Kabarak Journal of Research & Innovation
www.kabarak.ac.ke

Accelerators of Depth in Nascent Derivative Markets: Case of Nairobi Securities Exchange

Faith Mwende CHRISTOPHER[1], Amos NJUGUNA[2]& Peter KIRIRI[3]

[1, 2,3]United States International University - Africa
[1]faithlinge@gmail.com
[2]amnjuguna@usiu.ac.ke
[3]pnkiriri@usiu.ac.ke

Submitted 24th May, 2021, Accepted 25th June, 2021, Published 14th July, 2021

ABSTRACT

The Kenyan derivatives market is at nascency which raises doubt on its depth in the short term and hence the urgency for intervention. During the first weeks of derivatives trading, the market was characterized by low volumes, a clear indication of low market depth. This study anticipated that the derivatives market in Kenya will face market depth struggles, this study sought to determine the factors that accelerate the derivatives market depth at nascent stage. This study examined the factors that would accelerate the market depth 154 days after its inauguration. The study adopted descriptive research design and obtained secondary data from Nairobi Security Exchange derivatives and equity price lists starting 4th July 2019 to 31st January 2020.The study quantified the effect of hypothesized accelerators of derivatives market depth using granger causality and Autoregressive Distributed Lags model for the first 30 weeks of trading. Empirical results show Size of the underlying cash market does not accelerate market depth of respective futures market ($\beta = 7.621$, $p = 0.111$and $\beta = -16.154$, $p = 0.19$ in single stock futures and equity index futures respectively). Similarly, volatility of the underlying spot market does not have a significant effect on market depth of respective futures market ($\beta = 22.93$, $p = 0.06$ and $\beta =-1.227$, $p = 0.868$ in single stock futures and equity index futures respectively). The study recommends NSE and CMA to conduct a pilot study on whether new derivatives products whose underlying assets are more frequently traded accelerate the derivatives market growth in Kenya.

Keywords: Market depth, size, volatility, liquidity, derivatives.

Link: http://ojs.kabarak.ac.ke/index.php/kjri/article/view/407

I. INTRODUCTION

McDonald (2010) defines a derivative as an agreement of value whose worth depend on the price of another product in the cash market. The markets have gained substantial value and are now a central pillar of international financial system**.** The global derivative market has been growing (Tian, 2017) evolving from 9 billion contracts in 2005 to 30 billion contracts in 2018 which was 20.9% increase in volumes on 2017 (Rahman, 2019; World Federation of Exchanges, 2019). This increase of traded volumes is facilitated by growth of derivatives contracts in America region which was up by 23.8%, the Asia Pacific Region which was up by 27.1% and the Europe, Middle East and Africa (EMEA) region up by 5% (World Federation of Exchanges, 2019). Kenya launched its derivatives market in July 2019 by trading futures contracts which offer investors Equity Index Futures and Single Stock Futures of the most heavily traded companies in the Nairobi Securities Exchange (NSE) such as Safaricom Plc, Equity Group, KCB group and East African Breweries. Regionally, Kenya is the second country to offer the product after South Africa (Ngugi, 2019).

As stipulated in the Capital Markets Act and the capital markets derivatives market regulation, 2015 the main reasons for establishing derivatives market in Kenya were to manage risk due to uncertainty in the stock and commodity prices, increase the liquidity in the financial markets, and improve the price discovery in the Kenyan financial markets which will provide individuals with better information and judgment on the market movement to take positions in the market (Ngugi, 2019). These results are yet to be realized and policy makers are currently grappling to accelerate the gains. The need to accelerate derivatives market growth in Kenya raises questions of market depth. The underlying question is whether the derivatives market in Kenya will evolve from formative stage to successful market as that of Johannesburg Stock Exchange (JSE) in South Africa. In attempt to answer that question, existing literature has identified factors which accelerate the market depth. Black (1986) established that the liquidity and price variability of the underlying cash market and type of products traded positively influences the success of derivatives market in New York Stock Exchange. Kim and Waweru (2015) studied Asian markets and established that liquidity, volatility and size of the underlying cash market and products traded determined the success of the derivatives market. This research examined whether liquidity, volatility and size of the underlying spot market accelerates the market depth of derivatives in Kenya.

II. THE PROBLEM

Despite the growth of derivatives market globally, emerging economies have been delayed due to a variety of problems, including high capital and prices for derivatives and low economic growth in some emerging markets (Aysun & Guldi, 2011). As a result of these complexities, derivatives market in most of emerging markets fail. According to Kim and Waweru (2015) most derivatives markets fail because of lack of activity. Kim and Waweru (2015) and Black (1986) noted that successful markets have more than 1,000 traded contracts per month. Derivatives market in Kenya is at its nascent stage which raises doubt on its depth in both the short term and long term. During the date of kick off, that is 4th July 2019, the derivatives market in Kenya was characterized by low volumes, a clear indication of low market depth. According to the NSE Derivatives daily price list contracts traded were less than 5 in the first week of trading and only 27 traded contracts in the first month of derivatives trading (Nairobi Security Exchange [NSE], 2019).

Besides, Munda (2019) noted that two stocks (KenGen Co. Plc and Bamburi Cement Ltd) part of the seven stocks of the pilot study were dropped during the go live of the market due to failure to meet the minimum market capitalization requirement of Kshs. 50 billion for a stock to trade in the Kenyan Derivative Market. Low number of traded contracts and dropping of some of the underlying stock signifies a low market depth and raises questions whether the market will accelerate from formative stage to being classified as success. Cytonn Investments (2019) hypothesized that the Kenyan derivative market could face challenges of low liquidity, high price variability and few products due to the macroeconomic environment. The market regulation, less developed market structures, accounting complexities of financial derivatives, and lackluster government and CMA policies could also hinder the accelerated growth of financial market depth of derivatives market in Kenya (Ikiao, 2018). Anticipating that the derivatives market in Kenya will face market depth struggles, this study sought to determine the factors that accelerate the derivatives market depth at nascent stage. Prior studies have identified several factors which accelerate the market depth or success of financial markets but not in the Kenyan derivatives market context. Jobst (2008), Kim and Waweru (2015) studied factors that lead to derivatives market success in US markets and Asian derivatives market respectively. In Africa, studies by Adelagan (2009) and Mulei (2019) placed special focus on the South African derivatives market growth. Given the fact that Kenyan derivatives market is still new, there is need to conduct a study on accelerators of derivatives market depth and close the existing knowledge gap.

III. OBJECTIVES

The broad objective of the study was to determine the accelerators of derivatives market depth in Kenya. The specific objectives of the study are to determine the influence of:

1. Size of the underlying spot market on derivatives market depth in Kenya.
2. Volatility of the underlying spot market on derivatives market depth in Kenya.
3. Liquidity of the underlying spot market on derivatives market depth in Kenya.

IV. LITERATURE REVIEW

Various studies have affirmed that size of the underlying cash market is crucial to the success of futures market. Black (1986) avers that large market size is a necessary condition for futures to depth. Nguyen and Faff (2002) also showed that depth of derivatives markets is to a large extent determined by large cash market. Moreover, N'Zue (1995) suggests that derivatives are most likely to be traded effectively on an exchange if there is already a large market share (cash market) in terms of value and market volume. Rashid et al. (2010) concluded that derivatives are most likely efficiently traded on an exchange if the market participants have a wide spot market in terms of value and volume.

Existing research also identifies volatility of the underlying spot market which is measured by the annualized standard deviation as important determinant of market depth. In derivatives trading, volatility is important because it is a reliable measure of future prices (Bakshi, Cao & Chen, 1997). Volatility in the stock market is correlated to macroeconomic factors which have long-term effect on market depth (Hung et al., 2011). Kim and Waweru (2015) empirical research found that volatility of the underlying spot prices positively influences market depth. Black (1986) also observes that price variability of the underlying cash market is a determinant for depth of the derivatives market. Volatile cash market agreements would accelerate the depth of the derivatives market.

Similarly, Kawaller et al. (2011) found that trade volume changes is a reflection of market volatility changes. *Corkish* et al. (1997) in the empirical analysis of futures market concluded that volatile spot market is an important condition for increasing market depth. Moreover, researchers have also established that spot market liquidity is important accelerator of market depth. According to Nekhili and Thorpe (2011) investors will always prefer liquid market even at the expense of low hedging because trading costs and the execution risk will be lower. Carlton (1984) established liquidity to be strongly associated with the derivatives trading levels. Yuferova (2016) also found that liquidity has a positive and significant effect on derivatives market depth. Corkish et al. (1997) revealed that contracts with more depth are liquid, but liquidity does not necessarily ensure sufficient volume to guarantee depth.

V. METHODOLOGY

A. Research design and data source

The study adopted descriptive research design which involves a blend of qualitative and quantitative data in a single study with a principle that utilization of both approaches offers comprehensive understanding of study problems (Curtis, 2011). The study employed secondary data which was obtained from Nairobi Security Exchange derivatives and equity price lists starting 4th July 2019 to 31st January 2020. The total number of observations was 30 weeks; hence census survey was used taking into account all the 30 weeks of study. The study used open interests or contracts traded as a proxy measure of derivatives market depth. Market capitalization was used to measure the size of the underlying spot market. Volatility of the underlying spot market was obtained by calculating the standard deviation of daily prices of selected stocks. Liquidity of the underlying spot market was obtained by calculating the turnover velocity.

B. Data analysis techniques

The study used statistical inference tests namely the Granger Causality Test, Johansen Cointegration Test and Autoregressive Distributed Lag Model (ARDL). The study used ARDL to establish the effect of independent variables on dependent variable. ARDL is a form of standard least square regression which can include lags in both the explanatory or explained variables as regresses (Gujarati, 2009). The following equation shows the ARDLmodel specification.

$$Y_t = 2\alpha Y_{t-i} + 2\beta_i X1_t + \beta_i X2_t + \beta_i X3_t + \varepsilon \qquad (1)$$

Where; Y = number of contracts traded.
αY_{t-i}= First lag of open interest.
X1= Size of the underlying spot market.
X2= Volatility of the underlying spot market
X3=Liquidity of the underlying spot market.
t is the indication of time series
ε is the error term.

Unit root test and post-estimation tests namely autocorrelation and homoscedasticity were conducted to establish the robustness of the model.

VI. Results

A. *Diagnostic Tests*

Prior to inferential analysis, unit root tests were conducted to establish whether the variables data was stationary and the results were presented in Table 1.

Table 1 Unit Root Tests

Variable	Test Statistic	1%Critical Value	5%CriticalValue	10%CriticalValue	Z(t) P.value	Stationary at level
D.Y	-2.202	2 2-2.518	-1.721 2 2	-1.323	0.0195	I(I)
D.X1	-2.202	2 2-2.518	-1.721 2 2	-1.323	0.0149	I(I)
D.X2	-4.106	-2.518	-1.721	-1.321	0.0003	I(I)
X3	-4.619	-2.518	-1.721	-1.323	0.0001	I(0)

Unit root tests were conducted on level data I(0) and it was established that only spot market liquidity was stationary at level as shown in Table 1. First differencing was conducted for the number of open interests, size and volatility of the underlying spot market. The p value of the differenced variables namely number of open interests, size and volatility of the underlying spot market were 0.0195, 0.0149 and 0.0003 respectively which is less than the standard threshold of 0.05. The results implies that number of open interests, size and volatility of the underlying spot market were stationary at first difference I (I).

Additionally, robust tests were conducted to establish whether the ARDL models adhered to conditions of homoscedasticity and absence of serial autocorrelation. The study checked for the autocorrelation using the D-Watson statistic which states that there is no serial autocorrelation. In model 1 (see below), there was no serial autocorrelation since the p-value is greater than 0.05 (Durbin-Watson d-statistic (5, 29) p = 0.9415). Additionally, the null hypotheses of white test states that there is homoscedasticity (no heteroskedasticity). The heteroskedastic test for model 1 revealed that there was no heteroskedasticity (chi2 (9) = 12.00, Prob > chi2 = 0.6059). Further, for model 2, there was no serial autocorrelation since the p-value is greater than 0.05 (Durbin-Watson d-statistic (5, 29) p = 0. 6002387) and no heteroskedasticity (chi2(9) = 17.25, Prob > chi2 = 0.2431). The models were proved to have no problem of autocorrelation or heteroskedasticity hence were suitable and robust.

B. *Granger causality test results*

Table 2 shows the granger causality test results. Prior to granger causality tests, lag selection using Vector Auto Regression (VAR) model was conducted to establish the number of lags in granger causality model and the results presented in Table 2.

Table 2 Granger Causality

	Single Stock Futures		Equity Index Futures	
	F	Prob>F	F	Prob>F
Market Depth to Size	2.7037	0.2964	5.3687	0.473
Size to Market Depth	15.725	0.0611	10.692	0.058
Market Depth to Volatility	0.6756	0.7089	5.3687	0.373
Volatility to Market Depth	1.5011	0.4566	10.692	0.058
Market Depth to Liquidity	0.67097	0.7111	4.9307	0.177
Liquidity to Market Depth	1.2973	0.5017	5.4374	0.142

N = 30

Granger causality are significant at $p < 0.05$.

Results in Table 2 shows that derivatives market depth does not granger cause size of the underlying cash market of both single and equity index futures (p-value = 0.2964 and p-value = 0.473 respectively) and that size of the underlying cash market does not granger cause derivatives market depth of both single and equity index futures (p-value = 0.0611 and p-value = 0.058 respectively). Also, derivatives market depth does not granger cause volatility of the underlying cash market of both single and equity index futures (p-value = 0.7089 and p-value = 0.373 respectively). Similarly, volatility of the underlying cash market does not granger cause derivatives market depth of both single and equity index futures (p-value = 0.4566 and p-value = 0.058 respectively).

C. Johansen cointegration

Johansen Cointegration test was conducted to establish whether there is long run relationship between independent and dependent (market depth) variables. The results were presented in Table 3.

Table 3: Johansen Cointegration Results

	Single Stock Futures			Equity Index Futures		
Market Depth	maximum rank	max statistic	5% critical value	maximum rank	max statistic	5% critical value
Size of the underlying cash market	0	14.1645	14.07	1	6.4471	3.76
Volatility of the underlying spot market	0	10.7342	14.07	1	3.8095	3.76
Liquidity of the underlying spot market	0	10.1635	14.07	0	11.0475	14.07

The results in Table 3 revealed that there exists a long run linear relationship between size of the underlying spot market and derivatives market depth of both single stock futures and equity index futures (Max Statistics > 5% critical value). Volatility and liquidity of the underlying spot market of single stock futures do not have long run linear relationship with single stock futures market depth. Volatility of the underlying spot market of equity index futures has long run linear relationship with equity index futures market depth while liquidity of the underlying spot market of equity index futures has no long run linear relationship with equity index futures market depth (Max Statistics < 5% critical value.

D. Autoregressive distributed lag (ARDL) regression results

Given the results from Johansen cointegration, the autoregressive distributed lag model (ARDL) is chosen over Error Correction Model (ECM) model since there was only one cointegrating equation. Table 4 Model 1 shows the ARDL results of single stock futures and model 2 shows the results of market depth against the depth of equity index futures.

Table 4 ARDL Regression Output

	Model 1			**Model 2**		
Y	**Coef.**	**t**	**P>t**	**Coef.**	**t**	**P>t**
Yt-1	0.99	9.93	0.000	1.06	10.3	0.000
X1	7.621	1.66	0.111	-16.154	-1.35	0.19
X2	22.93	11.639	0.06	-1.227	-0.17	0.868
X3	-51.97	-2.12	0.045	-476.01	-1.48	0.152
Cons	-90.47	-1.64	0.114	191.631	1.36	0.188
Number of Observations	29			29		
F(2,26)	76.38			78.62		
Prob > F	0.000			0.000		
Adj R-squared	0.915			0.9173		

According to the results, the first lag of open interest has a positive and significant effect on open interest in both single stock futures and equity index futures (β = 0.99, *p* = 0.000 and β = 1.06, *p* = 0.000 respectively). That implies that holding all other factors constant, the first 30 trading weeks of open interest of single stock and equity index futures will result into 99% and 106% increase in the next 30 weeks of open interest of single stock and equity index futures respectively. Size of the underlying cash market does not have a significant effect on market depth of respective futures market (β = 7.621, *p* = 0.111and β = -16.154, *p* = 0.19 in single stock futures and equity index futures respectively). Similarly, volatility of the underlying spot market does not have a significant effect on market depth of respective futures market (β = 22.93, *p* = 0.06and β =-1.227, *p* = 0.868 in single stock futures and equity index futures respectively). Liquidity of the single stock futures underlying spot market has negative and significant effect on single stock futures market depth (β = -51.97, *p* = 0.045). However, liquidity of the equity index futures underlying spot market has no significant effect on equity index futures market depth (p-value > 0.05).

VII. CONCLUSION

Based on the results the study concludes that at nascent stage, size of the underlying cash market, volatility and liquidity of the underlying spot market does not accelerate the derivatives market depth. The results revealed that size, volatility and liquidity of the underlying spot market do not cause any significant change in single futures market depth and equity index futures at derivatives formative stages in Kenya.

VIII. RECOMMENDATIONS

Basing from the conclusion, this study recommends NSE and Capital Markets Authority (CMA) to focus on other determinants of market depth, other than size, liquidity and volatility of underlying assets.

For instance, NSE and CMA should conduct a pilot study to establish whether introducing new derivatives products whose underlying assets are more frequently traded such as currency and agricultural produce (Kenya is a global leader in production and export of flowers, coffee and tea) is going increase the market depth and accelerate the derivatives market growth in Kenya.

IX. References

Adelagan, O. J. (2009). *The derivatives market in South Africa: Lessons for sub-Saharan African countries* (Working Paper No. 09/196). International Monetary Fund. https://www.imf.org/en/Publications/WP/Issues/2016/12/31/The-Derivatives-Market-in-South-Africa-Lessons-for-Sub-Saharan-African-Countries-23250

Aysun, U., & Guldi, M. (2011). Derivatives market activity in emerging markets and exchange rate exposure. *Emerging Markets Finance and Trade*, 47(6), 46-67. https://www.jstor.org/stable/41343440

Bakshi, G., Cao, C., & Chen, Z. (1997). Empirical performance of alternative option pricing models. *The Journal of finance*, 52(5), 2003-2049. https://doi.org/10.1111/j.1540-6261.1997.tb02749.x

Black, D. G. (1986). *Success and failure of futures contracts: Theory and empirical evidence*. New York, NY: Salomon Brothers.

Carlton, D. (1984). Futures Markets: Their Purpose, Their History, Their Growth, Their Successes and Failures. *Journal of Futures Markets*, 9(*4*), 237–271.https://doi.org/10.1002/fut.3990040302

Corkish, J., Holland, A., & Vila, A. (1997). *The determinants of successful financial innovation: An empirical analysis of futures innovation on LIFFE* (Working Paper No. 70). Bank of England. https://www.bankofengland.co.uk/working-paper/1997/the-determinants-of-successful-financial-innovation

Curtis, C. (2011). Social research: A practical introduction. *Sage Journal*, *3*(12), 237-245. https://dx.doi.org/10.4135/9781526435415

Cytonn Investment. (2019, July 7). *Understanding the derivatives market*. https://cytonn.com/topicals/understanding-the-derivatives-1

Gujarati, D. N. (2009). *Basic econometrics*. New York, NY: McGraw-Hill Education.

Hung, M.W., Lin, B.H., Huang, Y.C., and Chou, J.H., (2011), Determinants of Futures Contract Success: Empirical Examinations for the Asian Futures Markets. *International Review of Economics & Finance*, 20 (32), 452-458. https://doi.org/10.1016/j.iref.2010.11.015

Ikiao, S. (2018). Factors hindering the growth of the derivative market in Kenya [Master's thesis, KCA University]. Institutional Repository. http://41.89.49.13:8080/xmlui/bitstream/handle/123456789/1410/Ikiao-Effect%20Of%20Internationalization%20On%20Organizational%20Performance%20Of%20Food%20And%20Beverages%20Manufacturing%20Firms%20In%20Kenya.pdf?sequence=1&isAllowed=y

Jobst, A. A. (2008). The development of equity derivative markets: An examination of current standards and challenges in emerging Asia. *International Journal of Emerging Markets*, *3*(2), 163-180.https://doi.org/10.1108/17468800810862623

Kawaller, I. G., Koch, P. D., & Peterson, J. E. (2011). Volume and volatility surrounding quarterly redesignation of the lead S&P 500 futures contract. *The Journal of Futures Market*, *21*(12), 1119-1149. https://doi.org/10.1002/fut.2202

Kim, Y. K., & Waweru, F. (2015). *Factors Behind Exchange-Traded Derivatives Products Success*. https://su-plus.strathmore.edu/handle/11071/3633

McDonald, M. (2010). Market segmentation. *International Journal of Finance and Accounting*, *23*(4), 12-19.

Mulei, M. (2019). Derivatives and Economic Growth in South Africa: Lessons for Kenya. [Master's thesis, University of Nairobi].UCT.https://open.uct.ac.za/handle/11427/31049

Munda, C. (2019, July 04). *Bamburi, KenGen miss futures list on low cap*. Business Daily. https://www.businessdailyafrica.com/bd/markets/capital-markets/bamburi-kengen-miss-futures-list-on-low-cap-2256330

N'Zue, F. F. (1995). *Success and failure of agricultural futures contracts, how to best predict semivariance, and GARCH option pricing with implied volatility*. [Master's thesis, Oklahoma State University]. Shareok. https://shareok.org/handle/11244/34480.

Nekhili, M., & Thorpe, M. (2011). Volatility dynamics in Dubai gold futures market. *International Research Journal of Applied Finance*, 2(11), 1303-1313. https://ro.uow.edu.au/dubaipapers/274/

Ngugi, B. (2019, July 11). NSE banks on newly launched futures trading to deepen the market. *Business Daily*. https://www.businessdailyafrica.com/bd/markets/market-news/nse-banks-on-newly-launched-futures-trading-to-deepen-market-2257186

Nguyen, H., & Faff, R. (2002). On the determinants of derivative usage by Australian companies. *Australian Journal of Management*, *27*(1), 1-24. https://doi.org/10.1177%2F031289620202700101

Rahman, A. (2019). Exchange-traded funds markets in Europe: Development patterns. Journal of Exchange-Traded Funds in Europe, 34(7), 61-119. https://doi.org/10.1016/C2017-0-00064-2

Rashid, S., Winter-Nelson, A., & Garcia, P. (2010). *Purpose and potential for commodity exchanges in African economies* (Working Paper No 1035). International Food Policy Research Institute. https://www.ifpri.org/publication/purpose-and-potential-commodity-exchanges-african-economies

The World Federation of Exchanges. (2019, May 13). *The world Federation of exchanges releases first quarter 2020 & full year 2019 market highlights*. Retrieved from https://www.world-exchanges.org/news/articles/world-federation-exchanges-releases-first-quarter-2020-full-year-2019-market-highlight

Tian, C. (2017). Governing global derivatives. *International Journal of Economics and Finance*, *14*(3), 32-37. https://doi.org/10.1177%2C2700101

Yuferova, D. (2016). *Price Discovery, Liquidity Provision, and Low-Latency Trading* [Doctoral Dissertation, Erasmus University]. EU Repository. https://repub.eur.nl/pub/93017/EPS2016379F-A9789058924452.pdf