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Stock pricing in Latin America: The synchronicity effect

Bruno Figlioli*, Fabiano Guasti Lima

School of Economics, Business Administration and Accounting at Ribeirão Preto, University of São Paulo, Accounting Department, Av. Bandeirantes, 3900. Monte Alegre, Ribeirão Preto, SP, Brazil

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ABSTRACT

This paper investigated whether the stock price synchronicity level (SPSL) is a pricing factor in the Latin American scenario. To do so, the shares with the highest liquidity level listed in the stock exchange in five Latin American (LA) countries (Argentina, Brazil, Chile, Mexico and Peru) were used. The results indicated that the SPSL is associated with a positive premium. This premium was obtained by the CAPM model and by the Fama-French three- and five-factor models. There was evidence that the average SPSL increases in periods of greater turmoil in the financial markets. Moreover, it was found that the SPSLs are not associated monotonically with the efficiency levels of stock prices. Overall, the use of the SPSL factor in asset pricing models reduced the bias in estimating the stock premiums in LA.

1. Introduction

Empirical studies, such as that of Leite et al. (2018), provide evidence on the low efficiency of asset pricing models[1] to explain the average stock returns in the Latin American (LA) scenario. This finding remains valid even when considering other regions with profiles of economic growth and social development closer to LA. It follows that the forces underlying the behavior of stock returns are quite specific to particular countries or regions, as suggested by Griffin (2002) and Cakici et al. (2013).

From this perspective, a study directed at LA can contribute to a better understanding of how the process of asset pricing occurs from the idiosyncrasies verified in this environment. It is highlighted that LA presents very distinct legal and regulatory enforcement levels, micro- and macroeconomic conditions, information flow (microstructures) and capital market efficiency, compared to developed economies (Chong and López-de-Silanes, 2007). As a result, investors will demand higher premiums for investing in LA compared to more mature economies because of the additional risks (Donadelli and Persha, 2014; Roggi et al., 2017).

To mitigate possible biases in the risk premium estimates for the equity investments of the companies (shares listed on stock exchanges) in LA countries, the stock price synchronicity levels (SPSL) are investigated in the present study as one of the explanatory factors of these premiums. The motivation for the inclusion of this risk factor in asset pricing models is related to the low levels of stock price informativeness verified in less developed countries (Jin and Myers, 2006; Khanna and Thomas, 2009; Morck et al., 2000).

The SPSL refer to the proportion of the stock price that reflect the general market information, rather than specific company information (Roll, 1988). Therefore, the SPSL can be understood as a relative measure of stock idiosyncratic risk (Aabo et al., 2017). Such a matter permeates a lively academic debate regarding whether the specific company information is priced and if such information represents noise or better-quality information content (Kelly, 2014). Therefore, the SPSL can represent a factor that

* Corresponding author.
E-mail address: figlioli@usp.br (B. Figlioli).

[1] The Fama-French three- and five-factor models (Fama and French, 1992, 1993, 2015).

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captures the production and disclosure of general and specific information of the companies from the idiosyncrasies of the LA economy.

That said, the research problem was defined as follows: is the stock price synchronicity level (SPSL) a relevant factor in asset pricing in LA countries?

To answer the research problem, the research uses the data of the greatest marketability shares in the following five countries of LA: Argentina, Brazil, Chile, Mexico and Peru. The final sample included 290 companies covering the period from January 2000 to April 2018.

The SPSL factor was developed from the stock excess returns to the risk-free rate, which corresponds to the difference of these returns from the stocks with lower and greater synchronicity levels.[2] The SPSL factor was then tested in the asset pricing models by using panel data regressions and portfolio analysis.

The results obtained by the regression analysis indicated a positive and statistically significant premium in relation to the SPSL factor. The CAPM model, as well as the Fama-French three- and five-factor models (Fama and French, 1992, 1993, 2015), were unable to explain the premium associated with the SPSL factor. This result indicated that the relative idiosyncratic risk level (i.e., SPSL) of the stocks is a pricing factor in the Latin American scenario.

Another important result was the realization that the periods with the greatest average level of joint synchronicity among the stocks are associated with the periods of greatest turmoil in the financial markets. For instance, in some cases, "peaks" in the stock synchronicity levels were identified during the subprime securities crisis period in the North American scenario. This result indicates that the greatest synchronicity levels do not correspond, necessarily, to more informative prices for the stocks, as posited by Kelly (2014).

In the portfolio analysis, using the GRS test (Gibbons et al., 1989), it was identified that the CAPM model and the Fama-French three- and five-factor models were suitable for explaining the stock returns for portfolios with high synchronicity levels. An opposite result was found from the portfolios with lower synchronicity level. These results were consistent when considering other possible stock pricing factors, such as gross profitability (Novy-Marx, 2013), accruals (Ball et al., 2016), investments (Titman et al., 2004) and the sales growth rate (Lakonishok et al., 1994).

In the portfolio analysis, the results indicated that the possible abnormalities related to the asset pricing models, as presented in the papers of Harvey et al. (2016), Hou et al. (2015) and Fama and French (2018), are associated with the low synchronicity level stocks. This aspect identified in the stock pricing becomes more important when ascertaining that in the analysis of minimum and optimal variance portfolios, the participation of low synchronicity level stocks surpasses 50%.

It was also tested whether the SPSL represented noise or specific information of the companies reflected in the stock price. The results indicated that the stocks with the lowest SPSLs, but with low bid-ask spread levels, presented market values with a greater association with accounting profits. That indicates that the dichotomous classification for the synchronicity construct between noise or information is debatable (Xing and Anderson, 2011).

Overall, the results obtained have important implications for the company assessment area and contribute to a greater understanding of the risk-return relationship of the stocks listed on the stock exchanges in the LA scope. A fundamental point of the study was the finding that the estimation of risk premiums was sensitive to the informational composition of stock prices. The evidence suggests that the SPSLs capture important characteristics of average stock returns in the LA context, increasing the efficiency of asset pricing models (the CAPM and Fama-French three- and five factors models) in explaining these returns.

In this sense, the study also aims to contribute to the literature that investigates the asset pricing processes in undeveloped or emerging economies, as can be observed in Harvey (1995), Estrada (2000), Fuenzalida and Mongrut (2010), Roggi et al. (2017), among others. Additionally, a wide range of economic-financial information users, such as investors, regulators, risk-rating agencies and investment analysts, can benefit from new mechanisms of company assessment in a region that, according the World Federation Exchanges (WFE, 2018), is becoming one of the main investment routes in developing countries.

This paper is divided into five sections. The first section is this introduction. In the second section, the literature review and the hypotheses development are presented. The third section deals with the methodological aspects. The fourth presents the results and discussion. Finally, the fifth section presents the conclusions.

2. Literature review and hypotheses development

2.1. Synchronicity

One of the main functions of the financial market is the incorporation of relevant information to the asset prices since this function is essential in assessment processes (O'Hara, 2003). From this, it can be inferred that the asset prices reflect, in greater or lesser degree, the expectations of economic agents regarding the cash flow generation and their risk levels.

For the capital market, Grossman and Stiglitz (1980) propose that when the acquisition of information has heavy costs, the stock prices will partially reflect the relevant information. In this same line of reasoning, Veldkamp (2006) indicates that the investors have a substantial share of low-cost information that is common to most of these economic agents. Thus, the low investment in obtaining more specific information of the companies, which tends to be more onerous than more general information on the market, can lead to a comovement effect of stock prices. Such an effect can be measured by the SPSL.

[2] For this case, the cut-off refers to the median value of the stock price synchronicity. Detailed information is given in Section 3.2.

Bartram et al. (2009) identified four factors that would determine the levels of idiosyncratic risk[3] embedded in the stock prices, which are as follows: country risk, ownership rights, development of the financial market, and information environment. These factors are detailed as follows:

1) country risk: a higher level of macroeconomic volatility for a certain country reduces the company's propensity to apply their resources to risky projects (Bartram et al., 2009). For instance, in the Chinese market, Chen et al. (2018) indicated that the level of the company-specific and available information for the investors drastically decreases in periods of greater political uncertainty;
2) ownership rights: Morck et al. (2000) identified that developing countries, classified according to the levels of Gross Domestic Product (GDP), presented greater SPSLs than the developed ones, which can occur due to the lower levels of ownership rights protection in the case of developing countries. Jin and Myers (2006) and Khanna and Thomas (2009) find that the SPSLs are a result of the low-quality corporate governance observed in less developed economies;
3) financial market development: Chelley-Steeley and Lambertides (2016) suggest that the more developed markets present lower information asymmetry among informed and uninformed investors (noise traders). Such markets create, therefore, a greater incentive for transactions based on a better-quality information; and.
4) information environment: the countries with the worst information environment tend to present high SPSLs. For instance, Piotroski and Roulstone (2004) and Chan and Hameed (2006) identified that, in the case of developing countries, the investment analysts have incentives to provide, in their investment recommendations, more general market information over the specific information of the companies.

For LA, the four factors described above take on a very specific outline. That is, the stock price formation is intrinsically related to the idiosyncrasies observed in that environment. For example, the financial markets in LA countries may be characterized, in general, by presenting high volatility of asset prices and low liquidity. The erratic economic growth and the high political instability corroborate this characterization (Bittencourt, 2012; Escobari et al., 2017). Moreover, LA has been experiencing a premature deindustrialization process. The structures of its economic growth are founded, basically, on the performance of the primary sectors of the economy (Diao et al., 2017). In this regard, the economic agents are extremely careful in performing long-term investments, independently of the most promising future perspectives (Leite et al., 2018).

Once the specificities for the LA scenarios have been identified, the interaction of company-specific information with the stock prices and the role performed by more general market information in this pricing process, such as economic and political rumors, are unclear. Therefore, the SPSL represents an emerging matter in need of clarification in LA.

2.2. Hypotheses development

The proposition of new risk factors in asset pricing models seems to be guided more by empirical than theoretical factors. Even if such factors increase the explanatory and predictive power of these models, they do not mean, necessarily, the identification of some more persistent standard of stock returns (Fama and French, 2018).

Nonetheless, the literature in the finance field has indicated that the idiosyncratic risk is priced. According to Merton (1987), in an incomplete information market, the investors will require a premium to keep a portfolio that is not optimally diversified. O'Hara (2003) understands that through the information asymmetry present in the markets, the investors have knowledge of the traded assets, but ignore the importance of each asset, which would be more suitable to develop their investment portfolios. In this regard, the elimination of stock nonsystematic risk by diversifying the investment becomes quite questionable.

On the other hand, the empirical studies carried out in several countries have identified that the idiosyncratic risk can capture important economic aspects subjacent to this phenomenon, as increments of information flow brought about by increased use of information technologies in the investment field (Chelley-Steeley and Lambertides, 2016).

Such studies, many times, reach results which are contrary to those of theoretical prediction. For instance, Ang et al. (2009), from a sample of 23 developed-countries, identified that the portfolios formed by high-level idiosyncratic risk stocks presented a negative differential of approximately −1,31% a month compared to the portfolios with low idiosyncratic risk levels. This negative premium was identified as a persistent characteristic of the stock return, at least for the developed economies. It is seen that such a result is contrary to the theoretical predictions of Merton (1987) and O'Hara (2003), who suggest a positive premium for this type of risk.

Different from Ang et al. (2006, 2009),[4] the investigation of whether the idiosyncratic risk is priced in the capital market will be tested by the SPSL in the present study. This measure regarding the idiosyncratic risk (SPSL) may provide better risk premium estimates for the following two reasons: i) the relationship between systematic and diversified risks is not stable over time, as indicated by Campbell et al. (2001); and ii) measures regarding the relative idiosyncratic risks would be more robust compared to absolute measures in identifying noises incorporated into the stock prices (Aabo et al., 2017). Thus, Hypothesis 1 is presented in its alternative form.

Hypothesis 1. (H1): The SPSL is a pricing factor in the LA capital market scope.

[3] The SPSL fit as a relative measurement of the stock idiosyncratic risk.

[4] The authors measured the idiosyncratic risk by the error term of the Fama and French (1993) three-factor model. Such a measure may be considered in absolute terms in relation to this type of risk.

Hypothesis 1 intends to provide evidence regarding the pricing process in LA. According to Grandes et al. (2010), approximately 67% of the total average volatility of the stocks can be granted to the idiosyncratic risk; nevertheless, such risk meets serious constraints to be eliminated by diversification processes due to, among others, the low liquidity seen in these markets.

The second hypothesis related the SPSL to the periods of greater turbulence in the financial markets.[5] The association between idiosyncratic risk and macroeconomic variables can be found in Campbell et al. (2001). The authors concluded that the company-specific risk (aggregate) has a predictive value for the Gross Domestic Product (GDP) growth rate in the North American scenario. Goyal and Santa-Clara (2003) and Guo and Savickas (2008) suggest an association between idiosyncratic risk and the market portfolio return.

For the studies related to LA, Figlioli et al. (2017), when investigating the IFRS adoption process in the Brazilian scenario, identified an increase in the SPSL in periods of financial crises, regardless of the accounting standards adopted. The authors suggest that the role of noise traders is more significant in these periods, which tends to distort the stock prices widely.

From these considerations, Hypothesis 2 is presented next in its alternative form.

Hypothesis 2. (H2): there is a positive premium associated with the SPSL in periods of greater turmoil in the financial markets in the Latin American scenario.

The justification for Hypothesis 2 is in the plausibility of greater stock price comovement in periods of higher risk levels. That implies a positive association between the SPSL and the returns required by the investors in such periods.

The third hypothesis investigates whether the SPSL represents noise or specific information about the companies. Studies on the theme have indicated several inconsistencies. According to Morck et al. (2000, 2013) and Durnev et al. (2003, 2004), the SPSL represents an inverse measure of stock price informativity. In this context, lower SPSLs are associated with the company-specific information embedded into the stock prices, which would make them more informationally efficient. On the other hand, Hou et al. (2006), Dasgupta et al. (2010) and Kelly (2014) suggest that the stock price informativity is positively associated with the SPSL.

Fundamentally, such studies suggest a monotonic relation (strictly positive or negative) between the SPSL and the stock price information efficiency, as indicated by Xing and Anderson (2011). Accordingly, Hypothesis 3 was set, and it is described next in its alternative form.

Hypothesis 3. (H3): the relation between the SPSL and the stock price information efficiency is not monotonic.

Hypothesis 3 intends, therefore, to identify how the idiosyncratic risk, used in the current study as an explanatory variable of the stock excess returns, is associated with the information available to the economic agents for decision making.

3. Methodological aspects

3.1. Data collection and sample

The data used in the paper were collected on a daily, monthly and yearly[6] basis, which is the format in the Thomson Reuters™ information system. All the values of the observations collected are in nominal North American dollars. When necessary, as regarding the stock prices, their values were adjusted for earnings of any nature, to avoid the discontinuity of financial series.

The period of analysis spans from January 2000 to April 2018, corresponding to 220 months. This period of analysis was chosen because the data necessary for conducting the research prior to the year 2000 were limited, which makes it difficult to carry out econometric tests for a larger time window. However, Foye (2018) and Leite et al. (2018) indicate that the 220-month period is adequate for estimating the risk premium in the LA scenario. The authors performed these estimates from a period of analysis of 228 months (July 1997 to June 2016) and 98 months (July 2007 to February 2017), respectively.

To form the sample, stocks traded in LA countries that had at least 80% of the transactions carried out during the working days of trading within the period of analysis were chosen. This procedure aimed to mitigate matters related to the low shareholding liquidity level observed for the Latin American companies. The very low liquidity levels identified, mainly in the developing markets, may lead to biased estimators and to inference errors regarding the econometric models (Bekaert et al., 2007). Moreover, when a certain company trades more than one stock type, just the stock with the higher liquidity level was chosen to form the sample.

Procedures for the exclusion of sample data were also adopted as follows: i) exclusion of data regarding the financial sector; ii) exclusion of data of companies which presented, for a certain period, negative equity (the results were based on the assumption of a business continuance - going concern); and iii) exclusion of extreme observations[7] (1st and 99th percentiles).

The final sample consisted of information from 290 companies located in the following five LA countries: Argentina, Brazil, Chile, Mexico and Peru. Information provided by the International Monetary Fund (IMF) certifies that these countries represent approximately 76% of the Gross Domestic Product (GDP)[8] generated in all LA in 2017. Thus, the sample was expected to be adequate to capture the relevant characteristics of stock returns for this region. One limitation of the sample, however, is that it was not possible

[5] The term "periods of greater financial market turmoil" refers to both the financial crises and the economic recessions.

[6] The estimation of risk premiums (sections 3.2 and 3.3) employed monthly data, as recommended by Gregory et al. (2018). The levels of stock liquidity (section 3.1) were identified through daily data. Additional tests (Section 3.3.3) used annual data.

[7] The treatment of the outliers from the winsorization of the variables (1st and 99th percentiles) does not change the results.

[8] Information available at: https://www.imf.org/external/pubs/ft/weo/2017/02/weodata/index.aspx.

Table 1
Composition of the sample.

Country	Number of companies	Valid observations	Relative frequencies
Argentina	46	9572	16.25%
Brazil	87	17,664	29.99%
Chile	71	14,229	24.16%
Mexico	48	9970	16.93%
Peru	38	7471	12.68%
Total	290	58,906	100.00%

Notes: This table shows the composition of the sample separated according to the countries analyzed. The valid observations refer to monthly data collection. The relative frequencies regard the number of valid observations for each country in relation to the number of total valid observations.

to extract sufficient data from the database for countries such as Colombia and Venezuela. For these countries, a large amount of missing data was verified along with the low level of liquidity of their capital markets. Table 1 shows the composition of the sample.

Table 1 shows that the majority of observations are from Brazil and Chile, which make up 54.15% of the sample. Argentina and Mexico add 33.18%. The fewest observations were from Peru, which corresponds to approximately 13% of the sample.

3.2. Measurement of the SPSL factor

The measurement of the SPSL followed Chan and Hameed (2006). The monthly returns of each stock (dependent variable) and within the period of analysis were receded in relation to the monthly returns representative of the market portfolio[9] (independent variable) of the respective country in which the stock is traded. This econometric model was, thus, defined as follows:

$$R_{it} = \alpha + B_1 MKT_t + \varepsilon_t \tag{1}$$

where R_{it} represents the stock return i for the period t. MKT_t refers to the market portfolio return for the period t. α is the linear coefficient. β_1 is the angular coefficient, and ε_t is the error term.

Econometric model 1 does not use the stock return data regarding the economic sector of the companies as an independent variable. According to Chan and Hameed (2006), the high sectoral concentration observed in developing countries makes it difficult to isolate the effect of sectoral returns in relation to the SPSL. Such a procedure is justified in this paper, considering that only the stocks with the greatest liquidity level in each country analyzed were chosen to comprise the sample, which greatly reduced number of companies belonging to the same sector.

The coefficients of determination (R^2) obtained from Model 1 and for each stock of the sample, suffered a logistic transformation, as recommended by Morck et al. (2000, 2013) and Durnev et al. (2003, 2004). This modeling was defined in the following way:

$$SPSL_i = ln\left(\frac{R_i^2}{1 - R_i^2}\right) \tag{2}$$

In the formula above, $SPSL_i$ represents the stock price synchronicity level i. R_i^2 represents the coefficient of determination in relation to the stock i, and ln is the Napierian logarithm.

Afterwards, the stocks traded in each market were arranged according to the median value of the SPSL variable. This procedure separated the sample into two company groups: those which the lowest SPSL (Small_SPSL) and those with the highest SPSL (Big_SPSL).

For each month in the January 2000 to April 2018 period, the stock excess returns at the risk- free rate for the theoretical Small_SPSL and Big_SPSL portfolios were calculated. The excess returns of these portfolios were pondered by the companies' market value and the risk-free rate used refers to the *U.S. Treasury Bill*[10] with three-month maturity. With that information, the SPSL factor was calculated from the following expression:

$$Factor\_SPSL_t = Small\_SPSL_t - Big\_SPSL_t \tag{3}$$

where the $Factor\_SPSL_t$ represents the factor of the stock price synchronicity levels for the month t. $Small\_SPSL_t$ is the portfolio formed by the excess stock returns at the risk-free rate and that presented a low SPSL. This portfolio refers to the month t. Big_SPSL_t is the portfolio formed by the excess stock returns at a free rate and that presented a high SPSL. It refers to the month t.

The SPSL factor, operationalized by the $Factor\_SPSL_t$ variable, was used in the asset pricing models as an explanatory variable of the stock returns. This topic is presented in the next section.

[9] The following stock indices were used as market portfolio representatives: Argentina (Merval); Brazil (Ibovespa); Chile (IPSA); Mexico (IPC); and Peru (S & P/BVL Peru General).

[10] It represents a risk-free rate proxy for the North American scenario. The use of this risk-free rate can be observed in Fama and French (2017), in which the authors tested the efficiency of an asset pricing five-factor model for a sample, which comprised observations from 23 developed markets. In this paper, the authors used the *U.S. Treasury Bill* with a one-month maturity.

3.3. Econometric models

As stated by Ang et al. (2018), the literature in the finance field shows two branches for the test of risk factors in asset pricing models, as follows: the development of portfolios and the analysis of individual assets. The authors indicate that the stock aggregation in portfolios entails the reduction of the dispersion of estimated coefficients, which would lead to a less reliable measure of the load estimation for each risk factor. Nonetheless, portfolio analysis is widely used in these types of tests (Fama and French, 1992, 1993, 2015, 2017, 2018).

Thus, to mitigate the biases in the estimation of the parameters in the econometric models, both a panel data regression and portfolio analysis were used.

3.3.1. Panel data regression

In the panel data regression analysis, the SPSL factor was tested from modified versions of the CAPM model (Lintner, 1965; Mossin, 1966; Sharpe, 1964) and the Fama and French (1992, 1993, 2015) three- and five-factor models. This econometric modeling is presented next.

$$R_{it} - Rf_t = \alpha + \beta_1 MKT_{Lt} + \beta_2 MKT_{Lt-1} + \beta_3 MKT_{Lt-2} + \beta_4 Factor\_SPSL_t + \beta_5 Cond\_SPSL + \beta_6 D1\_Incond + \beta_7 D\_Argentina + \beta_8 D\_Chile + \beta_9 D\_Mexico + \beta_{10} D\_Peru + \varepsilon_t \quad (4)$$

$$R_{it} - Rf_t = \alpha + \beta_1 MKT_{Gt} + \beta_2 MKT_{Gt-1} + \beta_3 MKT_{Gt-2} + \beta_4 SMB_t + \beta_5 HML_t + \beta_6 Factor\_SPSL_t + \beta_7 Cond\_SPSL + \beta_8 D1\_Incond + \beta_9 D\_Argentina + \beta_{10} D\_Chile + \beta_{11} D\_Mexico + \beta_{12} D\_Peru + \varepsilon_t \quad (5)$$

$$R_{it} - Rf_t = \alpha + \beta_1 MKT_{Gt} + \beta_2 MKT_{Gt-1} + \beta_3 MKT_{Gt-2} + \beta_4 SMB_t + \beta_5 HML_t + \beta_6 CMA_t + \beta_7 RMW_t + \beta_8 Factor\_SPSL_t + \beta_9 Cond\_SPSL + \beta_{10} D1\_Incond + \beta_{11} D\_Argentina + \beta_{12} D\_Chile + \beta_{13} D\_Mexico + \beta_{14} D\_Peru + \varepsilon_t \quad (6)$$

where R_{it} is the stock return i for the period t. Rf_t refers to the risk-free rate for the period t. For this rate, the *U.S. Treasury Bill* with three-month maturity was used as the representative of the risk-free rate. MKT_{Lt}, MKT_{Lt-1} and MKT_{Lt-2} represent the excess local market portfolio return at the risk free rate for the periods t, t-1 and t-2, respectively. MKT_{Gt}, MKT_{Gt-1} and MKT_{Gt-2} represent the excess global market portfolio return at the risk free rate for the periods t, t-1 and t-2, respectively. SMB_t is the size factor for the period t. HML_t is the value factor for the period t. CMA_t is the investment factor for the period t. RMW_t is the profitability factor for the period t. $Factor\_SPSL_t$ refers to the premium representative factor in relation to the SPSL for period t. Cond_SPSL is the variable related to the conditional SPSL. D1_Incond refers to dichotomous variable, which takes the value 1 for the stocks that presented SPSL values below the median value for this variable and takes the value 0 for all the other observations. D_Argentina, D_Chile, D_Mexico and D_Peru represent dichotomous variables associated with the countries. For example, D_Argentina takes the value 1 if the stock is traded in the Argentinean market and the value 0 for all other observations. Brazil has taken on the reference category in relation to the countries analyzed, and ε_t is the error term.

Model 4[11] uses the stock excess returns at a risk-free rate as a dependent variable. For market portfolio excess returns, the data of the stock indices in relation to the country in which the target stocks of the study are traded were used. For this variable (market portfolio excess returns), lagged variables were inserted to control the results by possible delays in which the stock returns absorb the market information, as advocated by Hou and Moskowitz (2005). Model 4 was tested for each analyzed country as well as collectively.

On the other hand, models 5 and 6[12] use the data made available by professor Kenneth R. French's[13] digital library for the following variables: MKT_G (global market portfolio excess return), SMB (size factor), HML (value factor), CMA (investment factor) and RMW (profitability factor). This strategy of using data from premiums obtained by certain risk factors in developed economies as explanatory factors of stock returns in developing countries can be observed, for instance, in the work of Leite et al. (2018). Moreover, another important aspect in the use of proxy variables for premiums obtained in international markets is that the common risk factors identified among the LA countries may signal the integration level of the financial markets for that region, even if there is no relevant economic integration. That way, models 5 and 6 were tested for the joint sample of the countries analyzed.

For the three asset pricing models (models 4, 5 and 6), it was expected that the coefficient related to the $Factor\_SPSL_t$ variable, which is directly associated with the test of Hypothesis 1, would present a positive sign and statistical significance. This result would indicate a positive premium related to the lower SPSL stocks. The identification of a positive premium for stocks with higher levels of idiosyncratic risk is in accordance with the theoretical predictions of Merton (1987) and O'Hara (2003). The models proposed also use the D1_Incond variable as a way to identify whether the $Factor\_SPSL_t$ does not express just a less important factor when controlling the results through the rating of stocks from low to high SPSLs.

For the test of Hypothesis 2, the Cond_SPSL variable was developed. This variable represents the conditional SPSL (variable over time). To do so, dynamic conditional correlations were calculated, based on Engle (2002), between the stock returns and the local

[11] Based on the CAPM model developed by Sharpe (1964), Lintner (1965) and Mossin (1966).

[12] Models 5 and 6 were based, respectively, on the Fama and French (1992, 1993, 2015) three- and five-factor models.

[13] Kenneth R. French is a Finance professor at the *Tuck School of Business at Dartmouth College*. The information is available at: http://mba.tuck.ia dartmouth.edu/pages/faculty/ken.french/data_library.html.

market portfolio returns. These correlations were squared to obtain a proxy variable for the conditional R^2 for each stock. Afterwards, the conditional SPSL were calculated for each stock and period (monthly) following the same procedures previously mentioned (section 3.2). The averages for each month in relation to the conditional SPSL were also obtained. Finally, the Cond_SPSL variable takes on a value of 1 for values equal to or higher than the 95th percentile of the mean conditional SPSL and a value of 0 for the other observations.

Thus, whether the periods of higher mean stock comovement levels (conditional SPSL) are associated with the periods of greatest turmoil in the financial markets was tested. The coefficient of the Cond_SPSL variable was expected to present a positive sign and statistical significance, which would indicate that investors would require an additional premium in such periods.

As a robustness test, a second sample was developed for the Brazilian case. This sample consisted of information from 106 companies not belonging to the main sample. For the formation of this sample, it was necessary to reduce the period of analysis (January 2006 to April 2018) as a way to obtain sufficient data to conduct the econometric tests. The data exclusion procedures were applied, as presented in Section 3.1. For Argentina, Chile, Mexico, and Peru, it was not possible to develop new samples due mainly to the number of shares listed in the capital markets of these countries and that they could more satisfactorily meet the criteria adopted for the formation of the samples.

The test with the second sample aims to check the persistence of the SPSL factor in explaining the stock returns, even for a sample that presented a mean shareholding liquidity level below the main sample of the study. Moreover, this robustness test allows the identification of whether the SPSL factor would be just a spurious association in relation to the main sample.

3.3.2. Portfolio analysis

For the portfolio analysis, the excess returns at the free risk rate and pondered by the company market value, and referring to the 290 stocks analyzed, were separated into 9 portfolios (3x3 portfolios). A greater portfolio number, such as the 25 portfolios (5x5 portfolios) observed in Fama and French (1992), would hardly enable the reduction or elimination of idiosyncratic risk. For a total of 290 assets, the average of the stocks belonging to each portfolio (5x5 portfolio) would be approximately 12. While with the 3x3 portfolio, it would be approximately 32 stocks, on average.

Another important issue in the portfolio analysis regards the plausibility of using data from more than one country in forming portfolios corresponding to a certain region. This research strategy can be seen in Fama and French (2017). The authors combined the data of 23 developed countries in the following four regions: North America, Japan, Asia and Pacific and Europe. Thus, this study develops the portfolio analysis for the Latin American scenario.

For the construction of 3x3 portfolios, the stocks were separated in thirds in an independent way in relation to the SPSL (monthly data) and for other possible pricing factors, which are as follows:

a) beta coefficient: for this variable, the stocks were classified from the beta coefficient (market risk) for a 5-year period. For instance, the portfolio setting for 2005 considered the calculation of the beta coefficient from 2000 to 2004. This variable is strongly based on the CAPM model (Lintner, 1965; Mossin, 1966; Sharpe, 1964);
b) company size: the stocks were classified according to the company market value in relation to June of each year, as recommended by Fama and French (1992, 1993);
c) book-to-market ratio: the portfolio setting considered the values taken on by this variable in relation to June of each year, as recommended by Fama and French (1992, 1993);
d) gross profitability: for this variable development, the yearly gross profitability of the companies for the year t was staggered in relation to the mean total asset corresponding to the year t-1. This staggering procedure can be seen in the paper of Novy-Marx (2013). Then, the portfolios corresponding to the year t were constructed from the values obtained for the gross profitability of the companies in relation to the year t-1;
e) accruals: according to Ball et al. (2016), the noncash component of book profits (accruals) is a priced factor in the capital market. The measurement of the accruals followed Sloan (1996), from the following expression:

$$Accruals_t = \frac{(\Delta CA - \Delta Cash) - (\Delta CL - \Delta DLC - \Delta TP) - Dep}{TA} \tag{7}$$

where ΔCA is the change in current assets. ΔCash is the change in cash. ΔCL is the variation of current liabilities. ΔDLC is the change in debt (loans and financing). ΔTP is the change in taxes payable. Dep refers to depreciation and amortization. TA represents the average total assets. For the Accruals variable, the portfolios corresponding to the year t were developed from the values taken on by this variable in the year t-1;

f) investments: according to Titman et al. (2004), the stock prices tend to quickly reflect the announcements of large corporate investments. For the operationalization of portfolios based on investment levels, the annual investments in fixed assets (Capital Expenditure- CAPEX) were staggered by the average total assets of the companies for the year t-1. The portfolios corresponding to the year t were developed from the values taken on by this variable in the year t-1; and.
g) sales growth rate: according to Lakonishok et al. (1994), the companies that present growing sales rates over the time tend to incorporate a premium in relation to their stock returns. That way, the construction of the portfolios for the period t are based on the historical average for four lagged periods (t-1, t-2, t-3 and t-4) for sales growth rates, as recommended by Lakonishok et al. (1994).

The objective intended with the portfolio analysis, from the SPSL and the other risk factors used, was to identify the suitability of the CAPM model (Lintner, 1965; Mossin, 1966; Sharpe, 1964) and the Fama-French three- and five-factor models (1992, 1993, 2015) to explain the stock returns for these portfolios. To that end, the GRS test (Gibbons et al., 1989), which tests the intercept significance (alpha) of the asset pricing models for a certain portfolio set, will be used. It was expected that the GRS test would present statistical significance for the portfolios with low SPSLs and, at the same time, did not present significance for the portfolios with higher values for the SPSL. This result would provide evidence that the SPSL is a pricing factor in the capital market, which is obtained only in a partial way by more traditional asset pricing models.

As an additional way to investigate the SPSL role in the stock pricing process, minimum variance portfolios and optimal variance portfolios were developed from the considerations of Markowitz (1952). The creation of these portfolios involved the separation of the stocks in five portfolios (for each of the 20% observations) in relation to the SPSL values. This analysis used the following two distinct periods: from January 2000 to April 2018 and from January 2010 to April 2018. This procedure aimed to identify the persistence of the results between the different portfolios and for different periods. The stocks with the lowest SPSLs were expected to have a substantial role in creating the portfolios. Such a result would bring further evidence regarding the relevance of the SPSL factor to the development of investment strategies in the LA scenario.

3.3.3. SPSL: information or noise?

How the relative idiosyncratic risk (SPSL) is incorporated in the stock prices, to identify whether this type of risk represents pricing of relevant information or it merely consists of noise, was investigated from a econometric modeling based on accounting information. According to Durnev et al. (2003, 2004), the accounting information conveys one of the main sources of the company-specific information. This econometric modeling was defined in the following way:

$$ln(MV_{it}) = \alpha + \beta_1 ln(Book_{it}) + \beta_2 ln(Abs(NetIncome_{it})) + \beta_3 DLoss_{it} + \beta_4 ln(Abs(NetIncome_{it})).\ DSPSL_{it} + \beta_5 ln(Abs(NetIncome_{it})).\ DBidAsk_{it} + \beta_6 ln(Lev_{it}) + \beta_7 DChile + \beta_8 DMexico + \varepsilon_t \quad (8)$$

where MV_{it} represents the market value of company i for period t. $Book_{it}$ refers to the equity of company i for period t. $NetIncome_{it}$ is the net profit before taxes of company i and for period t. $Dloss_{it}$ refers to the dichotomous variable, which takes on the value 1 if the net profit before taxes for company i in period t presents a negative value. It takes on the value 0 for the other observations. $DSPSL_{it}$ refers to a dichotomous variable that takes the value of 1 for the stocks with SPSL values equal to or lower than the median value for this variable in period t. It takes on the value of 0 for the other observations. $DBidAsk_{it}$ refers to a dichotomous variable that takes on the value of 1 in the following condition: stocks with values equal to or lower than the median value for the *Bid-Ask* spread for company i in period t. It takes on the value of 0 for the other observations. Lev_{it} is the financial leverage for company i in period t. This variable conveys the relation between the liabilities and the equity. DChile and DMexico represent dichotomous variables that take on the value of 1 for the stocks traded in the Chilean and Mexican markets, respectively. It takes on the value 0 for the other observations. Brazil is the reference category for this econometric modeling. Ln is the Napierian logarithm. Abs represents the absolute value, and ε_t is the error term.

Model 8 was tested from the yearly data for the following two distinct periods: 2007 to 2017 and 2013 to 2017. The second period of the analysis aimed to control the results by using the IFRS adoption process in the LA[14] scenario.

The countries in model 8 were Brazil, Chile and Mexico. These countries presented the highest levels of market capitalization in Latin America during the period from 2007 to 2017.[15] This size factor of capital markets can present important relationships regarding how information interacts with stock prices through different mechanisms, such as the quantity and quality of the reports made by investment analysts (Chan and Hameed, 2006; Piotroski and Roulstone, 2004), the participation of institutional investors in the ownership structure of companies (De-la-Hoz and Pombo, 2016), the market anomalies associated with small firms (Fama and French, 2018), among others. Therefore, the exclusions of data from Argentina and Peru[16] in model 8 were aimed at controlling the results through aspects related to the levels of development achieved by the capital markets analyzed.

For model 8, the coefficients related to the equity and accounting profit (β_1 and β_2 coefficients) were expected to present a positive sign and statistical significance. On the other hand, for periods with negative accounting profit, a coefficient (β_3) with a negative sign was expected, indicating a reduction of the market value of the companies in such profitability conditions. The results were also controlled by the financial leverage of the companies. The β_6 coefficient was expected to present a positive sign and statistical significance.

For the Hypothesis 3 test, it was conjectured that the β_4 and β_5 coefficients would present opposite signs, which would indicate that the SPSLs are not monotonically related (strictly positive or negative) to the information efficiency levels of stock prices.

More specifically, the β_4 coefficient was expected to present a negative sign, which would denote a lower company market value reaction in relation to the accounting profit for stocks with lower SPSLs. This result could suggest that the SPSL represents noises that are incorporated into the stock prices. Nevertheless, it was assumed that the β_5 coefficient presents a positive sign. That is, for the stocks with lower SPSL values, but which demonstrated low Bid-Ask spread levels, the company market value would have be a greater response to the disclosure of accounting profit. On the other hand, this result would indicate that the SPSLs are associated with specific information about the companies and that are reflected in the stock prices.

[14] Brazil has fully adopted the IFRS since 2010. Mexico and Chile adopted this accounting standard beginning in 2012 and 2013, respectively.

[15] Information available at: https://www.imf.org/external/pubs/ft/weo/2017/02/weodata/index.aspx.

[16] The unreported results indicate that the inclusion of data from Argentina and Peru in model 8 does not change the results.

Table 2
$SPSL_i$: descriptive statistics.

Statistics	Argentina	Brazil	Chile	Mexico	Peru	LA
Average	−2.373	−2.455	−2.578	−2.350	−1.592	−2.345
Standard deviation	1.106	1.456	1.740	1.872	0.928	1.537
Asymmetry	−0.908	−0.750	−3.184	−1.230	−0.654	−1.894
Kurtosis	4.384	3.159	16.052	4.630	3.352	10.007
P1	−6.191	−6.420	−12.453	−9.003	−4.103	−6.930
P5	−4.126	−5.309	−6.629	−6.452	−3.411	−5.027
P25	−3.134	−3.247	−2.826	−3.252	−2.080	−3.020
P50 (median)	−2.134	−2.221	−2.196	−1.757	−1.453	−2.016
P75	−1.589	−1.404	−1.575	−1.137	−0.977	−1.404
P95	−0.846	−0.539	−1.104	−0.108	−0.101	−0.540
P99	−0.536	−0.087	−0.895	0.105	0.279	0.040

Notes: Table 2 presents the descriptive statistics for the SPSL variable (price synchronicity levels for stock i) separated according to the countries analyzed as well as for LA. These statistics refer to the measures of central tendency (average and median), sample dispersion (standard deviation), asymmetry, kurtosis and the distribution percentiles (P1, P5, P25, P50 (median), P75, P95 and P99).

The use of stock Bid-Ask spread in model 8 is justified because this variable is suitable to capture the information asymmetry levels involved in stock price forming (Armstrong et al., 2011). This variable was defined in the following way:

$$Bid\ Ask\ spread = \frac{Ask_{it} - Bid_{it}}{Ask_{it}} \tag{9}$$

where Ask_{it} is the *Ask* price for stock i in period t. Bid_{it} is the Bid price for stock i in period t.

Finally, model 8 was tested from the regressions based on Fama and MacBeth (1973). For these regressions, the t statistic was adjusted in accordance with the recommendations of Newey and West (1987). Panel data regression models with robust standard errors and clustering per stock were also used.

4. Results

4.1. Descriptive statistics

The descriptive statistics related to the SPSL variable are presented in Table 2, which follows.

Brazil and Chile presented the lowest averages and medians for the SPSL variable, while Peru showed the highest values for these statistics. Argentina and Mexico had intermediate values for the measures of central tendency. Results very similar to those reached can be found in Marcet (2017). The author identified that for the 2000–2015 period, Peru presented an average value for the coefficient of determination (R^2) of 24.99% regarding the stocks investigated. For the same period, the average R^2 values identified for Brazil and Chile were approximately 18.07% and 17.43%, respectively.

Thus, Peru was identified as the country with the lowest information efficiency level compared to the other countries that are part of the sample of this paper, mainly when compared to Brazil and Chile.

For LA, an average SPSL of −2.345 was identified. Xing and Anderson (2011) found a value of −2.51 for this variable in the North American scenario. In the Chinese market, Lin et al. (2015) had a value of −0.38. For the United Kingdom, Morck et al. (2000) reached an approximate value of −2.72. Thus, the results found for LA in relation to the SPSL are aligned to the values observed in more developed economies.

Another analysis performed concerns the correlation coefficients between the SPSL factor, operationalized by the $Factor\_SPSL_t$ variable, and the other risk factors used in the regression tests. The partial and semipartial correlations between the share returns and risk factors were also analyzed. These results are presented in Table 3.

Table 3 Panel A demonstrates that the correlations between the $Factor\_SPSL_t$ variable and the other risk factors, although the majority presents statistical significance at the 1% level, had relatively low values, which suggests the $Factor\_SPSL_t$ variable captures other dimensions associated with risks. The greatest correlation level found is related to the representative variables of market portfolio excess return (MKT_L and MKT_G) with the $Factor\_SPSL_t$. Nevertheless, the analyses of the partial and semipartial correlations (Table 3 - Panel B and C) indicated that the correlation between the stock excess returns (R_{it} – Rf_t) and the $Factor\_SPSL_t$ variable is positive and statistically significant, even when controlling such results by the other risk factors. This result provides some initial indications that the premium associated with the SPSL is positive. The next section will analyze this possible premium from regressions.

Table 3
Correlations.

Variables	Argentina	Brazil	Chile	Mexico	Peru	LA
Panel A: bivariate correlations - factor_SPSL$_t$ reference variable						
MKT_L	−0.361***	−0.386***	−0.056***	−0.532***	−0.445***	−0.271***
MKT_G	−0.197***	−0.307***	0.012	−0.408***	−0.087***	−0.131***
SMB	−0.008	0.064***	−0.010	−0.271***	0.053***	−0.013***
HML	0.042***	−0.065***	0.031***	0.078***	−0.100***	0.000
CMA	0.117***	−0.024***	0.043***	0.159***	−0.016	0.044***
RMW	0.179***	0.038***	0.056***	0.315***	−0.039***	0.081***

Variables	Partial Corr.	Semipartial Corr.	Significance
Panel B: Partial and semi partial correlations - ($R_{it} - Rf_t$) reference variable			
Factor_SPSL	0.098	0.092	0.000
MKT_L	0.345	0.344	0.000
Panel C: partial and semipartial correlations- ($R_{it} - Rf_t$) reference variable			
Factor_SPSL	0.030	0.030	0.000
MKT_G	0.044	0.044	0.000
SMB	0.006	0.006	0.131
HML	−0.006	−0.006	0.149
CMA	−0.004	−0.004	0.383
RMW	0.007	0.007	0.077

Notes: Table 3 is divided into three panels (A, B and C). Panel A shows the Pearson correlations between the Factor_SPSL$_t$ and the MKT_L (local market portfolio excess return to risk-free rate), MKT_G (global market portfolio excess return to risk-free rate), SMB (size factor), HML (value factor), CMA (investment factor) and RMW (profitability factor). Panel A provides information according to the countries analyzed and for the LA sample. Panels B and C provide the partial and semipartial correlation coefficients, having as the reference variable the expression ($R_i - Rf_t$), which expresses the stock excess returns to the risk-free rate. The significance levels for the results are presented in the following way: *** significance at 1%, ** significance at 5%, * significance at 10%.

4.2. Panel data regression

The preliminary tests (*Wooldridge* and *Pesaran*) used long panel data regression from the first order autoregressive effects AR(1) with heteroscedastic error terms. The results are presented in Table 4.[17]

The market premiums, represented by the local and global market portfolio (MKT_L and MKT_G), presented coefficients with positive signs and statistical significance. In many cases, the lagged variables for the market premiums were significant, which suggests that the market premium is incorporated into the stock returns with a certain delay. Another important result was that the market premiums observed in more developed economies were suitable in explaining the stock returns in the Latin American scenario, which implies a relative integration for these financial markets.

For the regression analysis, the SMB, HML, CMA and RMW factors provided little explanation for the behavior of the stock returns in LA. An exception is the HML factor, which presented negative and statistically significant premiums for the LA(2) and LA(3) tests.

Those negative premiums found for the HML factor in the LA scope differ from the results observed in developed economies, as evinced in Fama and French (1992, 1993, 2015, 2017, 2018). Nonetheless, negative premiums for the HML factor in developing economies can be identified in the work of Leite et al. (2018). That way, the dynamics regarding the risk factors have, most likely, very peculiar characteristics when investigating the stock returns in less developed economies.

The Brazil (1) and Brazil (2) tests, which used the data for a second sample for the Brazilian scenario, indicate that the factor regarding the SPSL (Factor_SPSL$_t$) proved to be persistent in explaining the stock returns. It is worth noting that these tests used both premiums by the risk identified in the local economy (Brazil (1)) and in international markets (Brazil (2)).

Such results corroborate the idea that the idiosyncratic risk is a relevant element in stock pricing and is associated with a positive premium. Thus, the investors would demand additional excess returns for low SPSL stocks. This result is in accordance with the theoretical predictions of Merton (1987) and O'Hara (2003). They differ, however, from the papers of Ang et al. (2006, 2009).

For the Cond_SPSL variable, the coefficients were shown to be statistically significant with a positive sign for the cases of Argentina, Brazil(1), AL(1), AL(2) and AL(3). For Chile, the coefficient had a negative sign, which is contrary to what was expected. Mexico and Peru did not present significant coefficients for this variable. Additionally, the Brazil(1) and Brazil(2) tests were not relevant. From these findings, other analyses were carried out for the Cond_SPSL variable. Fig. 1 shows the mean conditional synchronicity levels for the period from January 2007 to December 2010.

In Fig. 1, it is ascertained that the greatest mean stock price comovement levels took place in Peru and Mexico in November 2008. Argentina and Brazil also presented an increase for the conditional SPSL in this same period. For Chile, the variation occurred mainly

[17] The results for the Fama and French (1992, 1993, 2015) three- and five-factor models had very close results regarding the risk factors. Thus, just the five-factor model results were reported in Table 4.

Table 4
Panel data regression analysis.

Variables	Argentina	Brazil (1)	Brazil (2)	Brazil (3)	Chile	Mexico	Peru	AL (1)	AL(2)	Al(3)
Constant	0.023***	0.006	0.030***	0.009*	0.002	0.005***	0.010***	0.018***	0.004**	0.002
MKT_{Lt}	0.598***	0.515***	1.044***		1.062***	0.873***	0.978***	0.706***		
MKT_{Lt-1}	0.248***	0.276***	0.100**		−0.050	0.169***	0.049	0.190***		
MKT_{Lt-2}	−0.036	0.218***	0.206***		0.061	0.081***	−0.018	0.082***		
MKT_{Gt}				1.331***					0.711***	0.714***
MKT_{Gt-1}				0.164					0.302***	0.316***
MKT_{Gt-2}				0.149					0.154**	0.157*
$Factor\_SPSL_t$	**0.408*** **	**0.210** **	**1.147*** **	**0.892*** **	**0.449*** **	**0.337*** **	**0287*** **	**0.387*** **	**0.256*** **	**0.320*** **
Cond_SPSL	0.055***	0.121***	−0.014	0.015	−0.021**	0.003	.-0.006	0.039***	0.056***	0.064***
D1_Incond	0.002	0.033***			0.018***	0.003	0.004	0.016***	0.016***	0.017***
SMB_t				−0.311					0.178*	0.206
HML_t				−0.302					−0.274**	−0.333*
CMA_t				0.006					−0.004	−0.001
RMW_t				0.445					0.177	0.218
D_Argentina								0.0022**	0.001	0.002
D_Chile								−0.018***	−0.017***	−0.016***
D_Mexico								−0.021***	−0.190***	−0.019***
D_Peru								−0.016	−0.008	
Observations	9572	17,664	14,128	14,128	14,229	9970	7471	58,906	58,906	51,435
R2	13.95%	0.31%	0.93%	0.61%	2.17%	13.52%	12.32%	0.95%	0.46%	0.48%
Wald chi2	323.83***	251.47***	564.13***	168.62***	976.30***	1466.11***	892.60***	8464.01***	5814.95***	3471.79***

Notes: These results are separated for each country level, as well as for the LA scenario. For the Brazilian case, the results referring to Brazil (1) represent the main sample. The results for Brazil (2) and Brazil (3) are related to the second sample for this country. Three models were tested for LA: AL(1)-used data from the local market portfolio; AL(2)-used data from the global market portfolio; and Al(3)- besides using data from the global market portfolio, it purged the data from Peru. MKT_{Lt}, MKT_{Lt-1} and MKT_{Lt-2}: local market portfolio excess return to the risk-free rate for the periods t, t-1 and t-2, respectively; MKT_{Gt}, MKT_{Gt-1} and MKT_{Gt-2}: global market portfolio excess return to the risk-free rate for the periods t, t-1 and t-2, respectively; SMB_t: size factor; HML_t: value factor; CMA_t: investment factor; RMW_t: profitability factor; $Factor\_SPSL_t$: representative factor of the premium in relation to the SPSL for period t; Cond_SPSL: variable related to the conditional SPSL; D1_Incond: dichotomous variable that takes on the value of 1 for the stocks which present values for the SPSL lower than the median value for this variable. It takes on the value of 0 for the other observations; D_Argentina, D_Chile, D_Mexico and D_Peru: dichotomous variables aimed to control the results regarding the target countries in this paper. Brazil was the reference category for this econometric model. The significance levels for the results are represented in the following way: *** significance at 1%, ** significance at 5%, * significance at 10%. Bold indicates the results found for the Factor_SPSL variable are the most relevant within the regression analysis. In this sense, its results were highlighted in relation to the other results.

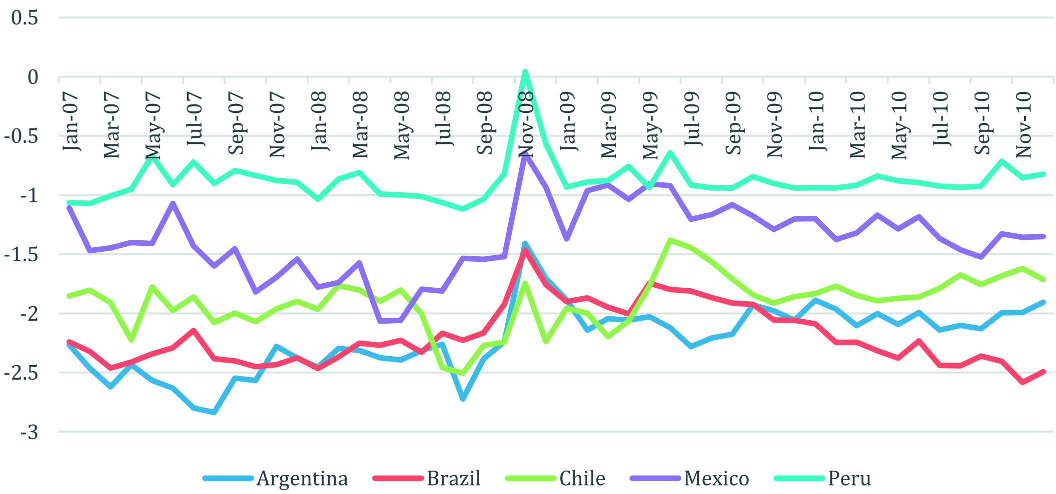

Fig. 1. Mean conditional synchronicity levels.
Notes: Fig. 1 shows the evolution of the mean conditional synchronicity levels for Argentina, Brazil, Chile, Peru and Mexico over the period corresponding from January 2007 to December 2010.

from May 2009 to July 2009.

The most substantial alterations ascertained for the conditional SPSL are very close to the beginning of the subprime security crisis in the North American scenario. For example, the fall of the Lehman Brothers investment bank took place on September 15, 2008. Therefore, the results found for the Cond_SPSL variable indicate that the SPSL increases in periods of greater turmoil in financial

Table 5
Portfolios.

	SPSL			Difference (1–3)
	Low (1)	(2)	High (3)	
Beta coefficient				
Low beta coefficient	0.888%	0.770%	0.114%	0.774%**
Average beta coefficient	0.695%	0.318%	0.827%	0.132%
High beta coefficient	0.986%	−0.230%	0.212%	0.774%***
Company size				
Small companies	2.803%	0.746%	1.152%	1.651%***
Average companies	1.960%	0.320%	0.349%	1.611%***
Large companies	1.670%	0.013%	0.356%	1.315%***
Book-to-market ratio				
Low BTM	1.153%	0.351%	0.335%	0.818%*
Average BTM	1.618%	0.680%	0.182%	1.436%**
High BTM	3.707%	0.075%	0.794%	2.913%**
Gross profitability				
Low profitability	1.941%	0.190%	0.101%	1.840%*
Average profitability	4.304%	0.610%	0.500%	3.804%*
High profitability	0.864%	0.279%	0.553%	0.311%
Accruals				
Low accruals	2.685%	0.247%	0.489%	2.196%*
Average accruals	0.772%	0.152%	0.156%	0.616%
High accruals	3.977%	0.701%	0.610%	3.367%**
Investments				
Low investments	4.094%	0.476%	0.330%	3.764%**
Average Investments	0.894%	0.342%	0.383%	0.511%
High investments	1.473%	0.289%	0.523%	0.950%
g-Revenues				
Low g-revenues	3.949%	0.542%	0.828%	3.121%*
Average g-revenues	1.314%	0.039%	0.186%	1.128%**
High g-revenues	0.964%	0.525%	0.329%	0.635%

Notes: This table presents the stock excess returns at a risk-free rate according to the corresponding portfolios. The portfolio setup followed the stock price synchronicity levels (SPSL), beta coefficient, company size, the book-to-market ratio (BTM), gross profitability, accruals, investments and sales growth (g-revenues). For the analysis of the average differences, the Student's *t*-test was used. The significance levels for the results presented are as follows: *** significance at 1%, ** significance at 5%, * significance at 10%.

markets, as advocated by Figlioli et al. (2017). Some of these SPSL changes, however, were not captured by the regression analyses. Additional tests (not reported) indicated that this stock return behavior can be partly explained by the risk factor regarding the market premium.

4.3. Portfolio analysis

From the portfolio analysis, a mean statistically significant difference in the stock returns regarding the SPSL was identified. The portfolios formed by low SPSL stocks presented, in almost all the cases, higher returns than the portfolios formed by high SPSL stocks. This stock return difference was not captured by the beta coefficient of the stocks, company size, relation between equity per share and stock price (book-to-market), gross profitability, accruals, investment or sales growth rate. The portfolio analysis results are presented in Table 5, as follows:

The results reached, as Table 5 demonstrates, identified some peculiarities for the LA scenario. For instance, the works of Fama and French (1992, 1993, 2015, 2017, 2018) suggest that the abnormalities observed for the stock returns are predominantly related to the small-sized companies. Nevertheless, the portfolios setup by the SPSL and regarding the company size identified positive premiums for the three company classes, i.e., small, average and large. It was also identified that even companies with high accrual levels incorporated into the accounting profit, which are low quality according to Sloan (1996), had additional premiums. According to this author, the premiums obtained would be associated with low levels of accruals for the profits.

To identify whether those premiums regarding the SPSL can be explained by asset pricing models, the GRS test (Gibbons et al., 1989) was used. The results are presented in Table 6.

The GRS test indicated opposite results regarding the suitability of the CAPM model and the Fama-French three- and five-factor models in explaining the stock returns. For the low SPSL portfolios, the intercepts were statistically significant, that is, there is evidence of risk factors omitted in such models. For the high SPSL portfolios, the intercepts did not present significant coefficients, at least for one of the three pricing models used in the analyses.

Table 6
GRS test.

Beta coefficient	Low SPSL	Average SPSL	High SPSL
CAPM	2.939**	2.734**	2.717**
3-Factor	2.967**	2.809**	2.744**
5-Factor	3.009**	1.863	1.659
Company size	Low SPSL	Average SPSL	High SPSL
CAPM	2.979**	1.430	0.784
3-Factor	3.295**	1.373	0.851
5-Factor	3.810**	2.051	1.916
Book-to-market ratio (BTM)	Low SPSL	Average SPSL	High SPSL
CAPM	3.631**	3.304**	1.738
3-Factor	3.906***	3.267**	2.189*
5-Factor	2.706**	2.319*	2.598*
Gross profitability	Low SPSL	Average SPSL	High SPSL
CAPM	3.346**	1.479	1.377
3-Factor	3.469**	1.620	1.370
5-Factor	2.485*	0.732	0.899
Accruals	Low SPSL	Average SPSL	High SPSL
CAPM	2.712**	2.812**	1.423
3-Factor	2.799**	2.936**	1.267
5-Factor	2.367*	1.886	2.459*
Investments	Low SPSL	Average SPSL	High SPSL
CAPM	3.764**	0.092	0.695
3-Factor	3.971***	0.125	0.650
5-factor	2.965**	0.310	0.356
g-revenues	Low SPSL	Average SPSL	High SPSL
CAPM	3.912***	2.700**	2.633*
3-Factor	4.093***	2.490*	2.834**
5-Factor	3.174**	2.176	2.070

Notes: Table 6 presents the results for the GRS test. This test is separated for the portfolios formed by the stock price synchronicity levels (SPSL) and by the other risk factors: beta coefficient, company size, the book-to-market ratio (BTM), gross profitability, accruals, investments and sales growth (g-revenues). The test also took into account three asset pricing models, i.e., the CAPM model and the Fama-French three- and five-factor models. The significance levels for the results are presented the following way: *** significance at 1%, ** significance at 5%, * significance at 10%.

Table 7
SPSL in setting up optimal and minimum variance portfolios.

	The lowest				The highest		
	SPSL1	SPSL2	SPSL3	SPSL4	SPSL5	return	Risk
Panel A: portfolio setup period: January 2000 to April 2018							
Optimal variance	24.140%	43.203%	29.287%	1.428%	1.942%	2.771%	3.162%
Minimum variance	26.938%	38.686%	26.572%	4.552%	3.252%	1.420%	1.973%
Panel B: portfolio setup period: January 2010 to April 2018							
Optimal variance	45.409%	25.036%	26.308%	0.000%	3.247%	2.428%	1.836%
Minimum variance	34.487%	37.741%	20.977%	2.013%	4.782%	1.008%	0.857%

Notes: Table 7 presents the participation of stocks in setting up optimal and minimum variance portfolios when considering distinct ratings for the SPSL (SPSL1 to SPSL5). The analyses are separated into two distinct periods: January 2000 to April 2018 (Panel A) and January 2010 to April 2018 (Panel B). For the setup of these portfolios, the following representative asset risk-free rate was used: 5.5% per year, 10% per year and 15% per year. The results obtained for these different rates were qualitatively equivalent, thus, only the results for the 5.5% per year rate are presented.

Regarding the high SPSL portfolios, the asset pricing models presented distinct efficiency levels in capturing the dynamics of stock returns. These models were more representative for the following portfolios: i) CAPM: portfolios formed by the company size and the book-to-market ratio; ii) three-factor model: portfolios formed by the accruals; iii) five-factor model: portfolios formed by the stock beta coefficient, gross profitability, investment and sales growth.

What can be inferred from the GRS test is that the possible abnormalities identified by the stock prices are associated with, in the LA scenario, low SPSL stocks. This result delimits, therefore, the conditions in which the asset pricing models are less efficient. Moreover, the results obtained have relevant empirical implications when considering, for instance, that the paper of Harvey et al. (2016) has catalogued 316 of these abnormalities. The SPSL also performed a substantial role in strategy formulation of investment diversification, as indicated by the results presented in Table 7.

From the results reached, it was observed that the participation of low SPSL stocks (SPSL1 and SPSL2) reach the gap between 67% and 70% in the optimal variance portfolio setup when considering both periods analyzed (January 2000 to April 2018 and January

Table 8
The SPSL tests as noise or as information.

	Period 1	Period 1	Period 2	Period 2
Variables	FM	RE/Clust	FM	RE/Clust
Constant	1.610**	4.340***	0.467	2.984**
$\ln(\text{Book}_{it})$	0.655***	0.642***	0.718***	0.756***
$\ln(\text{Abs}(\text{NetIncome}_{it}))$	0.309***	0.187***	0.289**	0.106***
DLoss_{it}	−0.023***	−0.021***	−0.032**	−0.012***
$\ln(\text{abs}(\text{NetIncome}_{it}))$. DSPSL_{it}	**−0.032*****	**−0.047*****	**−0.031*****	**−0.050*****
$\ln(\text{abs}(\text{NetIncome}_{it}))$. DBidAsk_{it}	**0.019*****	**0.024****	**0.025*****	**0.050*****
$\ln(\text{lev}_{it})$	0.055***	0.017	0.073***	0.0780**
DChile	0.038*	−0.089	0.033	0.008
DMexico	0.242**	0.240*	0.459**	0.546***
Observations	1917	1917	681	681
R2	87.18%	84.69%	86.53%	83.48%
F/chi2 probability	146.60***	971.80***	52.14***	639.06***

Notes: Table 8 presents the results for the LA sample. The dependent variable represents the company market value. The independent variables are: Book_{it}: equity of company i in period t; NetIncome_{it}: net income before taxes for company i in period t; Dloss_{it}: a dichotomous variable that takes on the value of 1 if the net income before taxes for company i in period t presents a negative value. It takes on the value of 0 for the other observations; DSPSL_{it}: a dichotomous variable that takes on the value of 1 for the companies with stocks with SPSL values equal to or lower than the median value for this variable in period t. It takes on the value of 0 for the other observations; DBidAsk_{it}: a dichotomous variable that takes on the value of 1 in the following condition: stocks with values equal to or lower than the median value for the SPSL, and with values equal to or lower than the median value for the Bid-Ask spread for company i in period t. It takes on the value of 0 for the other observations; Lev_{it}: financial leverage for company i in period t; DChile and DMexico: dichotomous variables aimed to control the results according to the countries analyzed. Brazil is the reference category for this econometric modeling; ln: Napierian logarithm; abs: absolute value. Period 1 refers to the years from 2007 to 2017. Period 2 refers to the years from 2013 to 2017. FM: regressions based on Fama and MacBeth (1973). For these regressions, the Newey and West (1987) recommendations were used for the adjustment of the statistics t. To do so, six lags were used. RE: regressions with robust standard errors. Clust: regressions with clustering per stocks. The results for the RE and Clust regressions were equivalent. The results of the variables highlighted in the text refer to the main results for this econometric modeling. The other variables are controls established in the tests.

2010 to April 2018). For the minimum variance portfolios, this gap is between 65% and 72%. Despite the SPSL relevance identified in the portfolio setup, this factor is just partly explained by the asset pricing models, mainly the portfolios associated with low SPSLs.

4.4. The SPSL test: information or noise?

Table 8 presents the results regarding the investigation regarding whether the SPSL pertains to noises or specific information of the companies incorporated into the stock prices.

The results in Table 8 indicate that the equity and accounting profit are positively associated with the company market value. The results were found to be consistent when identifying coefficients with positive signs for the period representative variable in which a certain company reported accounting losses (Dloss). Evidence that the financial leverage is positively associated with the company market value was also found.

One of the main results for these tests indicated that the response of the market value due to accounting profits is lower for the companies that are associated with the low SPSL stocks. The variable represented by the expression - $\ln(\text{abs}(\text{NetIncome}_{it}).\text{DSPSL}_{it}$ - presented coefficients with negative signs and statistical significance in all the models, which suggests that the low SPSL stocks incorporate less specific information about the companies compared to the highest SPSL stocks. That may result, as suggested by Hou et al. (2006), Dasgupta et al. (2010) and Kelly (2014), in greater noise levels, which are reflected in the stock prices.

Nonetheless, the results reached also suggest that even the low SPSL stocks, but with reduced levels of information asymmetry (captured by the stock bid-ask spread), represent companies with greater market value sensitivity in relation to accounting profit. The variable represented by the expression - $\ln(\text{abs}(\text{NetIncome}_{it}).\text{BidAsk}_{it}$ - presented coefficients with positive signs and statistical significance in all the models. The interpretation that SPSLs are inversely associated with stock price efficiency can be found in Morck et al. (2000, 2013) and Durnev et al. (2003, 2004).

There are indications, therefore, that the relation between the SPSL and the stock price efficiency is not monotonic (strictly positive or negative). The SPSL rating, a priori, as a representative construct of noise or information is quite incomplete. For example, the identification in the present study of an increase in the SPSL in periods of financial crisis supports the interpretation that the average comovement increase of the stocks are caused by noises, which are incorporated into the stock prices. As highlighted by Xing and Anderson (2011), what is relevant is the distinction between the situations in which the SPSL represents noise or information.

4.5. Discussion

Even with the improvements seen in the last decades, asset pricing models are deficient tools for capturing more fundamental characteristics of stock returns. According to Fama and French (2018), it is essential to understand the subjacent forces for standards identified for stock returns and, thus, assess the chance these standards have of being persistent over time.

Thus, one of the gaps identified in the literature regards the role played by idiosyncratic risk in the pricing processes in the Latin American scenario. Although LA is experiencing a process of more international integration, mostly from the early 21st century on, the prices of the stocks listed on the stock exchanges for this region tend to represent a noisy measure of its intrinsic value (theoretical value).

The results indicated that the relative idiosyncratic risk, measured by the SPSL, is priced and generates a positive premium (Hypothesis 1), and this result is aligned to the theoretical predictions of Merton (1987) and O'Hara (2003). Nonetheless, the explanation of these premiums by asset pricing models was ambiguous; the CAPM model and Fama-French three- and five- factor models were shown to be more suitable for explaining the returns for high SPSL stocks than for those with low SPSL. This result shows that a number of abnormalities identified for the stock prices are related for the stocks with lower SPSLs.

As an example, Fama and French (2017) identified that the five-factor model fails to capture the behavior of returns for the smaller sized companies, mainly for those which presented low profitability, but which invest aggressively. Through the results reached in the present study, the risk factor related to the SPSL can capture, at least partially, these characteristics of the companies and which are reflected in the stock prices.

The other results obtained suggest that low SPSLs do not correspond, necessarily, to information noises. In periods of turmoil in the financial markets, the SPSLs tend to rise (Hypothesis 2). The waves of exaggerated pessimism or optimism of the investors would be more related to movements in the stock prices during these periods than the economic or financial fundamentals of the companies (Shiller, 2003), which would generate an effect of a greater mean comovement of stock prices.

It was also identified that the SPSL does not represent a monotonic relation regarding the information efficiency of stock prices (Hypothesis 3). In this context, the idiosyncratic risk pricing process in a certain circumstance can be both based on noise and information, as highlighted by Xing and Anderson (2011).

The effects mentioned and which are associated with the idiosyncratic risk pricing in LA, very possibly, lie in several aspects. A nonexhaustive list includes the following approaches:

a) the market portfolio risk is not directly observable (Roll, 1977). Therefore, empirical papers use proxy variables in the measurement of this type of risk. For less developed economies, the determination of this variable becomes quite complex, which, in turn, makes it more difficult to suitably isolate the market portfolio returns;
b) the low shareholding liquidity observed in LA imposes restrictions to the investment diversification process (Grandes et al., 2010). Thus, the idiosyncratic risk is not completely eliminated in the investment portfolios;
c) the increased use of information technologies for investment analysis, as highlighted by a Chelley-Steeley and Lambertides (2016), can create mechanisms so that specific company information is priced; and.
d) the high level of shareholding concentration and the aspects regarding corporate governance are factors that result in the magnitude in which the company-specific information is made available to the market, in the LA scope (Chong and López-de-Silanes, 2007).

From the idiosyncrasies presented for LA, the relationship between systematic risk pricing and idiosyncratic risks has not shown to be fixed over time. The average values for the SPSL in LA were consistent with those observed in developed economies, which indicates an improvement in the information levels for the capital markets in the Latin American scenario.

5. Conclusions

With the greater integration of financial markets, the need to structure a more robust understanding regarding the stock pricing processes in LA becomes evident. This area has economic, social, cultural and political idiosyncrasies that are associated with how economic agents generate and share relevant information in asset assessment.

In that respect, there was reasonable evidence that the relative idiosyncratic risk is a pricing factor in the LA capital market that can help many users of economic-financial information to more reliably estimate the premiums obtained by the stocks, and which are associated with risk factors. Moreover, the stock valuation, according to the procedures adopted in the study, can have a substantial impact on other matters in the Latin American scenario, such as mergers and acquisitions of companies and Initial Public Offerings (IPO). These kinds of operations demand the determination of the fair value of the companies.

As a suggestion for future research, it would be interesting to relate different measures of the information composition of stock prices, segregating the levels of information and noise, with asset pricing models. Such an approach may bring new evidence regarding the identification of relevant factors in the estimation of risk premiums. For example, in some conditions, the CAPM model (unifactorial) was more adequate in explaining the average stock returns compared to the Fama-French three- and five-factor models in LA. This research can be deepened both in mature economies as well as in underdeveloped or emerging markets.

Another research area may focus on identifying whether the SPSL represents a pricing factor in other financial markets, such as the real estate market and the debt securities market. It could also be tested whether the SPSL is a construct with predictive value for the economic cycles of certain countries or regions. Finally, the examination of the role played by institutions and the development of financial markets can bring important contributions to the literature related to the asset pricing, especially for undeveloped economies.

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