Macroeconomic Factors and Value and Growth Strategies: Evidence from Brazil

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Abstract: In this work we apply the arbitrage pricing theory (APT) model to study the effects of macroeconomic variables on investment strategies involving value and growth stocks listed on the Brazilian Stock Exchange (B3). To build and order the portfolios, we use four fundamental market indicators that permit identifying value and growth stocks. The macroeconomic variables used are real GDP, exchange rate, unemployment rate, money supply (M1), interest rate and consumer confidence index. The principal results are that growth strategies during the period studied were mainly influenced by unemployment, inflation and exchange while value strategies were preponderantly affected by GDP. In relation to the market risk factor, it was statistically significant for all the value and growth portfolios, and in general the market betas of the values stocks were greater than those of the growth stocks.

Keywords: Value strategies, growth strategies, financial returns, APT, macroeconomic variables.
JEL Classification: C13, E44, G12, N26

1. INTRODUCTION

Based on the general equilibrium hypothesis of Arrow (1953) and the mean and variance theory proposed by Markowitz (1952, 1959), Sharpe (1964), Lintner (1965a, 1965b) and Mossin (1966) all presented variations of the capital asset pricing model (CAPM), considered for many years to be ideal to analyze the behavior of the returns of different assets. Although it is a model with sound microeconomic fundamentals, it has been subject to many criticisms. One of them is the need to impose restrictions on the distribution of returns of individuals' utility function. However, the greatest problems identified involve the empirical validation of the results, due to the impossibility of testing it empirically, as a consequence of the impossibility of observing the market portfolio under the hypothesis that the market portfolio is efficient.

The arbitrage pricing model is a theoretical construct based on the hypothesis of no arbitrage. It has become a theoretical and empirical alternative to the CAPM. Based on a hypothesis about the generation of asset returns and the no-arbitrage hypothesis, Ross (1976) proposed the existence of a linear relationship between expected asset returns and macroeconomic variables that determine systemic risk, with alternative assumptions that incorporate more than one factor to explain the movement of asset prices. From a theoretical standpoint, the APT does not need hypotheses regarding the distribution of asset returns, or about the structure of individuals' preferences, in contrast to the CAPM. Besides this, the APT does not rely on the assumption that the economy is in equilibrium; it is also valid for situations of imbalance, only requiring the hypothesis of no arbitrage opportunities. In relation to the market portfolio criticisms not resolved by the CAPM, the APT leaves this discussion about how to identify it by the wayside, opening a path to include other factors that affect the expected returns of assets besides the market portfolio factor, as in the CAPM. In particular, it is possible to relate macroeconomic variables and stock market returns, in which various risk elements are able to explain the behavior of asset returns.

This paper's objective is to shed light on the effects of macroeconomic variables on the investment strategies involving value and growth stock listed for trading on the Brazilian Stock Exchange (B3 – *Brasil, Bolsa, Balcão*). We use fundamental indicators of market value to build and order the simulated portfolios. As risk factors, we consider, besides market risk, the following macroeconomic variables: real GDP, exchange rate, unemployment rate, money supply (M1), interest rate, and consumer confidence index.

The main results are that the market risk factor was statistically significant for all the value and growth portfolios, and in general the market betas estimated for the value stocks were greater than the betas of the growth stocks. In relation to the growth strategies formulated, they were mainly affected by the macroeconomic variable unemployment rate, inflation and exchange while the value strategies were affected principally by GDP.

The paper is organized in five sections including this introduction. The second section presents a review of the Brazilian and international literature; the third section describes the methodology and data; the fourth section presents the results; and the fifth contains my conclusions and final considerations.

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2. LITERATURE REVIEW

The relationship between macroeconomic variables and financial returns in a context of factor models has motivated many studies in the Brazilian and international literature. Particular mention can be made of the works of Kristjanpoller and Morales (2011) for Chile, Králik (2012) for Romania, Ikoku and Okany (2014) for Nigeria and South Africa, and Malhotra (2010) for the United States, while in Brazil, studies have been published by Garcia and Bonomo (2001), Schor, Bonomo and Pereira (2002), Leal (2004), Rebeschini and Leal (2016) and Carrasco-Gutierrez and Piazza (2012).

Malhotra (2010) analyzed whether a set of factors explained the returns of 20 stocks in the United States, using monthly data from 2000 to 2005. The results indicated that the risk factors that affected stock returns were: number of shares traded, price-earnings ratio (P/E), market capitalization and growth. On the other hand, Kristjanpoller and Morales (2011), utilizing the APT, verified that the macroeconomic variables monthly economic activity index, inflation and copper price had an effect on the returns of stocks traded in the Chilean market. Králik (2012) investigated the relationship of local and global macroeconomic factors with stock market indices in Romania using the APT, finding evidence that the exchange rate, interest rate, gold price, global MSCI and oil price were statistically significant in affecting the stock returns in the Romanian market. Ikoku and Okany (2014) examined the impact of economic and financial crises on the sensitivity of stock indices to macroeconomic risk factors in Nigeria and South Africa. Through the APT, they found that inflation rate, exchange rate, oil price and gold price relevantly impacted the stock prices of those two countries.

Kabeer (2017) studied the influence of macroeconomic factors on stock markets performance in the South Asian Association for Regional Cooperation (SAARC) and China. The empirical evidence showed that inflation and foreign exchange were positively related with stock returns in Bangladesh. Conversely, in China they found that stock returns were weakly correlated with foreign direct investment.

Chellaswamy and Faniband (2020) analyzed the impact of Chinese macroeconomic factors on the Shanghai Stock Exchange (SSE) during the period from January 1998 to December 2018 using a quantile regression approach. The authors concluded that the Chinese consumer price index significantly affected the SSE returns only for lower quantiles. However, they found that the Indian consumer price index had a significant and positive impact on the Nifty returns for the upper quantiles.

Sarika Keswani and Bharti Wadhwa (2021) explored the relationships among macroeconomic factors and the Indian stock market. The results indicated that a long-term relationship among disposable income, GDP, foreign institutional investor, and stock returns as well as a negative long-term relation of stock incomes and youth unemployment and inflation.

Alshihab, Salem. (2021) investigated the impact of the macroeconomic variables interest rate, oil price, exchange rate, and money supply on stock market returns in the Gulf Cooperation Council (GCC). The empirical results suggested the high reliance of governments and stock markets in the GCC on macroeconomic determinants, specifically oil prices, while other determinants were found to have lesser effect on stock market returns.

For Brazil, Garcia and Bonomo (2001) used data from 1976 to 1992, before the inflation stabilization achieved by the "Real Plan" (in 1994) to test the CAPM and APT models. The Bovespa Index was used to represent the local market portfolio and the risk premium was calculated as the difference between the stock index and the interest rate paid on interbank deposits (an overnight benchmark rate known as the CDI). They concluded that inflation was the most significant macroeconomic variable.

Schor, Bonomo and Pereira (2002) tested the validity of the APT model using 10 portfolios of stocks traded on the Bovespa (predecessor of B3) for the period from January 1987 to November 1997. The factors utilized were industrial output, inflation, credit risk, real interest rate and market portfolio. The authors concluded that although not all of the factors contributed to the stock returns, there was an improvement of the ability to explain the historical returns of the portfolio index with the APT, and suggested it can be an additional tool to manage Brazilian stock portfolios.

Leal (2004) presented an application of the APT in Brazil for the period from January 1996 to December 2001. Considering the same factors used by Schor, Bonomo and Pereira (2002), they evaluated whether the APT was pricing portfolios classified according to the value-growth criterion in a systematically different way. The results indicated that the factors industrial production and inflation did not have significant coefficients, while the real interest rate and market portfolio were significant factors for all the portfolios. The author observed that the classification of portfolios according to the relative market price (value-growth) did not provide evidence of systematic pricing differences.

Rebeschini and Leal (2016) tested the APT model using assets of Brazilian investment funds and macroeconomic risk factors in the period from December 2002 to December 2012. The results demonstrated that market risk and the interest rate term structure were the only factors that were statistically significant to explain the returns of all the categories of investment funds. Finally, they concluded that the APT model better explained the historic returns of stock investment funds in the Brazilian market than the CAPM, but that it was not possible to obtain reliable estimates of the risk premiums of the macroeconomic factors for predictions.

Table **1** presents a summary of the studies that have used different sets of macroeconomic variables in the APT framework. In general, the majority of these works used as macroeconomic variables output, real exchange rate, interest rate, stock market return and inflation, all of which were also considered in this study.

3. METHODOLOGY

3.1. Selection and Collection of Data

In this study, we selected firms with shares traded on the B3 in the period from 2004 to 2015. We excluded financial insti-

Table 1. Macroeconomic variables of Brazilian and International Studies.

Author(s)	Country /Method	Macroeconomic Variables Tested	Result – Statistically Significant Variables
Malhotra (2010)	USA / APT	Inflation; money supply; industrial production; oil price; risk premium; S&P500; growth factor; exchange rate; earnings spread; number of shares traded; market capitalization; price-earnings ratio (P/E).	Number of shares traded; P/E; market capitalization; growth factor.
Kristjanpoller & Morales (2011)	Chile / APT	Short-term interest rate, long-term interest rate; inflation; oil price; monthly economic activity index; copper price.	Monthly economic activity index; inflation; copper price.
Králik (2012)	Romania / APT	Industrial production; Inflation; exchange rate; international reserves; interbank and benchmark interest rates; money supply; oil price; gold price; global MSCI.	Exchange rate; benchmark interest rate; gold price; global MSCI; oil price.
Ikoku & Okany (2014)	Nigeria and South Africa / APT	Inflation; exchange rate; oil price; gold price.	Inflation; exchange rate; oil price; gold price.
Garcia & Bonomo (2001)	Brazil / APT	Market risk; inflation.	Inflation.
Schor, Bonomo & Pereira (2002)	Brazil / APT	Output; inflation; interest rate, credit risk.	Output; inflation; interest rate.
Leal (2004)	Brazil / APT	Industrial production; inflation; real interest rate; market portfolio factors.	Real interest rate; market portfolio factors.
Rebeschini & Leal (2016)	Brazil / APT	Market risk; interest rate term structure.	Market risk; interest rate term structure.
Messias & Carrasco-Gutierrez (2021)	Brazil / APT	GDP; inflation; real exchange rate; interest rate; consumer confidence index; unemployment rate; market return; money supply.	Unemployment rate; real exchange rate; inflation, GDP and market return.

tutions and insurance companies due to the possibility of generating distortions because of high leverage. The stock prices and Ibovespa data were collected from the Economatica database. The macroeconomic variables used were the real GDP gap, exchange rate, unemployment rate, real money supply (M1), interest rate and consumer confidence index. The nominal GDP, nominal exchange rate, inflation (IGP-M – General Market Price Index), money supply (M1), consumer confidence index (CCI) and interest rate (benchmark rate - Selic) were obtained from the IpeaData website, while the unemployment rate was obtained from the site of the Central Bank of Brazil. The producer price index (PPI) was used to construct the real exchange rate and was obtained from the Organization for Economic Cooperation and Development (OECD).

The nominal GDP series was deflated using the IGP-M and was seasonally adjusted by applying the X-12-ARIMA procedure. The GDP gap was obtained by the difference between the real GDP series and the short-term component obtained via the HP filter. Inflation was determined from the General Market Price Index (IGP-M), estimated by Getulio Vargas Foundation. The stock price data were adjusted for earnings, including dividends, and the monthly returns were calculated using the month-end closing prices.

3.2. APT Model

3.3. Strategies to Construct Value and Growth Portfolios

To construct the value and growth stock portfolios, we followed the methodological procedures established by Fama and French (1992) and subsequently adopted in the works of Costa Jr. et al. (2000) and Cordeiro et al. (2013). The value and growth portfolios can be defined as follows:

- Value portfolios: composed of shares that, when arranged in order according to a determined value measure, are located at the upper end of the classification (25% of the shares).
- Growth portfolios: composed of shares that, when arranged in order according to a determined value measure, are located at the lower end of the classification (25% of the shares).

To classify the stocks, we used four fundamentalist measures of market value, each applied separately, so there was no combination among them to determine the ordering of the portfolios. These value measures are described below:

- Book value/market value ratio: accounting value per share divided by the stock price (henceforth referred to as B/M).
- EBITDA/price ratio: earnings before interest, taxes, depreciation and amortization divided by the market value of the stock (henceforth referred to as EBITDA/P).
- Sales to price ratio: net operating revenue per share divided by the market value of the stock (henceforth referred to as S/P).
- Market capitalization: closing share price in each month times the number of shares outstanding (henceforth referred to as MC).

Table 2. Sample Size According to Ratios and Period of Computing the Return.

Year	B/M Ratio	Nº Number of Actions Involved	EBITDA/P Ratio	Nº Number of Actions Involved	S/P ratio	Nº Number of Actions Involved	L/P	Nº Number of Actions Involved	Market Capitalization	Nº Number of Actions Involved
2010	15	1,445	15	1,428	36	3,230	14	1,344	36	3,230
2011	18	1,700	23	2,100	33	2,975	19	1,764	37	3,315
2012	23	1,615	27	2,436	38	3,400	19	1,764	39	3,485
2013	32	2,890	30	2,688	52	4,590	36	3,192	57	5,015
2014	47	4,165	54	4,704	60	5,355	59	4,032	65	5,695
2015	41	3,655	44	3,864	71	6,205	49	4,116	80	6,970
TOTAL	176	15,470	193	17,220	290	25,755	196	16,212	314	27,710

The shares of the companies that presented B/M, EBITDA/P, S/P, E/P or MC with values falling in the first quartile were classified as value shares and those falling in the last quartile as growth shares. The companies that did not present data related to the ratios identified above or had insufficient monthly quotations were excluded from the study.

After forming the portfolios, we then calculated the annual rate of return achieved by each stock in the respective portfolios. The stock return of each company was defined assuming discrete capitalization as follows:

$$R_{j,t} = (P_{j,t} - P_{j,t-1})/ P_{j,t-1}$$

The gross returns of the stocks were obtained by solving the equation $1+R_{j,t} = P_{j,t}/P_{j,t-1}$, where $R_{j,t}$ is the total return of stock j in year t; $P_{j,t}$ is the closing price of stock j in December of year t, and $P_{j,t-1}$ is the closing price of stock j in December of year t-1. With the individual returns of the stocks composing each portfolio, the next step was to compute the average return of each portfolio in each period t. For that purpose, we calculated the simple arithmetic mean of the stock returns of the components of each portfolio, i.e., so that each stock contributed equally to the composition of the average return of the portfolios on date t.

4. RESULTS

4.1. Descriptive Statistics and Unit Root Tests

Table **2** shows the number of firms in the sample and their respective quotations for the corresponding period.

The unit root test results of the macroeconomic variables are presented in Table **3**. The ADF, ADF-GLS and Phillips-Perron tests showed a unit root in the variables exchange rate, money supply (M1) and unemployment rate. For the other variables, the null hypothesis of the existence of a unit root was rejected, so they were stationary. To incorporate the risk factors in the APT model, it was necessary to assure stationarity of the series, so the series on exchange rate, money supply and unemployment were transformed into stationary series by means of first differences.

4.2. Econometric Results

The econometric strategy used involved estimating the APT model in seven-year moving windows (84 monthly observations of excess returns), a procedure also employed by Rostagno *et al.* (2006). We began the procedure in 2004 and completed the first period in 2010, while the second window started in 2005 and ended in 2011, and so forth until the last time period, ranging from 2009 to 2015. In each of these periods, we verified the effects of the macroeconomic risk factors on the value and growth strategies. On the other hand, since our interest was to ascertain the existence of evidence of the effects of the macroeconomic risks in some of the mentioned time periods, we considered the statistical significance of the factors at the 10% level.

Table **4** presents the econometric results for the growth and value portfolios that were arranged in order according to the B/M ratio. For the growth strategy, there was evidence of the effects of GDP in periods 1 and 2, as well as the effect of unemployment in periods 3 and 4. We also point to one-time effects of the exchange rate and money supply in period 5 and of inflation in period 2. In turn, for the value portfolios, GDP had an effect in periods 1 and 2, exchange rate had an effect in periods 1 and 5, and unemployment had an effect in period 6.

Table **5** shows the results of the growth and value portfolios ordered according to the EBITDA/P ratio. The growth strategies were mainly affected by inflation (periods 3 and 4), exchange rate in period 3, money supply in period 5 and consumer confidence index in period 3. With regard to the value strategies, the main impacts were caused by exchange rate (periods 1, 3 and 5) and GDP (periods 1, 2 and 3).

Table 3. Unit root Tests (1).

Variables	ADF Test[(2)] t-Statistic	ADF [GLS] Test[(3)] t-Statistic	PP Test[(4)] t-Statistic
$Exchange_t$	-1.66025	-0.52602	-1.98484
$\Delta Exchange_t$	-3.04658	-1.27089	-9.24615

GDP_t	-2.97541	-2.82711	-4.81045
ΔGDP_t	-16.6596	-3.45980	-17.2527
$M1_t$	-1.99539	-0.70875	-2.26032
$\Delta M1_t$	-1.58352	-0.679033	-13.1007
$unemp_t$	-2.58180	-0.39923	-2.27593
$\Delta unemp_t$	-1.79332	-0.08410	-12.6699
$selic_t$	-2.36857	-1.17135	-2.14434
$\Delta selic_t$	3.79087	-0.38599	-21.8323
$inflation_t$	-4.39635	-2.82469	-6.11110
$\Delta inflation_t$	-13.5350	-1.05339	-21.9157
icc_t	-0.63362	-0.84334	-0.84167
Δicc_t	-7.99840	-7.97541	-10.6911

Notes:
(1) Applied to test intercept equations. Significance of 5%.
(2) Critical values: -2,578,636 (1%). -1.942710 (5%) and -1.615460 (10%). The Modified Akaike Method was used.
(3) We use the Bastlett Kernel estimation method with Newey-West Bandwidth. Critical values: -3.466176 (1%). -2,877186 (5%) and -2,575189 (10%). The Modified Akaike Method was used.
(4) The PP test has the null hypothesis of stationarity of the series. Critical values: Critical values: 0.7390 (1%). 0.4630 (5%) and 0.3470 (10%). Default (Bartlett kernel) and Bandwidth Newey-West Bandwidth were used.

Table 4. Econometric Results for the Portfolios Ordered According to the B/M Ratio.

	Period 1	**Period 2**	**Period 3**	**Period 4**	**Period 5**	**Period 6**
	(2004-2010)	**(2005-2011)**	**(2006-2012)**	**(2007-2013)**	**(2008-2014)**	**(2009-2015)**
a) Portfólios de crescimento						
RM	0.765***	0.653***	0.530***	0.512***	0.588***	0.670***
	(0.0692)	(0.0797)	(0.150)	(0.148)	(0.0857)	(0.0651)
Exchange	-0.0121	-0.0179	-0.0945	-0.163	-0.175**	-0.0265
	(0.0609)	(0.0764)	(0.150)	(0.142)	(0.0848)	(0.0533)
M1	-0.116	-0.223	0.600	0.554	0.606**	0.189
	(0.189)	(0.224)	(0.408)	(0.362)	(0.270)	(0.282)
GDP	0.378**	0.398**	-0.0212	-0.0881	-0.0710	-0.174
	(0.169)	(0.196)	(0.325)	(0.294)	(0.190)	(0.163)
Inflation	-0.581	-1.595*	-1.699	-1.328	-0.281	0.0483
	(0.741)	(0.872)	-1.491	-1.356	(0.853)	(0.682)
unemployment	0.0235	0.0236	-0.0707*	-0.0591*	-0.0246	0.000162
	(0.0165)	(0.0199)	(0.0356)	(0.0339)	(0.0190)	(0.0149)
CCI	0.0772	-0.0301	-0.166	-0.110	0.0935	0.0173
	(0.0994)	(0.130)	(0.277)	(0.250)	(0.133)	(0.0993)
Cons	0.0161***	0.0219***	0.0231**	0.0201**	0.0114*	0.0131***
	(0.00588)	(0.00626)	(0.0112)	(0.0101)	(0.00589)	(0.00469)
R^2	0.686	0.570	0.291	0.331	0.621	0.646
b) *Portfólios* de valor						

RM	0.709***	0.901***	1.079***	1.093***	1.067***	0.979***
	(0.0718)	(0.0847)	(0.0869)	(0.0917)	(0.102)	(0.102)
Exchange	-0.126**	-0.104	-0.0469	-0.0940	-0.172*	-0.0652
	(0.0632)	(0.0811)	(0.0871)	(0.0881)	(0.101)	(0.0835)
M1	0.00749	0.0885	0.0297	0.0974	0.148	0.369
	(0.196)	(0.237)	(0.237)	(0.225)	(0.322)	(0.441)
GDP	0.490***	0.453**	0.0151	-0.0370	-0.247	-0.179
	(0.176)	(0.208)	(0.189)	(0.182)	(0.228)	(0.256)
Inflation	0.321	0.443	0.333	-0.814	-0.0339	-0.441
	(0.769)	(0.927)	(0.865)	(0.840)	-1020	-1068
unemployment	0.00838	0.00678	-0.0276	-0.0116	-0.0263	-0.0417*
	(0.0171)	(0.0211)	(0.0207)	(0.0210)	(0.0227)	(0.0234)
CCI	-0.0343	-0.0275	0.0788	-0.0658	0.00525	0.0378
	(0.103)	(0.138)	(0.161)	(0.155)	(0.159)	(0.156)
Cons	0.000908	-0.000267	-0.00637	-0.00174	-0.0103	-0.0104
	(0.00610)	(0.00665)	(0.00647)	(0.00624)	(0.00705)	(0.00735)
R^2	0.673	0.690	0.767	0.788	0.743	0.627
Observations	84	84	84	84	84	84

Note: *, ** and *** mean rejection of the null hypothesis at 10%, 5% and 1%, respectively. Estimates corresponding to all years were obtained considering a window of 7 years backwards. The results presented for the year 2010 correspond to the last 84 months. For the results obtained in 2011 we started in 2005 and so on. ICC represents the consumer confidence index.

"Values in parentheses are the standard errors of the estimated parameters".

Table 5. Econometric Results for the Portfolios Ordered According to the EBITDA/P Ratio.

	Period 1	**Period 2**	**Period 3**	**Period 4**	**Period 5**	**Period 6**
	(2004-2010)	**(2005-2011)**	**(2006-2012)**	**(2007-2013)**	**(2008-2014)**	**(2009-2015)**
a) Growth portfolios						
RM	0.860***	0.884***	0.899***	0.613***	0.708***	0.608***
	(0.226)	(0.0828)	(0.0803)	(0.0906)	(0.0723)	(0.0707)
Exchange	0.0326	-0.0681	-0.147*	-0.145	-0.0934	-0.0574
	(0.199)	(0.0794)	(0.0805)	(0.087)	(0.0715)	(0.0579)
M1	0.523	-0.028	-0.115	0.238	0.556**	0.451
	(0.62)	(0.232)	(0.219)	(0.222)	(0.228)	(0.306)
GDP	0.366	0.0559	0.21	0.112	-0.124	-0.044
	(0.554)	(0.203)	(0.175)	(0.18)	(0.161)	(0.177)
Inflation	1.443	-0.979	-2.125***	-1.597*	-0.0995	0.0452
	(2.427)	(0.907)	(0.8)	(0.829)	(0.72)	(0.741)
unemployment	-0.0131	-0.00603	0.000747	-0.0111	-0.0133	-0.00625
	(0.054)	(0.0207)	(0.0191)	(0.0207)	(0.016)	(0.0162)
CCI	0.11	0.127	-0.372**	0.0264	0.0322	0.0802
	(0.325)	(0.135)	(0.149)	(0.153)	(0.112)	(0.108)

Cons	-0.00713	0.00899	0.0261***	0.0201***	0.00832*	0.0145***
	(0.0193)	(0.0065)	(0.00598)	(0.00617)	(0.00497)	(0.0051)
R^2	0.142	0.685	0.773	0.611	0.729	0.576
b) *Value portfolios*						
RM	0.685***	0.789***	0.634***	0.742***	0.782***	0.672***
	(0.0584)	(0.0516)	(0.0779)	(0.0705)	(0.0808)	(0.084)
Exchange	-0.177***	-0.0548	-0.154*	-0.0789	-0.194**	-0.0847
	(0.0514)	(0.0495)	(0.0781)	(0.0677)	(0.08)	(0.0688)
M1	-0.0964	0.00653	0.187	0.201	0.189	0.15
	(0.16)	(0.145)	(0.212)	(0.173)	(0.254)	(0.364)
GDP	0.253*	0.321**	0.401**	0.222	-0.0193	-0.3
	(0.143)	(0.127)	(0.169)	(0.14)	(0.18)	(0.211)
Inflation	0.412	-0.183	-0.582	-0.459	-0.423	-0.95
	(0.626)	(0.565)	(0.776)	(0.645)	(0.804)	(0.881)
unemployment	0.0132	0.0162	0.0155	-0.00332	-0.00422	-0.0129
	(0.0139)	(0.0129)	(0.0185)	(0.0161)	(0.0179)	(0.0193)
CCI	0.0281	0.0183	-0.00811	0.0452	0.0573	0.0506
	(0.084)	(0.0844)	(0.144)	(0.119)	(0.125)	(0.128)
Cons	0.000669	0.00471	0.00632	0.000602	-0.00257	0.00333
	(0.00497)	(0.00406)	(0.0058)	(0.0048)	(0.00556)	(0.00605)
R^2	0.755	0.817	0.657	0.75	0.732	0.57
Observations	84	84	84	84	84	84

Note: *, ** and *** mean rejection of the null hypothesis at 10%, 5% and 1%, respectively. Estimates corresponding to all years were obtained considering a window of 7 years backwards. The results presented for the year 2010 correspond to the last 84 months. For the results obtained in 2011 we started in 2005 and so on. ICC represents the consumer confidence index.

"Values in parentheses are the standard errors of the estimated parameters".

Table 6. Econometric Results for the Portfolios Ordered According to the S/P Ratio.

	Period 1	**Period 2**	**Period 3**	**Period 4**	**Period 5**	**Period 6**
	(2004-2010)	**(2005-2011)**	**(2006-2012)**	**(2007-2013)**	**(2008-2014)**	**(2009-2015)**
a) Growth portfolios						
RM	0.318	1.019*	0.670***	0.76	0.839***	0.699***
	(0.403)	(0.541)	(0.253)	(0.483)	(0.164)	(0.129)
Exchange	-0.4	0.0488	-0.216	-0.318	-0.280*	-0.162
	(0.355)	(0.518)	(0.253)	(0.464)	(0.163)	(0.106)
M1	1.306	0.999	1.106	0.747	0.144	-0.0808
	(1.103)	(1.516)	(0.689)	(1.183)	(0.517)	(0.559)
GDP	-0.464	0.409	0.0222	1330	-0.304	-0.16
	(0.986)	(1.328)	(0.549)	(0.961)	(0.365)	(0.324)
Inflation	0.526	-5.425	-2.799	-3.497	-1.543	-1.983
	(4.319)	(5.918)	(2.515)	(4.424)	(1.635)	(1.353)

unemployment	-0.159	-0.0578	-0.158**	-0.0602	-0.0686*	-0.0361
	(0.0962)	(0.135)	(0.0601)	(0.11)	(0.0363)	(0.0296)
CCI	0.306	-1.801**	-0.147	1157	0.198	0.0598
	(0.579)	(0.884)	(0.468)	(0.817)	(0.254)	(0.197)
Cons	0.0187	0.0717*	0.0135	0.0303	-0.00942	0.00134
	(0.0343)	(0.0425)	(0.0188)	(0.0329)	(0.0113)	(0.0093)
R^2	0.029	0.071	0.249	0.096	0.482	0.393
b) *Value portfolios*						
RM	0.707***	0.813***	0.775***	0.76	0.693***	0.747***
	(0.0503)	(0.04)	(0.048)	(0.483)	(0.0534)	(0.0483)
Exchange	0.000101	-0.00139	-0.0233	-0.318	-0.0641	-0.0243
	(0.0443)	-(0.0383)	(0.0481)	(0.464)	(0.0528)	(0.0395)
M1	-0.0403	-0.00993	0.053	0.747	0.168	0.216
	(0.138)	(0.112)	(0.131)	(1183)	(0.168)	(0.209)
GDP	0.199	0.226**	0.244**	1330	0.0634	-0.00993
	(0.123)	(0.0983)	(0.104)	(0.961)	(0.119)	(0.121)
Inflation	-0.5	-0.589	-0.622	-3.497	-0.0815	0.12
	(0.539)	(0.438)	(0.478)	(4.424)	(0.531)	(0.506)
unemployment	0.00261	0.0101	0.0146	-0.0602	0.0145	-0.0054
	(0.012)	(0.0099)	(0.0114)	(0.11)	(0.0118)	(0.0111)
CCI	0.0958	0.0379	-0.0447	1157	-0.00255	0.0336
	(0.0723)	(0.0654)	(0.0889)	(0.817)	(0.0827)	(0.0737)
Cons	0.0109**	0.0101***	0.0112***	0.0303	0.00704*	0.00415
	(0.00428)	(0.00314)	(0.00357)	(0.0329)	(0.00367)	(0.00348)
R^2	0.774	0.882	0.853	0.096	0.802	0.798
Observations	84	84	84	84	84	84

Note: *, ** and *** mean rejection of the null hypothesis at 10%, 5% and 1%, respectively. Estimates corresponding to all years were obtained considering a window of 7 years backwards. The results presented for the year 2010 correspond to the last 84 months. For the results obtained in 2011 we started in 2005 and so on. ICC represents the consumer confidence index.

Table **7** the results of the growth and value portfolios ordered according to the L/P ratio. The macroeconomic variable exchange rate had an influence on the growth portfolios in nearly all the intervals, i.e., periods 1, 3, 5 and 6. In turn, inflation only had an influence in period 4. On the other hand, the value portfolios were affected once each by exchange rate (period 5) and unemployment rate (period 1).

"Values in parentheses are the standard errors of the estimated parameters".

Table **6** reports the results of the growth and value portfolios ordered according to the S/P ratio. In this case, the growth strategies were affected mainly by unemployment rate (periods 3 and 5) and once each by exchange rate (period 5) and CCI (period 2). The results for the value portfolios only showed an effect of GDP in periods 2 and 3.

Finally, Table **8** reports the results of the growth and value portfolios ordered according to the MC index. In this case, the growth portfolios were affected by unemployment in periods 3, 5 and 6 and by GDP in period 1, in 2010. With respect to the value portfolios, GDP also had the most prevalent effect (periods 2, 3 and 4), followed by inflation (periods 3 and 4), with exchange rate having an effect in period 5.

Table 7. Econometric Results for the Portfolios Ordered According to the L/P Ratio.

	Period 1	**Period 2**	**Period 3**	**Period 4**	**Period 5**	**Period 6**
	(2004-2010)	**(2005-2011)**	**(2006-2012)**	**(2007-2013)**	**(2008-2014)**	**(2009-2015)**
a) Growth portfolios						
RM	0.821***	0.738***	0.687***	0.675***	0.720***	0.567***
	(0.0905)	(0.0642)	(0.0864)	(0.0748)	(0.0752)	(0.0629)
Exchange	-0.171**	-0.0723	-0.164*	-0.0937	-0.168**	-0.122**
	(0.0796)	(0.0615)	(0.0866)	(0.0718)	(0.0744)	(0.0515)
M1	0.243	-0.0383	-0.0283	-0.154	0.27	0.278
	(0.248)	(0.18)	(0.236)	(0.183)	(0.237)	(0.272)
GDP	0.23	0.187	0.07	0.156	0.0705	-0.0246
	(0.221)	(0.158)	(0.188)	(0.149)	(0.167)	(0.158)
Inflation	1.159	-0.753	-1.195	-1.281*	-0.169	-0.472
	(0.969)	(0.702)	(0.861)	(0.685)	(0.748)	(0.659)
unemployment	0.0184	-0.00232	-0.012	0.0152	-0.0141	-0.0162
	(0.0216)	(0.016)	(0.0206)	(0.0171)	(0.0166)	(0.0144)
CCI	0.092	-0.0415	-0.124	0.0269	-0.00277	-0.0484
	(0.13)	(0.105)	(0.16)	(0.126)	(0.116)	(0.096)
Cons	-0.00249	0.00795	0.0162**	0.0148***	0.00683	0.0143***
	(0.00769)	(0.00504)	(0.00644)	(0.00509)	(0.00517)	(0.00453)
R^2	0.63	0.724	0.638	0.69	0.723	0.635
b) *Value portfolios*						
RM	0.699***	0.895***	0.551***	0.690**	0.804***	0.803***
	(0.0706)	(0.0609)	(0.105)	(0.29)	(0.0943)	(0.0829)
Exchange	-0.0788	-0.0339	-0.0563	-0.309	-0.258***	-0.0454
	(0.0621)	(0.0583)	(0.105)	(0.279)	(0.0933)	(0.0679)
M1	-0.0643	0.188	-0.0273	0.0743	0.402	0.298
	(0.193)	(0.171)	(0.286)	(0.71)	(0.297)	(0.359)
GDP	0.202	0.163	0.304	0.864	-0.131	-0.095
	(0.173)	(0.15)	(0.228)	(0.577)	(0.21)	(0.208)
Inflation	-0.607	-0.32	-1.552	-1.744	0.396	0.223
	(0.756)	(0.666)	(1.045)	(2.656)	(0.939)	(0.869)
unemployment	0.0437**	0.0177	0.0206	0.0543	0.00611	-0.0109
	(0.0168)	(0.0152)	(0.025)	(0.0663)	(0.0209)	(0.019)
CCI	0.0435	-0.0543	-0.198	0.534	-0.0772	0.142
	(0.101)	(0.0995)	(0.194)	(0.491)	(0.146)	(0.127)
Cons	0.0106*	0.00512	0.012	0.03	0.00771	0.000786
	(0.006)	(0.00478)	(0.00782)	(0.0197)	(0.00649)	(0.00598)
R^2	0.669	0.805	0.402	0.165	0.701	0.615

Observations	84	84	84	84	84	84

Note: *, ** and *** mean rejection of the null hypothesis at 10%, 5% and 1%, respectively. Estimates corresponding to all years were obtained considering a window of 7 years backwards. The results presented for the year 2010 correspond to the last 84 months. For the results obtained in 2011 we started in 2005 and so on. ICC represents the consumer confidence index.
"Values in parentheses are the standard errors of the estimated parameters".

Table 8. Econometric Results for the Portfolios Ordered According to the MC Index.

	Period 1	**Period 2**	**Period 3**	**Period 4**	**Period 5**	**Period 6**
	(2004-2010)	**(2005-2011)**	**(2006-2012)**	**(2007-2013)**	**(2008-2014)**	**(2009-2015)**
a) Growth portfolios						
RM	0.879***	0.727***	0.876***	0.77	0.838***	0.777***
	(0.207)	(0.178)	(0.206)	(0.535)	(0.152)	(0.13)
Exchange	-0.0871	-0.103	-0.164	-0.312	-0.127	-0.103
	(0.182)	(0.17)	(0.206)	(0.514)	(0.151)	(0.107)
M1	0.58	0.78	0.53	0.304	0.0309	-0.0953
	(0.566)	(0.499)	(0.562)	(1.310)	(0.48)	(0.563)
GDP	0.908*	0.529	0.593	1.694	-0.0121	-0.222
	(0.506)	(0.437)	(0.447)	(1.063)	(0.339)	(0.327)
Inflation	0.468	-2.788	-2.906	-3.648	-2.406	-2.179
	(2.217)	(1.947)	(2.05)	(4.898)	(1.517)	(1.364)
unemployment	-0.054	-0.0616	-0.0906*	-0.00358	-0.0884**	-0.0597**
	(0.0494)	(0.0444)	(0.049)	(0.122)	(0.0337)	(0.0298)
CCI	0.214	0.172	-0.0317	1418	0.0736	0.109
	(0.297)	(0.291)	(0.381)	(0.905)	(0.236)	(0.199)
Cons	-0.00534	-0.000813	0.00328	0.031	-0.00249	-0.0013
	(0.0176)	(0.014)	(0.0153)	(0.0364)	(0.0105)	(0.00938)
R^2	0.254	0.303	0.357	0.072	0.471	0.429
b) *Value portfolios*						
RM	0.898***	0.780***	0.847***	0.781***	0.695***	0.714***
	(0.0474)	(0.0364)	(0.0452)	(0.0481)	(0.049)	(0.0471)
Exchange	-0.039	-0.0445	-0.0109	-0.0543	-0.0852*	-0.0414
	(0.0417)	(0.0348)	(0.0453)	(0.0462)	(0.0485)	(0.0386)
M1	0.0494	-0.0294	-0.0637	0.0277	0.161	0.144
	(0.13)	(0.102)	(0.123)	(0.118)	(0.154)	(0.204)
GDP	0.16	0.211**	0.241**	0.168*	0.00113	-0.0422
	(0.116)	(0.0893)	(0.0983)	(0.0956)	(0.109)	(0.118)
Inflation	0.106	-0.333	-1.072**	-1.159**	0.00163	0.0209
	(0.508)	(0.398)	(0.45)	(0.44)	(0.488)	(0.494)
unemployment	0.00676	0.0169*	0.00841	0.00885	0.00829	-0.000604
	(0.0113)	(0.00908)	(0.0108)	(0.011)	(0.0108)	(0.0108)

CCI	0.0153	0.0143	-0.102	-0.091	-0.00844	-0.00372
	(0.0681)	(0.0594)	(0.0838)	(0.0814)	(0.0759)	(0.072)
Cons	-0.00125	0.00757***	0.0142***	0.0136***	0.00701**	0.00966***
	(0.00403)	(0.00286)	(0.00337)	(0.00327)	(0.00337)	(0.0034)
R^2	0.866	0.897	0.884	0.873	0.835	0.797
Observations	84	84	84	84	84	84

Note: *, ** and *** mean rejection of the null hypothesis at 10%, 5% and 1%, respectively. Estimates corresponding to all years were obtained considering a window of 7 years backwards. The results presented for the year 2010 correspond to the last 84 months. For the results obtained in 2011 we started in 2005 and so on. ICC represents the consumer confidence index.
"Values in parentheses are the standard errors of the estimated parameters".

Table 9. Result of Betas for the Value and Growth Portfolios.

Portfolios	**Portfolios Ordered According to the B/M ratio**					
	2010	**2011**	**2012**	**2013**	**2014**	**2015**
Growth	0.765***	0.653***	0.530***	0.512***	0.588***	0.670***
Value	0.709***	0.901***	1.079***	1.093***	1.067***	0.979***
	Portfolios ordered According to the EBITDA/P Ratio					
Growth	0.860***	0.884***	0.899***	0.613***	0.708***	0.608***
Value	0.685***	0.789***	0.634***	0.742***	0.782***	0.672***
	Portfolios Ordered According to the S/P Ratio					
Growth	0.318	1.019*	0.670***	0.76	0.839***	0.699***
Value	0.707***	0.813***	0.775***	0.76	0.693***	0.747***
	Portfolios Ordered According to the L/P Ratio					
Growth	0.821***	0.738***	0.687***	0.675***	0.720***	0.567***
Value	0.699***	0.895***	0.551***	0.690***	0.804***	0.803***
	Portfolios Ordered According to the MC Index					
Growth	0.879***	0.727***	0.876***	0.77	0.838***	0.777***
Value	0.898***	0.780***	0.847***	0.781***	0.695***	0.714***

Note: *, ** and *** mean rejection of the null hypothesis at 10%, 5% and 1%, respectively. The results presented in this table correspond to the results obtained in the econometric estimates presented in tables 1 to 8.

In summary, the results show that the growth portfolios were affected by the unemployment rate. In other words, the returns of this type of investment strategy in the period studied were influenced by changes in the labor market, which in turn could have been related to fiscal and/or monetary policy shocks. In relation to the value portfolios, they were affected mainly by the exchange rate and less frequently by the short-term GDP performance. This can be explained because many large Brazilian companies are exporters of commodities, so that much of their revenue is in dollars and is thus affected by the exchange rate, with direct influence on their profits.

With respect to the market risk factor, it was significant for all the value and growth portfolios. Table 9 presents a summary of the estimated betas of the value and growth portfolios from the results indicated by the previous tables. It can be observed that in general, the market betas of the value stocks are greater than those of the growth stocks.

5. CONCLUSIONS

In this work, we studied the effects of macroeconomic factors on the performance of investment strategies focused on value and growth stocks of firms with shares listed for trading on the Brazilian Stock Exchange (B3). To order the portfolios we used the indicators B/M, EBITDA/P, S/P, L/P and MC, and investigated their ability to affect the returns of those stocks in the period from January 2004 to December 2015.

The empirical results showed the following: for the portfolios ordered according to the B/M ratio, GDP was the most important factor in both growth and value portfolios. According to the fundamentalist measure EBITDA/P ratio, inflation was the most important factor for growth portfolios and GDP for the value portfolios. Related to the portfolios classified according to the S/P ratio, unemployment was the most relevant factor in explaining the growth portfolios and

GDP in explaining the value portfolios. According to the L/P ratio, the exchange best explained the growth portfolios. Finally, for the portfolios ordered according to the MC index, unemployment was the most important determinant of growth portfolios and GDP of the value portfolios.

In general, the returns of the growth portfolios were mainly affected by the macroeconomic variable unemployment rate, inflation and exchange while the value portfolios were affected principally by GDP.

The market risk factor, represented by the B3 index (Ibovespa), affected all the value and growth portfolios, as expected, because since stocks are variable-income assets, they are naturally affected by the main stock market index in Brazil.

This work makes empirical contributions to the analysis of the macroeconomic risk factors that affect portfolios selected according to value and growth strategies. Future extensions can consider other metrics of the risk of value and growth investment strategies, such as the Sharp index, Treynor index, Jensen's alpha, volatility, liquidity indicators and earnings variability. Besides these, other macroeconomic risk factors can be considered, such as credit default swaps and banking spread, to name a few.

CONFLICT OF INTEREST

The authors declare to have no conflict of interest.

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