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Does Information Asymmetry moderate the relationship between Liquidity and Treasury Bonds in Kenya?

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Abstract

In bond markets, information efficiency seem to conduit the link between the bond liquidity and yields of treasury bonds. The objective of this study was assess moderating role of information efficiency on the relationship between bond liquidity and bond yields of treasury bonds in Kenya. The moderating effect of information efficiency on the relationship between bond liquidity and bond yields of treasury bonds in Kenya was computed using the method proposed by Baron and Kenny (1986). Panel regression analysis was used to test the hypothesized relationship. Hausman specification test was used to determine the best panel data model of analysis. The study adopted longitudinal research designs to collect, measure and analyse the daily panel data of treasury bonds for 10 years starting 2009 to 2018. This study used a population of seven Kenyan treasury bonds, which were actively trading at the secondary market and had bond tenor of 5 years and above. In 2009 is when the government automated the bonds trading at Nairobi Securities Exchange (NSE). Using the criterion technique, the bonds that met these criteria were 5-year bond, 10-year bond, 12-year bond, 15-year bond, 20-year bond, 25-year bond and 30 years bond constituted in Central Bank of Kenya (CBK) Treasury bond series. Study indicated that there was a very low positive correlation between bond yields of treasury bonds in Kenya and information efficiency which was statistically significant. Increased information efficiency was associated with better bond yields of treasury bonds in Kenya. The results rejected the null hypothesis meaning that the information efficient had moderating effect on the relationship between the bond liquidity and bond yields of treasury bonds. This study was crucial to scholars since introduction of moderating variable on the relationship between the bond liquidity and bond yields unravelled differences among the existing empirical evidences. The study recommend improved customer care practices that would increase trader's subscription at treasury bonds market.

Keywords: Information Efficiency, Bond Liquidity, Bond Yields

Introduction

Information efficiency plays a major role in determination of asset prices and market efficiency that determines the level assets liquidity and yields. When new information is released in the market, it induces sharp price adjustment, widens the bid/ask spread thus slowing down trading and affecting bond yields

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(Fleming & Remolona, 2001). It is through the bonds yields, which results into well-developed yield curves used by investors as a pricing tool for future investments (Subrahmanyam, 2009; Green, 2004). Therefore yields are influenced by several common factors amongst them are prices, liquidity and information efficiency (Hasbrouck, Duane & Seppi 2001). According to Goldstein and Yang (2014), new information could trigger trading and influence the relationship between bids/ask spread and yield spread.

This study was anchored on liquidity preference theory by Keynes (1936), opined that investors prefer liquid and high interest rates on long-term bonds as compared to short-term securities, which are illiquid. While other theories offered diverse perspectives including, efficiency market hypothesis advanced by Fama (1965), posit that markets are efficient and that securities prices fully reflect current market information and traders cannot make abnormal profits despite the traders' expertise whether analytical or fundamental. The microstructure theory by O' Hara (1995), argued that assets are traded under specific and explicit laid down trading mechanisms. Lastly, expectations theory advanced by Hicks (1939), and Lutz (1940), postulate that yield curve shape reflects investors' expectations about future interest rates.

Research Problem

Questions have been raised on whether information efficiency affects bond yields. The common position is that bond liquidity determines changes in yields a trader would get as compensation for bond investment (Chen, Lesmond & Wei (2007). Differing views are that bond yields determine the liquidity premium demanded from investors for longer-term investments (Goyenko, Subrahmanyam & Ukhov (2016). To unravel these contractions, the study introduced information efficiency as moderator to test the effect on the relationship between the bond liquidity and yields. Central bank of Kenya (CBK) implemented bond-restructuring program to develop efficient and liquid government bond market to guide pricing at the primary and secondary bond markets in 2001 to 2014 (Ngugi & Agoti, 2010).

Despite implementation of market development reforms, the Kenyan treasury bonds market remains informationally inefficient and characterized by lack of structural bonds and demand by traders exceeds the available supply, hence the lack of liquidity. Thus, the effect of bond liquidity on yields is insignificant (Thupayagale 2015). Contrary, Thotho (2017) argued that liquid bonds offered lower prices and were more attractive to traders, hence translated to better yields .While on the other hand Weda, Namusonge, and Oloko (2014) found out that the benchmark bond yields affected the bonds liquidity at NSE.

Globally, Bai, Fleming and Horan (2013) found out that increased liquidity was influenced by the information efficiency that as well translated into reliable bond yields. A study conducted in China on the microstructure of China's government bond market found a significant moderating effect of information efficiency on bond liquidity and yield curve. There was also methodological differences in conducting the studies. Some studies adopted linear other nonlinear models. Using the Kendall Tau test, they found out that certain announcements had significant effects on relation between liquidity and yields, even when such yields were measured at a daily level. Anticipation of positive information by traders had impact on the spread of the bid/ask prices and yields. The study limited to China, hence there was a need to conduct a similar study in Kenya.

Thupayagale (2015) studied fixed income market efficiency of Kenya's 10-year local currency bond. He analyzed bond daily yields using the GARCH models, ARFIMA-FIGARCH models. He found out that the market was informational inefficient, illiquidity and had structural shortage of bonds. The paper used the nonlinear models, which might yield different results from linear models. Inferring from the contradictory findings globally and locally. There were notable differences in the methodology adopted, operationalization, conceptualization and contextualization of the studies. Some studies adopted linear models while other used the nonlinear models. To resolve these contradictions the study introduced information efficiency as a moderator between the relationship between the bond liquidity and yields of treasury bonds.

Research Objective

The general objective of this study was to assess the effect of information efficiency on the relationship between bond liquidity and bond yields of treasury bonds in Kenya.

Literature Review

Fleming and Remolona (1999), analyzed the treasury market of US on how liquidity influenced the price formation. The data was analyzed with vector error correlation. The data entailed quotes of bid/ask, prices of bonds and the trading size for each trade. They found out that arrival of new information induced sharp price adjustment, surging trade volume, widened the bid/ ask spread thus slowing down trading and yields. A declining liquidity would lead to a sloping yield curve. The findings were clear evidence that information efficiency was significant in treasury bonds trading. Information efficiency influenced the ability of

liquidity on relationship of yields (Blommestein & Santiso, 2007). Yields changes were caused by efficient interest rates on arrival of enhanced information (Elton & Green, 1998). According to Fleming and Remolona (2001), and Green (2004), shape of yields curves can be a reaction because of new information release. Therefore, variation of yields is significant before and after announcements. Asymmetric information influences the yield changes (Chordia, Roll & Subrahmanyam 2001).

A study conducted in Italy between January 2007 and February 2012 by Girardi and Impenna (2013), analyzed the Italian sovereign bonds market. Price discovery, order flow and the role of information in the secondary markets for Treasury bonds was the key focus. Using state space model, they found out that Liquidity was not necessary for formations of yields and only order flow mattered. Limited to Italy and therefore its finding could not be applied to the current study.

According to Goldstein and Yang (2014), new information could trigger trading and influence the relationship between bids/ask spread and yield spread. Information efficiency influences the ability of liquidity on relationship of yields (Blommestein & Santiso, 2007). Yields changes are caused by efficient interest rates on arrival of enhanced information (Elton & Green, 1998). According to Fleming and Remolona (1999), and Green (2002), shape of yields curves can be a reaction because of new information release. Therefore, variation of yields is significant before and after announcements. Asymmetric information influences the yield changes (Chordia et al., 2001). It is deduced that theoretical and empirical literature are yet to conclusively address the research question: to what are the effects of information efficiency on the relationship between bond liquidity and bond yields of treasury bonds in Kenya? To address the above research question, the study addressed the objective through the following null hypothesis:

H_{03}: There is no significant moderating effect of information efficiency on the relationship between bond liquidity and bond yields of treasury bonds in Kenya.

The hypothetical relationships were as presented in Figure 1 below.

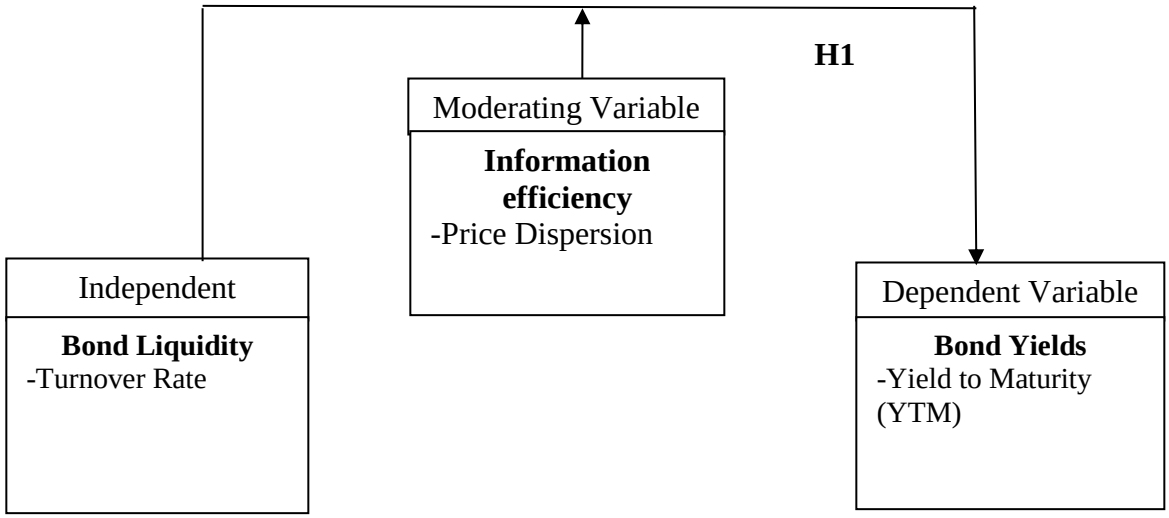

Figure 1: Conceptual Model

Research Methodology

This study adopted longitudinal research designs to collect measure and analyze the data. The daily data on the variables were collected over the period 10 year period starting 2009-2018 from the Nairobi Securities Exchange databank and Central Bank of Kenya Website. This period marked the implementation period where key reforms for public debt management and bonds market development envisaged in the government's Medium-Term Debt Strategy (MTDS) (Ngugi & Agoti, 2010). The study analyzed 7 actively traded treasury bonds, 5-year bond, 10-year bond, 12-year bond, 15-year bond, 20-year bond, 25-year bond and 30 years bond constituted in CBK Treasury bond series. Panel data was most appropriate for it constituted repeated observations for the same indicators each time and allowed for heterogeneity of data (Okiro, Omoro & Kinyua 2014). The bond market was characterized by low trading and occasionally some days would go without trading, hence the unbalanced panel data was deemed fit for this study.

Hausman specification test was used to check the suitably of fixed or random effect for the study dataset (Arfah, Raya & Hendrawan 2021). The Breusch-pagan Lagrange multiplier (LM) test was used to select between a random effects regression and a simple OLS regression. To test the moderation effects on the relation between the dependent and independent variable, hierarchical multiple regression was applied. The moderating effect of information efficiency on the relationship between bond liquidity and bond yields of

treasury bonds in Kenya was computed using the method proposed by Baron and Kenny (1986). To assess the effect of information efficiency on the relationship between bond liquidity and bond yields of treasury bonds in Kenya, the study formulated panel regression analysis models to test hypothesis one.

Model 1: $BY_{it}= \beta 0 +\beta 1BL_{it} + \varepsilon_{it}$

Model 2: $BY_{it}= \beta 0+\beta 1BL_{it}+\beta 2IE_{it} + \varepsilon_{it}$

Model 3: $BY_{it}=\beta 0+\beta 1BL_{it} + \beta 2IE_{it} + \beta 3(BL*IE)_{it} + \varepsilon_{it}$

Where;

BY_{it}=Bond Yield where i = bond and time= t,

BL_{it}=Bond Liquidity where i = bond and time= t,

IE_{it}=Information Efficiency where i = bond and time= t,

$\beta 0, \beta 1, \beta 2$ and $\beta 3$ = Regression coefficients and

ε_{it} is the error term

Results and Discussions

Table 1 below present summary of descriptive statistics for 10 years from 2009 to 2018. , Bond liquidity was operationalized using turnover rate while bond yields was measured by yield to maturity. Information efficiency operationalized using the price dispersion. Bond Liquidity had a minimum of zero, maximum of .26, mean of .005 and standard deviation of .0085. Bond liquidity was positively distributed with skewness of 6.96 (standard error 0.25). The skewness for a normal distribution should be zero, and any symmetric data should have a skewness near zero. Meaning that the data distribution was positive for the skewness indicating that data had the right tail which was long relative to the left tail. Negative values for the skewness indicated data skewed to the left. The Kurtosis had a value of 113.9 with a standard error of 0.51. The kurtosis for a standard normal distribution is three. The standard normal distribution should have a kurtosis of zero. In addition, positive kurtosis indicates a "heavy-tailed" distribution and negative kurtosis indicates a "light tailed" distribution. This indicated excess kurtosis (leptokurtic distribution).

The minimum and maximum values of bond yields were 2.05 and 76.13 respectively with a mean of 11.56 and standard deviation of 2.46. The bond yields positively distributed with skewness of 2.05 indicating that data the right tail was long relative to the left tail. The kurtosis was above the value of three (67.76) with standard error of 0.51, implying the excess kurtosis (leptokurtic distribution).

Table 1: **Summary of Descriptive Statistics.**

Variable	N	Minimum	Maximum	Mean	Standard Deviation	Skewness		Kurtosis	
						Statistic	SE	Statistic	SE
Bond Liquidity	9262	.00000	.26	.0051	.0085	6.96	.025	113.9	.051
Bond Yields	9262	2.0500	76.13	11.56	2.4623697	2.05	.025	67.76	.051
Information Efficiency	9262	108.38	90.30	.098	7.49363	1.07	.025	49.54	.051

Information efficiency had a minimum and maximum of 108.38 and 90.30 respectively (mean .098, standard deviation 7.49). Information efficiency negatively distributed with skewness of 1.07 indicating data skewed to the left. By skewed left, it meant that the left tail was long relative to the right tail. The study indicator had a kurtosis of that was above the value of three (49.54 with a standard error of 0.51) implied the excess kurtosis (leptokurtic distribution).

The moderating effect of information efficiency on the relation between bond liquidity and bonds yields of treasury bonds in Kenya was calculated using the Baron and Kenny (1986). After analysis the fixed effects model was preferred. In step 1 of Moderation analysis, Fixed-effects model regression analysis was used to estimate the relationship between Bond Yields (BY), Bond liquidity (BL) and Information Efficiency (IE). Results of this study showed that Bond liquidity (β= -39.47, $p<0.01$) is a significant predictor of Bond Yields (BY) as shown in table 2 below. Similarly, Information Efficiency (β= 0.017, $p<0.01$) is a significant predictor of Bond yields. Based on the results of this study, F-test statistic was statistically significant ($p<0.05$), which meant that the overall model was statistically significant, $F(2, 9253) = 791.55$, $p<0.05$. R-squared (R^2) was 0.146, which suggested that jointly, Bond liquidity and Information efficiency accounted for 14.6% of the variance in Bond Yields (dependent variable).

In step 2 of Moderation analysis, Fixed-effects model regression analysis was used to estimate the relationship between Bond Yields (BY), Bond liquidity (BL), Information Efficiency (IE) and interaction term (BL*IE). Results of this study showed that Bond liquidity (β= -39.21, $p<0.01$) is a significant predictor of Bond Yields (BY) as shown in table 3 below. Similarly, Information Efficiency (β= 0.02, $p<0.01$) is a significant predictor or Bond yields. Based on the results of this study, F-test statistic was statistically significant ($p<0.05$), which means that the overall model was statistically significant, $F(3, 9252) = 532.08$,

p<0.05. R-squared (R^2) was 0.147, which suggested that jointly, Bond liquidity, Information efficiency and interaction term (BL*IE) accounted for 14.7% of the variance in Bond Yields (dependent variable).

Table 2: Fixed–Effects Regression Results, Dependent Variable: Bond Yields, Predictors: Bond Liquidity and Information Efficiency

BY	Coef.	Std. Err.	t	P>t
BL	-39.47***	1.396	-28.27	0.000
IE	0.017***	0.001	26.12	0.000
_cons	22.88***	0.728	31.42	0.000
Model Summary				
R-squared	0.146			
F(2,9253)	791.55			
Prob > F	0.0000			
Observations	9262			
Number of Bond_ID	7			

*** p<0.01, ** p<0.05, * p<0.1

Source: Research Data (2022)

Where;

BY is Bond Yields (dependent Variable) Measured by Yield to Maturity (YTM)

BL is Bond liquidity (independent variable) measured by turnover rate

IE is Information Efficiency (Moderator) measured by price dispersion?

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Table 3: Fixed–Effects Regression Results, Dependent Variable: Bond Yields, Predictors: Bond Liquidity, Information Efficiency and Interaction term (BL*IE)

BY	Coef.	Std. Err.	t	P>t
BL	-39.21***	1.40	-28.05	0.000
IE	0.02***	0.0006	25.94	0.000
BL*IE	0.31***	0.09	3.37	0.001
_cons	22.77***	0.73	31.26	0.000
Model Summary				
R-squared	0.147			
F(3,9252)	532.08			
Prob > F	0.0000			
Observations	9262			
Number of Bond ID	7			

*** p<0.01, ** p<0.05, * p<0.1

Source: Research Data (2022)

Where;

BL is Bond liquidity measured by turnover rate

IE is Information Efficiency measured by price dispersion?

*BL*IE is interaction term computed by multiplying centered independent variable (Bond Liquidity) and Centered moderator (Information Efficiency)*

Hypothesis H_{01} sought to determine the effect of information efficiency on the relationship between bond Liquidity and Bond yields (dependent variable) by suggesting that there was no significant moderating effect of information efficiency on the relationship between bond liquidity and bond yields of treasury bonds in Kenya. Results of this study showed that the interaction term (BL*IE) was statistically significant ($p<0.05$). Furthermore, model 3a and Model 3b were all statistically significant and therefore information

efficiency had a moderating effect on the relationship between bond liquidity and Bond yields of treasury bonds in Kenya. The null hypothesis was H_1 therefore rejected.

The model regression equations are as follows:

Model: $BY_{it} = \beta_0 + \beta_1 BL_{it} + \beta_2 IE_{it} + \varepsilon_{it}$

The regression equation can be re-written as follows:

$BY_{it} = 22.88 - 39.47 BL_{it} + 0.017 IE_{it} + \varepsilon_{it}$

The model regression equations are as follows:

Model 3b: $BY_{it} = \beta_0 + \beta_1 BL_{it} + \beta_2 IE_{it} + \beta_3 BL*IE_{it} + \varepsilon_{it}$

The regression equation can be re-written as follows:

Output equation: $BY_{it} = 22.77 - 39.21 BL_{it} + 0.02 IE_{it} + 0.31 BL*IE_{it} + \varepsilon_{it}$

Discussion of Findings

The finding established that the information efficiency had a significant effect on the relationship between the bond liquidity and bond yields hence rejecting the null hypothesis and accepting the alternative hypothesis. These findings were consisted with the findings of Bai, Fleming and Horan (2013) who found out that certain announcements had significant effects on relation between liquidity and yields, even when such yields measured at a daily level. Contrary Thupayagale (2015) found out that the market was informational inefficient, illiquidity and had structural shortage of bonds. These papers used the nonlinear models, which might yield different results from linear models. This study adopted a linear regression models to analyses the variables that could be possible cause of different research findings.

The study supports Efficient Markets Hypothesis (EMH) Fama (1965), which posits that markets are efficient when security prices entirely capture current market information about the value of the institution, and traders cannot make abnormal profits by using available information irrespective of their technical and fundamental know how. Fama (1965), argues that informational efficiency is when all available details are captured by asset prices. Malkiel (1973), tested information efficiency using the random walk analysis and found out that movements of assets prices were unpredictable. While, supporting these theorist, Thotho, 2017 argued that efficiency market theory is rich of informational efficiency thus it predicts a relationship between bond liquidity and bond yields during release of news.

Conclusions and Recommendations

Results of this study indicated that there was a very low positive correlation between Bond Yields of treasury bonds in Kenya and Information efficiency, which was statistically significant. This implied that increased information efficiency was associated with better bond yields of treasury bonds in Kenya. The results rejected the null hypothesis meaning that the information efficient had moderating effect on the relationship between the Bond Liquidity and Bond Yields of treasury bonds.

The study adopted fixed effects models (FEM) to operationalize and test research hypothesis. Identification of relationship among variables will help securities exchanges and traders make decisions on how to build on the interactions between bond yields and market microstructure elements and provides better understanding of the behavior of yields in bonds markets. Theoretically, this study reaffirmed the role of information efficiency in securities hence supporting the Efficient Markets Hypothesis by Fama (1965). This study also supported the Liquidity preference theory as postulated by Keynes (1936) that argue that traders prefer liquid and high interest rates on long-term bonds as compared to short-term securities that are illiquid.

This study was crucial since it provided arguments on the operations at the securities exchange and soundness of secondary bonds market that could be used to design optimal regulatory framework. Introduction of moderating variable on the relationship between the bond liquidity and bond yields unraveled differences among the existing empirical evidences. This study indicated that the overall model was statistically significant and that Bond liquidity and Information Efficiency were significant predictors of bond yields.

Treasury bonds investments being safer investments, this study recommend more emphasizes to be laid on the how Nairobi securities exchange should ensure efficiency in trading securities. Trading bonds is an expensive exercise since one required to have at least Ksh50, 000 to purchase bonds. This locks out most of low-income earners; we therefore recommend the minimum amount to be reviewed to reasonable figures. Bond Liquidity, Order Flow, Information Efficient and Bond Liquidity are micro variables of securities markets; however, macro variables such as inflation, Interest rates, government regulations, foreign exchange, automation and public debt can as well contribute to the growth of securities markets. Hence, it

is important to carry out research on this area. This study only focused on domestic bonds, however the study suggest that studies could be carried out on Eurobonds, corporate bonds and equity markets.

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