and liquidity factors alone. However increases in explanatory power are greatest for the three small size portfolios and in particular for the small size – low illiquidity portfolio where the additional factors are highly statistically significant. The severity of illiquidity issues affecting the model is highlighted in the adjusted R^2 of 7.94% for the small size high illiquidity portfolio in the one-factor model which leaps to 61.35% upon the inclusion of the size and liquidity factors. A similar dramatic increase in explanatory power from the inclusion of the size and liquidity factors arises in the large size high illiquidity portfolio where the adjusted R^2 in the one-factor model is 1.17% and increases to 39.20%. Although the application of this model to highly illiquid markets is questionable and the implicit assumptions regarding inter and intra asset market integration are very tenuous these are important results in the context of emerging markets, as the vast majority of research on the original of Sharpe (1964) and Lintner (1965) is confined to developed markets.

In all cases within East Africa the Jensen alpha, α_p, term was not statistically different from zero which is in line with theory. The estimated coefficients on both the market excess return ($\hat{\beta}$) and the illiquidity factor (ILLIQ) are large and significant in almost all cases. Those on the size factor-mimicking portfolio (SMB) are smaller in the majority of cases and are only significantly different from zero in the large or small-size company portfolios. The coefficients on the large-size portfolios are negative as well as being highly statistically significant. The negative sign on the large-size portfolio betas indicates that large firms' returns decrease when the size premium increases, which is the opposite for small firms. This behaviour is not expected and is indicative of a reversal of the documented "size effect" that effects the valuation of smaller firms (Martinez et al 2005). It is also a feature of an extremely heterogeneous universe of stocks, where there are considerable differences in stocks within markets as evidenced from the descriptive statistics in Table 4. This is the opposite of what would be expected and does not provide investors with good hedging opportunities. Thus, as with the results for the small-size portfolios, a different valuation method would be needed to price very high illiquidity stocks and firms accurately. The estimated coefficients on the illiquidity factor-mimicking portfolios are negative for low and medium-illiquidity portfolios indicating as expected that more liquid firms experience a decrease in expected returns when aggregate market illiquidity increases. In general, the coefficients on the low-illiquidity and medium-illiquidity portfolios are negative, as one would expect, with firms paying lower returns when the illiquidity variable increases. However, the coefficients on the high-illiquidity portfolios are positive indicating that these companies pay higher returns when the illiquidity measure increases. The increased explanatory power of these models illustrates that the augmented CAPM is appropriate for illiquid markets.

Tables 7 and 8

(iii) Modelling country portfolios

Country and industry portfolios were formed from the simple price-weighted averages of stock returns across stocks aggregated into either industries or countries. The time invariant CAPM, size-illiquidity and size-price-to-book value augmented CAPM models were applied to the portfolios with results reported in Table 8.

Average Returns in West Africa

The evidence from Ghana and BRVM indicates that there is a substantial increase in explanatory power arising from the inclusion of the additional size and either illiquidity or price to book value factors. However the addition of size and illiquidity terms has the greatest increase in explanatory power for the aggregate market portfolio for Ghana and BRVM where the R^2 in the former is 39.28% and in the latter 38.96%. The inclusion of size and price to book factors cause the largest

increases albeit in the very low explanatory power of the industry portfolios where the price to book beta for the communications and consumer non-cyclical industries in BRVM is large and statistically significant. Similarly returns are driven in the consumer non-cyclical and financial industries in Ghana by a large and positive price to book term. However the very low R^2 of all four industry models would indicate that these fail to fully capture the returns generating process in each case. Nigeria is quite different from the other West African markets, as by virtue of sheer size it's stocks dominate the market universe (see Table 5). Consequently the explanatory power of the traditional CAPM as well as it's three factor counterparts is over 98% for the aggregate Nigerian portfolio, while the additional size, price to book value and illiquidity factors are all not statistically significant. The Jensen alpha terms in each case are also not statistically significant indicating considerable integration between Nigeria and the overall SSA universe. However the evidence suggests that returns in the Nigerian financials and consumer non-cyclical industry sectors are largely driven by price to book factor, as the R^2 from the inclusion of size and price to book factors in the former is 44.83% and in the latter 45.54%.

Average Returns in East Africa

The evidence from Kenya as well as Kenyan industry portfolios is mixed regarding which of either of size and price to book or size and illiquidity factors produce greatest increases in explanatory power. The addition of size and price to book value factors produce large increases in R^2 for the aggregate Kenyan market portfolio (18.01%) and for the Kenyan Communications industry (5.03%) while the addition of size and illiquidity factors play a more important role in explaining returns in the Consumer non-cyclical (8.44%) and Financials sectors (20.28%). An additional issue in modelling Kenyan portfolios is the low levels of statistical significance of the market betas indicating a poor fit between Kenyan stocks and the aggregate SSA universe.

Average Returns in Southern Africa

The evidence contrasting the benefits to explanatory power of models arising from the addition of either the size and price to book factors or the size and illiquidity factors is less clear across Southern African country and industry portfolios. The inclusion of the latter in modelling the Botswana country portfolio leads to an R^2 of 33.03%, as compared to an R^2 of 32.54% through the inclusion of the former. However the statistical significance of all factors including the market is low indicating a poor fit of the model. The models for Botswana consumer non-cyclical and financials industry portfolios have low explanatory power (under 5%) and also low statistical significance of factors although both exhibit a marginal increase in R^2 for the preferential addition of size and price to book value factors as opposed to illiquidity.

The evidence from Zambian industry portfolios shows that size and price to book value factors are highly statistically significant in explaining returns both in the consumer non-cyclical

and financials industry portfolios. The inclusion of size and price to book value factors as opposed to size and illiquidity factors leads to R^2 values of 79.03% for consumer non-cyclical and 77.04% for financials industry portfolios. In contrast to Zambia the evidence from Mauritius and Namibia reveals that explanatory power is highest with the inclusion of size and illiquidity factors. The R^2 value for the three factor size-illiquidity model of Mauritius is 19.66%, for Mauritius financials 21.04%, and for Mauritius consumer non-cyclical 20.22%. Similarly for Namibia the R^2 is 20.43% and 22.85% when including size and illiquidity factors as opposed to price to book value.

(iii) Time-varying coefficient CAPM

The time varying coefficient model based on the augmented CAPM was only estimated including market, size and illiquidity factors. The evidence in Table 9 provide some support to the findings of the preceding section where maximum likelihood convergence is achieved solely for the time varying coefficient models including only the alpha and market premium terms for Nigeria and the Nigerian consumer non-cyclical and financial industries. Equally in the highly illiquid market sectors of Botswana, Botswana consumer non-cyclical and BRVM Communications maximum likelihood convergence is achieved using only alpha, market and illiquidity factors. This would provide some support that illiquidity factor does have an important role in valuation using this time varying methodology**.**

Figures 1 to 14 provide time series plots of the evolution of the liquidity betas across industry portfolios. The evidence in Figures 1 to 6 reveals that liquidity betas and not significantly different from zero, owing to their standard error being less than zero, for most of their time spans across industries. However Botswana is an exception where the liquidity beta is reflective of the highly illiquid nature of the overall market inasmuch that it is large, positive, and has a standard error that is positive for the majority of study period. The time evolution profiles of Figures 2 and 3 also reveal that liquidity beta profiles are similar between the same industry in different markets within a region, as is the case between the consumer non-cyclical industry in BRVM and neighbour Ghana. This would indicate common liquidity effects or factors between the two markets. Figures 7 and 8 reveal the time profiles of liquidity betas for the communications industries of BRVM and Kenya. These indicate a short period of low correlation for both countries communications sectors with aggregate illiquidity between April 2004 and April 2005 and a corresponding decrease in liquidity beta since the onset of financial crisis and recession in developed OECD Western markets from mid-2007. Figures 9 to 14 reveal the time evolving profiles of liquidity betas for Sub Saharan Africa's financial sectors. These profile reveal sizeable increases in liquidity betas for the financial sectors of Mauritius, Namibia and Zambia, all of which are dominated by internationally orientated banks, since the onset of financial crisis in OECD markets. However the profiles of Botswana, Kenya and Ghana in contrast do not reveal any significant increases during this period outside their normal trend.

Table 9

Figures 1 - 14

(iv) Modelling sector portfolios and cost of equity estimation

Table 10 provides costs of equity estimates arising from the three contrasting models, namely the time invariant linear size-liquidity and size-price to book value augmented CAPM and the time varying size-liquidity analogue of the CAPM. These reveal strong variation in estimates between industrial sectors and their overall markets, as between Botswana and the local financial and consumer non-cyclical sectors. The estimates formed from application of the time varying parameter model exhibit considerably less variation between industrial sectors and aggregate market portfolios. However the estimates of cost of equity across country portfolios and industry sectors is in line with expectations: Nigeria and Zambia have by far the highest values, in line with well documented shortcomings in corporate governance and regulatory enforcement while Botswana, benefiting from close proximity to South Africa, has a strong corporate governance regime based on it's neighbours King II report and well designed and implemented regulation and enforcement mechanisms. Namibia unexpectedly has a high cost of equity (28.94% overall and 25.12% for financial sector) which may be indicative of issues relating to small, illiquid local stocks being traded in a continuous auction within the JSE-SETS integrated trading link. This would also partly explain the very high bid-ask spread value for this market earlier in Table 4 despite the perceived technological benefits arising from such a link. Cost of equity estimates for Kenya are in line with other previous studies, notably Hearn (2009) and costs of equity would be expected to be higher in Ghana than in BRVM owing to the former having a more rudimentary regulatory and enforcement regime and a trading system (continuous auction) less able to maximise price discovery in conditions of extreme illiquidity. The cost of equity is calculated from the combination of the annualised market, size and liquidity premiums using the 1 month UK Treasury rate as the risk free rate.

Table 10

5. CONCLUSIONS

This study proposes to augment the traditional CAPM and it's time varying counterpart with additional returns based size and liquidity factors that mimic underlying state variables present within a universe of stocks. It contrasts the explanatory power and fit of the Fama and French (1993) three factor model incorporating size and price to book value factors. The recently developed Liu (2006) liquidity measure is used to capture the multi-dimensional nature of liquidity, although it has particular strength in measuring trading speed, a particularly prominent feature in emerging markets where there are considerable variations in time between order submission and trade execution. The valuation models are uniquely applied to the markets of Sub Saharan Africa,

excluding South Africa, namely Cote d'Ivoire (BRVM), Ghana, Nigeria, Kenya, Mauritius, Zambia, Botswana and Namibia, which while being at the forefront of Africa's policy drive towards regional integration and also subject to increasing interest by international portfolio managers. The implications of the study in terms of comparative costs of equity faced by firms within various industry sectors seeking to raise cost effective finance adds additional value to the findings. An additional benefit from the application of time varying techniques is that a study of the effects of the financial crisis and recession in developed OECD countries on domestic African industries can be undertaken.

The application of both the multifactor CAPM and time varying coefficient models reveals the relative contributions of the market, size and either price to book value or liquidity premiums in the conditional modelling of the returns generating process across size and liquidity sorted portfolios. In general there is little increase in explanatory power between the application of the linear CAPM and its three-factor counterpart, including the additional size and liquidity factors for the Nigerian market, which is expected as this market's stocks overwhelmingly dominate the aggregate SSA market universe. The addition of the size and price to book value factors are found to have a more significant impact in explaining returns than size and liquidity in all other SSA markets. Similar findings arise from the application of time varying Kalman filter techniques. These reveal market premiums are sufficient to explain returns in Nigeria and it's component industries, while the illiquidity premium alone assists in explaining Cote d'Ivoire (BRVM) and Botswana industries and the inclusion of the combination of size and illiquidity premiums are necessary in modelling returns within all other SSA markets and industries.

These results provide some support for the continued use of the risk-return paradigm in emerging markets although this is limited to larger more liquid markets in the presence of extremes of illiquidity. The evidence from the estimates of costs of equity reveals that these are highest in Nigeria and Zambia, where returns in the latter are largely driven by a considerable liquidity premium alone. There are considerable differences in cost of equity both across markets and between component industries providing further evidence of the degree of segmentation present in SSA regions equity markets. Finally Botswana has the lowest costs revealing the benefits inferred from firms able to list on this market and gaining from well implemented regulation and corporate governance codes. However the considerable differences between sectors and across the wider SSA region as a whole shows the necessity for markets to adopt well designed regulation and it's efficient enforcement together with corporate governance codes.

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Table 1 Market Capitalisation and Traded Value profiles, 2008

	Nigeria	Ghana	BRVM	Cape Verde	Kenya	Uganda	Tanzania	Mauritius	Botswana	Namibia	Zambia	Malawi	Swaziland
Listed Firms	234/1*	36/4*	40/1*	4	51	9	14	89	20/11*	7/22*	19/10†	14	6
Proportion Market Capitalisation to total (%)													
Top 1	10.14	19.09	48.18	37.35	15.07	48.84	33.82	94.34	22.67	40.75	31.04	69.35	74.50
Top 5	32.13	62.78	70.79	100.00	51.90	95.51	85.61	97.74	81.39	78.89	78.43	-- --	97.60
Top 10	51.72	79.32	81.60	-- --	73.98	-- --	98.98	98.43	95.28	93.29	96.08	-- --	-- --
Top 50	91.58	-- --	-- --	-- --	99.98	-- --	-- --	99.82	-- --	-- --	-- --	-- --	-- --
Proportion Traded Value to total (%)													
Top 1	8.72	25.98	53.90	98.64	24.82	-- --	32.59	29.11	16.59	29.85	33.39	69.71	65.77
Top 5	35.56	79.06	89.38	100.00	63.21	-- --	91.89	66.14	62.64	71.63	92.56	-- --	98.31
Top 10	51.67	93.15	95.48	-- --	79.68	-- --	98.99	77.86	91.91	94.69	98.74	-- --	-- --
Top 50	87.98	-- --	-- --	-- --	100.00	-- --	-- --	98.32	-- --	-- --	-- --	-- --	-- --
Proportion Sector Market Capitalisation to total (%)													
Financials	61.96	61.13	8.88	43.72	42.03	21.14	5.41	1.82	83.06	47.58	43.74	70.60	21.46
Comm.	0.69	0.02	49.79	-- --	19.62	1.16	-- --	-- --	-- --	-- --	4.81	-- --	-- --
Basic Materials	0.53	0.93	0.34	37.35	1.69	-- --	-- --	0.02	-- --	44.88	-- --	-- --	-- --
Cons cyclical	1.85	0.46	4.30	18.93	3.59	4.06	22.58	1.05	3.13	2.16	0.49	-- --	4.04
Cons non-cyclical	22.47	31.41	24.78	-- --	18.04	24.79	47.54	95.07	10.03	4.27	32.51	-- --	74.50
Diversified	1.17	-- --	-- --	-- --	0.65	-- --	-- --	1.96	-- --	-- --	-- --	28.56	-- --
Energy	5.35	5.94	3.41	-- --	4.95	-- --	0.26	0.01	2.84	-- --	1.74	-- --	-- --
Industrial	5.88	-- --	5.95	-- --	8.08	48.84	9.20	0.07	0.88	1.10	12.35	0.84	-- --
Technology	0.11	0.10	-- --	-- --	-- --	-- --	-- --	-- --	0.05	-- --	-- --	-- --	-- --
Utilities	-- --	-- --	2.54	-- --	1.35	-- --	-- --	-- --	-- --	-- --	4.36	-- --	-- --
Proportion Sector Traded Value to total (%)													
Financials	79.26	76.62	6.87	1.21	40.18	-- --	0.01	59.25	74.83	47.61	3.69	30.26	28.22
Comm.	0.42	0.01	54.18	-- --	31.16	-- --	-- --	-- --	-- --	-- --	31.87	-- --	-- --
Basic Materials	0.52	0.19	0.10	98.64	0.97	-- --	-- --	0.27	-- --	31.57	-- --	-- --	-- --
Cons cyclical	2.82	0.65	1.72	0.14	4.98	-- --	23.83	27.97	9.45	6.44	0.08	-- --	6.01
Cons non-cyclical	8.61	20.62	35.08	-- --	10.70	-- --	9.19	9.29	13.13	8.13	38.76	-- --	65.77
Diversified	0.70	-- --	-- --	-- --	0.59	-- --	-- --	2.10	-- --	-- --	-- --	69.71	-- --
Energy	3.83	1.90	0.81	-- --	7.65	-- --	0.60	0.24	1.65	-- --	0.20	-- --	-- --
Industrial	3.65	-- --	0.95	-- --	2.52	-- --	31.50	0.88	0.71	6.24	22.43	-- --	-- --
Technology	0.20	0.01	-- --	-- --	-- --	-- --	-- --	-- --	0.23	-- --	-- --	-- --	-- --
Utilities	-- --	-- --	0.28	-- --	1.25	-- --	-- --	-- --	-- --	-- --	2.97	-- --	-- --

Source: Compiled by authors from Bloomberg and Datastream

Notes: (1) BRVM is the Bourse Regionale des Valuers Mobilieres and is based in Cote d'Ivoire

(2) *denotes number of secondary cross-listed shares (listing by registration only) and † denotes number of quoted (as opposed to full listed) firms

Table 2 Contrast of market regulations and institutions

	Commercial Law	No. Brokers	Market Clearance Procedures	Capital Gains Tax	Trading Hours	Trading Arrangements
Kenya	Common law	18	Partial G30 compliant. DVP undertaken T + 3.	Exempt	10-00am – 12-00noon	Automated Trading system – previously Open Outcry commenced by sounding a bell
Mauritius	Civil Code		Partial G30 compliant. DVP undertaken T + 3.	Exempt	9-00am – 10-00am: Pre-Opening electronic call auction. 10-00 am – 13-30 pm: Continuous Trading. 13-30 pm – 14-15 pm: Run-Off	Electronic continuous auction, SEMATS (Stock Exchange of Mauritius Automated Trading System) was launched on 29th June 2001
BRVM	Civil Code	9 in Cote d'Ivoire; 4 in Benin; 3 in Senegal; 1 in all other UMEAO countries	Partial G30 compliant. DVP undertaken T + 3.	Exempt	10-00 to 10-30am	Pre-opening call auction followed by continuous auction
Ghana	Common Law	16	Partial G30 compliant. DVP undertaken T + 3.	Exempt	10-00am to 11-00am	Automated Trading system (Continuous auction)
Nigeria	Common law	219	Custodial facilities provided by brokers with sufficient capitalisation. Mostly G30 compliant and DVP undertaken at T + 3	Exempt	11-00am to 13-00pm	Call Over trading system was replaced in April 1999 by Automated Trading System (ATS) which serves as an electronic order matching system
Zambia	Common law	3	Partial G30 compliant. DVP undertaken T + 3.	Exempt	10-00am - 11-00am: Pre-opening electronic call auction 11:00am – 1300pm: Continuous trading 13:00pm - 14:00pm: Run Off	Automated Trading system (Continuous auction)
Botswana	Common law	4	Partial G30 compliant. DVP undertaken T + 3.	Exempt	10-00am – 12-00pm	Electronic call auction conducted in trading room within exchange building.
Namibia	Common law	6	Fully G30 compliant including custodial facilities. DVP undertaken T + 3	Exempt	8-25 am – 9-00 am: Pre-Opening electronic call auction. 9-00 am – 4-00 pm: Continuous Trading. 4-00 pm – 6-00 pm: Run-Off	JSE SETS Electronic Trading system (SETS trading system has been in place at the London Stock Exchange and replaced the former JET system in 2002)

Notes: (1) Namibia adhere to Roman-Dutch civil code but commercial and securities regulatory law follows English common law

Table 3. Small Equity Market characteristics

	2005	2006	2007	2008
Panel A: BRVM brokerage order flow from Mali				
Individual				
Mean buy order size (shares)	558	1,173	11,263	5,800
Mean sell order size (shares)	350	80	5,342	24,855
Total Number of individual investors	21	11	12	12
Proportion of activity by single individual (%)	37.58%	93.27%	98.09%	87.51%
Institution				
Mean buy order size (shares)	0	69	2,226	9,150
Mean sell order size (shares)	0	0	260	22,294
Overall				
Traded value Equities (Mali) UK£(m)	0.46	0.29	0.41	0.47
Traded value Equities (BRVM) UK£(m)	16.67	51.03	79.36	150.43
% of total traded value on BRVM	2.76%	0.56%	0.52%	0.31%
Panel B: Mozambique Stock Exchange				
Individual				
Mean buy/sell order size (shares)	3,650	1,035	1,817	-- --
Institution				
Mean buy/sell order size (shares)	0.00	12,750	1,479	-- --
Annual Mean time from order submission to trade execution (days)	-- --	12.71	20.00	-- --
Panel C: Cape Verde Islands Stock Exchange				
Individual				
Buy Orders				
Overseas individual investors (shares)	-- --	-- --	1,344,000 [1]	12,101 [13]
Domestic individual investors (shares)	-- --	30 [2]	93 [22]	23,898 [20]
Sell Orders				
Overseas individual investors (shares)	-- --	-- --	-- --	224 [2]
Domestic individual investors (shares)	-- --	-- --	1,184 [7]	3,970 [52]
Institution				
Buy Orders				
Overseas institution investors (shares)	-- --	-- --	4,157 [15]	233 [41]
Domestic institution investors (shares)	-- --	250 [1]	6,682,935 [8]	334,092 [3]
Sell Orders				
Overseas institution investors (shares)	-- --	-- --	-- --	6,724 [1]
Domestic institution investors (shares)	-- --	-- --	28,675,541 [21]	2,787,072 [2]
Annual Mean time from order submission to trade execution (days)	8.05	15.46	6.14	19.11
Total Buy order value (US$) '000	1.88	275.55	16,824.27	20,118.82
Total Sell order value (US$) '000	2.56	1,121.22	11,802.28	18,247.86

Source: Compiled by authors from Societe de Gestion et d'Intermédiation (SGI), Bamako, Mali, from Bolsa de Valores de Maputo and Standard Bank, Maputo, Mozambique and from Bolsa de Valores de Cabo Verde, Praia, Cape Verde.

Notes: (1) In case of Mali all investors are Malian and are either resident in Mali or France. Traded Value denominated in millions GBP (UK£)

(2) In case of Cape Verde individual investors are both émigrés as well as other non-residents. Investment banks, local offices of Bank of Portugal, and other private institutional investors form the Institutional investor category.

Table 4 Summary Statistics

Country	Sector	No. Firms	Local market				£UK equivalent		
			Zero Return (%)	Price	Volume (thousands)	Market Capitalization (millions)	Price	Market Capitalization (millions)	Bid-Ask spread (%)
Swaziland	Overall	6	94.26 [97.61]	401.31 [415.50]	331.01 [1.45]	19,084.93 [20,735.67]	-- --	-- --	-- --
Mozambique	Overall	1	95.34 [100]	14,605.58 [13,722.72]	4.50 [0.17]	1,403,592.39 [1,242,049.88]	-- --	-- --	0.1779 [0.1579]
Cape Verde	Overall	4	97.82 [98.38]	5,321.34 [5,391.26]	1.38 [0.33]	1,737.77 [1,736.42]	67.33 [68.87]	22.08 [23.19]	-- --
Malawi	Overall	14	98.33 [98.33]	675.79 [619.60]	573.92 [52.77]	139.34 [113.45]	-- --	-- --	-- --
Tanzania	Overall	14	89.48 [91.14]	909.72 [900.92]	377.35 [182.49]	180,885.65 [117,930.35]	0.49 [0.48]	86.23 [71.69]	-- --
Uganda	Overall	9	84.58 [85.24]	3,033.26 [2,842.34]	-- --	2,204,789.86 [1,994,759.31]	1.03 [1.04]	756.74 [765.04]	-- --
BRVM	Overall	41	92.84 [93.50]	24,708.14 [21,121.02]	4.95 [2.33]	35,266.04 [27,147.46]	26.32 [20.58]	38.16 [26.83]	0.0740 [0.0693]
	Communications	3	86.33 [86.66]	33,828.14 [23,976.61]	19.63 [10.26]	314,182.21 [238,249.11]	36.91 [24.76]	343.83 [246.97]	0.0611 [0.0363]
	Cons. Non-cyc.	11	91.58 [92.66]	29,018.87 [22,669.23]	8.53 [1.36]	33,544.11 [25,632.24]	31.08 [22.61]	36.17 [25.06]	0.0796 [0.0763]
Ghana	Overall	30	84.39 [87.68]	0.64 [0.24]	292.02 [140.39]	33.40 [10.39]	0.48 [0.38]	23.08 [17.24]	-- --
	Financials	10	82.75 [84.74]	1.59 [0.66]	380.15 [121.88]	67.00 [19.09]	1.21 [1.04]	44.50 [34.29]	-- --
	Cons. Non-cyc.	12	84.02 [86.72]	0.34 [0.13]	275.44 [38.97]	31.67 [10.16]	0.26 [0.23]	22.41 [15.09]	-- --
Nigeria	Overall	230	78.18 [80.13]	10.38 [9.51]	34,561.92 [22,134.75]	22,067.16 [13,896.78]	0.05 [0.03]	95.41 [58.32]	-- --
	Financials	62	70.60 [74.79]	4.68 [3.57]	101,089.58 [72,539.76]	45,372.33 [28,197.54]	0.02 [0.01]	194.79 [118.32]	-- --
	Cons. Non-cyc.	57	77.65 [78.63]	12.20 [11.46]	9,347.31 [6,764.80]	22,730.03 [21,045.15]	0.05 [0.05]	98.92 [89.04]	-- --
Mauritius	Overall (Main Board)	40	83.46 [84.06]	38.09 [29.79]	357.83 [302.11]	1,581.34 [1,129.18]	0.84 [0.78]	33.94 [29.94]	-- --
	Financials	16	81.62 [82.95]	27.56 [21.81]	695.86 [578.22]	2,030.31 [1,490.8]	0.60 [0.60]	44.08 [37.67]	-- --
	Cons. Non-cyc.	6	78.27 [79.33]	33.67 [27.47]	267.22 [208.68]	2,997.20 [2,136.21]	0.73 [0.7]	62.87 [53.45]	-- --

Country	Sector	No. Firms	Zero Return (%)	Price	Volume (thousands)	Market Capitalization (millions)	Price	Market Capitalization (millions)	Bid-Ask spread (%)
Botswana	Development & Enterprise Mkt	51	82.98 [82.8]	145.17 [62.59]	133.24 [69.61]	15,954.74 [1,649.66]	2.86 [1.42]	292.09 [38.85]	-- --
	Overall	18	93.29 [93.75]	376.34 [316.02]	907.25 [584.02]	72029.65 [57454.49]	39.72 [35.95]	7361.48 [6742.04]	-- --
	Financials	11	92.39 [92.83]	280.72 [213.3]	1,330.17 [884.23]	104,414.30 [85,075.28]	28.31 [24.76]	10,499.05 [10,100.37]	-- --
	Cons. Non-cyc.	3	92.95 [93.55]	899.13 [963.06]	683.70 [299.47]	71,619.33 [67,456.53]	100.93 [93.22]	7965.56 [7887.95]	-- --
Zambia	Overall	21	92.63 [93.33]	1089.10 [698.26]	2,870.42 [509.39]	249,135.35 [183,306.67]	0.17 [0.15]	40.41 [27.34]	-- --
	Financials	6	94.51 [95.16]	2,167.03 [1,783.79]	9,634.67 [420.5]	360,187.54 [200,969.88]	0.37 [0.26]	60.10 [35.66]	-- --
	Cons. Non-cyc.	6	90.33 [91.41]	1,049.53 [306.52]	1,035.31 [323.55]	288,408.33 [110,239.00]	0.15 [0.05]	42.17 [20.03]	-- --
	Industrial	3	88.80 [89.29]	957.20 [352.43]	1,237.30 [52.00]	225,141.59 [255,260.30]	0.14 [0.07]	31.10 [31.53]	-- --
	Quoted Board	3	98.26 [100.00]	79.96 [45.00]	770.25 [244.35]	398,042.47 [361,143.75]	0.01 [0.01]	52.77 [46.31]	-- --
Kenya	Overall	66	67.08 [67.49]	40.80 [41.16]	5,219.65 [1,493.67]	4,265.78 [1,434.17]	0.36 [0.34]	34.25 [15.6]	0.0743 [0.0696]
	Financials	32	44.33 [45.91]	30.74 [20.01]	10,841.39 [3,231.06]	6,458.74 [1,777.46]	0.26 [0.22]	51.44 [19.55]	0.0576 [0.052]
	Cons. Non-cyc.	13	67.60 [67.56]	67.04 [66.77]	3,762.06 [1,156.71]	3,928.83 [1,207.56]	0.60 [0.56]	31.25 [11.77]	0.0759 [0.0695]
	Communications	5	50.32 [50.00]	37.36 [32.90]	6,577.35 [394.43]	5,028.54 [1,863.47]	0.31 [0.32]	40.75 [18.05]	0.0638 [0.0502]
Namibia	Overall	30	59.76 [51.02]	29.99 [24.56]	626.91 [542.31]	19,752.41 [13,763.01]	2.72 [2.40]	1,548.84 [1,169.15]	0.1949 [0.1877]
	Local	7	92.29 [95.23]	9.79 [2.28]	626.64 [254.27]	300.09 [214.25]	2.20 [1.89]	25.32 [19.42]	0.1766 [0.1565]
	Financial (Local)	5	91.44 [96.78]	12.92 [3.29]	386.55 [76.06]	365.05 [306.13]	3.70 [3.77]	31.65 [23.07]	0.1628 [0.121]

Source: Compiled by authors from Bloomberg, Datastream and National stock exchanges

Notes: (1) * Indicates Namibian domestic market of 7 locally listed firms. Remaining 22 Namibian firms have primary listings in South Africa and are considered South African

Table 5. Summary statistics for equally weighted monthly excess returns on 9 size-illiquidity and size-price-to-book value portfolios for period 2001 to 2009

Portfolio	S/L	S/M	S/H	M/L	M/M	M/H	B/L	B/M	B/H
Panel A: Portfolios sorted on Size- Price to Book Value									
Summary statistics for portfolios									
Mean	0.06822	0.02704	0.04473	0.01694	0.01932	0.03311	0.03093	0.03281	0.03089
Median	0.01801	0.00482	0.02097	0.00901	0.02048	0.02601	0.01742	0.01538	0.02329
Std. Dev.	0.36982	0.08018	0.12150	0.05264	0.04776	0.05848	0.10744	0.10512	0.05100
Skewness	8.544	1.833	4.650	0.405	0.198	0.573	4.287	6.402	2.146
Excess Kurtosis	76.267	8.221	32.180	3.719	2.633	3.039	29.374	51.143	12.072
Panel B: Portfolios sorted on Size-illiquidity									
Summary statistics for portfolios									
Mean	0.10007	0.03006	0.03418	0.02886	0.01913	0.02197	0.02246	0.04108	0.03324
Median	0.01610	0.02011	0.00400	0.01877	0.01473	0.02482	0.02373	0.01922	0.02111
Std. Dev.	0.54089	0.06575	0.09673	0.06622	0.04979	0.03864	0.05341	0.13310	0.12446
Skewness	8.387	2.013	2.333	0.886	0.900	-0.060	1.247	6.534	7.521
Excess Kurtosis	74.121	10.272	10.672	3.884	5.006	2.834	9.023	52.933	64.435
Panel C: Average Number of stocks per size-illiquidity/Price to Book Value sorted portfolio									
Nigeria	21.51	14.40	14.36	10.48	5.80	10.25	13.27	7.72	8.77
Ghana	0.00	0.00	0.43	1.28	1.14	1.58	1.71	2.71	1.02
BRVM	0.70	0.57	2.58	0.57	2.16	1.72	1.00	1.00	1.71
Kenya	6.51	4.90	3.31	2.99	6.55	7.35	1.59	4.76	4.36
Mauritius	2.60	0.84	0.13	5.69	6.94	1.23	1.70	1.47	0.00
Botswana	0.00	0.00	0.00	0.00	0.00	0.13	3.94	5.43	5.64
Zambia	0.30	0.84	1.36	2.28	0.70	0.57	1.27	1.14	0.43
Namibia	0.42	0.00	0.00	1.53	0.00	0.00	1.87	0.00	0.00
Overall Mean	32.04	21.55	22.18	24.81	23.29	22.83	26.34	24.24	21.93

Table 6. Summary statistics for individual market and sector portfolios and factors

	Mean	Median	Std. Dev.	Skewness	Kurtosis
Panel A: Market Portfolios					
Botswana	0.03985	0.01821	0.22519	8.435	75.074
Botswana Consumer Non-Cyclical	0.00799	0.01492	0.06187	-0.024	5.302
Botswana Financials	0.01633	0.01444	0.04534	-0.048	2.769
BRVM	0.03235	0.01800	0.12818	7.658	65.831
BRVM Communications	0.01763	0.01359	0.04211	0.047	2.575
BRVM Consumer Non-Cyclical	0.01935	0.01837	0.04172	0.292	3.868
Ghana	0.03129	0.01642	0.09543	7.358	62.273
Ghana Consumer Non-Cyclical	0.02175	0.02092	0.03317	0.297	3.436
Ghana Financials	0.02310	0.02130	0.03259	0.523	3.112
Kenya	0.02909	0.01982	0.05628	2.706	18.316
Kenya Communications	0.02401	0.01895	0.03211	0.469	3.244
Kenya Consumer Non-Cyclical	0.02072	0.01694	0.03115	0.129	3.072
Kenya Financials	0.02524	0.01919	0.04366	-0.013	3.422
Mauritius	0.02530	0.01877	0.04693	2.163	13.196
Mauritius Consumer Non-Cyclical	0.02349	0.01306	0.03892	0.128	2.963
Mauritius Financials	0.02096	0.01389	0.03456	0.189	3.041
Namibia	0.02508	0.01846	0.04557	2.149	13.150
Namibia Financials	0.02084	0.01369	0.03386	0.159	3.015
Nigeria	0.03647	0.02077	0.08479	5.472	41.423
Nigeria Consumer Non-Cyclical	0.02383	0.01809	0.03712	0.823	3.840
Nigeria Financials	0.02394	0.01899	0.04114	0.864	3.914
Zambia	0.03741	0.02230	0.08228	5.046	36.094
Zambia Consumer Non-Cyclical	0.02500	0.02233	0.04008	0.813	3.933
Zambia Financials	0.02529	0.02244	0.03986	0.749	3.728
Panel B: Factor Portfolios					
Market	0.03741	0.02230	0.08228	5.046	36.094
Size	0.01884	-0.00852	0.19148	7.250	61.923
Price-to-Book-Value (PBV)	-0.00613	0.00437	0.13207	-6.537	55.418
Illiquidity	-0.02434	-0.00245	0.19429	-7.186	62.646
Panel C: Factor Portfolio Correlations	Market	Size	PBV	Illiquidity	
Market	1.000				
Size	0.5752	1.000			
Price-to-Book-Value (PBV)	-0.5601	-0.5915	1.000		
Illiquidity	-0.5945	-0.6287	0.5752	1.000	

Table 7 Time series regressions using equally weighted monthly contemporaneous market excess returns for 9 portfolios formed on size and illiquidity for period: 2002 – 2008, for all sample markets.

Portfolio	S/L	S/M	S/H	M/L	M/M	M/H	B/L	B/M	B/H
Panel A: Size-Price to Book Value									
CAPM-adjusted performance									
$\hat{\alpha}(\%)$	-0.078291	0.010314	0.024387	0.007967	0.011061	0.021359	0.011194	0.018890	0.024549
	(-2.71)	(1.08)	(2.02)	(0.91)	(1.95)	(2.71)	(0.98)	(2.54)	(4.10)
$\hat{\beta}$	3.916247	0.447137	0.543852	0.239791	0.220832	0.314063	0.527655	0.371942	0.169369
	(3.93)	(1.43)	(1.39)	(1.50)	(1.56)	(1.96)	(1.23)	(1.34)	(1.20)
Adj R^2 (1)	0.7561	0.2008	0.1249	0.1298	0.1341	0.1852	0.1529	0.0734	0.0632
Three-factor Fama and French (1993) CAPM performance									
$\hat{\alpha}$	0.008612	-0.014695	-0.013456	-0.000503	-0.001566	0.005984	-0.016413	-0.001768	0.009912
	(1.32)	(-2.26)	(-1.87)	(-0.06)	(-0.32)	(1.19)	(-1.71)	(-0.18)	(2.51)
$\hat{\beta}$	0.945486	1.239848	1.633106	0.554722	0.628973	0.804757	1.588924	1.192294	0.659059
	(4.92)	(5.46)	(7.22)	(3.73)	(5.48)	(6.35)	(3.92)	(2.02)	(5.26)
$\hat{s}$	0.952764	-0.068190	0.261899	-0.176854	-0.060513	-0.052992	-0.691785	-0.604445	-0.125108
	(10.90)	(-0.72)	(1.75)	(-2.41)	(-0.86)	(-0.56)	(-3.95)	(-1.76)	(-1.43)
$\hat{h}$	-1.025878	0.548814	1.279880	-0.003395	0.245005	0.323778	-0.153106	-0.221405	0.216331
	(-14.07)	(6.66)	(4.79)	(-0.05)	(3.01)	(2.00)	(-1.19)	(-0.85)	(2.15)
Adj R^2 (4)	0.9854	0.6114	0.7803	0.2769	0.4067	0.4646	0.6791	0.4573	0.3788
Panel B: Size-Illiquidity									
CAPM-adjusted performance									
$\hat{\alpha}(\%)$	-0.115417	0.015375	0.020936	0.015377	0.012903	0.016196	0.013244	0.018250	0.024512
	(-2.80)	(1.72)	(1.67)	(1.90)	(1.54)	(3.42)	(2.23)	(1.54)	(2.65)
$\hat{\beta}$	5.760005	0.392588	0.354042	0.360326	0.166349	0.154455	0.246284	0.610329	0.233212
	(4.10)	(1.84)	(1.24)	(2.06)	(1.01)	(1.48)	(1.63)	(1.17)	(0.88)
Adj R^2 (1)	0.7648	0.2319	0.0794	0.1905	0.0641	0.0971	0.1333	0.1317	0.0117
Three-factor Size and Illiquidity CAPM performance									
$\hat{\alpha}$	-0.014222	0.003288	0.008570	0.008244	0.005071	0.009438	0.006232	-0.012316	-0.007017
	(-1.12)	(0.50)	(1.19)	(1.30)	(0.76)	(2.25)	(1.18)	(-0.66)	(-0.44)
$\hat{\beta}$	1.856938	0.882006	0.992156	0.578778	0.462657	0.420295	0.461188	1.765194	1.494586
	(2.60)	(3.00)	(2.47)	(2.62)	(3.19)	(3.48)	(2.08)	(1.94)	(1.59)
$\hat{s}$	1.271834	-0.027345	0.708740	-0.393487	-0.129306	-0.057146	-0.385807	-0.513063	-0.153477
	(7.97)	(-0.40)	(3.99)	(-3.41)	(-2.23)	(-0.71)	(-6.46)	(-2.25)	(-0.87)
$\hat{h}$	-0.857206	0.234535	1.021526	-0.261918	0.033585	0.086729	-0.256424	0.122156	0.524660
	(-2.92)	(2.10)	(4.70)	(-2.00)	(0.50)	(0.98)	(-3.18)	(0.46)	(1.61)
Adj R^2 (4)	0.9691	0.4347	0.6135	0.3645	0.1917	0.2604	0.3991	0.4330	0.3920

Notes: (1) Numbers in parentheses are t-statistics.
(2) One month T-bill risk free rate for month t, which is taken as the one month UK Gilt rate in this case

Table 8 Time series regressions for equally weighted monthly excess returns on country portfolios with size and illiquidity for 2002 to 2009

	$\hat{\alpha}$	$\hat{\beta}$	$\hat{s}$	$\hat{h}$	Adj R^2
Panel A: Botswana					
CAPM	0.026631 (2.05)	0.353261 (0.78)			0.0045
CAPM + SMB	-0.019951 (-0.69)	2.080541 (1.27)	-0.957385 (-1.30)		0.2631
CAPM + SMB + ILLIQ	-0.026370 (-0.85)	2.475922 (1.36)	-0.245506 (-0.89)	0.895184 (1.35)	0.3303
CAPM + SMB + PBV	-0.002108 (-0.12)	1.613364 (1.29)	-1.234511 (-1.40)	-0.792596 (-1.04)	0.3254
Panel B: Botswana Consumer Non Cyclical					
CAPM	0.006916 (0.78)	0.028626 (0.63)			0.0014
CAPM + SMB	0.006899 (0.72)	0.029249 (0.27)	-0.000346 (-0.01)		0.0014
CAPM + SMB + ILLIQ	0.007006 (0.73)	0.022711 (0.20)	-0.012117 (-0.12)	-0.014803 (-0.14)	0.0017
CAPM + SMB + PBV	0.004475 (0.46)	0.092735 (0.73)	0.037313 (0.72)	0.107707 (1.21)	0.0183
Panel C: Botswana Financials					
CAPM	0.016264 (2.93)	0.001874 (0.03)			0.0001
CAPM + SMB	0.013944 (2.25)	0.087867 (0.71)	-0.047663 (-1.06)		0.0161
CAPM + SMB + ILLIQ	0.013772 (2.29)	0.098501 (0.74)	-0.028517 (-0.24)	0.024077 (0.20)	0.0174
CAPM + SMB + PBV	0.011427 (1.97)	0.153790 (1.25)	-0.008558 (-0.18)	0.111844 (2.40)	0.0500
Panel D: BRVM					
CAPM	0.024858 (2.89)	0.200310 (0.79)			0.0043
CAPM + SMB	0.002143 (0.11)	1.042622 (1.11)	-0.466871 (-1.11)		0.1908
CAPM + SMB + ILLIQ	-0.003896 (-0.22)	1.414598 (1.46)	0.202868 (1.64)	0.842192 (2.43)	0.3896
CAPM + SMB + PBV	0.011798 (0.86)	0.789819 (1.11)	-0.616832 (-1.22)	-0.428897 (-0.98)	0.2454
Panel E: BRVM Communications					
CAPM	0.017433 (3.18)	0.005286 (0.10)			0.0001
CAPM + SMB	0.014933 (2.37)	0.097992 (0.82)	-0.051384 (-1.16)		0.0218
CAPM + SMB + ILLIQ	0.014901 (2.47)	0.099938 (0.82)	-0.047880 (-0.42)	0.004407 (0.03)	0.0219
CAPM + SMB + PBV	0.012456 (2.06)	0.162839 (1.39)	-0.012917 (-0.29)	0.110018 (2.53)	0.0599
Panel F: BRVM Consumer Non Cyclical					
CAPM	0.016932 (2.66)	0.064713 (1.08)			0.0162
CAPM + SMB	0.014388 (1.98)	0.159062 (1.49)	-0.052295 (-1.25)		0.0392
CAPM + SMB + ILLIQ	0.013871 (2.04)	0.190862 (1.73)	0.004961 (0.03)	0.072000 (0.46)	0.0172
CAPM + SMB + PBV	0.011481 (1.65)	0.235160 (2.15)	-0.007154 (-0.19)	0.129105 (2.95)	0.0581

	$\hat{\alpha}$	$\hat{\beta}$	$\hat{s}$	$\hat{h}$	Adj R^2
Panel A: Ghana					
CAPM	0.025840 (3.56)	0.145592 (0.79)			0.0036
CAPM + SMB	0.008620 (0.63)	0.784104 (1.15)	-0.353910 (-1.15)		0.1973
CAPM + SMB + ILLIQ	0.004161 (0.36)	1.058801 (1.50)	0.140679 (1.46)	0.621943 (2.45)	0.3928
CAPM + SMB + PBV	0.016058 (1.55)	0.589369 (1.14)	-0.469426 (-1.27)	-0.330380 (-1.03)	0.2565
Panel B: Ghana Consumer Non Cyclical					
CAPM	0.019752 (4.09)	0.053389 (1.12)			0.0054
CAPM + SMB	0.017263 (3.13)	0.145687 (1.61)	-0.051158 (-1.46)		0.0286
CAPM + SMB + ILLIQ	0.016974 (3.21)	0.163492 (1.68)	-0.019100 (-0.17)	0.040313 (0.39)	0.0234
CAPM + SMB + PBV	0.015138 (2.83)	0.201339 (2.25)	-0.018146 (-0.58)	0.094417 (3.13)	0.0632
Panel C: Ghana Financials					
CAPM	0.021472 (4.57)	0.043536 (1.03)			0.0120
CAPM + SMB	0.018890 (3.63)	0.139262 (1.72)	-0.053058 (-1.71)		0.0271
CAPM + SMB + ILLIQ	0.018610 (3.61)	0.156545 (1.73)	-0.021939 (-0.26)	0.039132 (0.49)	0.0217
CAPM + SMB + PBV	0.017403 (3.39)	0.178197 (2.24)	-0.029962 (-1.03)	0.066055 (2.31)	0.0385
Panel D: Kenya					
CAPM	0.023506 (4.43)	0.149241 (1.33)			0.0358
CAPM + SMB	0.014942 (1.80)	0.466809 (1.24)	-0.176020 (-1.13)		0.1704
CAPM + SMB + ILLIQ	0.014956 (1.66)	0.465890 (1.10)	-0.177675 (-1.82)	-0.002081 (-0.01)	0.1599
CAPM + SMB + PBV	0.017306 (2.33)	0.404896 (1.19)	-0.212746 (-1.23)	-0.105039 (-0.95)	0.1801
Panel E: Kenya Communications					
CAPM	0.022388 (5.05)	0.043460 (1.06)			0.0002
CAPM + SMB	0.019886 (3.90)	0.136238 (1.39)	-0.051424 (-1.34)		0.0261
CAPM + SMB + ILLIQ	0.019995 (4.06)	0.129542 (1.37)	-0.063480 (-0.82)	-0.015161 (-0.20)	0.0149
CAPM + SMB + PBV	0.018070 (3.64)	0.183786 (1.91)	-0.023219 (-0.68)	0.080668 (3.05)	0.0503
Panel F: Kenya Consumer Non Cyclical					
CAPM	0.018408 (4.45)	0.061837 (1.38)			0.0146
CAPM + SMB	0.017046 (3.20)	0.112363 (0.82)	-0.028005 (-0.54)		0.0144
CAPM + SMB + ILLIQ	0.017968 (3.70)	0.055586 (0.48)	-0.130231 (-2.36)	-0.128548 (-2.54)	0.0844
CAPM + SMB + PBV	0.015565 (2.94)	0.151142 (1.07)	-0.005001 (-0.10)	0.065792 (1.43)	0.0277

	$\hat{\alpha}$	$\hat{\beta}$	$\hat{s}$	$\hat{h}$	Adj R^2
Panel A: Kenya Financials					
CAPM	0.020523 (3.66)	0.126103 (1.83)			0.0448
CAPM + SMB	0.018719 (2.51)	0.193002 (0.90)	-0.037080 (-0.45)		0.0437
CAPM + SMB + ILLIQ	0.020581 (3.23)	0.078311 (0.45)	-0.243580 (-3.53)	-0.259672 (-4.40)	0.2028
CAPM + SMB + PBV	0.016670 (2.29)	0.246660 (1.15)	-0.005251 (-0.05)	0.091034 (0.87)	0.0567
Panel B: Mauritius					
CAPM	0.020405 (3.99)	0.130886 (1.37)			0.0409
CAPM + SMB	0.012584 (1.82)	0.420876 (1.48)	-0.160734 (-1.40)		0.2048
CAPM + SMB + ILLIQ	0.012795 (1.72)	0.407921 (1.28)	-0.184061 (-2.29)	-0.029333 (-0.29)	0.1966
CAPM + SMB + PBV	0.014176 (2.20)	0.379209 (1.44)	-0.185451 (-1.46)	-0.070691 (-0.83)	0.2079
Panel C: Mauritius Financials					
CAPM	0.016651 (3.14)	0.115141 (1.85)			0.0637
CAPM + SMB	0.013438 (2.27)	0.234295 (1.61)	-0.066044 (-1.20)		0.1067
CAPM + SMB + ILLIQ	0.014646 (2.74)	0.159900 (1.33)	-0.199992 (-3.85)	-0.168439 (-3.41)	0.2104
CAPM + SMB + PBV	0.011271 (1.99)	0.291019 (2.00)	-0.032396 (-0.51)	0.096236 (1.19)	0.1403
Panel D: Mauritius Consumer Non Cyclical					
CAPM	0.018661 (3.49)	0.129114 (2.06)			0.0630
CAPM + SMB	0.016030 (2.44)	0.226671 (1.29)	-0.054073 (-0.81)		0.0803
CAPM + SMB + ILLIQ	0.017496 (3.02)	0.136372 (0.93)	-0.216656 (-3.53)	-0.204446 (-3.75)	0.2022
CAPM + SMB + PBV	0.014130 (2.22)	0.276417 (1.56)	-0.024565 (-0.32)	0.084397 (0.93)	0.0959
Panel E: Namibia					
CAPM	0.020211 (4.13)	0.130157 (1.40)			0.0435
CAPM + SMB	0.012534 (1.89)	0.414819 (1.50)	-0.157780 (-1.40)		0.2113
CAPM + SMB + ILLIQ	0.012791 (1.79)	0.399017 (1.28)	-0.186231 (-2.36)	-0.035777 (-0.36)	0.2043
CAPM + SMB + PBV	0.014244 (2.31)	0.370043 (1.44)	-0.184341 (-1.51)	-0.075965 (-0.95)	0.2174
Panel F: Namibia Financials					
CAPM	0.016535 (3.25)	0.115111 (1.91)			0.0668
CAPM + SMB	0.013239 (2.34)	0.237325 (1.62)	-0.067740 (-1.21)		0.1152
CAPM + SMB + ILLIQ	0.014471 (2.84)	0.161489 (1.33)	-0.204282 (-3.90)	-0.171701 (-3.53)	0.2285
CAPM + SMB + PBV	0.011433 (2.09)	0.284629 (1.94)	-0.039679 (-0.63)	0.080255 (1.05)	0.1365

	$\hat{\alpha}$	$\hat{\beta}$	$\hat{s}$	$\hat{h}$	Adj R^2
Panel A: Nigeria					
CAPM	-0.001777 (-1.63)	1.022352 (26.03)			0.9840
CAPM + SMB	0.000489 (0.34)	0.938344 (13.29)	0.046563 (1.71)		0.9883
CAPM + SMB + ILLIQ	0.000652 (0.42)	0.928297 (11.78)	0.028474 (1.89)	-0.022747 (-1.08)	0.9885
CAPM + SMB + PBV	0.000383 (0.30)	0.941123 (13.95)	0.048212 (1.56)	0.004715 (0.32)	0.9882
Panel B: Nigeria Consumer Non Cyclicals					
CAPM	0.015001 (2.97)	0.235941 (1.72)			0.2644
CAPM + SMB	0.008686 (2.41)	0.470104 (4.07)	-0.129790 (-2.33)		0.4385
CAPM + SMB + ILLIQ	0.008887 (2.47)	0.457762 (3.50)	-0.152010 (-2.52)	-0.027942 (-0.37)	0.4341
CAPM + SMB + PBV	0.002552 (1.03)	0.630707 (10.33)	-0.034521 (-1.00)	0.272474 (8.97)	0.7431
Panel C: Nigeria Financials					
CAPM	0.014269 (2.64)	0.258454 (1.59)			0.2580
CAPM + SMB	0.006844 (1.79)	0.533771 (3.93)	-0.152601 (-2.37)		0.4551
CAPM + SMB + ILLIQ	0.006883 (1.79)	0.531377 (3.29)	-0.156910 (-2.44)	-0.005419 (-0.06)	0.4483
CAPM + SMB + PBV	-0.000231 (-0.10)	0.719019 (10.55)	-0.042713 (-1.00)	0.314286 (8.43)	0.7858
Panel E: Zambia Consumer Non Cyclicals					
CAPM	0.015625 (2.96)	0.250652 (1.58)			0.2557
CAPM + SMB	0.008231 (2.15)	0.524845 (3.90)	-0.151978 (-2.39)		0.4621
CAPM + SMB + ILLIQ	0.008274 (2.16)	0.522203 (3.28)	-0.156734 (-2.43)	-0.005980 (-0.07)	0.4554
CAPM + SMB + PBV	0.001366 (0.63)	0.704597 (10.31)	-0.045350 (-1.06)	0.304961 (8.33)	0.7903
Panel F: Zambia Financials					
CAPM	0.015946 (2.95)	0.249847 (1.59)			0.2568
CAPM + SMB	0.008549 (2.19)	0.524104 (3.92)	-0.152013 (-2.37)		0.4656
CAPM + SMB + ILLIQ	0.008492 (2.16)	0.527613 (3.28)	-0.145695 (-2.19)	0.007946 (0.09)	0.4591
CAPM + SMB + PBV	0.001963 (0.83)	0.696539 (9.95)	-0.049726 (-1.14)	0.292548 (7.97)	0.7704

Table 9 Time varying CAPM model parameters

Country		Overall Mean	Overall High/ low	2003	2004	2005	2006	2007	2008	Convergence (Iterations)
Botswana	Constant	0.00018	0.0405/ -0.1492	0.01262	-0.03062	0.00817	0.00959	0.01247	0.01262	17
	Market Beta	0.63605	1.2033/ -0.1003	1.43008	0.88311	0.56064	0.86430	0.75956	1.43008	
	Size Beta	-- --	-- --	-- --	-- --	-- --	-- --	-- --	-- --	
	Illiquidity Beta	0.48871	4.7962/ -1.6332	0.82760	1.32542	0.23836	0.33203	0.51560	0.82760	
Botswana Consumer Non Cyclical	Constant	0.01021	0.2413/ -0.2091	0.04930	-0.01559	0.01271	-0.02602	0.04120	-0.00130	54
	Market Beta	-0.17241	0.1305/ -0.353	-0.48368	-0.21743	-0.22877	-0.00970	-0.04581	-0.03786	
	Size Beta	-- --	-- --	-- --	-- --	-- --	-- --	-- --	-- --	
	Illiquidity Beta	0.19563	0.5177/ -0.0303	0.49308	0.22461	0.14233	0.13191	0.14289	0.02474	
Botswana Financials	Constant	0.00897	0.0885/ -0.067	0.02088	0.00472	0.00827	0.01342	0.02360	-0.00646	28
	Market Beta	0.38113	0.8109/ -0.0005	1.04607	0.34141	0.25219	0.59023	0.60360	0.09434	
	Size Beta	-- --	-- --	-- --	-- --	-- --	-- --	-- --	-- --	
	Illiquidity Beta	0.30474	0.9344/ -0.2718	1.05305	0.13858	0.23073	0.44456	0.64418	0.04389	
BRVM	Constant	0.00292	0.0913/ -0.0564	-0.00704	-0.01517	-0.00941	-0.00044	0.02768	0.01275	34
	Market Beta	0.57932	0.9247/ 0.0094	0.79621	0.79916	0.82101	0.58791	0.54599	0.10282	
	Size Beta	-0.22582	1.3042/ -3.3351	-0.55864	-0.72460	0.00229	-0.18498	-0.38432	0.19782	
	Illiquidity Beta	0.51884	0.9733/ -0.1186	0.26084	0.46847	0.59666	0.73917	0.70606	0.04432	
BRVM Communications	Constant	0.01080	0.0866/ -0.0577	0.01858	0.00792	0.00965	0.01749	0.02825	-0.01113	32
	Market Beta	0.35165	0.8242/ 0.0702	1.01331	0.40720	0.25403	0.44909	0.49969	0.12976	
	Size Beta	-- --	-- --	-- --	-- --	-- --	-- --	-- --	-- --	
	Illiquidity Beta	0.21896	0.8589/ -0.255	0.93932	0.10251	0.06848	0.33399	0.53170	0.04350	
BRVM Consumer Non Cyclical	Constant	0.01785	0.129/ -0.0531	0.00058	0.00412	0.00178	0.02878	0.04864	0.00482	24
	Market Beta	0.33793	0.7374/ 0.0554	0.77222	0.43316	0.48064	0.31311	0.34945	0.09285	
	Size Beta	0.10876	0.4569/ -0.298	-0.37031	-0.12065	0.29620	0.23944	0.13039	-0.01160	
	Illiquidity Beta	0.35416	1.0073/ -0.2894	0.50586	0.03325	0.31538	0.76044	0.58110	0.05580	

Country		Overall Mean	Overall High/ low	2003	2004	2005	2006	2007	2008	Convergence (Iterations)
Ghana	Constant	0.01493	0.0595/ -0.0257	0.00009	0.02093	-0.00880	0.01006	0.03082	0.02222	23
	Market Beta	0.46894	2.4148/ -0.9783	0.69503	0.98172	0.46753	-0.22388	0.58469	0.54060	
	Size Beta	-0.24604	0.9231/ -2.2683	-0.57728	-0.50290	0.04143	-0.44735	-0.38871	0.09585	
	Illiquidity Beta	-- --	-- --	-- --	-- --	-- --	-- --	-- --	-- --	
Ghana Consumer Non Cyclical	Constant	0.01276	0.0588/ -0.0186	0.00661	0.02227	-0.01077	0.00931	0.02582	0.01760	43
	Market Beta	0.37789	1.5366/ -0.2663	0.77230	0.18235	0.62367	0.21551	0.67832	0.17247	
	Size Beta	0.01688	1.0468/ -1.5876	-0.64962	-0.13365	0.30242	-0.02750	-0.04866	-0.01049	
	Illiquidity Beta	0.27490	0.8149/ -0.093	0.18602	0.08666	0.09383	0.56371	0.51109	0.10507	
Ghana Financials	Constant	0.01735	0.0986/ -0.0377	0.01449	0.03051	-0.01457	0.02115	0.03185	0.01784	47
	Market Beta	0.32201	1.323/ -0.613	0.64407	0.11591	0.73916	0.02105	0.41750	0.31592	
	Size Beta	-0.08614	0.1493/ -0.4493	-0.54834	-0.32075	-0.03210	-0.05515	0.02036	-0.03912	
	Illiquidity Beta	0.11886	0.6253/ -0.499	0.33459	-0.11762	-0.05941	0.36367	0.34789	0.05441	
Kenya	Constant	0.00661	0.0209/ -0.007	0.01823	0.00373	-0.00192	0.00291	0.01419	0.01483	29
	Market Beta	0.60586	2.6163/ -0.676	0.73617	0.31353	0.73573	0.67114	0.95953	0.32602	
	Size Beta	-0.58449	-0.3994/ -0.744	-0.42484	-0.61708	-0.68984	-0.61153	-0.49756	-0.49935	
	Illiquidity Beta	-0.26111	1.5686/ -1.8197	-0.35070	-0.44781	-0.53614	0.01742	0.19945	-0.56371	
Kenya Communications	Constant	0.01504	0.0932/ -0.0364	0.01374	0.02788	-0.01641	0.02149	0.02785	0.01433	21
	Market Beta	0.36514	1.9007/ -1.0747	0.77143	0.03742	0.80866	-0.02490	0.55427	0.45798	
	Size Beta	-0.17693	0.1281/ -0.6534	-0.61611	-0.46775	-0.15478	-0.14053	-0.03309	-0.08045	
	Illiquidity Beta	0.05828	0.5139/ -0.531	0.19301	-0.28524	-0.15252	0.26912	0.35566	0.10857	
Kenya Consumer Non Cyclical	Constant	0.01044	0.0841/ -0.0537	0.00941	0.02188	-0.01717	0.01293	0.02583	0.00860	30
	Market Beta	0.42985	1.6458/ -0.7915	0.52062	0.07916	1.04302	0.03207	0.54739	0.44922	
	Size Beta	-0.39642	-0.1483/ -0.7526	-0.53889	-0.60848	-0.45267	-0.40944	-0.29108	-0.20446	
	Illiquidity Beta	-0.22134	0.2455/ -0.7692	-0.26487	-0.54945	-0.51412	-0.11722	0.06899	0.02570	

Country		Overall Mean	Overall High/ low	2003	2004	2005	2006	2007	2008	Convergence (Iterations)
Kenya Financials	Constant	0.00726	0.0385/ -0.0278	0.01593	0.00844	-0.00294	0.01299	0.01881	-0.00176	52
	Market Beta	0.48243	1.6278/ -1.1398	0.97164	0.31980	0.65371	0.10056	0.89255	0.44216	
	Size Beta	-0.43524	0.2865/ -1.7051	-0.26715	-0.77593	-0.36223	-0.25133	-0.54401	-0.22519	
	Illiquidity Beta	-0.39679	0.1114/ -0.9819	-0.55785	-0.80265	-0.74380	-0.31922	-0.00472	-0.08784	
Mauritius	Constant	0.00684	0.0476/ -0.0276	0.01715	0.00576	-0.00969	0.01297	0.02350	0.00117	54
	Market Beta	0.49558	1.5249/ -0.4816	0.72700	0.58621	0.91308	0.16520	0.44619	0.35554	
	Size Beta	-0.41521	0.3701/ -1.3804	-0.17958	-0.55074	-0.39155	-0.61563	-0.41306	-0.07686	
	Illiquidity Beta	-0.32175	0.0914/ -0.7626	-0.45568	-0.58590	-0.58348	-0.31736	-0.09334	-0.00201	
Mauritius	Constant	0.00770	0.0628/ -0.0457	0.01731	0.00792	-0.01299	0.02440	0.02294	-0.00480	63
Consumer Non	Market Beta	0.50904	1.5516/ -0.5992	0.65836	0.19945	0.88472	0.19079	0.60075	0.68409	
Cyclical	Size Beta	-0.42162	-0.1989/ -0.7884	-0.36701	-0.61233	-0.49970	-0.36632	-0.34541	-0.27188	
	Illiquidity Beta	-0.23367	0.2788/ -0.9701	-0.55887	-0.69853	-0.48764	-0.19010	0.17157	0.06088	
Mauritius	Constant	0.00756	0.0832/ -0.0484	0.01838	0.00540	-0.01364	0.02383	0.02403	-0.00267	17
Financials	Market Beta	0.45648	1.3954/ -1.0909	0.55851	0.31118	0.76449	0.20404	0.39099	0.62584	
	Size Beta	-0.30887	-0.1074/ -0.5679	-0.35690	-0.49800	-0.38809	-0.26967	-0.21550	-0.16076	
	Illiquidity Beta	-0.20092	0.2925/ -0.6834	-0.40394	-0.58846	-0.39012	-0.25980	0.13848	0.12222	
Namibia	Constant	0.00570	0.0599/ -0.0575	0.02593	0.00380	-0.01491	0.01612	0.01914	0.00425	59
	Market Beta	0.61798	2.2171/ -0.338	1.12571	0.57797	1.18424	0.40629	0.52691	0.37418	
	Size Beta	-0.35712	0.4195/ -0.9488	0.03993	-0.18179	-0.44465	-0.70106	-0.37824	-0.05464	
	Illiquidity Beta	-- --	-- --	-- --	-- --	-- --	-- --	-- --	-- --	
Namibia	Constant	0.00751	0.0811/ -0.0451	0.01417	0.00440	-0.01427	0.02393	0.02444	-0.00174	13
Financials	Market Beta	0.45094	1.3480/ -0.9894	0.68666	0.32179	0.79766	0.19250	0.36412	0.59026	
	Size Beta	-0.30780	-0.0908/ -0.5666	-0.41890	-0.50531	-0.37444	-0.27894	-0.22299	-0.14367	
	Illiquidity Beta	-0.20115	0.2823/ -0.6439	-0.38907	-0.55622	-0.41731	-0.25348	0.13094	0.11679	

Country		Overall Mean	Overall High/ low	2003	2004	2005	2006	2007	2008	Convergence (Iterations)
Nigeria	Constant	-0.00201	0.0072/ -0.0079	-0.00097	-0.00198	-0.00292	-0.00227	-0.00289	0.00020	14
	Market Beta	1.02051	1.3405/ 0.7033	1.06536	1.06657	0.95319	1.12299	1.02368	0.92842	
	Size Beta	-- --	-- --	-- --	-- --	-- --	-- --	-- --	-- --	
	Illiquidity Beta	-- --	-- --	-- --	-- --	-- --	-- --	-- --	-- --	
Nigeria Consumer Non Cyclical	Constant	0.00227	0.0423/ -0.0211	0.00962	-0.00313	-0.00366	0.01173	0.00670	-0.00050	16
	Market Beta	0.59538	1.2306/ -0.3191	1.15484	0.48965	0.66255	0.61286	0.64301	0.56644	
	Size Beta	-- --	-- --	-- --	-- --	-- --	-- --	-- --	-- --	
	Illiquidity Beta	-- --	-- --	-- --	-- --	-- --	-- --	-- --	-- --	
Nigeria Financials	Constant	-0.00181	0.0203/ -0.0301	0.00236	-0.00569	0.00025	0.00573	0.00249	-0.01275	15
	Market Beta	0.72638	1.3169/ 0.072	1.26340	0.64639	0.70164	0.87085	0.81606	0.58521	
	Size Beta	-- --	-- --	-- --	-- --	-- --	-- --	-- --	-- --	
	Illiquidity Beta	-- --	-- --	-- --	-- --	-- --	-- --	-- --	-- --	
Zambia Consumer Non Cyclical	Constant	-0.00040	0.0238/ -0.0317	0.00361	-0.00100	0.00209	0.00732	0.00296	-0.01457	25
	Market Beta	0.72200	1.2525/ 0.0850	1.15122	0.79105	0.71481	0.73317	0.71369	0.65141	
	Size Beta	0.02485	0.2132/ -0.1962	-0.09723	-0.01953	0.00584	0.05477	0.09013	-0.00988	
	Illiquidity Beta	-0.05109	0.1216/ -0.1918	0.00350	-0.14248	-0.11321	-0.07804	0.02372	0.06419	
Zambia Financials	Constant	-0.00018	0.0240/ -0.0326	0.00334	-0.00057	0.00222	0.00755	0.00349	-0.01481	21
	Market Beta	0.74439	1.3461/ -0.0149	1.15187	0.80182	0.72375	0.72071	0.70918	0.76850	
	Size Beta	0.03343	0.2558/ -0.2197	-0.10485	-0.02538	-0.00249	0.05412	0.12361	0.01581	
	Illiquidity Beta	-0.02074	0.2380/ -0.2266	0.00304	-0.16547	-0.11195	-0.05412	0.08329	0.15961	

Notes: Means calculated both annually and across entire sample period. High/ Low values given for the entire sample period

Table 10. Cost of Equity estimates derived from multi-factor regression (%)

	Cost of Equity Size-Liquidity CAPM	Size-Liquidity Time-varying coefficient	Size-Price to Book Value CAPM
Botswana	108.05%	29.18%	63.99%
Botswana Consumer Non-Cyclical	1.33%	17.22%	5.31%
Botswana Financials	4.12%	17.14%	7.51%
BRVM	61.88%	16.33%	31.31%
BRVM Communications	4.23%	17.58%	7.91%
BRVM Consumer Non-Cyclical	8.86%	16.75%	11.93%
Ghana	46.25%	22.86%	23.21%
Ghana Consumer Non-Cyclical	7.54%	18.38%	10.02%
Ghana Financials	7.12%	15.31%	8.65%
Kenya	21.39%	27.32%	17.83%
Kenya Communications	5.97%	16.67%	9.02%
Kenya Consumer Non-Cyclical	3.10%	21.07%	7.78%
Kenya Financials	4.87%	28.21%	12.88%
Mauritius	18.73%	27.69%	16.85%
Mauritius Consumer Non-Cyclical	8.16%	25.87%	14.62%
Mauritius Financials	7.35%	25.45%	14.09%
Namibia	18.34%	28.94%	16.41%
Namibia Financials	8.21%	25.12%	14.19%
Nigeria	52.71%	69.07%	53.30%
Nigeria Consumer Non-Cyclical	22.25%	40.30%	32.13%
Nigeria Financials	25.63%	49.16%	36.52%
Zambia	55.39%	67.68%	55.38%
Zambia Consumer Non-Cyclical	25.14%	51.22%	35.72%
Zambia Financials	25.36%	52.18%	35.25%

Notes: (1) Annualized cost of equity estimates generated at 12/2008 from the total risk premium
(2) The UK 3 Month Gilt/ Treasury rate is used in each case for risk free rate

Figure 1. Time varying liquidity betas for Botswana Cons. Non-Cyclicals

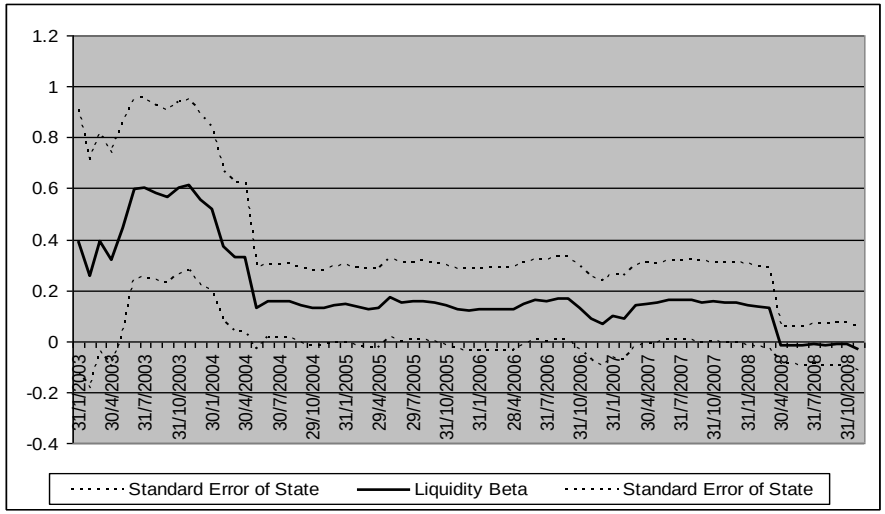

Figure 2. Time varying liquidity betas for BRVM Cons. Non-Cyclicals

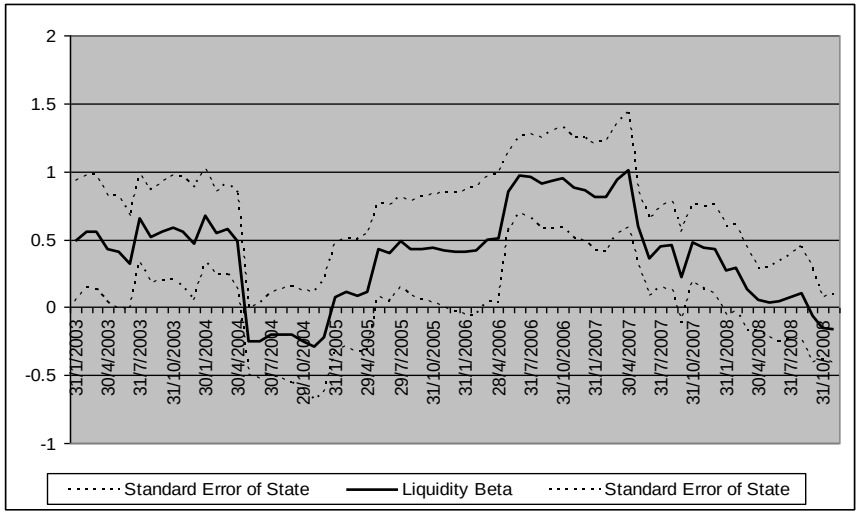

Figure 3. Time varying liquidity betas for Ghana Cons. Non-Cyclicals

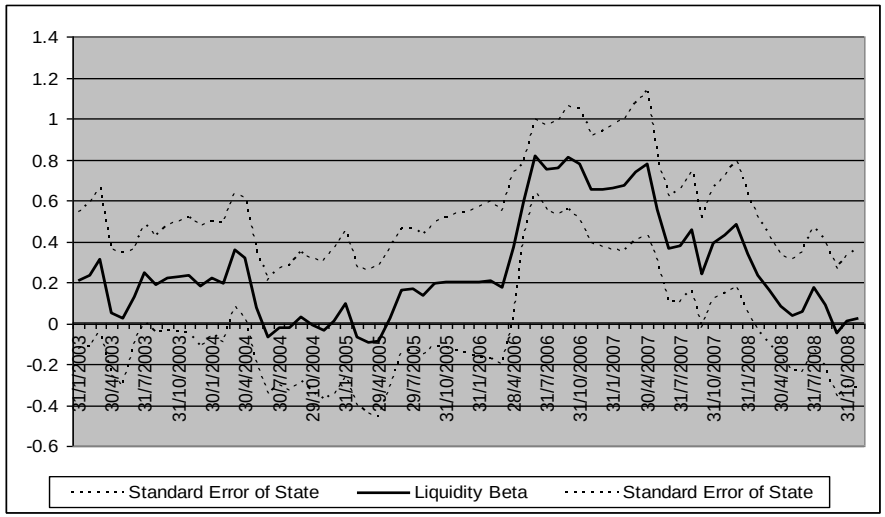

Figure 4. Time varying liquidity betas for Kenya Cons. Non-Cyclicals

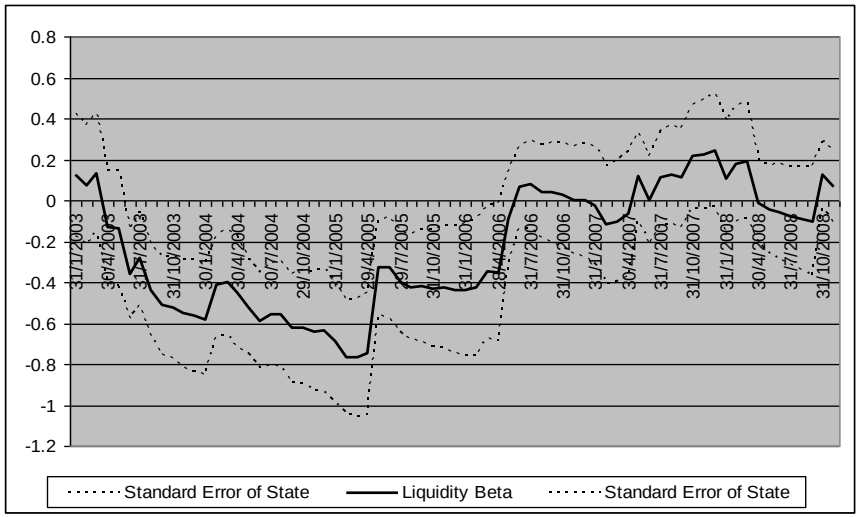

Figure 5. Time varying liquidity betas for Mauritius Cons. Non-Cyclicals

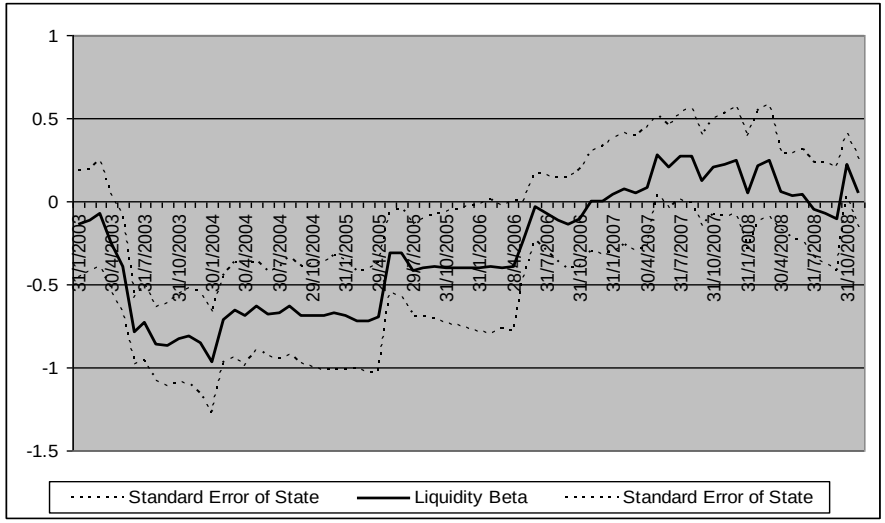

Figure 6. Time varying liquidity betas for Zambia Cons. Non-Cyclicals

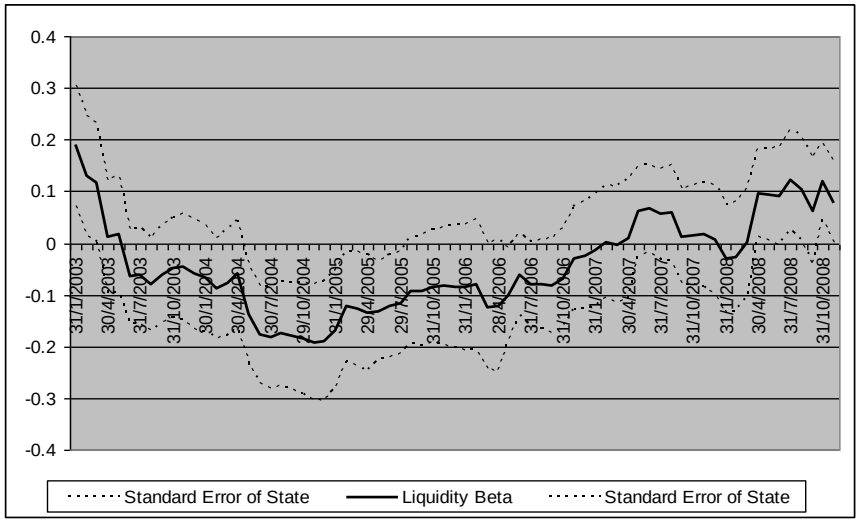

Figure 7. Time varying liquidity betas for BRVM Communications

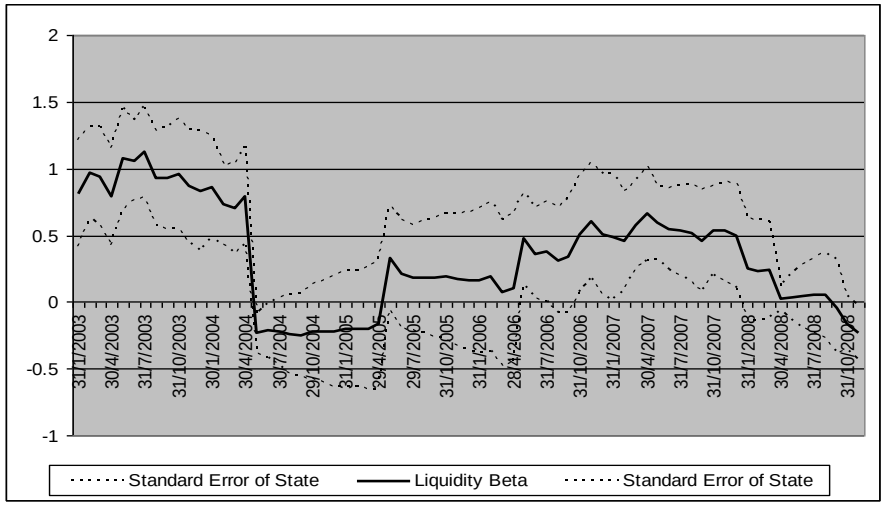

Figure 8. Time varying liquidity betas for Kenya Communications

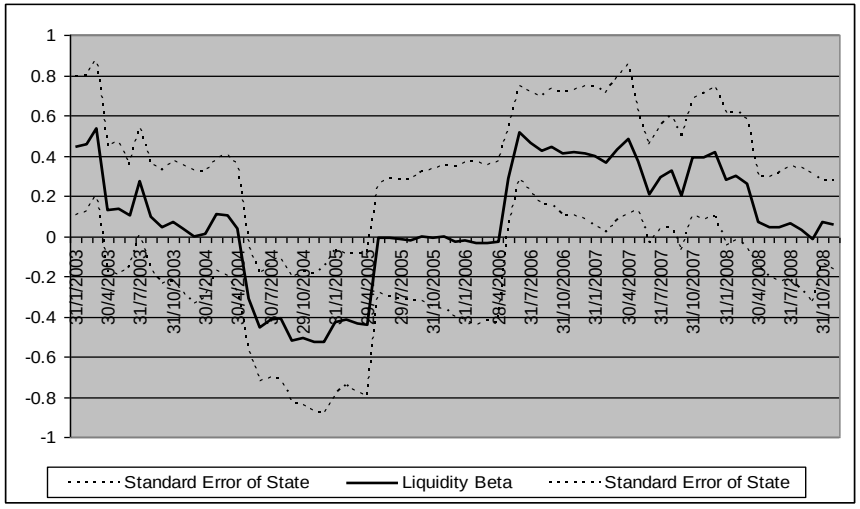

Figure 9. Time varying liquidity betas for Botswana Finance

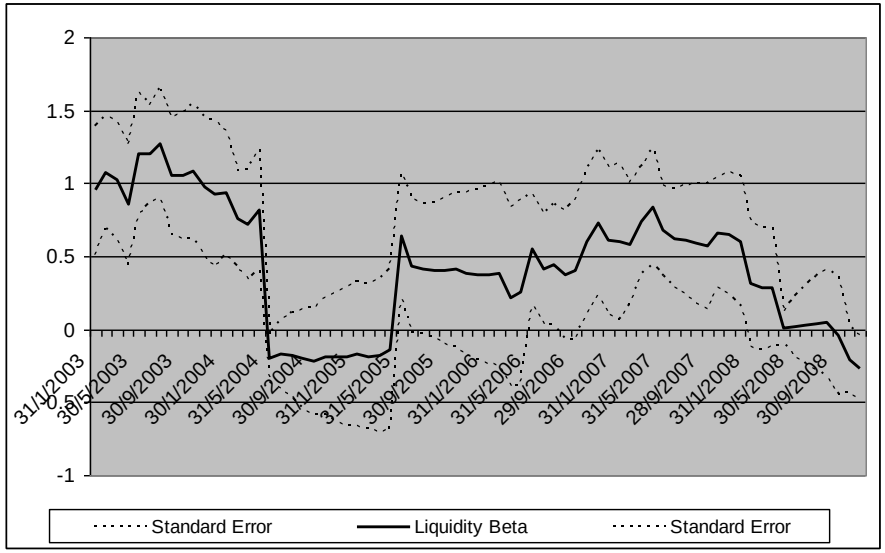

Figure 10. Time varying liquidity betas for Ghana Finance

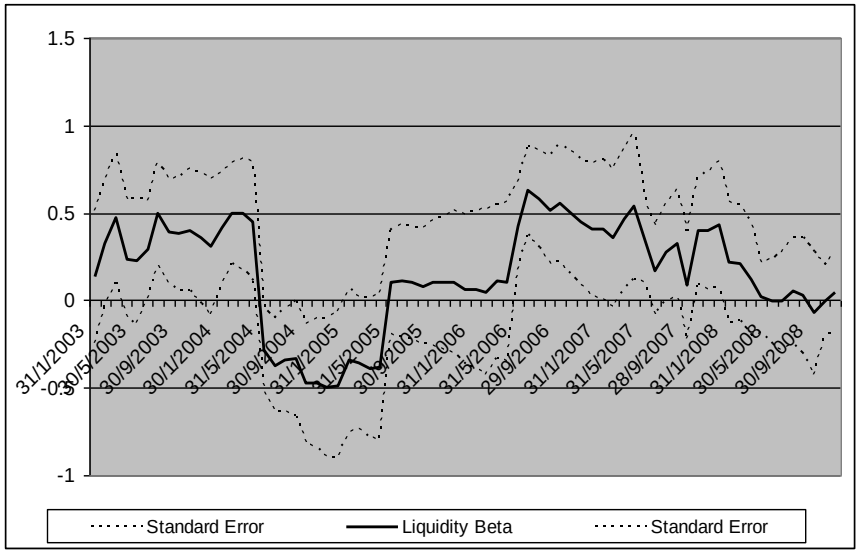

Figure 11. Time varying liquidity betas for Kenya Finance

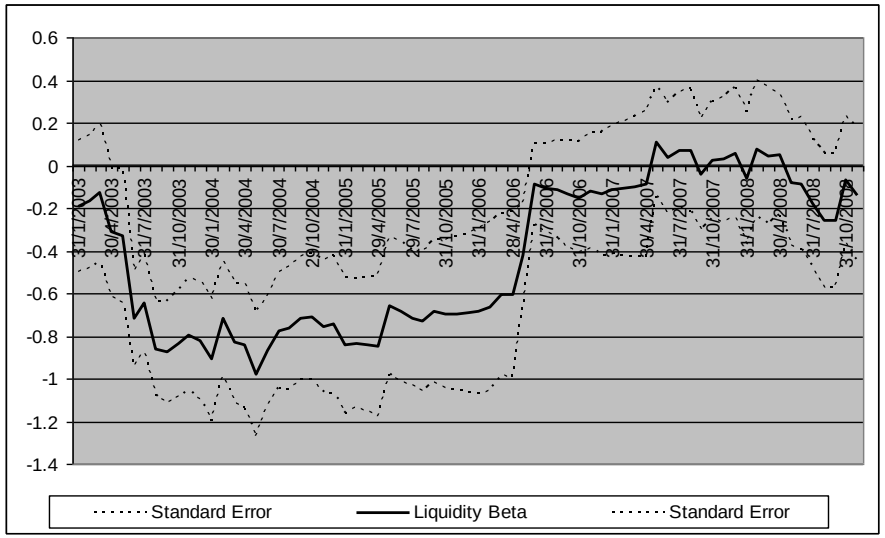

Figure 12. Time varying liquidity betas for Mauritius Finance

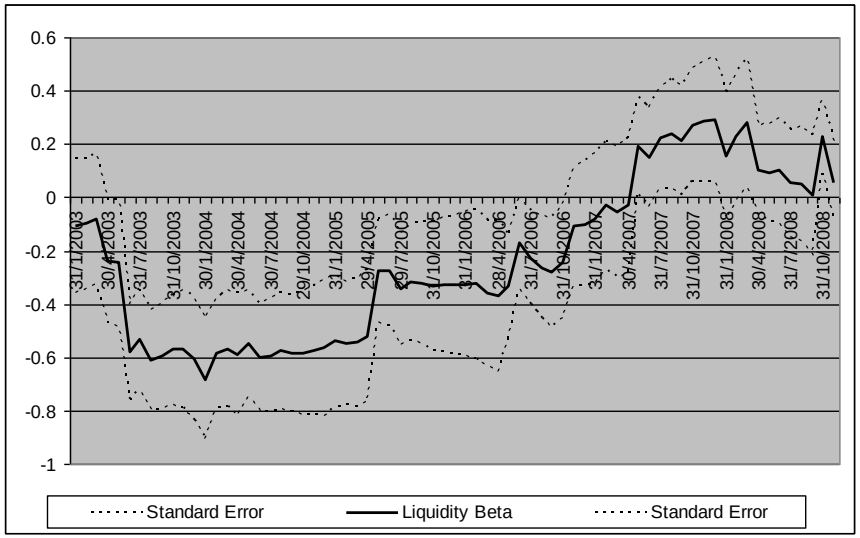

Figure 13. Time varying liquidity betas for Namibia Finance

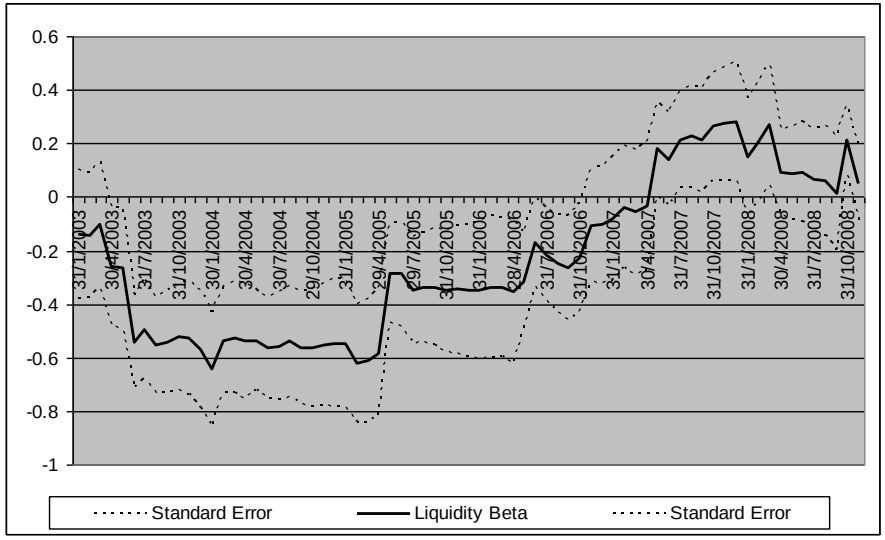

Figure 14. Time varying liquidity betas for Zambia Finance