Lisbon School of Economics & Management
Universidade de Lisboa

MASTER

FINANCE

MASTER´S FINAL WORK

DISSERTATION

THE IMPACT OF STOCK SPLITS ON LIQUIDITY

JOÃO MIGUEL JORGE ABREU SEMEDO

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SUPERVISION:
PROFESSOR ALCINO TIAGO CRUZ GONÇALVES

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GLOSSARY

MFW – Master's Final Work.

OLS – Ordinary Least Squares.

ROA – Return on Assets.

SS – Stock Splits.

RSS – Reverse Stock Splits.

TR – Turnover Ratio.

RS – Relative Spread.

LR- Leverage Ratio.

ABSTRACT

Prior studies suggest that managers of publicly traded companies use stock splits either to improve liquidity by bringing share prices back to a normal trading range, or to convey favourable information to investors and broaden the shareholder base. This study focuses on the first possibility, the one related to liquidity.

This dissertation provides new insights on the impact of Stock Splits (SS) on the liquidity of the stock for the firms that perform this corporate action. Liquidity is represented by two measures: Turnover Ratio (TR) and Relative Spread (RS). This analysis was made through two multiple linear regressions where the purpose is to assess if there is a statistical significance of SS for the explanation of the two dependent variables, TR and RS. The analysis was performed for a final sample of 500 companies from the S&P500 index, between the years of 2011 and 2022 and with a total of 111 stock splits done over the 11 and a half years of period analysis.

Results found show that the variable SS has a statistical significance for both the first regression (TR) and the second regression (RS), which shows that there is evidence of a linear relationship between stocks splits and liquidity.

However, the results also show that the statistically significant coefficient between SS and TR is negative, while the coefficient between SS and RS is positive, which suggests that stock splits actually have a negative impact on liquidity. This empirical result could be acknowledged as an opposition to the optimal price hypothesis, which suggests that splits are used by managers to move share prices into a trading range to increase liquidity.

KEYWORDS: Stock Splits; Split Events; Liquidity; Turnover Ratio; Relative Spread.

JEL CODES: G12; G14; G32

TABLE OF CONTENTS

LIST OF FIGURES

LIST OF TABLES

ACKNOWLEDGMENTS

This dissertation is only possible due to all the support and help of certain people, to whom I would like to show my gratitude.

First, I wish to sincerely thank Professor Tiago Gonçalves for his availability, encouragement, and guidance. His critical thinking and enthusiasm helped me greatly achieve my goals and improve this research.

I am also grateful to all Master's in Finance professors, for their knowledge and perseverance in such hard and unprecedented times.

I also want to acknowledge the immense support and love of my family, who have been my pillars of strength, inspiration, and guidance throughout my academic journey. Their unwavering belief in me has been my driving force, and I am forever grateful.

Finally, I am also thankful to my friends for their help, patience, understanding and support while I pursued this project.

1. INTRODUCTION

Liquidity plays a crucial role in the proper functioning of financial markets. Increasingly aware of this, managers have tried to maximize the liquidity levels of their companies over the years. Stock splits have historically been one of the preferred methods used to achieve this goal.

However, existing literature is far from consensual when analysing the impacts of stock splits in liquidity and some authors argue that this corporate action should not be used by managers if their main purpose is to increase liquidity levels of their stock, as it may lead to an opposite outcome (Copeland, 1979; Conroy et al., 1990; Easley et al., 2001).

The purpose of this work is to study the behavior of the liquidity levels of the major American companies that performed stock splits between January 1, 2011 and June 30, 2022. The index chosen is the S&P500, as it consists in the major five-hundred public American companies and is considered to represent the overall American economy.

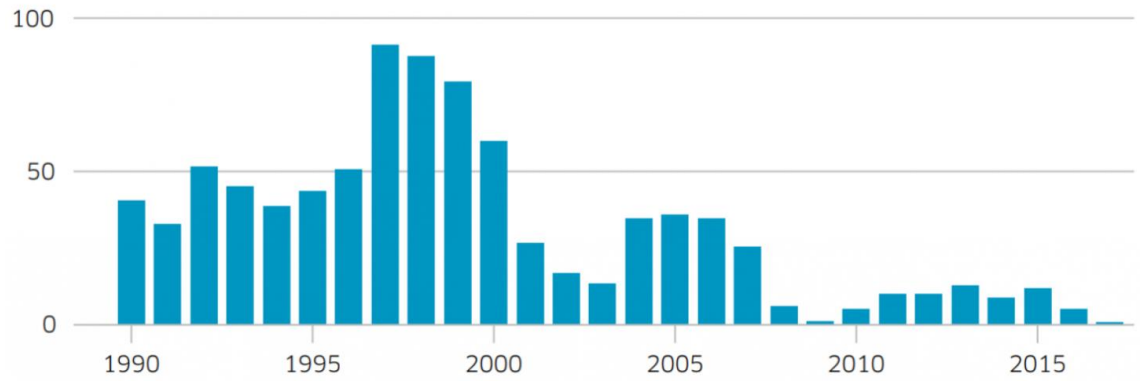
Split events can be classified as either forward stock split or reverse stock splits, depending on whether the number of existing shares is increased or decreased, respectively. This study focuses on forward stock splits. During the sample period, 129 split events were performed by 102 different companies. 111 were normal splits and the remaining 18 were reverse splits.

To perform this analysis, the metrics used for measuring liquidity are the Turnover Ratio (TR) and the Relative Spread (RS), which have never been used to test liquidity impacts after stock split events for the S&P500 components. These metrics have proven to be robust ways of measuring liquidity by previous literature.

One of the ways that this research is going to contribute for the previous literature is by using the aforementioned ways of measuring liquidity. These two variables have different behaviors: TR is positively related to liquidity and RS is negatively related. This implies that a liquidity improvement in a specific firm is associated with an increase in TR and a decrease in RS. This diversification of ways of measuring the studied variable confers robustness to the analysis by assuring that a liquidity impact is assessed by two distinct perspectives.

Furthermore, the lack of significant studies in recent years regarding stock split of American companies might be related to the fact that this corporate event is less common in American financial markets when compared to some decades ago, so researchers may have lost some interest on the subject. Figure 1 illustrates this downward trend in the number of stock splits: back in the 90's it was not uncommon for 50 stocks (around 10%) of the S&P500 to split in one year, but since the credit crisis the number of stock splits per-year has been closer to 10, just 2% of all tickers. However, being a topic of research that has produced so many contradictory results in the past and that involves such a critical market concept, it was decided it still is a relevant topic to address.

Figure 1 - Number of stock splits annually by S&P500 companies



Source: Wall Street Journal

The main results of the study include a statistically significant and negative relationship between stock splits and liquidity, as demonstrated by a decrease in the TR measure and an increase in the RS measure. This directly contradicts the optimal price hypothesis, which suggests that managers perform stock splits to realign per-share prices to a preferred price range to boost liquidity. Findings of this research are in line with studies by Copeland (1979), Conroy et al. (1990), Desai et al. (1998), Easley et al. (2001), and Kadapakkam et al. (2005), but contrast with more recent studies by Guo et al. (2008) and How and Tsen (2019).

This study proceeds as follows. Section II provides the literature review, where the definitions and main theories are presented, and testable hypotheses are developed. Section III describes the data and methodologies used to analyse it. Section IV presents the OLS main results. Finally, Section V presents the conclusions and limitations.

2. LITERATURE REVIEW AND HYPOTHESES

2.1. Definitions

This study uses two main concepts: stocks splits and liquidity. A stock split is a corporate action in which a company issues additional shares to shareholders by a specified ratio and based on the shares they held previously. There is no change to the company's total market capitalization as the price splits in the same proportion. Liquidity is generally described as the ability to trade large quantities quickly at low cost with little price impact (Liu, 2006). This description highlights four dimensions to liquidity: trading quantity, trading speed, trading cost, and price impact.

A forward stock split occurs when a company increases the number of its outstanding shares. Although the number of shares increases by a specific multiple, the share price drops in proportion, leaving the total market capitalization unchanged. Therefore, a split does not fundamentally change the company's value.

The most common split ratios are 2-for-1 and 3-for-1, which means that a shareholder will have, respectively, two or three shares for every share held before the split.

Stock splits are a puzzling corporate phenomenon (Ikenberry et al. 1996). Although seeming like a purely cosmetic change, research shows that significant price reaction is attributable directly to splits. This might be related to the fact that when a company abruptly decreases its per-share value, it becomes more accessible to a larger number of investors. Hu et al (2017) claim that firms are most likely to split their shares when they have been experiencing enough excess earnings in economic upturns. Research generally states that stock splits are used primarily by companies that have seen their share prices increase substantially in the past periods. "Splits are most often observed when prices have increased substantially in the recent past" – Ikenberry et al. (1996), p. 358. "In the period preceding the announcement of splits, there were, in general, substantial increases in the market value of equity" - Lakonishok & Lev (1987), p. 917. The persistence of stock splits and its associated price reactions in spite of their irrelevance to the firm's value has attracted the attention of financial economists for some time.

A reverse stock split, on the contrary, is a type of corporate action that consolidates existing shares into fewer proportionally more valuable shares. Also known as a stock

consolidation, stock merge or share rollback, it is done by managers for various reasons, which often are not perceived as a good sign by most investors (Woolridge and Chambers, 1983). It may signal a company in distress, as it raises the value of otherwise low-priced shares. It may be a way of attracting investors' attention and stay relevant in the equity markets. Most commonly, this type of corporate action has the practical objective of simply avoiding being delisted from a certain exchange.

A reverse/forward stock split is a stock split strategy to eliminate shareholders that hold fewer than a specified number of shares, who are cashed out. The strategy consists of performing a reverse stock split followed by a forward stock split. For example, if a company wants to reduce the number of shareholders to reduce its administrative costs, the managers would start by declaring a reverse stock split that exchanges one share for every 10 shares that the investor holds. Investors with less than 10 shares would not be able to complete the split and would, therefore, be cashed out. Then, the company would declare a forward stock split of 10 shares for one share. This second corporate action would effectively bring shareholders that were not cashed out to their original number of shares (Kenton et al., 2022).

2.2. Explanations for stock splits: signaling or an attempt to increase liquidity?

Numerous hypotheses have been advanced to explain the motivations that lead managers to declare stock splits. These hypotheses can be broadly classified into two groups: optimal price and signaling (Grinblatt et al. 1984).

The first hypotheses suggests that splits are used to move share prices into a trading range to increase liquidity, and the second one that they are used by management as signal of positive private information. These two stylized explanations for splits, although commonly referred in literature, lack empirical evidence.

Optimal price hypothesis, also referred as trading range hypothesis, suggests that splits realign per-share prices to a preferred price range (McNichols and Dravid, 1990). This range comes from the need to balance the preferences of institutional investors and retail investors. The first group is able to save brokerage costs if securities are priced high, due to the fixed per-share cost component, while the latter group prefer lower-priced securities as it enables them to buy in round lots. Therefore, if managers are interested in

having a broad and heterogeneous stockholder base, they must adjust stock prices by splitting their stock when a certain price per share is achieved.

Stocks which trade in the said optimal range are presumed to have lower brokerage fees as a percent of value traded and consequently appear to be more liquid. However, empirical evidence that splits lead to improved liquidity and marketability is far from conclusive, as seen later in detail by this study.

The second hypothesis found in literature for justifying stock splits is signaling. Signaling, as initially developed by Michael Spence (1973), is the idea that one party (the managers) credibly conveys some information about itself to another party (the investors). It is up to the signaler to choose whether and how to communicate the signal and up to the receiver how to interpret it. Signaling theory is applicable to many research fields and financial economists have developed several examples to demonstrate these relationships. For example, Connelly et al. (2011) state that "when top executives increase ownership stakes in their firms, they communicate to capital markets that diversification strategies are in the owners' best interests" and "leaders of a young firm in an initial public offering stack their board with a diverse group of prestigious directors to send a message to potential investors about the firm's legitimacy".

Due to the existence of asymmetric information, managers may use financial decisions such as stock splits, stock buybacks or dividends to convey favorable information to investors. In the case of dividends, it is argued that only high-quality firms have the ability to make dividend payments over the long run and that low-quality firms are not able to sustain such payments without compromising the future. This theory assumes that information on a company's financial health is not available to all parties in a market at the same time and that executives have more information about the company's prospects than the wider public. Therefore, managers may use signals to influence outside parties such as lenders and investors and change their perception of firm quality. As such, a split can be interpreted by the capital market as a signal of management's optimism about the future (Ikenberry et al. 1996).

To be considered credible, signals must be costly for firms that deliver them to the market even without favorable information on their side. Otherwise, it is considered falsely signaling. For stock dividends and buybacks these costs are intuitive and easy to

understand. In the case of stock splits, the cost of falsely signaling is related to the increase in the per-share trading cost because of the fixed cost element of brokerage commissions (Brennan and Copeland, 1988). Another cost is cash-in-lieu, which is a payment in cash that occurs when the shareholder only owns a partial share. There are also administrative costs to be taken into account, such as printing and legal (Brennan and Copeland, 1988). Furthermore, pessimistic managers or managers who follow the optimal price hypothesis are less likely to undertake a split, as they fear that a future decline in the firm's share price could result in the price falling below the acceptable range (Ikenberry et al. 1996).

The signaling hypothesis is supported by Grinblatt et al. (1984), McNichols and Dravid (1990) and Huang et al. (2013), based on positive return reaction to split announcements, but they only focus on a period of a few days surrounding the split event day. They argue that the announcement returns reflect positive changes in the eyes of investors, thus splits must relay positive signals about firm's prospects. However, the split might simply attract an unusual level of investor attention to the firm and this positive return may represent a temporary overreaction to a sudden increase in its visibility so the shift to a long-term measure of post-split measure is sensible. In other words, focusing on a such short period of time may fail to capture the continuous, long-term impacts of the split announcement (Tabibian et al., 2020).

The signaling hypothesis is undermined by some studies (Lakonishok and Lev, 1987; Asquith et al., 1989; Byun and Rozeff, 2003), which find no evidence of increases in earnings and no evidence of positive long-term returns after splits, thus questioning if this corporate action really signals positive information about the company. On the other hand, Ikenberry et al. (1996), Desai and Jain (1997) and Ikenberry and Ramnath (2002) use alternative techniques to measure long-term post-split returns and find evidence of positive abnormal returns, which would be consistent with signaling. In a way, the split signaling debate is at an impasse due to a disagreement as to the proper way to measure long-term returns (van Nes, 2022).

Extant literature is far from consensual when it comes to the practical effects of stock splits and has attracted the attention of scholars throughout the decades. The impact of stock splits on trading volume, volatility, liquidity, ownership structure and abnormal returns has been studied by several authors.

Lamoureux and Poon (1987) and Maloney and Mulherin (1992) report that splits increase the number of stockholders and the number of trades, but there is little evidence that splits lead to increased trading volume (Lakonishok and Lev, 1987; Lamoureux and Poon, 1987; Conroy et al., 1990). On the other hand, in a research conducted to examine signaling-based versus liquidity-based explanations for splits, Mohanty and Moon (2007) found a significant improvement in the average trading volume, comparing 12 months post splits announcement with that for prior to announcements.

Ohlson and Penman (1985) state that there is an increase in stock volatility after splits are completed, later confirmed by Conroy et al. (1990). More recently, Gharghori et al. (2017) conclude that option trading activity prior to the announcement of stock splits indicates that option investors anticipate an increase in stock volatility soon after the announcement.

The direction of liquidity changes subsequent to stock splits is subject to debate. Copeland (1979), Conroy et al. (1990), Easley et al. (2001), and Kadapakkam et al. (2005) argue that liquidity declines post-split, as measured by the increase of bid-ask spreads. This directly contradicts the hypothesis that splits are motivated by a desire for wider or more liquid markets and puts managers that justify splits on the basis of improving liquidity and marketability on a tricky position. However, more recent studies, namely Guo et al. (2008) and How and Tsen (2019), directly contradict these findings. Lin et al. (2009) show that if measured as incidence of no trading, liquidity increases post-split. They test the trading continuity improvement hypothesis, which asserts that managers of firms facing some possibility of trading discontinuity can use stock splits to attract more uninformed trading, which allows market makers to provide liquidity services at lower costs. These lower trading costs increase investors' propensity to trade and reduces liquidity risk. Dennis and Strickland (2003) report that changes in liquidity are negatively related to the level of institutional ownership before the split. This result suggests that there are liquidity gains for firms that split their stock, but the liquidity gains are conditional on the level of institutional ownership and liquidity before the split.

Baker and Gallagher (1980) firstly claim that managers use splits to increase ownership by individual investors, by nominally making the shares more affordable. Szewczyk and Tsetsekos (1995) report that firms with low pre-split institutional

ownership experience significant increases in the number of institutional shareholders following splits, while firms with high pre-split institutional ownership stabilize the proportion of their shares owned by institutions. Mukherji et al. (1997) show that stock splits increase the numbers of both individual and institutional shareholders, without affecting the proportion of equity held by institutions. They also find that changes in the numbers of individual and institutional shareholders are positively related to the split factor. Dennis and Strickland (2003) find that institutional ownership increases (decreases) for firms with low (high) institutional ownership before the split announcement. Since institutions trade more frequently than individuals, this may suggest that post-split gains in liquidity may be due to the change in institutional ownership.

As for abnormal returns, literature is more consensual. Abnormal returns following splits are reported by Ikenberry et al. (1996), Desai and Jain (1997), Ikenberry and Ramnath (2002), Devos et al. (2015) and Beladi et al. (2016). The later study interestingly finds that the likelihood of the occurrence and abnormal returns of stock split announcements are greater in the month of January, suggesting that firms are more likely to split shares and the market reaction to these announcements are greater in January compared to the other months of the year. The *January effect* is particularly valid for small-sized firms. Ariff et al. (2004) and Li et al. (2013) report abnormal split announcement returns, while Dennis and Strickland (2003) find that the abnormal return following a split is negatively related to institutional ownership before the stock split. Chern et al. (2008) suggest that the abnormal returns around stock split announcements are significantly lower for stocks that are optioned than for stocks that are not optioned. This test on the informational efficiency of trading in stock options in the context of stock split announcements, which as we know are generally associated with positive abnormal returns, is consistent with the hypothesis that the prices of optioned stocks embody more information, diminishing the impact of the corporate action announcement.

2.3. Research Question and Hypotheses

As mentioned, several previous studies have reported abnormal split announcement returns, but liquidity improvement still challenges the researchers. Copeland (1979) was the first to study the impact of stock splits on liquidity and found a permanent decrease in the year after the corporate action, as measured by higher bid-ask spreads. Conroy et

al. (1990) later confirmed these findings and attributed percentage spreads increase directly to decreases in share prices following splits.

More recently, other researchers (Guo et al., 2008 and How & Tsen, 2019) found that stock splits reduce bid-ask spreads and increase the number of small traders, who are attracted to the post-split lower prices, which are indicators of liquidity improvement. The first study's sample is comprised of all Tokyo Stock Exchange (TSE) common stocks that have split with a factor greater than 1.5 from January 1996 to December 2005 and the later study analyses 45 selected corporations listed on Bursa Malaysia that announced great than 1.5 split factor splits between January 2011 and December 2015.

Due to this contradictory results in literature, this study analyses whether liquidity improvement is a strong rationale for stock splits, as many managers seem to believe.

Research Question 1: do stock splits have a direct impact on the liquidity levels of companies that engage in this corporate action?

H1: there is a significant association between stock splits and liquidity.

Two measures of liquidity are proposed and described in the methodology chapter.

The main purpose of this study is to build-on existing literature on this matter and understand whether stock splits are a significant determinant for the proposed measures of liquidity. In other words, this research uses previous studies for further development and evidence that tries to shed a light to the relationship between liquidity and the studied corporate action. Considering that previous research yielded different findings over time, it remains unclear whether stock splits have an impact on liquidity.

The initial purpose of this study was to study the impact of stock splits in both liquidity and ownership structures. However, after extensive research in numerous sources and data bases, it was not possible to find a consistent measure of ownership structure available for all S&P500 constituents during the desired sample period.

3. DATA AND METHODOLOGY

3.1. Sample

The analysis focused on companies in the Standard & Poor's 500 (S&P500) Index for the years between 2011 and 2022, with quarterly data being used. The first observed period is Q4 2010 and the last observation is Q2 2022, making a total of 47 analysed quarters. Initially the sample was composed by 503 companies, which corresponds to the total companies that figure in the S&P500 index as of mid-2022. Three companies were eliminated, as they resulted from spinoffs, mergers or a split into different share classes. As a matter of example, Google's parent company, Alphabet, is listed in the index under two tickers: GOOG and GOOGL, which respectively correspond to its class-C and class-A shares. GOOG shares confer no voting rights, while GOOGL being common stock have the typical one-share, one-vote structure. In this case, the ticker used was naturally GOOGL, as it presents much higher liquidity levels and daily volumes traded. The same logic of prioritizing the common stock, which is the most traded instrument, was followed for the remaining companies. The resulting sample consists of 500 companies.

The main reason for choosing the S&P500 index to conduct this study is due to the fact that the frequency of stock split events for companies traded on this index is one of the highest that it was possible to have access to, with the Bloomberg terminal. Therefore, it allowed a more robust and detailed analysis with substantial data. This index is composed by companies with a large market capitalization and is considered the best individual indicator of the stock market in the United States of America.

In order to study the impact of stock splits on liquidity, the following databases were used: (a) Refinitiv, which provides total assets and total liabilities for public companies (b) Bloomberg, which provides market data such as market capitalization, shares outstanding, trading volume, traded value and prices for all constituents of the index. To ensure the perfect match between observations of different databases, the ticker symbol of each company was used.

The collection of stock split events performed by companies belonging to the S&P500 index between 2011 and 2022 was carried out through the Bloomberg terminal, followed by confirmation of every event through the websites of each company.

For most companies, it was not possible to obtain the full data for all quarters due to reasons such as the company not being yet listed on the S&P500 index for the respective quarter or because the company failed to meet the criteria of the index and was delisted. The fundamental database is an unbalanced dashboard with 23500 company observations, which results from 500 companies being observed for 47 quarters.

During the sample period, 102 different companies performed 129 split events, out of which 111 were normal splits and the remaining 18 were reverse splits, which can be seen in Tables I and II. The remaining 398 companies did not perform any split event during the time in analysis. Contrary to some previous authors, namely Guo et al. (2008), that do not consider stock splits with split factor of less than 1.5 this study opts for not excluding such cases as the number of events is already low and such criteria would reduce more the sample.

Table I - Number of split events (both forward and reverse stock splits) between 2011 and 2022

Year	Number of split events	Percentage
2011	19	14.7%
2012	18	14.0%
2013	18	14.0%
2014	12	9.3%
2015	16	12.4%
2016	10	7.8%
2017	7	5.4%
2018	8	6.2%
2019	4	3.1%
2020	7	5.4%
2021	6	4.7%
2022	4	3.1%
Total	**129**	**100%**

The years with the highest frequency of stock splits are the first three: 2011, 2012 and 2013, with 16 stock splits each year which combined equal to 43.2% of the sample. The frequency of this corporate action has been decreasing, as seen in Table II. The year with the least amount of stock splits was the pre-pandemic 2019, with only 3 occurrences.

Table II - Number of stock splits (only forward splits) between 2011 and 2022

Year	Number of stock splits	Percentage
2011	16	14.4%
2012	16	14.4%
2013	16	14.4%
2014	11	9.9%
2015	14	12.6%
2016	7	6.3%
2017	6	5.4%
2018	6	5.4%
2019	3	2.7%
2020	7	6.3%
2021	5	4.5%
2022	4	3.6%
Total	**111**	**100%**

Most companies (71.8%) only perform one stock split during the sample period, but there are cases of companies performing two (25.9%) and three (2.4%). The total number of different companies engaging in stock splits is 85, as seen in Table III.

Table III - Number of different companies that performed forward stock splits between 2011 and 2022

Frequency	Number of companies	Percentage
1	61	71.8%
2	22	25.9%
3	2	2.4%
Total	**85**	**100.0%**

3.2. Descriptive Statistics and Variables

For the aforementioned final sample of 500 companies, and for the 11 and a half years of analysis, observations were collected from the dependent variables (TR and RS) and from the control and independent variables in which all monetary values are presented in euros and always refer to the end of each quarter. One statistical correction performed was the elimination of outliers, by eliminating observations that lied outside the 1st and 99th quartile for both the dependent and control variables.

The Descriptive Statistics is presented in Tables V and VI below, with a separation by two groups of companies: firstly, the companies that performed stock splits during

sample period, hereinafter referred to as ESS, and secondly the companies that did not perform any SS during the same period, designated as ENSS. Table IV combines the two groups and represents the overall sample.

Table IV - Descriptive Statistics for ESS and ENSS combined

stats	TR	RS	SS	LR	SIZE	LogPrice
mean	.1409	.00073	.004531	.63271	23.5814	4.0002
N	22291	21555	23500	21637	21509	21338
sum	3139.74	15.8396	111	13689.93	507212.1	85356.73
max	.4931	.00790	1	1.2449	26.5294	6.2985
min	0	0	0	.09849	20.966	1.87421
range	.4931423	.079046	1	1.146475	5.563375	4.424282
sd	.077466	.008553	.0671585	.2055015	1.068244	.8228923
variance	.006001	7.31e-07	.0045103	.0422309	1.141145	.6771518

Table V - Descriptive Statistics for ESS

stats	TR	RS	SS	LR	SIZE	LogPrice
mean	.1427067	.000827	.0266507	.5971832	23.56556	3.698185
N	3832	3779	4165	3729	3741	3741
sum	546.852	3.125343	111	2226.896	88158.78	13834.91
max	.622266	.0095349	1	1.140293	27.23885	5.734286
min	0	0	0	.1160808	21.01485	1.598709
range	.622266	.0095349	1	1.024212	6.224003	4.135577
sd	.0735994	.0010473	.1610796	.1916949	1.111379	.750187
variance	.0054169	1.10e-06	.0259466	.0367469	1.235162	.5627806

Table VI - Descriptive Statistics for ENSS

stats	TR	RS	SS	LR	SIZE	LogPrice
mean	.1394	.00071	0	.6392	23.5835	4.0641
N	17786	17142	19502	17222	17122	16969
sum	2478.77	12.09676	0	11007.38	403795.9	68963.2
max	.4737491	.0072173	0	1.29818	26.47003	6.430142
min	0	0	0	.0943082	21.08416	2.0030
range	.4737491	.0072173	0	1.203872	5.385873	4.42713
sd	.0758426	.0007892	0	.2075464	1.050258	.8259603
variance	.0057521	6.23e-07	0	.0430755	1.103042	.6822104

The Pearson Correlation matrix is introduced by Table VII. Generally, the variables have a relatively low correlation between them. The highest correlations are registered between the variables SIZE and TR and between SIZE and LogPrice.

The first pair of variables was expected to have a negative correlation prior to conducting the tests, although the relation is not linear, and the Table confirms this prediction. Since the TR variable is calculated as the ratio between traded volume on a given quarter and the respective number of shares outstanding, it is somewhat predictable that this variable is inversely correlated to SIZE, which is the natural logarithm of market capitalization. The second pair of variables mentioned was expected to have a positive correlation, since higher share prices lead to higher market capitalizations, so it is normal that the two variables move in the same direction.

Table VII - Pearson Correlation Matrix

Variables	Turnover Ratio	Relative Spread	SS	LR	SIZE	LogPrice
Turnover Ratio	1.000					
Relative Spread	0.073***	1.000				
SS	-0.015**	0.009	1.000			
LR	-0.084***	-0.061***	-0.024***	1.000		
SIZE	-0.332***	-0.177***	-0.015**	0.115***	1.000	
LogPrice	-0.139***	0.088***	-0.035***	0.003	0.355***	1.000

Note: *, ** and *** indicate statistical significance levels at the 10%, 5% and 1% levels, respectively.

The Stock Splits (SS) variable was chosen as an independent variable, and as control variables, the variables Leverage Ratio (LR), Logarithm of Market Capitalization (SIZE) and Logarithm of Price (LogPrice). This is in line with extant literature and explanation on each variable is provided below.

Stock Splits (SS) is a dummy variable that assumes the value of 0 when the company does not present a stock split in the respective quarter and 1 when it does. As such, there is no need to perform the mentioned elimination of outlier observations that was done for the other variables.

Leverage Ratio (LR) is Total Assets divided by Total Liabilities. This measure is applied in previous studies, such as Joshi (2014), and intends to control for the different levels of leverage that the companies of the studied index present, as it covers several industries with different capital structures.

Logarithm of Market Capitalization (SIZE) is a natural log of market capitalization, which is defined as product of stock price and number of outstanding shares, and it intends to represent the relative size of each company. The logarithm was applied because the value of the Market Cap of each company was too high and was quite discrepant in relation to the values of the other variables collected.

Logarithm of Price (LogPrice) is a natural log of closing price for each quarter and intends to control for price variations.

3.3. Methodology

This study examines the impact of a specific corporate action, in this case the stock split event, in stock liquidity measurement. Liquidity is generally described as the ability to trade large quantities quickly at low cost with little price impact (Liu, 2006). This description highlights four dimensions to liquidity: trading quantity, trading speed, trading cost, and price impact. In this sense, liquidity is considered a complex concept and given its multidimensional characteristics, it is difficult to measure, so the use of a single measure is insufficient.

In line with previous studies (Dennis and Strickland, 2003 and Huang et al., 2013), to create a robust analysis, this study uses two measures that represent respectively the above-mentioned trading quantity and trading cost components of the liquidity concept, as follows:

(i) Turnover ratio (TR): It is the ratio of trading volume (in number of shares) to total number of shares outstanding, for each given quarter. This variable measures the trading activity and an increase in the turnover ratio indicates a stock liquidity improvement. *"Turnover ratio standardizes volume into a statistic that is consistent for large and small firms, and it also controls for the change in the number of publicly available shares around the split date."* – Dennis and Strickland (2003), p.362.

(ii) Relative spread (RS): This measure is obtained by dividing the average bid-ask spread with the average trading price, for each given quarter. It reflects the easiness of conversion of assets to cash and a decrease in the relative spread indicates a liquidity enhancement (Huang et al. 2013).

Thus, a liquidity improvement is identified whenever there is a significant positive/negative difference of the value of TR/RS compared to the prior interval. A company that performs a stock split with the objective of increasing liquidity should, therefore, expect an increase in the parameter TR and a decrease in RS.

The main objective of this study is to understand whether stock splits are a significant determinant of two robust measures of liquidity impact for the sample companies, TR and RS. For this purpose, two multiple linear regressions will be estimated through the method of least squares, OLS, which allow to understand the explanatory power of each of the independent variables on the dependent variables. STATA is the software used for all statistical analyses carried out throughout this study and all statistical tests were performed with a level of significance of 5%. The following equations intend to examine *H1*.

The two multiple linear regressions constructed are:

(1) $TR_t = \beta_{01} + \beta_{11}SS_t + \beta_{21}LR_t + \beta_{31}SIZE_t + \beta_{41}LogPrice_t + \varepsilon_t$

(2) $RS_t = \beta_{02} + \beta_{12}SS_t + \beta_{22}LR_t + \beta_{32}SIZE_t + \beta_{42}LogPrice_t + \varepsilon_t$

where variables in Equations (1) and (2) are *SS* representing Stock Splits, *LR* for Leverage Ratio, *SIZE* stands for Size or Logarithm of Market Cap, *LogPrice* for Logarithm of Price, *t* is time, and ε is the error term.

4. RESULTS

Two multiple linear regressions were estimated, with a significance level of 5%, from which the following results can be seen in Table VIII:

Table VIII - Multiple Linear Regressions – TR and RS

Variables	Turnover Ratio (1)	Relative Spread (2)
Stock Splits	-0.0290***	0.0002***
	(-4.16)	(2.71)
Leverage Ratio	-0.0194***	-0.0001***
	(-7.91)	(-5.06)
SIZE	-0.0226***	-0.0002***
	(-45.91)	(-31.97)
LogPrice	-0.0027***	0.0002***
	(-4.18)	(23.51)
Interception	0.6999***	0.0043***
	(64.10)	(34.78)
Year	No	No
Observations	19,361	19,384
R-squared	0.1251	0.0620
F-Test	691.68	320.36
P-value	0.000	0.000

Note: *, ** and *** indicate statistical significance levels at the 10%, 5% and 1% levels, respectively. Additionally, t statistics are presented in parentheses.

The coefficient of determination indicates that approximately 12.5% of the total variation of the TR variable is explained by the model (independent variable plus the control variables) and 6.2% of the total variation of the RS variable is explained by the model.

According to the significance result of the F-test statistic, both regressions are statistically significant, as the value is less than the 5% confidence level. This statistic

tests the significance of a set of parameters of a multiple linear regression model, when the model is fitted to the data using the OLS Method.

It is possible to verify that the SS variable reveals a statistical significance at 5% for both regression (TR and RS). This implies that for the first regression there is evidence that there is a negative linear relationship between the variable SS and the TR variable, while for the second regression there is evidence that there is a positive linear relationship between the variable SS and the RS variable. All control variables have statistical significance in both regressions.

Relatively to the signs of the coefficients, they are all negative for the first regression. This reveals that a positive variation in any of the four variables of the model leads to a negative variation in the TR. As for the second regression, the coefficients are negative for the variables LR and SIZE and positive for the variables SS and LogPrice. The constant term is not relevant for analysis in both regressions.

The fact that the coefficient of the SS is negative for the first regression and positive for the second regression might be considered as an unexpected result, as least from most managers' point of view. As mentioned before, a company that performs a stock split should expect an increase in its TR measure and a decrease of its RS measure, as these changes would imply an overall increase of liquidity levels. However, the results of this study contradict these expectations.

For the first regression, for every unit that the independent variable SS increases, TR measure will decrease, on average, in 0.029 units. Since SS is a dummy variable, this means that stocks of the S&P500 that performed stocks splits during the sample period have lower levels of liquidity, as measured by the TR ratio. Applying the same rationale for the second regression, a one unit increase in SS leads, on average, to a 0.0002 unit increase in RS ratio and means that the stocks that performed this corporate action have lower levels of liquidity, as measured by a higher RS.

As for the control variables, for every unit increase in LR, SIZE and LogPrice, the dependent variable TR decreases, respectively, by 0.0194, 0.0226 and 0.0027 units. In the second regression, for every unit increase in LR, SIZE and LogPrice, RS decreases, respectively, 0.0001 and 0.0002 and increases 0.0002 for LogPrice.

Controlling for year fixed effect is considered relevant, as the economy varies from year to year and macroeconomic factors may influence the decision of managers in engaging in stock splits. For the first regression, the independent variable SS does not lose its statistical significance when controlling for year fixed effect. The same behaviour is observed for the second regression, as the variable SS does not lose statistical significance.

Table IX - Regressions of TR and RS with year fixed effect

Variables	Turnover Ratio (1)	Relative Spread (2)
Stock Splits	-0.0246***	0.0002***
	(-3.66)	(2.61)
Leverage Ratio	-0.0229***	-0.0002***
	(-9.65)	(-7.70)
SIZE	-0.0241***	-0.0002***
	(-49.68)	(-38.81)
LogPrice	-0.0069***	0.0001***
	(-10.17)	(11.58)
Year	Yes	Yes
Observations	19,361	19,384
R-squared	0.1852	0.1704
F-Test	274.79	248.55
P-value	0.000	0.000

Note: *, ** and *** indicate statistical significance levels at the 10%, 5% and 1% levels, respectively. Additionally, t statistics are presented in parentheses.

Prior literature was mostly based in the use of a least-squares method to advance the statistical analysis. To robust this research and attempt to overcome possible constrains of previous studies, the use of panel data techniques has been applied to control potentially correlated, unobserved, time-invariant heterogeneity (Arellano, 2003).

In a multiple linear regression model, fixed effects and random effects are two methods to deal with unobserved heterogeneity across the observations. Unobserved

heterogeneity is a common issue in panel data analysis and can lead to biased estimates and incorrect inferences.

Fixed effects are used to control for unobserved heterogeneity that is constant over time, such as individual characteristics, firm or country-specific factors. It involves including a set of dummy variables for each entity in the regression. This means that the regression estimates are based on within-group variation, which is the variation in the data within each entity. This approach is useful when the focus is on understanding the effects of the observed variables on the dependent variable, while holding constant the effects of unobserved heterogeneity.

It is possible to observe that SS maintain their statistical significance when adding the fixed-effects into consideration, while the control variable LogPrice, although not the central scope, loses its statistical significance.

Controlling for the company's fixed effects over time, which have their own liquidity pattern, results prove to be robust for the regression of TR. Thus, we confirm the hypothesis that liquidity decreases based on the stock split. However, the same pattern is not observed in the second regression. The independent variable SS becomes statistically meaningless.

Fixed effects center their liquidity analysis on endogenous firm specific differences whereas random effects highlight and rely mostly on cross sectional differences among firms.

Table X - Regression of TR and RS with Fixed-Effects

Variables	Turnover Ratio (1)	Relative Spread (2)
Stock Splits	-0.0145***	0.0001
	(-3.17)	(1.52)
Leverage Ratio	0.0531***	0.0004***
	(13.34)	(8.25)
SIZE	-0.0169***	-0.0001***
	(-7.18)	(-4.13)
LogPrice	-0.0027	0.0002***
	(-1.13)	(6.42)
Interception	0.5195***	0.0026***
	(10.99)	(4.28)
Fixed Effects	Yes	Yes
Random Effects	No	No
Observations	19,361	19,384
R-squared	0.1852	0.1704
F-Test	282.19	58.12
P-value	0.000	0.000

Note: *, ** and *** indicate statistical significance levels at the 10%, 5% and 1% levels, respectively. Additionally, t statistics are presented in parentheses.

On the other hand, random effects are used to control for unobserved heterogeneity that is uncorrelated with the observed independent variables, such as measurement error or omitted variables. In this approach, unobserved heterogeneity is assumed to be randomly distributed across entities, and its effects are modelled as a random error term. Random effects are useful when the focus is on estimating the average effect of the observed variables on the dependent variable, while accounting for the effects of unobserved heterogeneity.

When random-effects are taken into account, SS maintains the statistical significance for TR, while LogPrice becomes statistically meaningless. As for RS, SS loses its statistical significance with the same test.

Table XI - Regression of TR and RS with Random-Effects

Variables	Turnover Ratio (1)	Relative Spread (2)
Stock Splits	-0.0148***	0.0001
	(-3.22)	(1.57)
Leverage Ratio	0.0456***	0.0003***
	(12.26)	(7.39)
SIZE	-0.0196***	-0.0001***
	(-11.57)	(-7.37)
LogPrice	-0.0001	0.0002***
	(-0.05)	(10.59)
Interception	0.5826***	0.0031***
	(17.03)	(7.78)
Fixed Effects	No	No
Random Effects	Yes	Yes
Observations	19,361	19,384
R-squared	0.1852	0.1704
P-value	0.000	0.000

Note: *, ** and *** indicate statistical significance levels at the 10%, 5% and 1% levels, respectively. Additionally, z statistics are presented in parentheses.

The results strengthen the consistency and robustness of the analysis, by reinforcing the previous pattern of a statistically significative, once again at 5% level, and negative association regarding stock splits and the turnover ratio. Hence, these contribute to the validation of *H1*. However, for the second regression (RS), stock splits become statistical meaningless when controlling for both fixed and random effects.

5. CONCLUSION, LIMITATIONS AND FURTHER RESEARCH

After so many contradictory studies over the past decades, the interrogation about the real impacts of stock splits on liquidity remained. The initially defined objective for this study, after analysing all the existing theories regarding the impacts and reasons why managers decide to split their stocks, focused on the analysis of the relationship between stock splits and two liquidity measures: TR and RS.

The results reveal that there is, on average, a linear relationship between SS and TR and a linear relationship between SS and RS. Therefore, the hypothesis previously defined for liquidity impact is verified, in other words, there is a significant association between stock splits and liquidity. The results suggest that stock splits have an impact on the liquidity levels of the companies that perform this corporate action, but not in the way that it was expected before the study. As mentioned before, a company that performs a stock split based on liquidity reasons should expect an increase in its TR measure and a decrease of its RS measure. However, the results of this study contradict this rationale for engaging on a stock split, by finding evidence that shareholder liquidity is actually lower for splitting firms. These findings are in line with Copeland (1979), Conroy et al. (1990) and Easley et al. (2001).

This empirical result could be acknowledged as an opposition to the optimal price hypothesis, which suggests that splits are used by managers to move share prices into a trading range to increase liquidity.

The use of panel data strengths the consistency and robustness of the results for the regression of TR, highlighting the negative association between stock splits and the turnover ratio, but does not lead to the same results for RS.

The results of this study have important implications for market participants, including investors, issuers, and regulators. For investors, it is important to be aware of the potential negative effects of stock splits on liquidity and to consider this information when making investment decisions. For issuers, these findings suggest that stock splits may not be an effective tool for increasing liquidity in the market, and that other strategies may be more appropriate. Finally, for regulators, these results highlight the need for careful consideration of the potential impact of stock splits on market liquidity when making policy decisions.

One of the main limitations found in this study was the reduced number of stock splits present in the sample, as for 23500 business observations there were only 111 stock splits, which may have had some impact on the results found. Using indexes with more than 500 companies or larger periods of sample data is advised to overcome this issue. To further robust the results, the use of a fixed control for industry would also have been appropriated. The addition of more statistically significant control variables would also add robustness to the model and respective results.

As described before, liquidity is considered a complex concept and given its multidimensional characteristics, it is difficult to measure, so the use of a single measure is insufficient. Two of the four dimensions of liquidity (trading speed and price impact) were not tested and could be object of further research.

Further investigations may also consider samples from other countries, namely European or Asian. Due to the differences in standards that govern financial reporting, the very perception of stock splits and the way in which managers, investors and companies manage this phenomenon may also be different and this can have direct impact on the liquidity levels. For instance, an European retail investor may handle stock splits of European companies of their portfolio in a very different way that they an American retail investor does when the same situation happens for an American company of their portfolio.

A long-term analysis of liquidity effects is also advised: since the liquidity effects of stock splits may take time to fully materialize, other studies could examine the long-term liquidity impact of stock splits. It could also look at whether the liquidity effects persist over time or if they are only temporary. Also, the fact that most studies on the impact and reasons of stock splits use data from decades ago, shows the necessity for more studies that collect data from more recent years, namely the decade of 2010s.

Finally, the examination of alternative signalling mechanisms would be adequate to complete the findings of this study. Since one of the proposed benefits of stock splits is improved signalling, another study could explore alternative signalling mechanisms that firms can use to convey positive news to investors. For example, it could look at the impact of dividend announcements or share repurchases on liquidity.

REFERENCES

Adisetiawan, R. & Atikah. (2018). Does Stock Split Influence to Liquidity and Stock Return? (Empirical Evidence in the Indonesian Capital Market). Asian Economic and Financial Review, 8(5), 682–690.

Almeida, J., & Gonçalves, T. C. (2022). A systematic literature review of volatility and risk management on cryptocurrency investment: A methodological point of view. Risks, 10(5), 107.

Almeida, J., & Gonçalves, T. C. (2023). A systematic literature review of investor behavior in the cryptocurrency markets. Journal of Behavioral and Experimental Finance, 100785.

Almeida, J., & Gonçalves, T. C. (2022). Portfolio diversification, hedge and safe-haven properties in cryptocurrency investments and financial economics: A systematic literature review. Journal of Risk and Financial Management, 16(1), 3.

Arellano, M. (2003). Panel data econometrics. Oxford university press.

Ariff, M., Khan, W. A., & Baker, H. K. (2004). Are stock splits credible signals? Evidence from the Singapore market. The Singapore Economic Review, 49(02), 163-177.

Baker, H. K., & Gallagher, P. L. (1980). Management's View of Stock Splits. Financial Management, 9(2), 73–77.

Beladi, H., Chao, C. C., & Hu, M. (2016). Another January effect—Evidence from stock split announcements. International Review of Financial Analysis, 44, 123-138.

Brennan, M. J., & Copeland, T. E. (1988). Stock splits, stock prices, and transaction costs. Journal of financial economics, 22(1), 83-101.

Chemmanur, T., Hu, G., & Huang, J. (2015). Institutional Investors and the Information Production Theory of Stock Splits. Journal of Financial and Quantitative Analysis, 50(3), 413-445.

Chern, Keh-Yiing, Tandon, K., Yu, S. & Webb G. (2008). The information content of stock split announcements: Do options matter? Journal of Banking & Finance, 32, 930–46.

Connelly, B. L., Certo, S. T., Ireland, R. D., & Reutzel, C. R. (2011). Signaling theory: A review and assessment. Journal of management, 37(1), 39-67.

Conroy, R.M., Harris, R.S., Benet, B.A. (1990). The Effects of Stock Splits on Bid-Ask Spreads, The Journal of Finance, 45 (4), 1285-1295.

Copeland, T., (1979). Liquidity Changes Following Stock Splits. The Journal of Finance, 34(1), 115-141.

Dennis, P., & Strickland, D. (2003). The effect of stock splits on liquidity and excess returns: Evidence from shareholder ownership composition. *Journal of Financial Research*, 26(3), 355-370.

Desai, A. S., Nimalendran, M., & Venkataraman, S. (1998). Changes in trading activity following stock splits and their effect on volatility and the adverse-information component of the bid-ask spread. Journal of Financial Research, 21(2), 159-183.

Desai, H. & Jain P. (1997). Long-run common stock returns following splits and reverse splits. Journal of Business, 70, 409-433.

Devos, E., Elliott, W. B., & Warr, R. S. (2015). CEO opportunism?: Option grants and stock trades around stock splits. Journal of Accounting and Economics, 60(1), 18-35.

Easley, D., O'hara, M., & Saar, G. (2001). How stock splits affect trading: A microstructure approach. Journal of Financial and Quantitative analysis, 36(1), 25-51.

Gaio, C., & Gonçalves, T. C. (2022). Gender diversity on the board and firms' corporate social responsibility. International Journal of Financial Studies, 10(1), 15.

Gaio, C., Gonçalves, T., & Azevedo, R. (2020). Earnings management: Evidence of listed and unlisted companies in europe. Innovar, 30(76), 77-90.

Gaio, C., Gonçalves, T., & Pereira, A. (2021). Financial crisis and impairment recognition in non-financial assets. Revista Brasileira de Gestão de Negócios, 23, 370-387.

Gaio, C., Goncalves, T., & Sousa, M. V. (2022). Does corporate social responsibility mitigate earnings management?. Management Decision.

Gaio, C., Gonçalves, T., & Venâncio, A. (2022). Cash holdings in start-ups: The role of founder sociodemographic characteristics. Journal of Business Research, 139, 520-528.

Gharghori, P., Maberly, E. D., & Nguyen, A. (2017). Informed Trading around Stock Split Announcements: Evidence from the Option Market. Journal of Financial and Quantitative Analysis, 52 (2), 705-735.

Gonçalves, T. C. (2022). The Impact of Discretionary Measurement Criteria on Investors' Judgement and Decisions. Games, 13(1), 3.

Gonçalves, T. C., Borda, J. V. Q., Vieira, P. R., & Matos, P. V. (2022). Log periodic power analysis of critical crashes: Evidence from the Portuguese stock market. Economies, 10(1), 14.

Gonçalves, T. C., Dias, J., & Barros, V. (2022). Sustainability Performance and the Cost of Capital. International Journal of Financial Studies, 10(3), 63.

Goncalves, T., Barros, V., & Serra, G. (2022). Political elections uncertainty and earnings management: Does firm size really matter?. Economics Letters, 214, 110438.

Gonçalves, T. C., & Gaio, C. (2023). Corporate sustainability disclosure and media visibility: Mixed method evidence from the tourism sector. Journal of Business Research, 155, 113447.

Goncalves, T., Gaio, C., & Ramos, P. (2022). Earnings management and impression management: European evidence. Problems and Perspectives in Management, 20(1), 459-472.

Gonçalves, T. C., Gaio, C., & Rodrigues, M. (2022). The Impact of Women Power on Firm Value. Administrative Sciences, 12(3), 93.

Grinblatt, M., Masulis, R. & Titman, S., (1984). The valuation effects of stock splits and stock dividends. Journal of Financial Economics, 13(4), 461-490.

Guo, F., Zhou, K. & Cai J. (2008). Stock splits, liquidity, and information asymmetry—An empirical study on Tokyo Stock Exchange, Journal of the Japanese and International Economies, 22 (3), 417-438

How, C. C. & Tsen, W. H. (2019). The Effects of Stock Split Announcements on the Stock Returns in Bursa Malaysia. Jurnal Ekonomi Malaysia, 53(2), 41–53.

Hu, M., Chao C., Malone, C. & Young, M. (2017). Real determinants of stock split announcements. International Review of Economics & Finance, 51, 574-598.

Huang, G. C., Liano, K. & Pan, M.S. (2013). The effects of stock splits on stock liquidity. J Econ Finan 39, 119–135.

Ikenberry, D., Rankine, G. & Stice, E., (1996). What Do Stock Splits Really Signal?. The Journal of Financial and Quantitative Analysis, 31(3), 357-375.

Joshi, G. (2014). Effects of Stock Splits on Return and Liquidity: a Study on Technological Companies. Available at http://arno.uvt.nl/show.cgi?fid=135587

Kadapakkam, P. R., Krishnamurthy, S., & Tse, Y. (2005). Stock splits, broker promotion, and decimalization. Journal of Financial and Quantitative Analysis, 40(4), 873-895.

Lakonishok, J. & Lev, B., (1987). Stock Splits and Stock Dividends: Why, Who, and When. The Journal of Finance, 42(4), 913-932.

Kenton, W., Scott, G., & Li, T. (2022). Reverse/Forward Stock Split. Available at https://www.investopedia.com/terms/r/reverse-forward-split.asp.

Lamoureux, C. & Poon, P., (1987). The Market Reaction to Stock Splits. The Journal of Finance, 42(5), 1347-1370.

Li, X., Stork, P. A., & Zou, L. (2013). An empirical note on US stock split announcements, 2000-2009. International Journal of Economic Perspectives, 7, 41–46.

Lin, J. C., Singh, A. K., & Yu, W. (2009). Stock splits, trading continuity, and the cost of equity capital. Journal of Financial Economics, 93(3), 474–489.

Liu, W. (2006). A liquidity-augmented capital asset pricing model. Journal of Financial Economics, 82(3), 631–671.

Madime, E., & Gonçalves, T. C. (2022). Determining Factors For Social and Environmental Practices of Corporate Responsibility in Mozambique. Revista de Gestão Social e Ambiental-RGSA, 16(2), e03002-e03002.

Madime, E., & Gonçalves, T. C. (2022). Consequences of social and environmental corporate responsibility practices: Managers' perception in mozambique. International Journal of Financial Studies, 10(1), 4.

Maloney, M. & Mulherin, J., (1992). The Effects of Splitting on the Ex: A Microstructure Reconciliation, Financial Management. Vol. 21, No. 4 (Winter, 1992), 44-59.

McNichols, M., & Dravid, A. (1990). Stock dividends, stock splits, and signaling. the Journal of finance, 45(3), 857-879.

Moreno, D., & Gonçalves, T. (2021). Collaborative governance outcomes and obstacles: Evidence from Portuguese armed forces. Cogent Business & Management, 8(1), 1906487.

Ohlson, J.A., & Penman, S. H. (1985). Volatility increases subsequent to stock splits: An empirical aberration. Journal of Financial Economics, 14(2), 251-266.

Saraiva, T., & Gonçalves, T. C. (2022). Should I Play or Should I Go? Individuals' Characteristics and Preference for Uncertainty. Games, 13(2), 31.

Saraiva, T., & Gonçalves, T. C. (2022). The Role of Emotions and Knowledge on Preference for Uncertainty: Follow Your Heart but Listen to Your Brain!. Risks, 11(1), 2.

Szewczyk, S. H., & Tsetsekos, G. P. (1995). Why Stock Splits? Evidence from Institutional Ownership. Available at SSRN: https://ssrn.com/abstract=6409.

Tabibian, S. A., Zhang, Z., & Jafarian, M. (2020). How Does Split Announcement Affect Stock Liquidity? Evidence from Bursa Malaysia. Risks, 8(3), 85.

van Nes, P. (2022). Three Essays on Splits, Insiders and Retail Traders, Theses and Dissertations (Comprehensive). Available at https://scholars.wlu.ca/etd/2446.

Woolridge, J. R., & Chambers, D. R. (1983). Reverse splits and shareholder wealth. Financial Management, 5-15.