

## An Analysis of the Impact of Demutualization on Stock Market Liquidity

Davis Nyangara<sup>1\*</sup> and Batsirai W Mazviona<sup>2</sup>

<sup>1</sup>Department of Finance, National University of Science and Technology, Bulawayo, Zimbabwe

<sup>2</sup>Batsirai W Mazviona, Department of Insurance and Actuarial Science, National University of Science and Technology, Bulawayo, Zimbabwe

\*Corresponding author: Davis Nyangara, Department of Finance, National University of Science and Technology, Bulawayo, Zimbabwe, Tel: 263773494558; E-mail: [dvsnyangara@gmail.com](mailto:dvsnyangara@gmail.com)

Received date: January 15, 2014, Accepted date: February 19, 2014, published date: February 25, 2014

Copyright: © 2014 Davis Nyangara, et al. This is an open-access article distributed under the terms of the Creative Commons Attribution License, which permits unrestricted use, distribution, and reproduction in any medium, provided the original author and source are credited.

### Abstract

This paper analyzes the impact of demutualization on stock market liquidity using annual data available from 24 demutualized and 26 mutual stock exchanges for the period 1990 to 2011. We use a panel data regression model to examine the nature and significance of the relationship between stock exchange demutualization and two measures of stock market liquidity (turnover rate and the value of volume traded relative to Gross Domestic Product (GDP)). The findings indicate that demutualized exchanges exhibit significantly greater liquidity compared to mutual exchanges after controlling for age, size, trading technology, and level of economic development. We also observe that, world-wide, the trend has been that automation of trading precedes demutualization, and that the time between automation and demutualization has a positive but statistically insignificant effect on liquidity. The study is a remarkable departure from the traditional focus on the exchange governance effects of demutualization. Furthermore, it contributes to the literature on financial market development by documenting some of the key drivers of stock market liquidity, which in itself is a widely acknowledged driver of economic growth.

**Keywords:** Demutualization; Stock exchange; Liquidity; Automation

### Introduction

Demutualization has been defined as the conversion of stock exchanges from a mutually owned organization to a company owned by various entities including the public [1]. The first stock exchange to demutualize was the Stockholm Stock Exchange in 1993, and since then, a number of stock exchanges around the world have been demutualizing. The changing landscape in the world's capital and financial markets arising from globalization has been cited as the reason for demutualization [2]. Schmiedel [3] reveals that due to recent technology improvements and changes in the competitive environment, new opportunities and threats have emerged and stock exchanges have responded by changing their ownership form.

However, the pace of demutualization has been very slow in emerging markets as compared to developed economies. By 2005, about 21 exchanges in developed markets had demutualized, representing almost 40% of the World Federation of Exchanges as compared to only 5 exchanges in emerging markets [4].

Studies on stock market development in emerging markets have recommended demutualization (alongside automation and other measures) as an important step for market development and enhancement [5,6]. The governance effects of demutualization however have attracted much of the attention of both academic and policy researchers, resulting in very little published research on the impact of demutualization on stock market liquidity. The very few studies that have paid some attention to the impact of demutualization on exchange liquidity include [7,8] and somewhat indirectly, Mishkin (2001). Stock market liquidity is well-documented as a significant driver of economic growth [6,9] and in view of the modern trend towards demutualization, it is important to understand how demutualization affects stock market liquidity.

The contribution of this paper is in three ways. Firstly, it generates evidence on the relationship between demutualization and stock market liquidity. Secondly, it identifies and analyzes the impact of other drivers of stock market liquidity, notably automation, size, age, and the level of economic development. Thirdly, it documents the variation in stock market liquidity conditions between 1990 and 2011, with potential insights into the effects of financial crises on stock market liquidity.

The rest of the paper is organized as follows: Section 2 provides a brief review of the literature on demutualization; Section 3 outlines the methodology of the study; Section 4 presents the findings; and Section 5 concludes the study.

### Literature Review

Stock exchanges all over the world initiate demutualization hoping to empower the market and to increase stock exchange performance. However, the trend of stock exchange demutualization continues to generate debate among academics and policy makers on the impact of such conversion on stock exchange performance.

### Demutualization and stock exchange performance

Domowitz and Steil [10] posit that demutualization of stock exchanges should result in improved market quality. Otchere and Abou-Zied [5] also document an improvement in profitability ratios and market quality (as proxied by foreign investor trading activity and bid-ask spreads) of the Australian Stock Exchange (ASX) following demutualization and self-listing. Krishnamurti et al. [11] conclude that demutualization improves stock exchange performance. Hazarika [8] also finds some evidence that suggests that demutualization enables stock exchanges to increase their trading volumes. Otchere [7] also finds evidence of improved stock market liquidity following demutualization. Aggarwal and Dahiya [12] report that

demutualization has significantly increased both operating performance and share values.

Despite the growing literature on the positive impact of demutualization on stock exchange performance, other studies dispute the efficacy of demutualization. Otchere and Oldford [13], for example, attribute the observed improvement in performance among demutualized exchanges to changes in their business models (the adoption of a for-profit objective function) or to the effects of market discipline and not necessarily the change in ownership structure. Lee [14] argues that the benefits derived from demutualized exchanges with direct investor access are actually low compared to the benefits that can be obtained from the presence of brokers with ownership interest in the exchange.

Other studies go further to document the negative effects of demutualization. Steil and Lucy [15,16] argue that the emergence of the demutualized for-profit stock exchange aggravates the conflicts of interest related to running the stock exchange as a commercialized entity and as a self-regulatory organization (SRO). If this conflict of interest is not properly managed, demutualized exchanges will seek profit maximization and thus will behave like monopolistic enterprises; raise price and reduce output, which has a negative impact on stock exchange performance [14]. Pirrong [17] argues that trader ownership of exchange assets reduces transaction costs, and governance by members limits the scope for wasteful opportunism.

Generally, while demutualization may improve exchange performance, conflicts of interest, as well as regulatory and legislative issues must be addressed if demutualization is to be successful [18,19].

## Stock market liquidity

Garcia and Liu [20] define liquidity as the ease and speed with which agents can buy and sell securities. It is one of the most important characteristics of a well-functioning stock market (Miller 1991). Liquid markets make investment less risky and facilitate long-term investment and saving [6,9,20] and hence contribute positively to economic growth [9]. Critiques however argue that stock market liquidity may negatively influence corporate governance by encouraging investor myopia [6].

## Measures of stock market liquidity

A variety of liquidity measures have been developed and applied in the literature. Sarr and Lybek (2002) provide an extensive coverage of liquidity measures for virtually all financial markets. On the basis of five characteristics of liquid markets (tightness, immediacy, depth, breadth, and resiliency), they classify liquidity measures into four categories: (i) transaction cost measures (focusing on transaction costs); (ii) volume-based measures (measuring transaction volume relative to price variability, thus depth and breadth); (iii) equilibrium price-based measures (measuring resiliency); and (iv) market impact measures (measure resiliency and speed of price discovery).

Among the list of measures above, transaction costs and volume-based measures have received the most attention in the literature. The two standard volume-based measures of stock market liquidity are: (i) value of volume traded as a percentage of GDP; and (ii) value of volume traded as a percentage of market capitalization, commonly referred to as the turnover ratio [5,6,9,20,21]. Garcia and Liu [20] submit that the two volume-based liquidity measures capture the degree of trading in comparison to both the economy and the market.

In the context of demutualization, it is reasonable to focus on volume-based measures of liquidity since the change in governance structure is usually aimed at attracting more participants to the market, increase trading activity, and market capitalization. While the perceived connection between exchange automation and market liquidity is somewhat implied by the expected increase in operational efficiency (lower transaction costs and speed of deal matching and execution), the same cannot be said about demutualization. However, based on perceived positive effects of demutualization on market quality [9], demutualization is expected to result in improved investor participation and boost trading volumes. This is consistent with empirical findings by Otchere and Hazarika [7,8] on the Australian Stock Exchange, and the London Stock Exchange and Borsa Italiana respectively.

## Methodology

### Sample selection

The study is based on a total of 50 stock exchanges from across the world, chosen to ensure a fair representation of both demutualized and mutual exchanges. The full sample consists of 24 demutualized exchanges and 26 mutual exchanges. Forty-five (45) of the exchanges in the sample are automated, and 5 are on manual trading (as at 2011). Availability of data for the period 1990-2011 was an important consideration in deciding the final sample (a summary of the stock exchanges used in this study is found in Appendices 1A and 1B).

### Specification of data used

The study uses secondary panel data from sample exchanges' websites, survey reports of the World Federation of Exchanges, as well as the IMF and World Bank databases. The panel data covers the period 1990- 2011 for each of the 50 stock exchanges. Panel data is very useful as it takes into account the heterogeneity of stock exchanges. Moreover by combining time series and cross sectional observations, panel data is more informative, gives more variability, less collinearity among variables, more degrees of freedom, and more efficiency. Since all exchanges have the same number of time series observations from 1990- 2011, the panel is balanced.

However, the use of panel data has its own drawbacks. Panel data can pose estimation and inference problems. Since such data involve both cross-sectional and time series dimensions, problems that plague cross-sectional data (e.g. heteroscedasticity) and time series data (e.g. autocorrelation) need to be addressed. Moreover, if many variables are considered, there is always the possibility of multicollinearity, which might make precise estimation of one or more parameters difficult.

### Research variables used

The study uses the turnover ratio (TOR) and value of volume traded as a percentage of GDP (ST) as measures of stock market liquidity in line with the extant literature. We regress each of the two liquidity measures against the following explanatory variables: the square of the ratio of market capitalization to GDP (MK1), the square root of the number of exchange-listed companies (LS1), the square root of the age of the exchange (Age1), and the difference between number of years since automation and the number of years since demutualization (AD). The functions of the market capitalization ratio and the number of listed companies measure the size of the stock market. The inclusion of size is informed by Levine and Zervos [9],

who find a positive relationship between stock market size and market liquidity based on a sample of 44 developed and emerging markets between 1986 and 1993. We introduce the age variable to test if there is any association between age and liquidity of an exchange. This variable has not been given much attention in the literature. We include the time gap between automation and demutualization to test if there is any merit in the observed sequencing of automation and demutualization in almost all exchanges that have demutualized so far (except Borsa Colombia, Bursa Malaysia, and Athens).

In order to capture cross-sectional variations, we introduce the following dummy variables: demutualization status (DS), economic status (ES), and automation status (AS). The demutualization and automation status dummies capture the impact of demutualization and automation on liquidity, while the economic status dummy is meant to control for the level of economic development. We introduce further dummies to account for time effect over the 22-year period. We divide the period into 4 sub-periods (1990-5, 1996-2000, 2001-6, and 2007-2011) in order to check for any structural breaks in liquidity over the study period. However, we only introduce 3 time dummies (T1, T2, and T3) to avoid the dummy variable trap. Our base period is the 1990-5 period. Of great interest is the 11 years between 1996 and 2006, a period over which 18 of the 24 demutualized exchanges in the sample were demutualized. This period also envelops the September 11 terrorist attacks of 2001, which shook global financial markets and set in motion a new era of country risk management by international investors. However, we find even greater interest in the 5-year period from 2007 to 2011, which witnessed one of the worst global financial crises in the history of the world. We would expect to find evidence in the data pointing to a disturbance of market liquidity and maybe some aspects of flight to liquidity.

### Data analysis

We use a panel data multiple regression model with cross-sectional and time effects on the regression intercept term. Thus, we develop models based on the assumption that unique features of exchanges such as demutualization, automation, and level of economic development result in different regression intercepts. Moreover, the time dummies introduced above mean that regression intercepts differ depending on the time period considered for the estimation. Thus, we do not impose a common intercept in our regressions. This approach is a version of the Fixed Effects Model, also called the Least Squares Dummy Variable Model (LSDV). The model is based on the assumptions of Ordinary Least Squares (OLS) regression.

We formulate the following basic regression models to estimate the impact of demutualization on stock exchange liquidity:

Where:

MK, ST, TOR, and LS are the market capitalization ratio, value of volume traded as a % of GDP, turnover ratio, and number of listed companies respectively. Age and AD are age of stock exchange, and difference between time since automation and time since demutualization, respectively. The cross-sectional dummies DS, ES, and AS, are dummies for demutualization status (1 if demutualized, 0 otherwise), economic development status (1 if developed, 0 otherwise), and automation status (1 if automated, 0 otherwise) respectively. The time dummies T1, T2, and T3 are dummies for the periods 1996-2000 (1 if observation is for a year between 1996 and 2000, 0 otherwise), 2001-6 (1 if observation is for a year between 2001 and 2006, 0 otherwise), and 2007-11 (1 if observation is for a year between 2007

and 2011, 0 otherwise). The parameters are partial regression slope coefficients, and are regression intercepts and residual terms respectively. The parameter values for the three equations above are obviously different but we define them similarly for all three models for mathematical simplicity.

We rely on the traditional assumptions of OLS regression, but test for multicollinearity and serial correlation using the correlation matrix approach and the Durbin Watson d statistic respectively. We assess the significance of each model based on the F-test and the R-square, and we also use the Durbin Watson d statistic to detect model misspecification. In line with the extant literature, we proceed to assess the statistical significance of regression coefficients based on both the t-statistic and the probability value. While we draw conclusions at the 5% level of significance, it is important to note that the p-value is the true level of significance, thus the statistical significance of results depends on the user's chosen level of acceptable Type 1 error.

## Findings

### Multicollinearity, serial correlation, and model robustness

We test for multicollinearity among our chosen regressors using a correlation matrix (see Appendix 1C) and find that multicollinearity is absent from our models. The highest correlation recorded between any two regressors is 0.53 (between age and the number of exchange listings). This is very low compared to an upper threshold of 0.80. We also test for serial correlation using the Durbin-Watson d-statistic and find that our models have large enough Durbin-Watson d-statistic values to rule out any positive serial correlation (d-values range from 1.77 to 2.22, which is reasonably close to 2). We also conclude, on the basis of the d-values, that our models have minimal specification error, if any. The adjusted R-square values for all models are satisfactory. F-test results for all models are significant and alternative transformations of variables, e.g. log transformations, could not yield reasonably superior results. On that basis, we conclude that our models are moderately robust.

### Regression results

Table 4.1 below shows the results of 4 regression models, two for each of the stock exchange liquidity indicators, one of which uses the full sample of 50 exchanges and the second one is based on a reduced sample of 25 exchanges (after excluding 15 very large exchanges and 10 very small exchanges). We find evidence of a general upward trend in stock market liquidity since the early 1990s. More pronounced increases in liquidity are observed between 1996 and 2000, and between 2007 and 2011. We suggest, based on the evidence in this paper, that the terrorist attacks of September 2001 may have significantly dampened the momentum on stock market growth generated by the demutualization fervor of the late 20th century. The growth in market liquidity between 2007 and 2011 is difficult to explain in the absence of further information on buyer-initiated trades and seller-initiated trades. It is most likely however that the increased trading activity is evidence of a flight to liquidity by some institutional investors affected by the sub-prime mortgage crisis.

	ST(full)	ST(restricted)	TOR(full)	TOR(restricted)
Intercept	-15.3398	-12.3741	-0.1710	-0.2114
	(-5.1759)	(-7.0814)	(-5.6627)	(-5.1189)

	[0.0000***]	[0.0000***]	[0.0000***]	[0.0000***]
<b>LS1</b>	1.7461	0.6230	0.0111	0.0048
	(17.5559)	(5.3472)	(10.9091)	(1.7462)
	[0.0000***]	[0.0000***]	[0.0000***]	[0.0813*]
<b>AGE1</b>	-0.8155	0.7324	0.0225	0.0374
	(-2.5570)	(4.2054)	(6.9083)	(9.0950)
	[0.0107**]	[0.0000***]	[0.0000***]	[0.0000***]
<b>DS</b>	32.2272	10.2781	0.2592	0.1618
	(9.0343)	(4.8937)	(7.1301)	(3.2598)
	[0.0000***]	[0.0000***]	[0.0000***]	[0.0012***]
<b>ES</b>	10.4934	13.6017	0.2213	0.3620
	(3.8751)	(9.5523)	(8.0183)	(10.7581)
	[0.0001***]	[0.0000***]	[0.0000***]	[0.0000***]
<b>AS</b>	-1.9697	2.5483	0.0078	0.0788
	(-0.5492)	(1.2637)	(0.2141)	(1.6538)
	[0.5829]	[0.2069]	[0.8305]	[0.0987*]
<b>AD</b>	0.4429	0.1732	0.0057	0.0121
	(1.1416)	(0.7837)	(1.4398)	(2.3120)
	[0.2539]	[0.4336]	[0.1502]	[0.0212**]
<b>T1</b>	6.5266	5.6149	0.0730	0.0291
	(2.0253)	(3.1509)	(2.2233)	(0.6915)
	[0.0431**]	[0.0017***]	[0.0264**]	[0.4895]
<b>T2</b>	0.6819	2.6938	0.0177	-0.0925
	(0.1977)	(1.3410)	(0.5037)	(-1.9496)
	[0.8434]	[0.1805]	[0.6146]	[0.0517*]
<b>T3</b>	11.3598	4.9392	0.1537	-0.0224
	(2.9003)	(2.1097)	(3.8512)	(-0.4045)
	[0.0038***]	[0.0353**]	[0.0001***]	[0.6860]
<b>MK1</b>	0.0014	0.0002	0.0000	0.0000
	(29.4507)	(4.1017)	(-2.3799)	(-0.7189)
	[0.0000***]	[0.0000***]	[0.0175**]	[0.4725]
<b>D-W d stat</b>	2.2236	1.7751	1.9257	1.9832
<b>Adj R-square</b>	0.6848	0.4948	0.4931	0.5115

**Table 4.1:** Summary of regression models; \*\*\*, \*\*, and \* signify that the coefficient is significant at the 1%, 5%, and 10% levels, respectively. The t-statistic is reported in parentheses and the p-value in square brackets. ST (full) and TOR(full) are models based on the full sample of 50 exchanges, whereas ST(restricted) and TOR(restricted) exclude 25 exchanges that are considered either 'very large' or 'very small' relative to their economies(average MK>40% or MK=0/<5%).

The regression results show that demutualization has significant positive effects on stock market liquidity for both the full sample and the restricted sample. Other significant drivers of stock market liquidity are size (based on listings and the market capitalization ratio), economic development status, and age of the stock exchange. Stock exchange automation has insignificant positive effects on stock market liquidity. The lag between automation and demutualization has positive effects on liquidity, but the statistical significance of the lag is very low.

### Interpretation of findings

The findings of this paper confirm findings by Otchere and Hazarika [7,8] on the positive effects of demutualization on stock market liquidity. Consistent statistical evidence on the significant positive effects of the level of economic development on stock exchange liquidity support the empirical literature on the role of economic development in fostering stock market development [20-23]. Our findings on the positive effects of stock exchange size on stock market liquidity confirm findings by Levine and Zervos [9]. The evidence on automation suggests that automation by itself is inadequate as a measure to achieve significant stock market development. Thus, automation should be implemented as preparation for the adoption of other measures such as demutualization. The automation-demutualization implementation lag appears to exert a reasonably positive effect on the success of the two policies. This finding suggests a possible link between information flow and operational efficiency due to automation, and the success of demutualization. Exchanges that take time to test and improve their trading systems are therefore expected to perform better than those that adopt automation and demutualization either simultaneously or in quick succession. Exchanges that demutualize before automating are expected to be even worse off, after controlling for all other factors.

### Conclusion

The study concludes that demutualization enhances stock market liquidity, in line with Otchere and Hazarika [7,8]. Furthermore, policies that foster economic growth must contribute positively to stock market liquidity (for example, policies that encourage the participation of pension and life assurance companies on the stock market). Policy sequencing is an important consideration in promoting stock market development. While automation is expected to reduce transaction costs and encourage more foreign participation, this study shows that the effects on liquidity are not statistically significant if automation is not followed by demutualization. Contrary to studies that document governance challenges of demutualization, we find convincing statistical evidence to support the view that demutualization significantly promotes stock market liquidity.

### References

1. Shahid A (2002) Small Stock Markets in a Globalized World. Project Syndicate: An Association of Newspapers around the World.
2. Aggarwal R (2002) Demutualization and Corporate Governance of Stock Exchanges. *Journal of Applied Corporate Finance* 15: 106-113.
3. Schmiedel H (2002) Total factor productivity growth in European stock exchanges: a non-parametric frontier approach. Bank of Finland discussion paper 11.
4. World Federation of Exchanges (WFE) 2005. Annual Report and Statistics.

5. Otchere I (2008) Stock exchange self-listing and value effects. *Journal of Corporate Finance* 926-953.
6. Yartey C A and Adjasi C K (2007) Stock Market Development in Sub-Saharan Africa: Critical Issues and Challenges. IMF working paper WP/07/29 Washington, International Monetary Fund.
7. Otchere I, Abou-Zied K. (2007) Stock exchange demutualization, self-listing, and performance: The case of the Australian stock exchange. *Journal of Banking & Finance* 32:512-525.
8. Hazarika S (2005) Governance Change in Stock Exchanges. Working Paper. University of North Carolina Chapel: Hill.
9. Levine R, Zervos S (1998) Stock Markets, Banks, and Economic Growth. *American Economic Review* 88: 537-558.
10. Domowitz I, Steil B (1999) Automation, trading costs and the structure of the securities trading industry. *Brookings-Wharton Papers on Financial Services* 33-81.
11. Krishnamurti C, Sequeira J.M, Fangjian F (2003) Stock Exchange Governance and Market Quality. *Journal of Banking and Finance* 27:1859-1878.
12. Aggarwal R, Dahiya S (2005) Demutualization and Public Offering of Financial Exchange. *Journal of Applied Corporate Finance* 18: 96-106.
13. Oldford E, Otchere I (2011) Can Commercialization Improve the performance of stock exchanges even without Corporatization. *The financial review* 46:67-87.
14. Lee R (2002) The future of securities exchanges. *Brookings, Wharton Papers on Financial Services* 1-33.
15. Steil B (2002) Changes in the Ownership and Governance of Securities Exchanges: Causes and Consequences. The Wharton School Financial Institutions Center, *Brookings-Wharton Papers on Financial Services* 1-31.
16. Lucy J (2004) Market demutualization and privatization: The Australian experience. International Organization of Securities Commission (IOSCO): Amman 2004 Annual Conference. Available from IOSCO website [accessed 9 June 2013].
17. Pirrong C (2000) A Theory of Financial Exchange Organization. *Journal of Law and Economics* 43: 437-471.
18. Coffee J (1999) Privatization and Corporate Governance: The Lessons from Securities Market Failure. *Journal of Corporation Law* 25: 1-39.
19. Karmel R (2000) Turning seats into shares: implications of demutualization for the regulation of stock and futures exchanges. Working paper.
20. Garcia V.F, Liu L (1999) Macroeconomic Determinants of Stock Market. *Journal of Applied Economics* 2:29-59.
21. Yartey C A (2008) Determinants of Stock Market Development in Emerging Economies: Is South Africa Different? IMF working Paper-WP/08/32 Washington, International Monetary Fund.
22. Mendiola A, O'Hara M (2003) Taking Stock in Stock Markets: The Changing Governance of Exchanges, Working Paper, Cornell University.
23. Mlambo C, Biekpe N (2007) The efficient market hypothesis: Evidence from ten African stock markets. *Investment Analysts Journal* 66.
- 24.