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Asymmetric information and daily stock prices in Brazil

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Abstract

This paper has the goal of analyzing the association between asymmetric information, measured by Corwin-Schultz bid ask spread estimator, and stock prices in the Brazilian stock market. Daily data from 64 corporations over a period of 10 years were examined using the Johansen-Fisher panel cointegration technique in order to assess the validity of asymmetric information measurements in shorter periods than in previous studies. The results indicate that asymmetric information anticipates stock prices over a period of up to two days in a theoretically consistent way. Future research may control the results via traditional finance variables.

Keywords: stock prices; asymmetric information; Corwin-Schultz estimator.

Información asimétrica y precios diarios de acciones en Brasil

Resumen

Este trabajo tuvo como objetivo analizar la asociación entre información asimétrica, medida a través del estimador Corwin-Schultz, y las cotizaciones bursátiles en el mercado de valores brasileño. Los datos diarios de 64 empresas, en un período de 10 diez años, se examinaron utilizando la técnica de cointegración de panel de Johansen-Fisher para evaluar la validez de una medida de información asimétrica en períodos más cortos que los estudios anteriores. Los resultados indican que la información asimétrica anticipa los precios de las acciones en un período de hasta dos días, de una manera teóricamente consistente. Las investigaciones futuras deberían controlar los resultados mediante variables financieras tradicionales.

Palabras clave: precios de las acciones; información asimétrica; estimador Corwin-Schultz.

Assimetria de informação e preços diários de ações no Brasil

Resumo

Este trabalho tem como objetivo analisar a associação entre informação assimétrica, medida pelo estimador Corwin-Schultz, e cotizações bursáteis no mercado brasileiro de ações. Foram analisados dados diários de 64 empresas, durante um perídodo de 10 anos, pela técnica de cointegração para dados em painel de Johansen-Fisher, para avaliar a validade de uma medida de informação assimétrica em períodos inferiores aos de estudos anteriores. Os resultados indicam que a informação assimétrica antecipa o preço das ações em um período de até 2 dias, de maneira teoricamente consistente. Pesquisas futuras deveriam controlar os resultados mediante variáveis financeiras tradicionais.

Palavras-chave: preços de ações; assimetria da informação; estimador de Corwin-Schultz.

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1. Introduction

Since Akerlof (1970), asymmetric information (i.e. the differences between the quantity and quality of information available to managers and investors, as well as between informed and uninformed traders) has become an increasingly popular topic of scholarly debate. Asymmetric information has been found to be a relevant factor in the development of several theories of finance (Modigliani & Miller, 1958; Muth, 1961; Fama, 1991; Myers & Majluf, 1984) and attempts to measure it have generated the research field known as market microstructure (Hasbrouck, 2007).

The main effect of asymmetric information is on the price of shares (Muth, 1961) and the speed at which information comes to be priced. Depending on the level of market development (Fama, 1991), this generates greater opportunities for informed investors. Consequent changes in the stock price, or abnormal returns, can be seen as an opportunity for informed investors and a challenge for individual uninformed investors (Akerlof, 1970).

A company's valuation, and consequently its stock price, are the result of several variables that merit further study. When analyzing a company's capital structure, one of the classic findings is the irrelevance of the price of its listed assets (Modigliani & Miller, 1958). On the other hand, Fama and French (1993) stated that the ideal capital market is characterized by the precise reaction of stock prices to the signals issued by companies, whereas the actual market follows the efficiency parameters of the market. Akerlof (1970) discussed the effects of uncertainty within the market, some of which are signs of a "dishonest" market caused by differences in information, among other factors. Myers and Majluf (1984) addressed investors' behavior, and their decisions in a market with information asymmetry, which is one of the main causes of market inefficiency.

The Brazilian stock market has the characteristics of semi-strong efficiency (Fama, 1991; Chaudhuri, 1991). It is possible to verify a "social difference" within national companies wherein agency theory applies, and inside traders have advance information as to the company's purchase of assets. According to Ripamonti (2016), informed traders position themselves strategically in negotiations, and therefore have a privileged position over uninformed traders, resulting in disillusionment with the stock market. Thus, the asymmetry of information may be the source of the market's inefficiency.

Amihud and Mendelson (1986) addressed asset prices and their bid-ask spread. They found that the greater the spread, the greater the return on assets, but their analysis did not encompass market inefficiency. Ripamonti, Silva and Moreira-Neto (2018) studied the possibility of forecasting share prices, but found that all market information, not only asymmetric information, can affect share prices.

The use of cointegration techniques produces more consistent results for samples that extend over more than 200 periods. Timmermann (1995), as well as previous researchers, had used quarterly data covering periods of more than 20 years from Brazilian corporations. In order to maintain consistency of results and comparability with previous studies, and considering also the availability of the data, this study collects data covering approximately 800 days, or little more than 10 years, which proved to be adequate for its stated purposes.

The Brazilian stock market is relatively new, and has undergone reforms aimed at increasing transparency of information and investor protection in the last 20 years. The asymmetry measure used in this study has been validated for quarterly periods (Ripamonti, 2016) in that market. However, considering the volatility of developing markets, there seems to be a need to confirm the validity results for shorter periods, more relevant to a very active trading environment. The Brazilian market was also chosen because of the recent increase in the participation of individual investors.

Within the context described above, this paper examines the relationship between price and asymmetry of information in order to evaluate their impacts on each other, while bearing in mind that their interactions are subject to time lags. The results indicate that asymmetry of information anticipates changes in the prices of net assets of the Brazilian stock market.

The rest of this paper is structured as follows: the following section is a review of the literature on asymmetric information and asset prices. This is followed by a description of the basic data and methodological issues. After this, there is a presentation and discussion of the findings and, finally, concluding remarks concerning the empirical and theoretical implications of this research.

2. Theoretical framework

2.1 Asymmetric information

Most information asymmetry studies use market dynamics for modelling (Hasbrouck, 1991). The theory of market microstructure categorizes information asymmetry into two types (Hasbrouck, 2007): *sequential*, with random traders; and the *single informed trader*, who can trade numerous times. The two models have in common that their trading relies on private information from agents. Competitive market creators define bid-ask quotas according to positive and negative information; the higher the asymmetry, the higher these quotas. Spread and business impact are determining variables in this model. Asymmetric information implies various corporate finance and asset pricing models. Sequential business models relate asymmetry to the observable market, and the construction of an alternative set of variables in empirical analyses is the main objective of microstructural

study. Still, Roll (1984) concluded that the bid-ask spread causes inefficiency in the availability of information, so that variations in expected returns may occur. Corwin and Schultz (2012) highlighted the simplicity of spread calculations, stating that the variable does not depend on the particularities of each market. They find that spread can be estimated using analysis of the actual market value, taking into account microeconomic effects, and they conclude that it is possible to analyze stock values of different scales even within large trades.

Levi and Zhang (2015) affirm the association between the cost of equity and asymmetric information. Market makers could increase the bid-ask spread by increasing the level of information asymmetry. This increase generates higher returns arising from a low level of market liquidity. The authors state that investors choose to hold their shares when information asymmetry is marked, so as to enjoy a greater return. They also show that temporary rises in information asymmetry can negatively affect companies. Stocks with higher volatility have higher prices on the days that information asymmetry is high.

For his analysis of the Brazilian market, Ripamonti (2016), using Corwin and Schultz's method of estimating the bid-ask spread, found that asymmetric information forecasts assist uninformed traders in formulating portfolios that improve the returns on their assets. His study also analyzes the relationships between information asymmetry between market-to-book (M/B) and returns, using cointegration techniques, and finds a negative relationship between asymmetry and returns owing to the prevalence of uninformed traders. The opportunity this gives to more informed traders would usually be thought to be associated with new companies, but his findings are that the opposite happens, because asymmetry occurs in more established companies.

Within an emerging market, low liquidity is observed, as are large asymmetries for small businesses. Rosati, Cummins, Deeney, Gogolin, Werff and Lynn (2017) also claim that information asymmetry has a strong relationship with increased turnover, causing inelasticity for uninformed traders, but this relationship may weaken when liquid traders are discreet in their timing. The authors also consider the possibility of malign actors (hackers) interfering with information systems. In their methodology, the bid-ask spread and the level of trading activity were used as a measure of information asymmetry.

Duarte, Hu and Young (2017) challenged the measure of asymmetry usually used in literature (Easley, Hvidkjaer, & O´Hara, 2002) on the basis that it would be no more efficient than the traditional model in identifying private information and may not be very reliable. This would confirm the importance of finding an alternative measure.

Gu, Wang, Yao and Zhang (2018) demonstrated in their results that the greater the asymmetry, the greater the negative effect of liquidity on diversification, as it results in more price monitoring by insiders, reducing the returns from better performance to company management. When a company is financially constrained, it will tend to diversify less by increasing the negative effect of liquidity.

Diamond and Kuan (2018) adopted the Corwin and Schultz (2012) bid-ask spread estimator to investigate the cost to investors of changes in U.S. stock market regulations aimed at diminishing the risks caused by high-frequency trading.

Hao, Prevost, and Wongchoti (2018) found asymmetric information is a relevant factor in the negative association between stock prices' low synchronicity and cost of debt in a large sample of corporations.

Marozva (2019) suggested liquidity as a fourth factor explaining excess stock returns in the Fama and French (1993) three-factor model of the Johannesburg stock market.

Michaelides, Milidonis and Nishiotis (2019) checked the findings of their research with the Corwin and Schultz (2012) estimator, after observing the anticipation of downgrade announcements of sovereign debt being manifested by currency depreciation in countries with poor-quality institutions.

Bohmann, Michayluk, Patel and Walsh (2019) observed a relationship between information asymmetry and stock liquidity, which can be explained by investors' interest in more liquid roles and by the relationship with return, dividends, and takeovers. The spread and closing-percent-quoted-spread (CPQS) variables with high and low frequency were analyzed. The results indicated that informed traders will trade with fewer privileges in the periods after which dividends have been announced, because such announcements reduce information asymmetry. This can cause difficulty when measuring the liquidity of a company: the company may be listed in the stock market, but the measure of volume of trades in its stock can be influenced by asymmetry.

Pan and Misra (2020) examined the cost of asymmetric information of 25 stocks of the main sectors of the Indian Stock Market, processing as many as 45 million data points. The authors computed asymmetric information measures from the bid-ask spreads, and by segregating the part of the spreads that represents the cost of the information needed to verify its determinants. The findings show a negative association between liquidity and asymmetric information.

Ripamonti (2020) examined the impact of asymmetric information on the capital structure adjustments of financial institutions, using Corwin and Schultz (2012) as the measure of asymmetric information.

Chen, Zimmermann and Pontiff (2020) developed an estimator to examine the portfolio publication impact on stock returns, or publication bias-adjusted returns. The authors tested their findings using Corwin and Schultz (2012) and other measures.

Lin Peng, Schwartz and Alan (2020) examined stock returns and resiliency, considering liquidity as a new measure of resiliency, and validated it against the Corwin and Schultz (2012) estimator and other liquidity measures.

Al-Awadhi and Alhasel (2020) found that liquidity is not a significant factor for stock pricing by retail traders, through a comparison of prices and liquidity measures, including Corwin and Schultz (2012) in the stock market of Saudi Arabia—a market without market-makers, and one dominated by retail traders.

2.2 Stock prices

Several theories address the pricing of assets. Ross (1976) stated that expected returns may depend on several market variables. Sharpe (1964) discussed the Capital Asset Pricing Model (CAPM) and affirmed the proportionality of the risk premium with the beta, which is the measure of the effects of all market portfolios. For price assessment, two factors are taken into account: time and risk, with the price for time being indicated by the rate of interest, while the price for risk is indicated by "ß". Roll (1984) demonstrated changes in the bid-ask spread through stock price variations, and Fama and French (1993) discussed three factors affecting the returns to an asset and consequently its price: size, market-to-book, and market risk. In 2017 Fama & French tested two more factors: investment and return.

Merton (1973) addressed the Intertemporal Capital Asset Price Model (ICAPM), and stated that risk can be explained by changes in asset price relative to the return on equity. Docherty, Chan and Easton (2013) discussed the variables that mathematically relate to the model, highlighting the value (HML), size (SMB) and moment (WML) as variables that explain innovation and opportunity (macroeconomic variables). Urbanski (2012) tested the three Fama and French factors (1993) in the ICAPM model and concluded that HML and SMB are related to the effects of the book-to-market and size effects on investors' growth expectations.

Kelly and Ljungqvist (2012) tested the effects of information asymmetry on stock prices. Their results show that an increase in asymmetry implies lower prices and reduced demand from uninformed investors. The lower prices were explained by the effect of liquidity risk on expected returns. This effect occurs when a large variation in turnover is observed, and when payoff uncertainty occurs, resulting in less trading by investors averse to risk. Buckley and Long (2015) also show that information asymmetry substantially affects stock prices. An increase in asymmetry decreases the number of trades of uninformed investors in riskier stocks, lowering the share price. Reduced risk and pricing errors can decrease information asymmetry. In the long term informed traders can have advantages that become less marked with correct pricing.

Vaianos and Wang (2012) also verified the relationship between asymmetry and expected returns, stating that it had been the subject of few studies. Among their conclusions, the positive relationship between information asymmetry, illiquidity, and expected return was affirmed.

However, when the market is imperfectly competitive this relationship can become negative.

In Liu and Wang (2016) asymmetry is measured according to a public signal variable that all investors can observe. Market makers in the authors' model can influence the activities of informed traders and discreet investors by enabling bid-ask adjustment. The authors claim that the magnitude of the bid-ask spread can decrease with information asymmetry, and that the spread is correlated with increased turnover, following the hypothesis that traders may target an equilibrium among uninformed and informed traders with spread being calculated on volume.

Bai, Li and Qin (2017) tested the possibility of the price being affected by short-term trades, but showed that in the absence of these traders, three factors—CAPM models and excess returns, size, and book-to-market (Fama & French, 1993)—do not behave properly. Fama and French (2017) tested the effects of the five factors—excess returns, size, book-to-market, profitability, and investment—in different markets around the world and showed that their behaviours vary depending on market conditions.

Ripamonti et al. (2018) observed positive relationships between information asymmetry and the price of assets. The return and market-to-book control variables presented positive relationships with asymmetry. The authors suggested future research, with portfolio selection according to information asymmetry and asset liquidity balancing.

Ripamonti (2019) states that asymmetric information can anticipate the capital structure adjustments.

Funaoka and Nishimura (2019) found domestic institutional investors have better information than foreign ones, owing to the fact that institutional investment sentiment and IPO first day returns are positively associated.

Matanova, Steigner, Yi and Zheng (2019) verified the increase of price accuracy when an IPO contains going concern opinions (GCO), confirming lawsuit avoidance theory, and having the empirical implication that IPO prospectuses with GCO result in better asset pricing.

3. Methodology

The main objective of this study is to verify whether the relationship between asymmetric information and stock prices, on a daily basis, is identical to that observed for quarterly periods (Ripamonti, 2016). As previously emphasized, daily periods may be more volatile. Consequently, asymmetric information measurements could be used to assist active traders or individual non-professional investors who trade stocks daily on the spot market without, in theory, having the same quality and quantity of information available to managers and other investors.

Considering market microstructure theory (Hasbrouck, 2007), it is assumed that there is a relationship between

asymmetric information and stock prices, and that this relationship occurs in a lagged way, with the asymmetry anticipating price movements.

In order to be able to analyse the eventual relationship, time series of asymmetric information and price covering at least 200 periods are necessary (Timmermann, 1995); this was achieved with the use of approximately 800 days of data between 2009 and 2019. Additionally, in order for the result to be generalizable, data were collected from 64 corporations whose share prices formed the main index of the Brazilian stock market in early 2019, mitigating distortions related to survival bias. Such corporations have the greatest liquidity in the Brazilian stock market, account for most of the trading volume of the stock exchange, and represent the behaviour of the market as a whole.

The measure for asymmetric information in this study is Corwin and Schultz (2012) non-negative two-days overnight adjusted (S_2). The variable used for price was the minimum daily closing price of each stock of the sample.

In general, studies on stock pricing use panel data analysis. However, variables may have properties that are captured by models only when their evolution over various periods is considered (Engle & Granger, 1987). For that reason, models have been developed that combine the characteristics of panel data and time series econometrics (Johansen, 1988; 1991; Larsson, Lyhagen, & Lothgren, 2001).

Secondary data was gathered from the Comdinheiro database (www.comdinheiro.com.br).

The data were analysed using the Johansen-Fisher panel cointegration technique (Johansen, 1988; 1991; Larsson et al., 2001) in order to assess the possible existence of a long-term relationship between asymmetry and price, as well as to estimate the mechanism of correction of errors in the short term. The asymmetry showed an average of 1.42% per day, and the average daily price of the sample was 21.33, as shown in table 1. The variables showed a negative correlation, as shown in table 2.

The null hypothesis of non-stationarity of the price series and information asymmetry was tested and, after the eventual existence of a cointegration rank and the optimal lag choice, was verified. Because these are daily data, we chose to investigate the optimal lag of up to 90 days. Table 5 presents results using a lag of up to 2 days, as there is no difference in the direction of the error correction mechanism.

4. Results

According to Hasbrouck (1991) asymmetric information impacts share prices, but the effect is more significant for small companies. Buckley and Long (2015) observed better performance from investors with more long-term information, owing to changes in pricing errors. Liu and Wang (2016) claim that the bid-ask spread decreases as the increase in information asymmetry is positive, and has a positive relationship with volume, owing to the performance of market makers.

Table 3 shows that only asymmetric information is stationary, while the results of the tests performed for the price variable did not reject the null hypothesis that the price was determined by other factors. In the assumptions, the cointegration technique presupposes the non-stationarity of the variables examined but, as the effect of asymmetry on price is being studied, stationarity of S_2 is acceptable. Table 4 confirms this possibility by demonstrating that MAX and TRACE test statistics indicate at least a long-term relationship between P and S_2. This shows that there is a long-term relationship between information asymmetry and price, confirming the theoretical framework of this study. The same tests confirmed the long-term relationship for most stocks when considered individually.

Table 1. Descriptive statistics

	P	S_2
Mean	21.33603	0.014283
Median	16.74815	0.012953
Maximum	245.1100	0.206228
Minimum	0.802772	0.000000
Std. Dev.	16.33711	0.012612
Skewness	3.020776	1.332522
Kurtosis	20.64321	7.518311
Jarque-Bera	2036808.	161158.0
Probability	0.000000	0.000000
Sum	2998929.	2007.533
Sum Sq. Dev.	37514582	22.35896
Observations	140557	140557

Note: P is the daily minimum share price. S_2 is the measure of asymmetric information (Corwin & Schultz, 2012). The sample consisted of the 64 most liquid shares in the Brazilian market from 2009 to 2019. Source: own elaboration.

Table 2. Correlation matrix

	P	S_2
P	1.000000	-0.112060
S_2	-0.112060	1.000000

Source: own elaboration.

Table 3. Stationarity of P e S_2

Method	Statistic	Prob.**	Cross-sections	Obs
P				
Levin, Lin & Chu t*	5.13921	1.0000	65	143081
Im, Pesaran and Shin W-stat	3.31214	0.9995	65	143081
ADF - Fisher Chi-square	103.774	0.9563	65	143081
PP - Fisher Chi-square	95.4450	0.9900	65	143121
S_2				
Levin, Lin & Chu t*	-316.548	0.0000	64	140384
Im, Pesaran and Shin W-stat	-252.731	0.0000	64	140384
ADF - Fisher Chi-square	7168.59	0.0000	64	140384
PP - Fisher Chi-square	3513.75	0.0000	64	140493

Note: the null hypothesis tested is that of the absence of unit root of the variables, which would lead to their endogenous behaviour and is premise for the application of Johansen's cointegration technique (1988; 1991).
Source: own elaboration.

Table 4. Max e Trace of P e S_2

Hypothesized No. of CE(s)	Fisher Stat.* (from trace test)	Prob.	Fisher Stat.* (from max-eigen test)	Prob.
None	1243.	0.0000	1263.	0.0000
At most 1	276.2	0.0000	276.2	0.0000

Note: maximum likelihood and trace tests indicate convergence in Johansen models (1988; 1991).
Source: own elaboration.

Table 5. VECM for P e S_2

Cointegration Equation		
P (-1)	1.000000	
SPREAD (-1)	14386.72	
	(81.6667)	
	[176.164]	
C	-226.8771	
Error Correction:	D(P)	D(S_2)
CointEq1	2.20E-05	-4.34E-05
	(1.3E-05)	(2.7E-07)
	[1.69664]	[-162.724]
D(P (-1))	0.059109	-0.000695
	(0.00286)	(5.9E-05)
	[20.6487]	[-11.8023]
D(P (-2))	-0.015379	0.001082
	(0.00286)	(5.9E-05)
	[-5.38129]	[18.3988]
D(S_2(-1))	-1.830138	-0.119033
	(0.16568)	(0.00341)
	[-11.0465]	[-34.9259]
D(S_2(-2))	-0.443212	-0.076141
	(0.12972)	(0.00267)
	[-3.41659]	[-28.5323]
C	0.007861	-4.05E-06
	(0.00155)	(3.2E-05)
	[5.06120]	[-0.12686]
R-squared	0.006667	0.365103
Adj. R-squared	0.006631	0.365080
Sum sq. Resids	47500.39	20.10126
S.E. equation	0.581746	0.011967
F-statistic	188.4006	16142.58
Log likelihood	-123124.9	422020.8
Akaike AIC	1.754476	-6.013235
Schwarz SC	1.754897	-6.012814
Mean dependente	0.008213	-8.17E-07
S.D. dependente	0.583684	0.015019
Determinant resid covariance (dof adj.)		4.20E-05
Determinant resid covariance		4.20E-05
Log likelihood		308986.2
Akaike information criterion		-4.402505
Schwarz criterion		-4.401523

Note: the parameters of the cointegration equation represent the long-term relationship, and those of the error correction mechanism represent the short-term adjustment performed in that relationship.
Source: own elaboration.

The joint analysis of the cointegration equation and the error correction mechanisms presented in Table 5 demonstrate that asymmetric information anticipates, up to 2 days beforehand, positive movements in stock prices. This is consistent with Ripamonti (2016), Kelly and Ljungqvist (2012), and Bohmann et al. (2019). As also expected, price has a long-term negative relationship with asymmetry, as prices rise at the same time that information is dispersed, causing uninformed traders to fail to anticipate positive returns. The anticipation can also be explained by the hypothesis of price monitoring by insiders supported by Gu et al. (2018).

The sample examined contained the most actively-traded shares in the Brazilian market. In this sense, long-term results would be consistent with those of Rosati et al. (2017), although only developing market conditions were present without low liquidity stocks being included in the studies. In addition, the negative ratio in the same period is consistent with Vaianos and Wang (2012).

Anticipation of asymmetric information to price movements can also be explained by the orders of so-called "market makers" (Levi & Zhang, 2015). Asymmetric information also contributes to the development of asset pricing models as an additional and specific factor to be considered in various models (Fama & French, 2017; Bai et al., 2017).

5. Conclusion

The present study observed that asymmetric information anticipates stock price movements over a period of up to 2 days, and has a long-term negative relationship with stock prices owing to the dispersion of information among uninformed traders.

This confirms the findings of previous studies and also validates an alternative measure of information asymmetry. The main implications are that market efficiency can be achieved by monitoring the measurement of asymmetric information and by selecting portfolios based exclusively on it.

Previous studies observed the relationship between asymmetric information and stock prices on a quarterly basis. The present study allows us to assume that the relationship can also be observed on a daily basis, specifically considering a lag of 2 days. It would therefore be possible for investors to anticipate positions in liquid shares that are part of the Ibovespa in the very short term. Thus, it is observed that the monitoring of asymmetry allows investors with little computational infrastructure the same ability to manage their portfolio as informed investors or corporate managers. In theory, the most liquid stocks would allow greater accuracy of asymmetric information measurements.

In theory, again, the ability of all economic agents to have access to private corporate information would bring about a reasonable level of market efficiency. This would allow the testing of theories of finance that assume the

premise of symmetric information, especially those of capital structure.

As the selected sample considered only liquid stocks, the findings might be quite different under illiquid conditions, or with the inclusion of traditional control variables for size, capital structure, and growth opportunities specified in the analysis.

Conflict of interest

The authors declare no conflict of interest.

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