The Dynamics of Liquidity-adjusted Capital Asset Pricing Model in Sub-Sahara Africa: Evidence from Ghana

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Abstract

This paper estimates the systematic liquidity risk in Ghana using the conditional version of liquidity–adjusted capital asset pricing model in an emerging Ghana's market. We find that co-movements between stock returns and individual liquidity, market liquidity as well as market returns react differently under different market conditions. Applying the size effect on liquidity, it is evidence that the size effect is stronger for smaller firms in Ghana than for larger firms. While the effect of the recent financial crisis do not exhibit a strong influence on the market, it effect is stronger in the down market than the up market. Finally, we explore the reasons behind the poor performance of stock in Ghana and concluded that lack of transparency and protection for firms are some of the problems.

Keywords: Asset pricing; Emerging market; Ghana; Liquidity; Liquidity risk; sub-Saharan Africa

Introduction

Liquidity as an aspect of finance is of great importance to individuals as well as governments. According to (Serieux et al., 2012), financial crises present a fundamental challenge to a country's economic and political system .Liquidity is defined as the ability of an asset to change hands easily without cost to the investor. It has assumed international dimension of importance to the extent that governments as well as individual portfolio investors are following it movement with rap attention. Its importance is given a deeper meaning by Ackert et al (2010) who indicates that an investor would not be indifferent between two assets that have the same expected returns but different levels of risk. In discussing issues on emerging markets in his study, Sen (2009) profile a negative relation in the Indian National Stock Exchange (NSE) between illiquidity shocks and monthly market returns. Datar et al. (1998) document a negative relationship between stock returns and share turnover. Rouwenhorst (1999) document that the return factors in emerging markets are quantitatively similar to those documented for many developed markets after working with a sample of 1705 firms from 20 emerging markets.(Brennan and Subrahmanyam,1996,Amihud and Mendelson,1986, Eleswarapu 1997) find a positive relationship between stock returns and the variable component of the bid-ask spread. According to Lee (2011), the pricing of global liquidity risk in developed countries and in countries with low information asymmetry, low political risk, and large cross-border holdings implies the importance of global investors and the degree of financial integration. Chan, Covrig, and Ng (2005) are of the view that any country that exhibit these properties serve as an attraction for global investors. The question that keeps on coming to well-meaning financial analyst is the question of lack of interest in Africa sub of the Sahara and the reasons

for their seemingly total neglect by the financial watchers. Hearn Bruce(2011) find evidence that liquidity and size factors are both significant in explaining cross section of returns and that the LCAPM outperform the traditional CAPM although both the linear CAPM as well as its time-varying analogue has questionable performance in the presence of extreme illiquidity. Some think that Africa's past problems were largely a function of structural and international factors and, as such, they are likely to continue (Wheeler, 1984; Mosley et al., 1995).However, many are of the view that the only way to reinvigorate and resuscitate the ailing economies on the continent is by establishing stock markets as the panacea for the numerous investment problems confronting the continent. Klick(2016)document that under conditions of minimal state presence, local governance is a dynamic mix of formal and informal authority that can create a dead space in which top-down development programs, no matter how sophisticated, are twisted, corrupted, or stopped dead.

There were only 11 stock markets operating in Sub-Sahara Africa by the end of before 1997 but the number has increase to more than 20 including one of the only regional stock exchanges in the world (Sally, 2013). In general, the performances of African stock markets are weak and their liquidity is limited (African Union, 2008). (Hearn & Piesse, 2009, Acquah-Sam & Salami, 2013) documents that the market is smaller, unregulated and it lacks proper governance system. It is dominated with volatile but substantial returns which is crowded with different degrees of liquidity cost. One cannot be totally blind to a greater concern in that the total value of African stocks outside South Africa is only 0.6 per cent of all emerging-market stocks (sally, 2013).

Despite being adjudged as the world's best performing market at the end of 2004 with a year return of 144 per cent in US dollar terms compared with a 30 per cent return by Morgan Stanley Capital International Global Index (Databank Group, 2004),the Ghanaian stock market is embedded with numerous investment problems. The Ghana stock exchange (GSE) was incorporated in 1989 but commenced trading in 1990 as a public company limited by guarantee. It is important to emphasise that though partially G30 compliant, and information disseminated through Bloomberg and Reuters, regulation is weak with trades and prices often being agreed informally and the market institutions merely being used to announce pre-agreed details (Akotey, 2008).Due to inherent problems of attracting the needed funds for investment by some small and medium size enterprises(SMEs),the GSE recently started operating what it terms as the Ghana Alternative Market (GAX, 2015) with a focus on businesses with a high potential for growth in the future and nurturing them to attain that height (GSE, 2015). Lack of the needed capital for expansion can inflict damage both on the firm and the country as a whole. It is indicated that financial crises are ubiquitous in the global economy, and they inflict substantial damage upon many countries (Blanton R.G. et al, 2015).

Bruce Hearn(2013) using the Lesmond(1999)zero returns model document that stock price, volatility, traded volume and size(market capitalization) are all negatively associated with illiquidity in Ghana and other 11 west African countries .Our paper contribute to the body of literature by using the Acharya and Pedersen Liquidity-adjusted capital asset pricing model to know how functional the model works in Ghana with respect to returns to the investors. Secondly, this study will verify the extent to which the price impact factor influences investment behaviour in Ghana. Thirdly, we will examine how risk factors in the form of financial crunch fair in an emerging economy like that of Ghana.

The rest of this paper is organized as follows; in section 2, we discuss the hypothetical scenarios. Section 3 looks at the methodology of the study. Section 4 discusses the main findings of the study and section 5 serves as the conclusion of the study.

Data

According to Jun et al (2003), using data for stock returns, liquidity measures, and other explanatory variables without appropriate adjustments may cause several potential sources of estimation biases. Drawing lessons from this, several precautionary measures were adopted to have a clean and unbiased data for the purpose of the study. Information concerning the number of trading days, the data for each firm operating in the market as well as other stock information necessary to carry out the work was taken from the Ghana Stocks Exchanges Data and Research section in Accra, Ghana. In order to have a database common to all equities, we followed (Lee, 2011, Karolyi et al (2012) and excluded all depository receipts, preferred stocks as well as investment fund from the database of our analysis. The stock initially traded for three (3) days for a number of equities but extended the days to cover the entire working days from Mondays to Fridays between 10:00am-11:00am except during periods of national holidays. The opening and closing prices, the year high and low, closing bid and offer prices, etcetera were all obtained from the GSE data stock. It was observed that, some of the stocks seldom trade on the market. Not to present misleading data and information, we rule that all stocks must be traded throughout the period under review to be considered for inclusion in our data analysis. For instance, a stock must trade for 2 days a week in order to be considered for evaluation. Any stock that is traded outside the normal opening and closing periods are excluded to prevent bias in the outcome of our results. At the end of our filtering rule, we ended up with 35 equities for inclusion in our analysis for the entire work.

Hypothesis

The literature reviewed indicates that the effect of liquidity on stock differs from one another depending on the approach adopted in undertaking the research. Most of the reviewed study points to the US as the only country that has benefitted most from the study on the role play by liquidity in asset pricing with less said about other markets especially in Sub-Sahara Africa. We intend to fill the gap by empirically investigating the relations between liquidity and asset pricing in Ghana which is a lower middle income country. The US market is an order-driven market whilst trading in Ghana is often agreed informally and the market institutions are merely being used to announce pre-agreed details (Akotey, 2008). As a result, we assume that the effect of liquidity risk in the two markets may not be the same. We intend to test the systematic liquidity risk documented by Acharya and Pedersen, 2005),Chordia et al(2000) as well as Pastor and Stambaugh (2003) in the Ghanaian stock market.

Since we are operating in a market not expose much to the financial world, we set the ground rules necessary to carry out our empirical analysis. The following hypothetical case will be deduced for the purpose of the study;

1. Liquidity stocks both at the firm and market levels are positively related to stock returns,$cov(c_t^i, c_t^M)$.

2. The relation between firms (individual) level and market level liquidity stock is negatively related to stock returns, $cov(r_t^i,\ c_t^M)$.

3. The relation between market liquidity and Individual stock returns is negatively related to stock returns, $cov(r_t^i, \ c_t^M)$.

The stated liquidity above are the theoretical deductions of Acharya and Pedersen(2005), which correspond to Pastor and Stambaugh(2003) as well as Chordia(2000) theoretical philosophies.

For the theory to be thoroughly investigated, we intend to combine the individual liquidity effect to examine it effect. As a result, the next liquidity hypothesis is that;

Hypothesis 4. The combine individual liquidity risk is priced in Ghana.

In addition to the above, it is possible that information asymmetry in either one or both markets may influence liquidity and stock returns. It is documented by Brennan et al. (2011) that during market downturn, price factors command more return premiums as illiquidity is incorporated into the equation. Also, it is an established fact that Sub-Saharan African market is small and risky (GAX, 2015).Base on this assertion, we come out with the fifth hypothesis which states that;

Hypotheses 5: The effect of liquidity is felt more in down market than in up market.

3. Research Design

3.1. Measuring Liquidity

The available literature document that many researchers use different approaches and measurement when studying liquidity and stock returns. Bruce Hearn (2011) in his combine study of some develop and emerging markets including Ghana adopted three liquidity measures to wit, the bid-ask spread of Jones (2002), zero daily return measure of Lesmond (1999) and Liu (2006) illiquidity measure for his study. In our desire to understand the operation of liquidity in Sub-Sahara in the context of Ghana, we decide to employ the Amihud (2002) illiquidity ratio as the basis for our measurement. This is in line with the price impact factor of Kyle (1985).

The Amihud illiquidity ratio is given;

$$ILLIQ_{i,t} = \frac{1}{D_{i,t}} \sum_{d=1}^{D_{i,t}} \frac{|R_{i,t,d}|}{V_{i,t,d}} \quad (1)$$

Where $R_{i,t,d}$ denotes absolute stock return of i on day d and month t. $V_{i,t,d}$ is the volume of trading for stock i on day d and of month t, and $D_{i,t}$ is the sum of trading days for stock i and month t. The Amihud illiquidity measurement is premise on everyday trading on the stock market and it is measured on data from daily trading activities of returns on volume ratio. It is anticipated that a higher ratio of the Amihud illiquidity measure is assumed to be preceded by a lower liquidity. This means that investors will prefer to be compensated (normally called risk premium) for holding such securities in period of insecurity.

Table 1 is a summary of the sample population data gathered in Ghana equity market during the period under review. The table is also a manifestation of smaller market capitalisation confirming the assertion that, most firms in Ghana and Sub-Sahara Africa in general is made up of smaller firms.

Table 1 Sample Population

This table reports the sample population for the years within which this analysis is carried out, the number of firms per year, the average monthly return and the sum of the market capitalization

Yr.	N	Mean	Median	Sum
2006	21	0.45	0.04	333.51
2007	21	0.47	0.04	384.19
2008	21	0.56	0.03	460.34
2009	24	0.66	0.03	530.01
2010	25	0.76	0.05	644.05
2011	30	0.69	0.03	640.17
2012	29	0.73	0.03	705.92
2013	32	0.72	0.04	662.64
2014	35	0.75	0.05	757.54
2015	35	0.85	0.05	948.35

3.2. The LCAPM Model

In our desire to study the condition of the Ghana stock market, we selected the LCAPM of Acharya and Pedersen (2005) as the principal model for our empirical study. The traditional CAPM is a model built on a cost free market; however, the LCAPM added an element of cost such as the cost of waiting for a transaction to be undertaking, a round trip to secure a trading activity as well as administrative cost into the traditional CAPM model. It is important to emphasise that in the absence of the introduce cost element, the two models are of the same structure and component. According to Acharya and Pedersen (2005), the standard CAPM hold for expected net returns (that is net of the relative illiquidity cost):$(r_{t+1}^{i} - c_{t+1}^{i})$.
As a result, the conditional version of LCAPM is displayed at time *t* as follows:

$$(R_{i,t} - R_f) = E_{t-1}(C_{i,t}) + \varphi_{t-1}Cov_{t-1}(R_{i,t}, R_{m,t}) + \varphi_{t-1}Cov_{t-1}(C_{i,t}, C_{m,t}) - \varphi_{t-1}Cov_{t-1}(R_{i,t}, C_{m,t}) - \varphi_{t-1}Cov_{t-1}(R_{m,t}, C_{i,t}) \quad (2)$$

Where $R_{i,t}$ is defined as gross return for stock *i* at month *t*, $R_{m,t}$ is the market returns at month *t*, $C_{i,t}$ represents the trading cost for stock *i* at month *t*, $C_{m,t}$ is the market aggregated liquidity cost at month *t* , R_f refers to gross risk-free rate, and c_t^i representing the trading cost for stock *i* at month *t.*

As we assume constant conditional covariance, variance and equal risk premium across the different risk factors, an equivalent formulation of 3 is given

$$E(c_t^i - r_t^f) = E(c_t^i) + \lambda\beta^{1i} + \lambda\beta^{2i} - \lambda\beta^{3i} - \lambda\beta^{4i} \quad (3)$$

Where the $\beta's$ in equation 3 denotes;

Each of the betas in Equation 3 is then interpreted as follows;

$$\beta^{1i} = \frac{cov\left(r_t^i, r_t^M - E_{t-1}(r_t^M)\right)}{var(r_t^M - E_{t-1}(r_t^M) - (c_t^M - E_{t-1}(c_t^M))} \quad (4)$$

$$\beta^{2i} = \frac{COV(c_t^i - E_{t-1}(c_t^i),\ c_t^M - E_{t-1}(c_t^M))}{var(r_t^M - E_{t-1}(r_t^M) - [c_t^M - E_{t-1}(c_t^M)]} \quad (5)$$

$$\beta^{3i} = \frac{COV(r_t^i, c_t^M - E_{t-1}(c_t^M))}{var(r_t^M - E_{t-1}(r_t^M) - [c_t^M - E_{t-1}(c_t^M)]} \quad (6)$$

$$\beta^{4i} = \frac{COV(c_t^i - E_{t-1}(c_t^i), r_t^M - E_{t-1}(r_t^M))}{var(r_t^M - E_{t-1}(r_t^M) - [c_t^M - E_{t-1}(c_t^M)]} \quad (7)$$

The combine net liquidity beta is given as

$$\beta^{5i} = \beta^{2i} - \beta^{3i} - \beta^{4i} \quad (8)$$

The LCAPM net liquidity risk then becomes,

$$\mathrm{E}(r_t^i - r_t^f) = E(c_t^i) + \lambda^1\beta^1 + \lambda^5\beta^5 \quad (9)$$

lastly, aggregate systematic risk is

$$\beta^{6i} = \beta^{1i} + \beta^{2i} - \beta^{3i} - \beta^{4i} \quad (10)$$

And the LCAPM becomes:

$$\mathrm{E}(r_t^i - r_t^f) = E(c_t^i) + \lambda t^1\beta^{1i} + \lambda t^6\beta^{6i} \quad (11)$$

The Amihud Illiquidity ratio then becomes

$$C_t^i = \alpha_0 + \alpha_1 C_t^i + \alpha_2 C_t^i + \ldots + \alpha_x C_t^i \quad (12)$$

We transform the Amihud illiquidity ratio where C_t^i is the measure of liquidity for stock i, t is the number of lags included in the equation.

$$r_{t+1}^i - r_{t+1}^f = \alpha_t + \lambda_1\mu_t^i + \lambda_2\beta_t^{1i} + \varphi_1 HLM_t + \varphi_2 Size_t + \varphi_3 MOM_t \quad (13)$$

$$r_{t+1}^i - r_{t+1}^f = \alpha_t + \lambda_1\mu_t^i + \lambda_2\beta_t^{1i} + \lambda_2\beta_t^{2i} + \varphi_1 HLM_t + \varphi_2 Size_t + \varphi_3 MOM_t \quad (14)$$

$$r_{t+1}^i - r_{t+1}^f = \alpha_t + \lambda_1\mu_t^i + \lambda_2\beta_t^{1i} + \lambda_3\beta_t^{3i} + \varphi_1 HLM_t + \varphi_2 Size_t + \varphi_3 MOM_t \quad (15)$$

$$r_{t+1}^i - r_{t+1}^f = \alpha_t + \lambda_1\mu_t^i + \lambda_2\beta_t^{1i} + \lambda_3\beta_t^{4i} + \varphi_1 HLM_t + \varphi_2 Size_t + \varphi_3 MOM_t \quad (16)$$

$$r_{t+1}^i - r_{t+1}^f = \alpha_t + \lambda_1\mu_t^i + \lambda_2\beta_t^{1i} + \lambda_3\beta_t^{5i} + \varphi_1 HLM_t + \varphi_2 Size_t + \varphi_3 MOM_t \quad (17)$$

$$r_{t+1}^i - r_{t+1}^f = \alpha_t + \lambda_1\mu_t^i + \lambda_2\beta_t^{6i} + \varphi_1 HLM_t + \varphi_2 Size_t + \varphi_3 MOM_t \quad (18)$$

$$r_{t+1}^i - r_{t+1}^f = \alpha_t + \lambda_1\mu_t^i + \lambda_2\beta_t^{1i} + \lambda_3\beta_t^{2i} + \lambda_4\beta_t^{3i} + \lambda_5\beta_t^{4i} + \varphi_1 HLM_t + \varphi_2 Size_t + \varphi_3 MOM_t \quad (19)$$

Where r_{t+1}^{i}-r_{t+1}^{f} indicates individual stock excess returns at month t+1, $\beta_t^{1i} to\ \beta_t^{6i}$ are the liquidity betas that are specified in equations (4) to (19), HLM_t represents the High minus Low at month t, SMB_t denotes market capitalization at month t and MOM_t is the cumulative returns over the past 12 months with a one lag with λ is the risk premium. Acharya and Pedersen, (2005); Lee, (2011) are of the view that the stated equations from(13) to (16) make it possible to determine what influence each individual liquidity risk, and moderate the multi-collinearity concerns for the betas. Equations (17) and (18) are the ones that determine the overall influence of the net liquidity risk effect and the aggregate systematic risks. Lastly, equation (19) investigates the joint effects of the liquidity betas.

3.4. Estimating illiquidity Portfolio Betas

Following Lee (2011) construction of liquidity portfolios, we follow in line and construct an LCAPM for the Ghanaian stock market and illiquidity using time series approach. The intention for using the time series over others such as the conventional Fama-Macbeth (1973) cross-sectional regression is to avoid statistical bias as document by Petersen (2009) who indicates that the Fama –Macbeth (1973) measure is associated with statistical bias whose outcome may not reflect the facts on the ground since it accounts only for correlation without considering serial correlation.

The illiquidity Portfolio betas in table 2 are measured based on equation 4 to 7 for the ten portfolios form in line with the Amihud (2002) illiquidity ratio using the individual stocks and their respective market returns from the GSE. In the construction of the illiquidity betas, we sort stocks into 10 equal parts and create 10 equally-weighted portfolios (deciles).Specifically, at the beginning of every year, illiquidity betas are calculated using the individual liquidity stocks as well as their respective market returns for the 10 equally weighted portfolios. Using the individual liquidity betas would have being the best and safest thing to do since it has the ability to increase the power of explaining our observations; however, it has an inherent cost of a greater noise which may skew the results of our analysis. The resultant outcome is the averages of these betas for each portfolio over the ten year period. At the end of the calculation, the resultant portfolio liquidity betas are assigned to the individual liquidity betas for the empirical analysis.

Table 2: Illiquidity portfolio betas

This table is the overall summary of the portfolio betas calculated with respect to the individual liquidity stocks and their respective market returns.

illiquidity betas	β_1	β_2	β_3	β_4	β_5	β_6	Returns
Lowest	0.001	2.2795	-0.0398	-0.0184	2.3376	2.3386	-0.14
1	0.001	2.2804	-0.0314	-0.0165	2.3283	2.3294	-0.74
2	0.0017	2.111	-0.01	-0.0002	2.1212	2.1229	-0.06
3	0.0019	2.2166	-0.0529	-0.0325	2.3021	2.304	-0.07
4	0.0019	2.1045	-0.011	-0.0007	2.1161	2.118	0.10
5	0.0022	2.1042	-0.0129	-0.0008	2.1179	2.1201	0.07
6	0.0036	2.1032	-0.0192	-0.0016	2.1239	2.1275	-0.05
7	0.0039	2.2548	-0.0093	-0.0015	2.2656	2.2694	0.89
8	0.0046	2.1001	-0.0168	-0.0015	2.1183	2.1229	-0.08
Highest	0.0191	0.1919	-0.0117	-0.0517	0.2553	0.2744	0.89

* means statistical significance at 1%, **means statistical significance at 5%, *** means statistical significance at 10%.

4.0. Empirical Findings

Analytical Results

We present results from table 3 which is an overall presentation of our seven different LCAPM equation from 13 to 19.We first of all discuss the impact of the individual liquidity betas to know the effect of each on the Ghanaian stock market and the reaction of portfolio investors. Regressions 1 represent the traditional CAPM market model. Regressions 2 to 4 represent the individual liquidity *β2, β3 and β4* respectively. From the analysis of the equations, we find that liquidity *β3and β4* are positive but insignificant. Beta 2 which is the positive co-movement that exist between individual liquidity stock and market liquidity is positive and significant at 5% level but carry's the wrong sign when run against all the control variables such as liquidity *β1, HLM, SMB* and the past returns which is given as *MOM*. This is a rejection of hypothesis 1, which indicates that the relations between stocks at both the level of the firm and market is positive. According to Jones (2002), Pastor and Stambough (2003) and Amihud (2002), the positive signs of illiquidity normally is a reflection of firms that are performing poorly and that to entice prospective investors in holding such stocks, current stock price will have to fall. This will intend lead to a fall in current stock returns. The finding also reject Acharya and Pedersen (2005) assertion that in the event of individual liquidity level falling and market liquidity level falling concurrently, investors will require compensation for holding such assets. We are of the view that this results may be due to information asymmetry and the lack of transparency in the affairs of the stock market especially in a market environment full of volatility.

Table 3

This table reports the time series regression of the build for model number 1 to 7 and discuss the equations from 13 to 19.the excess stock returns in this case is the dependent variable. The liquidity betas β1, β2 β3and β4 seen in this table are the ones calculated from equations 4 to 7 in our model. B5and β6 are the net liquidity beta and the systematic liquidity beta respectively. HLM, SMB and MoM are the high minus Low, Small minus Big and the past returns respectively.

Variables	1	2	3	4	5	6	7
Residual	0.276	0.030**	0.223	0.183*	0.047**	0.874	0.000***
	(0.658)	(0.935)	(0.998)	(1.135)	(1.252)	(-0.192)	(1.000)
β1	0.002***	0.002***	0.006***	0.005***	0.002***		0.000***
	(2.682)	(2.197)	(2.711)	(2.648)	(2.474)		(2.196)
β2		0.025**					0.000***
		(-3.625)					(-4.155)
β3			0.429				0.000***
			(1.409)				(1.905)
β4				0.340			0.000***
				(56.965)			(-51.856)
β5					0.069*		
					(-1.825)		
β6						0.050**	
						(2.375)	
Constant	0.000***	0.000***	0.000***	0.000***	0.000***	0.000***	0.000***
	(21.624)	(21.539)	(21.608)	(21.604)	(21.559)	(21.742)	(21.523)
Size	0.636	0.780	0.694	0.893	0.904	0.894	0.109*
	(-2.645)	(7.37)	(-2.292)	(-7.682)	(-4.249)	(-1.636)	(2.159)
HLM	0.379	0.99	0.467	0.571	0.666	0.893	0.29
	(-1.840)	(-0.012)	(-1.596)	(-1.198)	(-0.0583)	(-0.622)	(2.831)
MOM	0.315	0.628	0.996	0.819	0.435	0.141*	0.152*
	(0.061)	(0.014)	(0.000)	(-0.023)	(-0.045)	(0.216)	(-2.583)

* means statistical significance at 1%, **means statistical significance at 5%, *** means statistical significance at 10%.

After discussing the individual liquidity betas, we now turn our attention to the net and systematic liquidity betas to verify their effect on liquidity and stock returns. From regression 5 and 6, we find that the net liquidity beta is negative with a 10% significant level with the systematic liquidity beta being positively related to stock returns at 5% level when all the control variables remain constant. The important revelation from table 3 is that, the systematic liquidity risk denoted by β6 is priced even in presence of market risk. It can be express that liquidity is significantly priced in Ghana and that investors require some level of compensation as a hedge against the uncertainty surrounding the holding of a risky asset.

We have seen that the result of our finding especially the β6 support the finding of scholars such as Lee(2011), Acharya and Pedersen 2005,though with varying significant levels. We realise that in their analysis, Acharya and Pedersen got a strong and positive significance for

β5. In our case however, the β5 is rather carrying a weaker sign indicating that it does not have any influence in the presence of the aggregated liquidity beta in regression 6.
Lee (2011) finds a high significant value for both β2 and β4 which differs from the Ghanaian situation which has a weaker explanatory power. It is important to point out that the Hearn Bruce (2011) documents the difficulty of both the CAPM and the LCAPM having questionable performance in the presence of extreme illiquidity. Again, the structure of Ghana stock market may differ from well advance ones in magnitude and content.

The Size Effect

It is a fact that most of the firms in Sub-Sahara Africa are made up of smaller size attributable to lack of the financial muscles to carry out massive enterprise establishment. Debate is on-going concerning the relation between expected returns and size of the firm. It is documented that expected return is negatively related to the size of a firm and that small firms are more sensitive to liquidity risk (Fama and French, 1992, Banz, 1981, Chordia, 2000, Amihud, 2002, Pastor and Stambaugh, 2003). This is a confirmation that illiquidity effect is stronger in small markets than in big market. Others however differ in opinion concerning firm size and sensitivity of returns to the market. For instance, Fabre and Frino (2004) find that commonality in liquidity is mainly a large firm phenomenon. With this information, we set out to find out which of these assertions is true in the Ghanaian situation. In order to carry out this assignment, we sorted our data into three categories base on a 30:40:30 ratios. The sorting out is based on their market capitalization concurrently for a given month. The 30:40: 30 ratio is for the large, medium and small firms respectively. The outcome of the results serves as a confirmation of table 3 with regards to the size of a firm. The results from the regressions give a mix situation depending on the market we operate. In consistent with table 3, the net liquidity $\beta 5$ is negative and significant at a weaker 10% for all markets. The systematic liquidity $\beta 6$ also remain positive in all market sizes. It is observe that the signs of the liquidity beta 3 and 4 consistently remain unchanged irrespective of the market we operate. The conclusion that can be drawn from the size effect is that smaller firms are more sensitive and turns to react in the face of higher cost of production. This affirms the fact that liquidity is a small size phenomenon. Looking at the market structure of most enterprises in Ghana, many are running one the back of high interest rate, lack of energy to power their plants, importation of almost every single raw material for production leading to a higher operational cost and competing with the central government for investment fund and finally lack of proximity to the market.

Illiquidity shocks under different market conditions

Asset pricing plays an important role during different market situations and may not exhibit either same or similar tendencies at different time periods (Anthinisz and Putnins, 2014, Pastor and Stambaugh, 2004).) Research indicates that stock returns behave differently during up and down market situations (Chiang and Zheng, 2010, Brennan et al., 2011).The fact remains that, during market downturn, price factors command more return premiums as illiquidity is incorporated into asset pricing model (Brennan et al., 2011).Inspired by the reviewed literature, we decided to test the liquidity risk with respect to stock returns in Ghana and see the reaction of the market to shocks. According to Easley,Hvidjaer, and O'Hara(2010), the illiquidity premium factor pioneered by Amihud(2002) was significant

during the period between 1963-1983 but not during the period between 1984-2002. As a result, we divided the Ghanaian stocks into two periods: the upward (2006to 2008) and the downward periods (2008 to 2015) and find the outcome. We define the up market as the period of market boom with its positive effect in Ghana and the downturn period from 2009 to 2015 also showing the financial tsunami the world economy underwent during the period of total collapse of the world stock market. The result of our estimation is reported in table 5. We decide to report only the outcome from net liquidity $\beta 5$ as well as the systematic liquidity $\beta 6$ for the purpose of the current presentation. From table 5, we find that expected stock returns to market illiquidity are showing some mix reaction from the regression.

Table 4(Large)

This table reports the time series regression of the build for model number 1 to 7 and discuss the equations from 13 to 19.the excess stock returns in this case is the dependent variable. The liquidity betas β1, β2 β3and β4 seen in this table are the ones calculated from equations 4 to 7 in our model. B5and β6 are the net liquidity beta and the systematic liquidity beta respectively. HLM, SMB and MoM are the high minus Low, Small minus Big and the past returns respectively.

Variables	1	2	3	4	5	6	7
Residual	0.267	0.03**	0.219	0.178*	0.046**	0.880	0.000***
	(0.670)	(0.931)	(1.007)	(1.14)	(1.256)	(-0.181)	(1.000)
β1	0.002***	0.002***	0.006***	0.006***	0.002***		0.000***
	(2.685)	(2.198)	(2.712)	(2.647)	(2.473)		(4.155)
β2		0.025**					0.000***
		(-3.618)					(-4.155)
β3			0.432				0.000***
			(1.405)				(1.905)
β4				0.340			0.000***
				(57.125)			(-51.856)
β5					0.069*		
					(-1.828)		
β6						0.052**	
						(2.369)	
Constant	0.000***	0.000***	0.000***	0.000***	0.000***	0.000***	0.000***
	(-21.623)	(-21.539)	(-21.607)	(-21.604)	(-21.559)	(-21.741)	(-21.523)
Size	0.641	0.793	0.705	0.901	0.918	0.000***	0.13*
	(-6.917)	(1.844)	(-5.872)	(-1.893)	(-9.704)	(-3.803)	(5.685)
HLM	0.381	0.987	0.472	0.577	0.675	0.899	0.327
	(-1.854)	(-0.017)	(-1.601)	(-1.193)	(-0.575)	(-0.593)	(2.951)
MOM	0.322	0.616	0.989	0.813	0.43	0.14*	0.184*
	(0.060)	(-0.014)	(-0.001)	(-0.023)	(-0.046)	(0.215)	(2.505)

* means statistical significance at 1%, **means statistical significance at 5%, *** means statistical significance at 10%.

Net beta 5 continues to show weaker negative significance as against a positive and strong systematic liquidity β5 in the down market as against a negative net liquidity β5 with 5% significance for the up market. This is in shape contrast to a net liquidity beta that has shown a consistent weaker 10% level of significance throughout our discussions. The possible explanation is that liquidity is a multifaceted topic that gives itself different forms of explanation and measurement. However, notwithstanding this, the systematic liquidity beta6 shows a stronger and significant value for the down market than in the up market indicating that systematic liquidity beta is priced in Ghana. The result of the findings is also in tune with the existing literature such as the ones documented by Hameed et al., 2010, Anthnisz and Putnins, 2014). The findings are also robust to the findings documented in table 4 which indicate that systematic liquidity risk has a central role as far as the market situation in Ghana is concern.

TABLE 4(MEDIUM)

Variables	1	2	3	4	5	6	7
Residual	0.276	0.03**	0.223	0.184*	0.047**	0.872	0.000***
	(0.657)	(0.934)	(0.995)	(1.130)	(1.250)	(-0.196)	(1.000)
β1	0.002***	0.002***		0.005***	0.002***		0.000***
	(2.689)	(2.198)		(2.653)	(2.477)		(2.196)
β2		0.025**					0.000***
		(-3.623)					(-4.155)
β3			0.430				0.000**)
			(1.403)				(1.905)
β4				0.343			0.000***
				(56.568)			(-51.856)
β5					0.070*		
					(-1.822)		
β6						0.050**	
						(2.382)	
Constant	0.000***	0.000***	0.000***	0.000***	0.000**	0.000***	0.000***
	(-21.623)	(-21.539)	(-21.607)	(-21.604)	(-21.559)	(-21.741)	(-21.523)
Size	0.619	0.792	0.681	0.876	0.893	0.886	0.000***
	(-1.477)	(3.725)	(-1.276)	(-4.768)	(-2.539)	(-9.371)	(1.148)
HLM	0.373	0.987	0.462	0.565	0.662	0.888	0.000***
	(-1.877)	(-0.016)	(-1.627)	(-1.227)	(-0.596)	(-0.657)	(2.971)
MOM	0.314	0.625	0.997	(0.823)	0.437	0.140*	0.000***
	(0.061)	(0.014)	(0.000)	(-0.022)	(-0.045)	(0.216)	(-2.561)

* means statistical significance at 1%, **means statistical significance at 5%, *** means statistical significance at 10%.

TABLE 4(SMALL)

Variables	1	2	3	4	5	6	7
Residual	0.270	0.03**	0.220	0.18*	0.046**	0.878	0.000***
	(0.667)	(0.932)	(1.005)	(1.139)	(1.255)	(-0.185)	(1.000)
β1	0.002***	0.002***	0.006***	0.005***	0.002***		0.000***
	(2.683)	(2.198)	(2.711)	(2.647)	(2.473)		(2.196)
β2		0.025**					0.000***
		(3.620)					(-4.155)
β3			0.431				0.000***
			(1.406)				(1.905)
β4				0.340			0.000***
				(57.091)			(-51.856)
β5					0.069*		
					(-1.827)		
β6						0.051**	
						(2.372)	
Constant	0.000***	0.000***	0.000***	0.000***	0.000***	0.000***	0.000***
	(-21.624)	(-21.539)	(-21.608)	(-21.604)	(-21.559)	(-21.742)	(-21.523)
Size	0.640	0.788	0.703	0.899	0.914	0.902	0.120*
	(-2.965)	(8.055)	(-2.534)	(-8.223)	(-4.330)	(-1.714)	(2.439)
HLM	0.381	0.988	0.471	0.575	0.672	0.897	0.311
	(-1.847)	(-0.016)	(-1.597)	(-1.193)	(-0.577)	(-0.604)	(2.898)
MOM	0.320	0.619	0.991	0.814	0.431	0.140*	0.170*
	(0.061)	(0.014)	(-0.001)	(0.023)	(-0.046)	(0.215)	(2.898)

* means statistical significance at 1%, **means statistical significance at 5%, *** means statistical significance at 10%.

Table 5: This table reports of the Risk in different market situations for equation 8. β1, β5and β6 are the market net liquidity beta and the systematic liquidity beta respectively. HLM, SMB and MoM are the high minus Low, Small minus Big and the past returns respectively.

	Down Market		Up Market	
Variables	1	2	1	2
Residual	0.047**	0.874	0.200	0.387
	(1.252)	(-0.192)	(-0.385)	(-3.636)
β1	0.002***		0.009***	
	(2.474)		(2.527)	
β5	0.069*		0.045**	
	(-1.825)		(-1.285)	
β6		0.050**		0.172*
		(2.375)		(2.48)
Constant	0.000***	0.000***	0.000***	0.000***
	(-21.559)	(-21.742)	(-21.59)	(-21.768)
Size	0.904	0.894	0.109*	0.751
	(-4.249)	(-1.6361)	8.176	1.641
HLM	0.666	0.893	0.145*	0.894
	(-0.583)	(-0.622)	(-0.820)	(-0.928)
MOM	0.435	0.141*	0.072*	0.224
	(-0.045)	(0.216)	(0.112)	(0.514)

* means statistical significance at 1%, **means statistical significance at 5%, *** means statistical significance at 10%.

Alternative proxies for liquidity

I order to prove and validate our assertion that liquidity is a phenomenon of smaller emerging markets such as in Ghana, we turn our attention in finding an alternative proxy that will serve as a robust to the results that we have using the Acharya and Pedersen (2005) model. This is of significance since scholars often use different measures of liquidity to investigate the relations between liquidity and excess returns. For instance, Brennan and Subrahmanyam(1996) use transaction cost as a measure of liquidity with Datar and Radcliffe(1998) concentrating on trading volume turnover as a proxy for the measurement of liquidity. The Amihud(2002) is of the assumption that the percentage of the non-trading days is relatively low. In the study of some West Africa countries in addition to others, Hearn and Piesse(2011) find the BRVM countries and Ghana in particular as having one of the highest illiquidity ratios in the world when he used the Lesmond(1999) zero returns. They find the percentage of illiquidity in the Ghanaian market to be closer to 77%.Taking inspiration from this, we decide to apply the Lesmond(1999)zero return ratio as our proxy measure to study the Ghanaian market. One fundamental inspiration for using the Lesmond(1999) ratio is its ability to solve the inherent problem identify by Amihud(2002)illiquidity ratio as it captures the zero trading days in the case of Ghana.

Table 6 presents the report of the alternative liquidity proxy using the Lesmond(1999)zero returns. For the purpose of this analysis, we set aside the individual liquidity betas and report on the net and aggregated liquidity betas and their outcome. We find that the coefficient value

of net liquidity $\beta 5$ has the coefficient value giving us a positive sign and at a significant value of 5%. The same can be said of the systematic liquidity risk whose sign remain the same but has it significance level at 1%. This is a confirmation of the LCAPM and robust to the augment put forward in the discussions. The result is consistent with Hearn and Piesse (2011) who indicates the markets demonstration of severe price rigidity presence in these markets.

Table 6 This table reports of the zero returns proxy. β1, β5and β6 are the market net liquidity beta and the systematic liquidity beta respectively. HLM, SMB and MoM are the high minus Low, Small minus Big and the past returns respectively.

TABLE 6 ZERO RETURNS

	ZERO RETURNS	
Variables	1	2
Residual	0.633	0.984
	(-1.133)	(0.039)
β1	0.410	
	(-1.313)	
β5	0.053**	
	(2.176)	
β6		0.040**
		(2.473)
Constant	0.611	0.003
	(0.086)	(0.234)
Size	0.392	0.352
	(1.810)	(1.909)
HLM	0.428	0.441
	(6.235)	(6.266)
MOM	0.368	0.368
	(0.297)	(0.297)

* means statistical significance at 1%, **means statistical significance at 5%, *** means statistical significance at 10%.

5.0. Conclusion

Our findings prove that illiquidity risk is always present in stock returns in the emerging Ghanaian market. A lot of lessons can be learnt and policies deduce for the good of Ghana and Sub-Sahara Africa in general.

Most of the emerging markets in the region have smaller market capitalization as compare to the Group of 7 countries (G7) and other major economic superpowers. It is therefore important to integrate these emerging markets in Sub-Saharan Africa. The US market has a major influence in Sub-Sahara and hence any market downturn has a direct effect on the emerging markets on the sub-region.

There should be a conscious effort on the part of managers of the economy to invest more in the stock market to make it more attractive and efficient in the area of better bond market, well establish electronic trading with the needed personal, logistics to make it work.

Drivers of the economy should create the needed space in terms of lower interest rest, a private public partnership and the needed infrastructural development for new entrance as incentive which will go a long way in increasing the investment in the country.
Again, integrating the various regional blocks as far as stock market is concern should be the way forward in this modern technological world. This will bring the mobilization of the needed funds to execute the regional integration objectives as oppose to the fragmented smaller markets existing now.
Proper laws, promulgation of sound policies that will drive away the fear of potential investors into the Ghanaian market. Policies that will eliminate the bottlenecks for free mobilization of capital and fully adopting international best practices should be encouraged. All and sundry in the country should make conscious effort for political stability a hallmark , rule of law, transparency and less bureaucracy as a bedrock in Ghana.
Fama-Macbeth Covariance for net and systematic liquidity risks

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