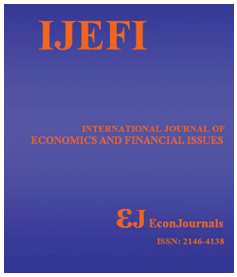

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Stock Market Liquidity during Periods of Distress and its Implications: Evidence from International Financial Markets

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ABSTRACT

Traditional market pricing models assume frictionless markets with abundant liquidity. This traditional models also incorporate stock market liquidity as an exogenous cost. However, this paradigm has many shortcomings due to its inability to explain some of the problems associated with security market illiquidity. The aim of this study was to explore the concept of stock market liquidity during periods of financial distress. A Markov switching GARCH model was used to investigate market liquidity in the CAC 40, DAX, JSE, Nasdaq Index and the Nikkei-225 during the 2007-2008 financial crisis and the Covid-19 pandemic. The sample period was January 1, 2020-December 31, 2021 and December 1, 2007-June 30, 2009. From the findings, some financial markets where still liquid despite the financial crisis with the exception of the Nasdaq index. Conversely, all the financial markets under consideration displayed strong illiquidity during the covid-19 pandemic. In essence, the level of market depth has significantly decreased from the financial crisis to the covid-19 pandemic which may be attributed to increasing margin requirements and information asymmetry as well as price restrictions. There is an urgent need for regulatory authorities to review some of the trading regulations during financial distress.

Keywords: Market Liquidity, Financial Markets, Markov Switching Model, Financial Distress
JEL Classifications: G1, G2, G4

1. INTRODUCTION

Market liquidity is a conspicuous aspect of stock market analysis when considering trading activities and the ability to exit the market. We have seen a couple of serious liquidity crises in financial markets ranging from Black Monday 1987: Junk Bond 1988: Japanese bubble 1990: United States Bond crash 1994: Mexican Crisis 1995: Asian crises 1997: Russian Crisis 1998: Long term capital management 1998: Dotcom crash 2000: September 11 Disruption 2001: Argentina crisis 2002 to the credit crunch 2007 over the past few years. Considering that these financial crises where linked to liquidity problems, it is therefore prudent to say that liquidity muddles are not a once-off scenario as it keeps resurfacing time and again. It will be reasonable and cautious to adjust our attitude towards stock market liquidity and to assume that there will always be a liquidity problem in the future. In finance literature, there are several definitions that are predominantly used to distinguish funding liquidity which relates to obtaining financing from market liquidity as a measure of market depth. As the term suggests, funding liquidity relates to the availability of credit in the market (Tran, 2020). Market liquidity on the other hand plays an important role in financial market analysis due to the perceived notion that fundamentals are usually based on liquidity drivers (Warsh, 2007). Prior literature also suggests that market liquidity plays an important role in determining the direction of the market in conjunction with earnings announcements (Grossman and Miller, 1988; Amihud, 2002: Amihud, Mendelson & Pedersen, 2005; Bhattacharya et al., 2019). Stock market liquidity arises from the willingness to trade on an index which ultimately increases the value and volume of trade (Abudy, 2020). In essence, market participants can quickly execute or exit their positions because there is an accessible

and legible market in the index at all times (Brunnermeier and Pedersen, 2008). Without this willingness, trading will be limited leading to illiquidity or liquidity crisis. Liquidity crisis results from mainly two sources which are, the absence of partners or buyers and fire sales of assets below their fundamental values (Boyson et al., 2011). During periods of financial distress, market participants move quickly to sell their assets to balance some of their losses due to slow economic growth. Due to the congruent views among investors regarding the direction of the market during financial distresses, there is an uncurbed amount of sellers and limited buyers to facilitate trading leading to illiquidity. From a firm's view point, balance sheets that are not aptly structured usually result in liquidity mismatch. This mismatch eventually drives sentiments in financial markets largely because of risk premia. There are basically three fault lines that exposes risk premia as a result of illiquidity which are maturity mismatch, credit risk and foreign exchange risk. It is also imperative to note that these fault lines are the crux that portrays sentiments in financial markets. In addition to the fault lines, stock market liquidity is also correlated to the structure of the financial market (Næs et al., 2011). These includes the level of restriction, technological advancement and the market transparency. These idiosyncratic traits are significant because trading in financial markets have become intertemporal with increasing uncertainty.

That notwithstanding, prior research has mainly focused on investigating stock market liquidity in a holistic manner (Nguyen et al., 2021; Umar et al., 2021; Kunjal, 2021; Tiwari et al., 2022; Gofran et al., 2022). There still exists a gap in literature to empirically investigate and examine the trends in stock market liquidity during periods of financial distress. The ability to refinance loans and other financial instruments is substantially as a result of decreasing liquidity. Hence, future refinancing in periods of distress will almost seem impossible if there is a decreasing trend in liquidity. Therefore, this study makes a noteworthy contribution in formulating macroeconomics government policies in addition to the literature in market liquidity.

2. LITERATURE REVIEW

As documented in prior literature (Nguyen et al., 2021; Umar et al., 2021; Kunjal, 2021), there are multiple definitions of stock market liquidity. However, the quotidian aspect is the ability to trade quickly without significantly moving the price (Bhattacharya et al., 2019). Hence larger volumes can be traded without a notable change in market price leading to lower transaction cost. Stock market liquidity is usually associated with market depth, resilience, immediacy and breath (Olbrys and Mursztyn, 2019). However, market depth and resilience are the most recurring themes of market liquidity. Market depth and resilience connotes large order flow from both the buy side and sell side with insignificant change in price (Enow et al., 2022). In this case, market participants expect to see low volatility in security prices. On a broader scale, market depth and resilience are a function of price impact and trading volume (Kijima and Ting, 2019). The characteristics of stock market liquidity varies considerably depending on the nature of the security market. This difference may be attributed to the market structure and the type of market. Order driven markets where counterparties are unknown, display market prices and trading quantities on the exchange (Wang et al., 2020). An important feature of these order driven markets are the level of transparency. The order books are readily available to all market participants and the exchange facilitates the process of matching the standardized supply and demand needs of traders which greatly improves liquidity (Marcel and Bruce, 1994). Equity securities, futures and options on short term interest rates are traded on order driven markets. Conversely quote driven markets are rather concluded on the basis of market quotes provided by markets makers. Market makers in these type of market take considerable risk with regards to price fluctuations. To minimise this risk, brokers are often persuaded to actively participate in the market so as to enhance liquidity in terms of depth. The quote provided by the market maker is valid for a specific period which causes liquidity in this type of market to vary considerably.

The four main factors conventional factors that impact stock market liquidity are; stable global monetary conditions, regulations in financial markets, growth in the size of the market and the performance of the banking sector (Miranda-Agrippino and Rey, 2020). Illiquidity is often accompanied by a wide trading spread gap as a result of large bid and offer mismatch. As seen in the past, liquidity crisis may lead to an entire market shut down as was the case in the Hong Kong 1987 crash where the market had closed for 4 days (Malliaris and Urrutia, 1992). The Tables 1 and 2 summarize prior literature on stock market liquidity during financial distress.

From Tables 1 and 2, it is evident that financial distress is often associated with illiquidity. From prior literature summarised in the tables above, financial markets experienced liquidity shortages during the 2007-2008 financial crisis and Covid-19 pandemic. The above studies directly imply that whenever there is a financial crisis markets experience liquidity shortages which might not be the case. Also, stock market liquidity trends are not clearly defined in these prior literature hence the purpose of this paper to fill in the gap in literature.

3. METHODOLOGY

As alluded in the study of Enow et al. (2022), liquidity is predominantly a function of market depth. Therefore, to empirically investigate stock market liquidity, daily trading prices and trading volumes were used. These two variables are the conventional measures of liquidity (Chordia et al., 2001; Acharya and Pedersen, 2005; Hasbrouck, 2009; Amidu, 2002; Amidu et al., 2005; Le and Gregoriou, 2020). This study used the Markov switching GARCH model which has an autoregressive property (Bauwens et al., 2010). This model was used to investigate liquidity because of its interrogative property component in addition to the autoregressive

Table 1: Stock market liquidity during the 2008-2009 financial crisis

Study	Model	Period	Country	Findings
Dang et al. (2014)	Regression analysis	January 2003-December 2007	17,493 stocks across 41 countries	The financial crisis had a negative impact on market liquidity

Table 2: Stock market liquidity during the Covid-19 pandemic

Study	Model	Period	Country	Findings
Nguyen et al. (2021)	Panel data regression	January 30th, 2020-May 15th, 2021	Vietnam	Negative relationship between the Covid-19 pandemic and market liquidity
Umar et al. (2021)	GARCH model	December 31, 2019-July 10, 2020	China	Significant liquidity decline in the Chinese stock market during the Covid-19 pandemic
Kunjal (2021)	T-statistics	March 5, 2020-June 12, 2020	South Africa	The market liquidity of specific firms listed in the Johannesburg stock exchange decreased significantly during the Covid-19 pandemic
Tiwari et al. (2022)	Wavelet coherence	December 2019-July 2020	China, Australia and G7 nations	Countries that were affected by the Covid-19 pandemic experienced lower liquidity
Gofran et al. (2022)	Multivariate regression analysis	January 2020-May 2020	China, Germany, Spain, US and UK	The pandemic caused short term liquidity problems but it will not be significant in the long run

Source: Author

Table 3: Stock market liquidity during the financial crisis for the CAC 40 & DAX

Variable	Coefficient	CAC 40 Standard error	Z-statistics	P-value	Coefficient	DAX Standard error	Z-statistics	P-value
		Regime 1				Regime 1		
C	6246.026	55.33	112.88	0.000*	16164.5	106.63	151.5	0.000*
Volume	00000183	0.0000622	0.29	0.7687	−0.000065	00000139	−4.71	0.000*
Sigma	558	0.0559	99.87	0.000*	568	0.08	70.8	0.000*
		Regime 2				Regime 2		
C	7137.94	39.36	181.32	0.000*	13238.94	147.40	89.8	0.000*
Volume	−0.000018	0.000047	−3.94	0.0001*	0000032	00000167	1.9	0.055
Sigma	5.02	0.0753	66.64	0.000*	656	0.0552	118.7	0.000*
		Transition matrix parameters				Transition matrix parameters		
ρ_{11}	5.64	1.18	4.75	0.000*	5.322259	1.33	3.99	0.0001*
ρ_{21}	−5.32	1.32	−4.01	0.0001*	−5.670551	1.18	−4.78	0.000*

Table 4: Stock market liquidity during the financial crisis for JSE & Nasdaq

Variable	Coefficient	JSE Standard error	Z-statistics	P-value	Coefficient	Nasdaq Standard error	Z-statistics	P-value
		Regime 1				Regime 1		
C	10454.24	39.32	265.84	0.000*	2577.17	47.26	54.52	0.0000*
Volume	0.00163	0.00190	0.86	0.3892	−0.000091	0.0000002	−4.29	0.0000*
Sigma	5.5	0.0753	73.38	0.000*	4.86	0.0509	95.45	0.0000*
		Regime 2				Regime 2		
C	11262.95	49.63	226.90	0.000*	1443.274	50.79	28.41	0.000*
Volume	0.000171	0.00015	1.10	0.2705	0.0000007	0.0000220	3.22	0.0013*
Sigma	5.78	0.00677	85.31	0.000*	4.94	0.0538	91.78	0.000*
		Transition Matrix Parameters				Transition Matrix Parameters		
ρ_{11}	3.47	0.53	6.50	0.000*	6.01	1.22	4.88	0.000*
ρ_{21}	−3.3	0.48	−6.92	0.000*	-5.95	1.25	−4.73	0.000*

*significant at 5%

Table 5: Stock market liquidity during the financial crisis for Nikkei-225

Variable	Coefficient	NIKKEI-225 Standard error	Z-statistics	P-value
		Regime 1		
C	28977.8	277.0191	104.60	0.000*
Volume	−0.793	382	−2.07	0.3892
Sigma	6.47	0.0684	94.65	0.000*
		Regime 2		
C	27969.99	317.79	88.01	0.000*
Volume	−0.00017	0.00039	−4.26	0.000*
Sigma	6.30	0.0712	88.53	0.000*
		Transition Matrix Parameters		
ρ_{11}	3.44	0.54	6.36	0.000*
ρ_{21}	−3.47	0.538	−6.46	0.000*

*significant at 5%

and GARCH property (Engle and Russell, 1998). Modelling liquidity using this method was suitable because the autoregressive component ensures that output variables depend linearly on the input variables and previous independent variables. In the context of this study, this blueprint models liquidity by using a conditional state of trading volumes (k) with variance (h_k.) and its distributive parameters (ε_k) to investigate the effect on price distribution. The Markov GARCH model is given by; Haas (2004).

Where S_t = k is the conditional state, h_k is the variance and ε_k is the distributive parameters. Also, the Markov switching GARCH model has regressive regime parameters that are used to explains the relationship between the dependent and independent variables.

Table 6: Stock market liquidity during the pandemic for the CAC 40 & DAX

Variable	Coefficient	CAC 40 Standard error	Z-statistics	P-value	Coefficient	DAX Standard error	Z-statistics	P-value
		Regime 1				Regime 1		
C	5311.36	46.25	114.8	0.000*	15920.75	63.19137	251.945	0.000*
Volume	−0.0000356	0.000042	−8.4	0.000*	−0.000618	0.0000094	−6.540587	0.000*
Sigma	5.95	0.0509	116.80	0.000*	0.000570	0.052	109.3836	0.000*
		Regime 2				Regime 2		
C	6668.82	61.40	108.59	0.000*	14228.31	120.74	117.8	0.000*
Volume	−0.000031	0.0000079	−3.92	0.0001*	−0.000167	0.0000111	−14.9	0.000*
Sigma	5.96	0.047	125.9	0.0000*	6.88	0.0412	167.04	0.000*
		Transition matrix parameters				Transition matrix parameters		
ρ_{11}	5.21	0.83	6.27	0.000*	6.083287	1.289994	4.71	0.000*
ρ_{21}	−5.97	1.08	−5.5	0.000*	−6.304316	1.203804	−5.23	0.000*

*significant at 5%

Table 7: Stock market liquidity during the pandemic for JSE & Nasdaq

Variable	Coefficient	JSE Standard error	Z-statistics	P-value	Coefficient	Nasdaq Standard error	Z-statistics	P-value
		Regime 1				Regime 1		
C	10399.68	49.71	209.20	0.000*	7565.3	262.90	28.77	0.000*
Volume	−0.000802	0.000163	−4.90	0.000*	0.0000718	0.00000551	13.01	0.000*
Sigma	6.02	0.0523	115.04	0.000*	7.29	0.00404	180.62	0.000*
		Regime 2				Regime 2		
C	11224.53	37.2	301.41	0.000*	13815.77	338.2305	40.84	0.000*
Volume	−0.00024	0.000104	−2.35	0.019*	0.0000192	0.0000734	2.61	0.009*
Sigma	5.81	0.044	130.89	0.000*	6.58	0.00527	124.9	0.000*
		Transition Matrix Parameters				Transition Matrix Parameters		
ρ_{11}	3.6	0.48	7.44	0.000*	6.35	1.20	5.25	0.000*
ρ_{21}	−3.9	0.46	−8.50	0.000*	−6.14	1.32	−4.62	0.000*

Table 8: Stock market liquidity during the pandemic for Nikkei-225

Variable	Coefficient	NIKKEI-225 Standard error	Z-statistics	P-value
		Regime 1		
C	28365.94	214.53	132.21	0.000*
Volume	0.00066	0.0000303	2.20	0.0275*
Sigma	6.68	0.00461	145.11	0.000*
		Regime 2		
C	25917.2	341.09	75.98	0.000*
Volume	−0.00041	0.0000401	−0.103	0.000*
Sigma	7.54	0.0000463	162.93	0.000*
		Transition Matrix Parameters		
ρ_{11}	6.19	1.23	5.02	0.000*
ρ_{21}	−6.17	1.23	−4.98	0.000*

*Significant at 5%

The regime parameters are given by;

$$h_{I\,t} \equiv \omega + \alpha\, y_{t-}^{2} + \beta\, h_{I\ t-}$$

$$h_{k,t} \equiv \omega_k + \alpha_k y_{t-1}^{2} + \beta_k h_{k,t-1}$$

Haas (2004). The sample financial markets where order driven markets such as the French stock market index (CAC 40), the German blue chip companies trading on the Frankfurt Stock Exchange (DAX), the Johannesburg stock exchange (JSE), Nasdaq Index and the Nikkei stock average (Nikkei-225). In line with the purpose of this study, the sample period was the financial crisis (December 1, 2007-June 30, 2009) and Covid-19 pandemic (January 1, 2020-December 31, 2021). The financial markets under consideration will be deemed liquid if the p-values in one or more regime are insignificant and vice versa. The section below highlights the findings of the Markov switching GARCH model.

4. RESULTS AND DISCUSSION

The Tables 3-8 highlight the findings of Markov model.

4.1. Stock Market Liquidity during the Financial Crises

The tables above present the findings from the Markov switching model. During the 2007-2008 global recession, some markets were still portraying signs of strong liquidity. This is evident in the CAC, the DAX, Nikkei-225 and JSE where the index price and volume relationship were insignificant (p-values more than 5%) in either regime 1 or regime 2. However, the Nasdaq index showed strong signs of illiquidity due to the significant price-volume relationship (p-values less than 5%). These findings are in accordance with the Basel Committee on Banking Supervision (BCBS) (2013) which indicated that some banks and other financial institutions where still showing signs of strong liquidity despite the 2007-2008 global meltdown. This study extends the BCBS (2013) findings by adding that some financial markets were also showing signs of strong liquidity.

4.2. Liquidity during the Covid-19 Pandemic

The tables above present the findings from the Markov switching model. During the 2007-2008 global recession, some

markets were still portraying signs of strong liquidity. This is evident in the CAC, the DAX, Nikkei-225 and JSE where the index price and volume relationship were insignificant (P-values more than 5%) in either regime 1 or regime 2. However, the Nasdaq index showed strong signs of illiquidity due to the significant price-volume relationship (P < 5%). These findings are in accordance with the Basel Committee on Banking Supervision (BCBS) (2013) which indicated that some banks and other financial institutions where still showing signs of strong liquidity despite the 2007-2008 global meltdown. This study extends the BCBS (2013) findings by adding that some financial markets were also showing signs of strong liquidity. With regards to the market liquidity results for the covid-19 pandemic in Tables 6-8, the findings indicate otherwise. From these results, all the markets under consideration portrayed strong signs of illiquidity. This is evident in the significant relationship between price and trading volume (P < 5%). In other words, the daily volumes moved the corresponding market prices significantly implying that the financial markets under consideration lack market depth. It can therefore be observed that liquidity during periods of financial distress have been altered. This may be due to the increasing margin requirements where the margin requirements for market participants have increased significantly in the past 10 years. Also, the level of market asymmetry has greatly increased which may be a contribution factor for decreasing liquidity. The level of margin requirement and information asymmetry are amplified during periods of financial distress hence a possible shift in liquidity in the 2007-2008 global crisis and Covid-19 pandemic.

5. CONCLUSION

The aim of this study was to empirically investigate market liquidity during periods of financial distress. More specially, the 2007-2008 financial crises and the recent Covid-19 pandemic. This study made use of the Markov switching model which is very useful in regression analysis because it takes into consideration structural breaks. The findings of this study indicated that some markets where liquid in the 2007-2008 financial crisis. However, all the financial markets under consideration in this study were illiquid. From this results it can be concluded that liquidity in financial markets is gradually fading especially during times of financial distress. This sentiment was also expressed by Berner (2015) who is of the opinion that liquidity is gradually shrinking notably during economic turbulence. According to Furse (2015), there is overwhelming evidence of continuous deteriorating market liquidity. It is therefore imperative that regulatory authorities act promptly to review some of the trading regulations during financial distress. This includes restrictions on price movements where some exchanges curbing prices. The curbing practice involves but not limit to circuit breakers that are implemented on prices when they exceed or drop below a certain level. The threshold limits can vary for each stock, companies with lower circuit breakers may not support higher trading volumes. Continues Curbing of prices during periods of financial distress have serious consequences which maybe one of the reasons for illiquidity during the covid-19 pandemic.

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