# ERASMUS UNIVERSITY ROTTERDAM

Master Thesis in Financial Economics

# Macroeconomic Surprises: how they impact the risky assets in the emerging markets

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## Abstract

Market participants monitor a massive flow of macroeconomic news every day and react to the surprise component of each release. This paper wants to investigate whether the unexpected components of a released announcement can price and predict return in emerging markets. Empirically, economic surprises related to macroeconomic growth consistently predict short-run returns in risky assets classes (equities, bonds, currencies), attributing these results to the presence of a momentum effect in the economic surprises. We apply this effect to a simple investment strategy using growth and inflation surprises in three emerging markets (Brazil, China, Brazil). The strategy outperforms the markets in most cases, providing an alpha between 0.89% and 5.53%. We propose a simple cross-sectional technique to investigate the equity exposure to the economic surprise. We find that stocks in the lowest beta decile generate a higher daily return compared to stocks in the highest beta.

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# 1 Introduction

Macroeconomic data are released every day and are monitored closely by the market participants. However, the most comprehensive measure of economic activity present low frequencies and are released only with a time lag (Caruso, 2019). Therefore, investors and market participants need to filter the new information to update their view of the current state of the economy.

Conventional wisdom suggests that If markets are efficient, market operators react when the actual releases are different from their expectations, and the caused macroeconomic surprise moves the markets. Moreover, studies have investigated the connection between macroeconomic shocks, represented as the difference between the value released and the corresponding market expectations for a specific macroeconomic indicator and asset. Specifically, it has been shown that unexpected macroeconomic surprises affect stock returns and volatilities, generating reactions in asset pricing.

Numerous empirical studies conducted in developed markets provide substantial evidence supporting the argument that changes in macroeconomic variables lead to stock return fluctuation. Fama (1981) showed a significant and positive relationship between equity returns and economic activities as gross national product or capital expenditure. On the other hand, a small but growing literature has begun to bring attention to the relationship between macroeconomic variables and equity returns in emerging markets. However, while other research has documented strong relations between fundamental economic activities and developed market returns, it is still unclear whether this relationship exists in emerging markets.

Therefore, this paper focuses entirely on macroeconomic surprises' impact on emerging markets. Firstly, we analyze the behavior of macroeconomic announcements and surprises during our sample period. We distinguish the macroeconomic variables into two main fundamental categories: economic growth and inflation. Second, we measure the impact of macroeconomic surprises across three different asset classes (equities, bonds, and foreign exchanges) and three central emerging regions (Brazil, China, and Russia). We also examine

the different impacts that global macroeconomic surprises present compared to those at the regional level. Third, we elaborate a simple momentum investment strategy through the surprises' impact on the equity returns. Lastly, we launch a cross-section analysis between the surprises and equity returns.

The objective of this study is to answer the fundamental question of whether surprises around macroeconomics news impact the emerging markets and their stock return. Moreover, the paper analyzes the impact of local surprises on the local return centering specifically on three major emerging regions.

To these ends, we construct an index for the surprises in the macroeconomic news. A multitude of difficulties arises in the construction of this index. Indeed, macroeconomic data are typically subject to future revisions and released with a delay. Ghysels et al. (2014) demonstrated that the use of real-time data substantially reduces the predictive power of macro variables for future bond returns as well as the implied countercyclicality of term premiums. A second problem regards the release frequency of the macroeconomic news. Most of the series on macroeconomic fundamentals are observed at a low frequency, unlike the continuous flow of macroeconomic information available to investors.

To manage these problems, we used the real-time information released on the announcement days. We captured the macroeconomic information across all significant macroeconomic factors, distinguishing them in growth or an inflation category and combining them in a daily measure of surprise in macroeconomic news. For building this index, we follow the same methodology adopted by Beber and Brandt (2009), who created a standardized measure of surprise from the daily announcement and the corresponding median survey forecast.

Through this study, we obtain the following results. First, through the autocorrelation analysis, surprises result persistent over time (Figure 2). Moreover, we find a positive correlation between factor over categories and factor correlations over regions (Table 2 and Table 3). Second, we sort the surprise index in increasing order and divide it into five equally sized buckets. For each bucket, we compute the following monthly excess return of the asset

classes and average these overall markets, following the methodology of Baltussen and Soebhag (2020).

Moreover, we sort the surprises either using a global index (composed by growth and inflation factor) or distinguishing by regional growth factor and regional inflation factor, considering both the local and global returns. With the global surprise index, the subsequent average monthly excess equity returns increase from the lowest to the highest quintile in each of the three markets. The most evident case is the Brazilian market, which presents the lowest quintile with 1.01% and 1.05% and reaches 1.84% and 1.46% in the highest, using the local and global returns. The resulting top minus bottom spread ranges from 0.09% for Russian markets to 1.49% for China.

Third, through different regression analyses, we find that global surprises predict subsequent daily returns for our sample from May 2005 to December 2020. We use this specific sample period to include all the macroeconomic news released in our three emerging markets. However, even though this period may seem short, it remains significant because it has important financial events as the financial crisis in 2008 and the most recent crisis due to the Covid-19.

The regression analysis shows that a global surprise index and growth surprise index significantly predict the daily equity return after controlling for its volatility index (Table 7). On the other hand, the regional global surprise index[1] significantly predicts Brazil and China's daily local equity return but with different signs. While Russia has negative predictability on its daily future return but not significant at any levels (Table 8).

Lastly, a simple investment strategy based on the global surprises index outperforms the equity markets and yields annualized alpha between 0,50% and 3,55% for the global index surprise and the Brazil index surprise, respectively (Table 11). We also use the same investment strategy using growth and inflation surprise indexes. Indeed, we find growth surprise index outperform the markets in most of the region (except for Russia), yielding an annualized alpha between 0,89% and 5,53%, excluding Russia. While for the inflation surprise

[1] This index is obtained equal weighting each region's growth and inflation macroeconomic variables. This methodology allows us to create an index that works as a proxy for the global surprises in that specific country.

index, the obtained results show that most of the time the market outperforms the index. Only Brazil's inflation index outperforms its regional market with an annualized alpha of 4,54%.

Further analysis finds that global index surprises predict positively bond return and negatively exchange rate return in the emerging markets. This last result confirms the theory that global index surprise presents a positive predictive power on most of the risky asset returns. Moreover, distinguishing between growth and inflation factors, we find that the growth factor predicts positively and negatively the bond return and exchange rate return, respectively. While for the inflation factor, we do not see a significant relationship between the indexes and the returns.

In addition to the research concerning the predictability of the macroeconomic surprises on the return of risky assets, we also investigate the role of these surprises in the cross-sectional pricing of equity returns. Therefore, we estimate the exposure that equity returns have concerning the global surprise index. We increment the analysis also including the growth factor and inflation factor. Adopting a similar methodology of Bali et al. (2017), we conduct tests to assess the predictive power of the beta surprise index over future equity return. Then, we run a rolling regression of the excess returns on the day-ahead of the surprise index and with a window size of one month. Next, we form decile portfolios by sorting individual returns based on their surprise index beta. Decile 1 contains returns with the lowest betas and decile 10 returns with the highest beta. We find that moving from decile 1 to decile 10, a significant cross-sectional variation in the average beta value is present; indeed, the average surprise beta increases from -2.54 to 2.03 for the global index.

Regarding the returns of the ten portfolios, we find that they decrease monotonically from 0.02% to -0.18% per day when moving from the lowest to the highest beta decile (Table 12). Even with the growth and inflation index, the beta cross-section decreases in the returns from the lowest to the highest beta decile. The values go from 0.02 (lowest beta) to -0.08 (highest beta) with the growth factors and from 0.08 (lowest beta) to -0.23 (highest beta) with inflation. These results show that higher exposure to the surprise effect does not necessarily bring a higher return. We note that surprises in the lower-betas deciles demand higher

returns, leading us to conclude that these surprises tend to move the market variance more. The result of this is a higher risk premium and higher return.

The remainder of the paper is structured as follows. Chapter 2 provides the essential literature regarding the impact of macroeconomic surprises on market returns. Chapter 3 describes the macroeconomic news data and the methodology to construct economic surprise indexes. Chapter 4 analyses the dynamics of these surprise indexes and documents momentum in economic surprises. Chapter 5 examines the predictive power of economic surprises on asset returns, presenting our investment strategies' results. Chapter 6 examines the cross-section between beta surprise and future returns. Furthermore, the last chapter concludes.

## 2 Literature Review

Macroeconomic variables' impact on equity markets plays a fundamental role for financial market participants. Several studies have investigated the relationship between the equity market and macroeconomic variables. The research of Chenn et al. (1986) explored the role of macroeconomic factors in determining stock returns. The authors observed that stock returns are exposed to systematic economic news, reflecting the theory that asset prices should depend on their exposure to the state variable that describes the economy. These conclusion results are also consistent with the asset-pricing theory (Merton, 1973), which stipulates that any variable (in a risk-averse economy) that affects the set of future investment or consumption opportunities earns a risk premium (Baltussen and Soebhag, 2020). Similarly, Patelis (1997) relates the results of the asset return predictability literature to macroeconomics variables by examining the role of monetary policy. Flannery and Protopapadakis (2002) document real macroeconomic variables' impact on aggregate equity return and find that stock market returns are significantly correlated with inflation and money growth.

To date, however, many studies have focused their attention on the fundamental macroeconomic variables and not on the unexpected component that can be present with the release of the news. To these ends, Pearce and Roley (1985) extended one of their

previous papers based on the effects of macroeconomic announcements, including a measure of unexpected changes or surprises. They examined the daily response of stock prices to the report of different economic variables such as CPI, PPI, and unemployment rate. They found that unexpected announcements in monetary policy had a significant influence on stock prices. However, studies on the relation between surprises in macroeconomic news and asset returns are scarce and limited. Indeed, most of them are typically dedicated to a specific market or asset class.

Balduzzi et al. (2001) investigate the response of economic announcements and their respective surprises on the prices of U.S. Treasury bonds. They found that many announcements and surprises significantly impact the price of bonds with different effects depending on their maturity. Moreover, they noticed that public news tends to be incorporated very quickly into the price for most announcements, typically a few minutes after their release. Through this previous research, we deduct that the surprise's impact can be seen immediately in the return of the risky assets. What remains still unknown is how long the surprise can impact the price.

Most of the cited literature focuses their analysis on announcements' impact on U.S. stocks and bonds. However, a dearth of research remains on the impact of macroeconomic announcements and surprises on the return of risky assets regarding emerging markets.

Many other works of literature focus on macroeconomic announcements and other news during various financial crises. For instance, Andritzky et al. (2007) examine how emerging market bonds react to macroeconomic announcements. Ganapolsky and Schmukler (2001) investigate the reaction of Argentina's stock market index, bond price, and interest rate to the news released during the Mexican Crisis of 1994-1995. Kaminsky and Schmukler (1999) examine the same effect during the Asian crisis. However, all these studies focus on the macroeconomic announcements and their impact on the emerging markets without considering surprises.

Therefore, we retain fundamental importance in investigating the impact of macroeconomic surprises on the return of equity, bond, and exchange rate inside the emerging markets. We provide an innovative and never-studied topic to the literature through this research.

# 3 Data and Methodology

Do macroeconomic surprises impact the asset prices and the return on emerging markets' risky assets?

As seen in the literature review, different studies have dedicated their attention to important thematic as the impact that one or several fundamental macroeconomic variables have on asset returns or the effect that surprise can have on the financial markets. However, none of them has dedicated a specific investigation on the emerging markets' surprises and how to react to asset prices.

This research wants to investigate this topic, analyzing the surprises generated from several fundamental macroeconomic variables in three specific emerging markets: Brazil, China, and Russia.

## 3.1 Bloomberg Economic Data

A critical role in the impact of macroeconomic surprises in the financial markets is played by real-time information. Macroeconomic data are tendentially subject to future revisions, and sometimes, they are released with a delay. Ghysels et al. (2014) find that this effect can impact the predictive power that macroeconomic factors have on the return. Therefore, we collect real-time macroeconomic news from the Blomberg Economic Calendar for Brazil, China, and Russia. The considered period ranges from May 2005 to December 2020 due to a shortcoming of macroeconomic information before these dates. Each announcement record consists of a release time, an announcement value, and a consensus forecast[2]. Therefore, we select 43 distinct macroeconomic variables for Brazil, 25 for China, and 25 for Russia. Thus, globally, we use more than 90 different variables to represent the economy in emerging markets. Then, this data set contains approximately 4.400 unique surprises for Brazil, 2.300 for China, and 2.600 for Russia. In total, we have around 9.000 unique macroeconomic surprises for our analysis. In appendix A, we provide further information on the exact number of macroeconomic variables and surprises considered in our data set for each country.

[2] We use Bloomberg survey economists during the weeks before each announcement's release to obtain a consensus estimate.

In line with Beber et al. (2015), we separate the aggregate economy into two main categories: inflation and growth. In practice, we split the set of macroeconomic variables into these two groups, creating an inflation and growth index per region with the respective surprises. We also aggregate all the macroeconomic variables in a unique index representing the whole economy in the emerging markets, equal weighting the three regional surprise indexes for growth, inflation, and global factors. Appendix A provides the allocation of the surprise either for growth, inflation, and global variables.

## 3.2 Construction Surprise Index and forward-filling

*Macroeconomic surprise* can be defined as the difference between the realized value of the macroeconomic release and the median (as known as consensus) of the forecast made by a panel of market participants and collected by the Bloomberg Economic Calendar.
McCoy et al. (2020) provide the methodology for building an index that gauges the surprise generated by the macroeconomic announcements and their median. Our surprise index ($S_{i,t)}$ is obtained with the following formula:

$$S_{i,t} = \sum_{i=1}^{N_{a,t}} \frac{(A_{i,t} - M_{i,t})}{std(A_{i,t} - M_{i,t})}$$

Where $N_{a,t}$ is the number of macroeconomic variables available at time $t$, $A_{i,t}$represents the realized value of the macroeconomic announcement, and $M_{i,t}$ the median of the forecast.

In practice, we calculate the divergences between the value of the announcement and its respective forecast for each macroeconomic variable. Second, we turn each of these gaps in a z-score on an expanding and recursive basis that allows us to find a mean and standard deviation of these z-scores under each macroeconomic variable. Lastly, we subtract the respective mean from the initial gap and divide the result for the standard deviation of the z-scores.
However, all these operations generated a sparse data matrix with many missing values. We solve this by forward filling the missing values by the last observed value of each

macroeconomic variable for each day in our sample. In this case, we can think of the time series in calendar time as a step function that changes in value when a new announcement is released for that variable. Others statistical model exists to impute missing values, but these models are far more complex (Baltussen and Soebhag, 2020).

## 3.3 Financial market data and control variable

The research is based on the impact of macroeconomic surprises released in the emerging markets on their asset return. To study this effect, we obtain data for several asset classes. As a primary asset, we consider the return from the stock markets. We get historical prices of the BOVESPA index, MOEX index, and Shanghai Composite index. Moreover, we include the MSCI Emerging Market index, which acts as a proxy for the regional stock market.
For the bond market, we calculate returns from the regional government bond 10-years. Lastly, we get the historical ratio series between the regional currency and the U.S. dollar for the exchange rate return. Additionally, we use the 3-month U.S. Treasury rate for the excess return.

Other indexes are included in our investigation. We consider the volatility index of each country as a control variable. Then, we obtain the historical series of the Cboe[3] Brazil ETF Volatility Index (VXEWZ), Cboe China ETF Volatility Index (VXFXICLS), Russia Volatility Index (RVI), and the Cboe Emerging Markets Volatility Index (VXEEM), which acts as a control variable for the global emerging markets. We control for the short rate and each country's term spread for bonds. The short rate is the return on the three-month U.S. Treasury bills, and the term spread is the difference between the local Government bond 10-year and the three-month U.S. Treasury bills. While for the currency market, we control only for the short rate.

[3] Chicago Board Options Exchange (CBOE) is the world's largest options exchange with contracts focusing on individual equities, indexes, and interest rates. It is also the originator of the Cboe Volatility Index (VIX), the most widely used and recognized proxy for market volatility.

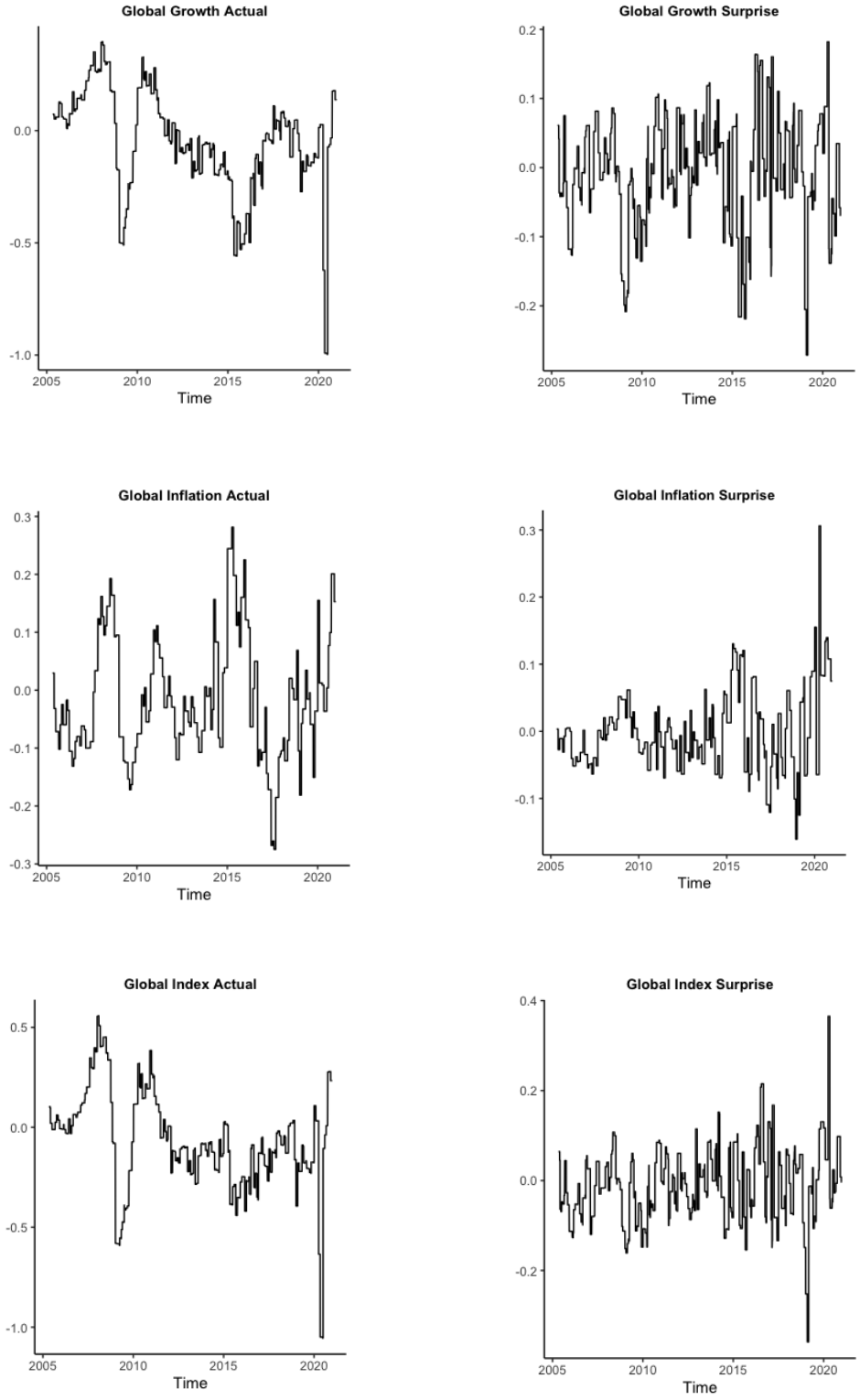
# 4 The behavior of economic surprises

In this paragraph, we describe the dynamics and the characteristics of our surprise indexes. Firstly, through an autocorrelation analysis, we find that surprises do not appear randomly but instead show a positive autocorrelation. This phenomenon has also been found by (Baltussen and Soebhag, 2020), and it is called "economic surprise momentum". Second, we conduct a correlation analysis among factors categories and regions. We show that local surprises are strongly correlated with global surprises. We also find a positive correlation between growth and inflation surprise and the global surprises in the three regions.

Figure 1 shows the time series plots for the global growth, global inflation factor, and global index. These three-time series act as a proxy for the emerging markets because they are obtained by averaging the actuals and surprises of Brazil, China, and Russia. The upper panel provides the time series for the global growth actuals and surprises. In the center, we find the actuals and surprises for the global inflation factor. In the last row, the two plots represent the time-series of the global index, obtained by merging the global growth and inflation factor under a unique parameter. From these plots, we can find a multitude of conclusions. The actual time series seems to be aligned with important economic events, such as the Financial Crisis in 2008 or the Covid-19 Crisis in 2020. However, the actuals for the inflation factors do not respect the same expansion and recession's variation followed by the growth and global index actuals. These significant divergences between growth and inflation factors indicate that both the measures capture different aspects of the economy, but unlike (Baltussen and Soebhag, 2020), we want to aggregate them in a global and unique index to investigate how the emerging markets react to surprises from the most fundamental macroeconomic variables.

Regarding the time series relative to the surprises, we notice numerous divergences between growth and inflation. Indeed, we find that growth surprises tend to align with the economic event, growing during expansion periods and vice versa. According to (Baltussen and Soebhag, 2020), these results indicate that forecasts are typically too low during periods of

**Figure 1: Time Series plots for global growth factors, global inflation factors, and global index.** The first row shows the global growth actual and surprise factors, respectively. The second row shows the global inflation actual and surprise factor. The third row shows the global index actual and surprise factors. The global index represents the equal-weighted growth and inflation factors under a unique measure.




Adapted source: Bloomberg data.

expansions but too high during periods of recessions. However, this effect seems most remarkable during economic shocks and crises.

On the other hand, we see a reverse effect for inflation surprises. Indeed, they do not tend to follow the economic events but behave in the opposite way, indicating that the expectations are too high during the expansion periods while too low during the recessions. Further remarks come from the plots in Appendix B, representing the same time series but at the regional level.

## 4.1 Descriptive Statistics

In this section, we report the descriptive statistics for the surprise indexes. Table 1 shows the main finding for Brazil, China, Russia, and the Global surprise index. The table is divided into three panels: the upper for the global-local surprise index, the middle for the growth-local surprise index, and the lowest for the inflation-local surprise index.

**Table 1: Descriptive Statistics.** Local and global surprise indexes are extracted from a large cross-section of macroeconomic surprises. The indexes have a daily frequency starting from 2005-05-02 till 2020-12-31. This table reports the number of observations (N), the mean, the standard deviation (sd), median (med), minimum (min), maximum (max), skewness (skew), and kurtosis (kurt). $\rho_1$ denotes the estimated autocorrelation between t and t-I using 20-day subsampling.

| Var. | N | mean | sd | med | min | max | skew | kurt | $\rho_1$ | $\rho_3$ | $\rho_9$ |
|---|---|---|---|---|---|---|---|---|---|---|---|
| $S_{BR}$ | 4089 | 0.01 | 0.17 | 0.01 | -0.50 | 0.45 | -0.39 | 0.42 | 0.47 | 0.05 | 0.01 |
| $S_{CH}$ | 4089 | -0.03 | 0.15 | -0.04 | -0.39 | 0.65 | 1.12 | 2.75 | 0.65 | 0.32 | 0.20 |
| $S_{RU}$ | 4089 | -0.002 | 0.12 | -0.006 | -0.43 | 0.49 | 0.19 | 2.43 | 0.67 | 0.16 | -0.02 |
| $S_{GL}$ | 4089 | -0.01 | 0.08 | -0.01 | -0.36 | 0.37 | 0.21 | 2.33 | 0.51 | 0.14 | -0.10 |
| $S_{G,BR}$ | 4089 | 0.01 | 0.14 | 0.015 | -0.36 | 0.33 | -0.24 | -0.07 | 0.42 | 0.05 | -0.04 |
| $S_{G,CH}$ | 4089 | -0.05 | 0.13 | -0.05 | -0.45 | 0.47 | 0.76 | 2.59 | 0.58 | 0.22 | 0.16 |
| $S_{G,RU}$ | 4089 | 0.02 | 0.15 | 0.03 | -0.64 | 0.36 | -1.23 | 3.67 | 0.67 | 0.16 | -0.02 |
| $S_{G,GL}$ | 4089 | -0.01 | 0.08 | -0.01 | -0.27 | 0.18 | -0.47 | 0.38 | 0.59 | 0.25 | -0.06 |
| $S_{I,BR}$ | 4089 | 0.005 | 0.15 | -0.0006 | -0.36 | 0.69 | 0.76 | 2.29 | 0.48 | 0.12 | 0.102 |
| $S_{I,CH}$ | 4089 | 0.01 | 0.05 | 0.003 | -0.06 | 0.17 | 0.56 | -0.26 | 0.68 | 0.20 | 0.05 |
| $S_{I,RU}$ | 4089 | -0.02 | 0.11 | -0.05 | -0.23 | 0.33 | 1.09 | 0.64 | 0.89 | 0.72 | 0.37 |
| $S_{I,GL}$ | 4089 | -0.001 | 0.06 | -0.01 | -0.16 | 0.30 | 1.01 | 2.95 | 0.63 | 0.33 | 0.08 |

Adapted source: Bloomberg data.

We notice that only Brazil has a positive mean in global, growth and inflation surprise indexes, indicating that forecasts are typically smaller than the actual announcements in this region.

On the other hand, China and Russia present a negative mean for the global index. Moreover, growth and inflation surprise indexes show a negative mean for Russia, while China shows a negative mean for the growth surprise index and a positive for inflation. Therefore, the means of the surprise indexes are not uniform among countries but change depending on the factor and the region. For the global surprise, we can notice that all the means are negative, indicating that forecasts are tendentially bigger than the actual announcements released in the emerging markets.

The last three columns of Table 1 show the estimated 1-month, 3-month, and 9-month of autocorrelations. We calculate these values using the 20-day-sub-sampling method on the daily surprise in line with Baltussen and Soebhag (2020). Across all the factors and regions, we notice a general positive 1-month and 3-month autocorrelation. The 1-month autocorrelation ranges from 0.42 to 0.89, while the 3-month from 0.05 to 0.72. Considering the 9-month autocorrelation, we notice that these values tend to be negative or close to zero. To conclude, based on these values, it seems the case that economic surprises are correlated over time. Moreover, in a short time horizon, positive (negative) surprises tend to be followed by positive (negative) surprises afterward, showing an "economic surprise momentum".

## 4.2 Autocorrelation among surprises

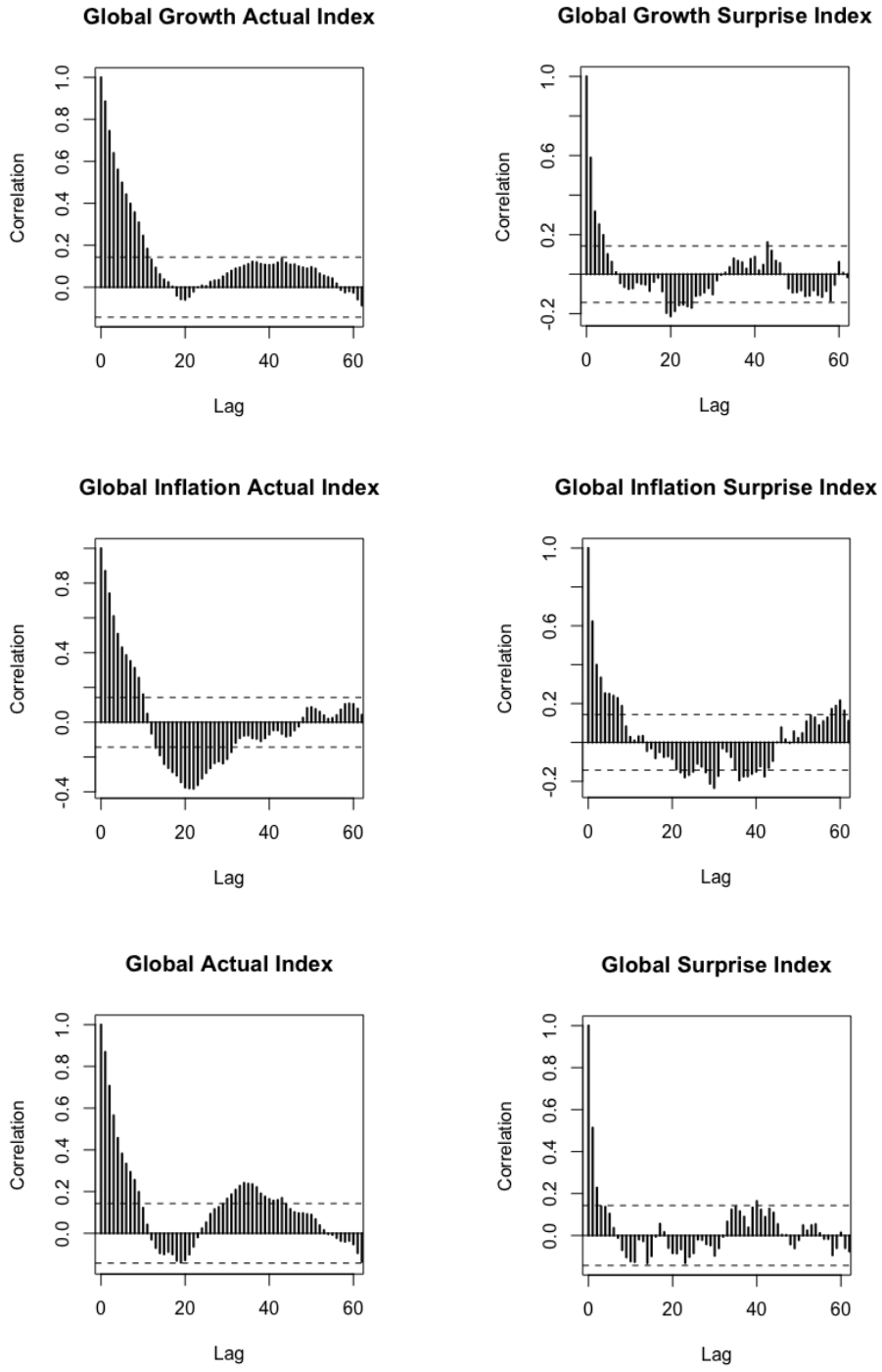
Table 1 shows a positive autocorrelation in all the surprises indexes. To this end, in this paragraph, we want to investigate and obtain a comprehensive overview of the surprise indexes' autocorrelation structure and provide additional information regarding the correlation among factors.

Figure 2 provides the autocorrelation plots for actuals and surprises in the global index, global growth, and global inflation[4]. To calculate the autocorrelation, we use the daily value and apply the 20-day resampling procedure. According to Baltussen and Soebhag (2020), this resampling procedure allows finding autocorrelation while controlling for local persistency due to forward filling.

[4] Appendix B shows the autocorrelation plots for the global actuals and surprises in Brazil, China, and Russia.

On the left part of Figure 2, we show the autocorrelation function (ACF) for global growth, inflation, and global index, respectively. While on the right side, we show the autocorrelation of the surprise.

**Figure 2: Autocorrelation function plots.** The first column shows the autocorrelation plots for the actual series. The second column shows the autocorrelation plots for the surprise series.




Adapted source: Bloomberg data.

From the autocorrelation plots, we obtain different results. First, we observe positive and significant autocorrelation over ten months for all the actual series. Moreover, the autocorrelation structure shows cycle periods of negative and positive values. We notice that the growth actual's cycle shows more frequently positive values than inflation actual. Indeed, we do not find any significant negative autocorrelation within the 5-year lag in the actual growth series, unlike the inflation series.

Regarding the surprise series, we find positive and significant autocorrelation up to and including the third lag, consistent with our descriptive statistics. We also find a negative and significant autocorrelation between the 20 and 30-month lag for the inflation and growth factors. Lastly, we notice that surprises exhibit a momentum pattern in the short period where positive (negative) surprises tend to be followed by more positive (negative) surprises.

## 4.3 Correlation between factors

In addition to the autocorrelation analysis, we also investigate the correlation between factors.

Table 2 describes the relationship among all estimated factors within regions. All the surprises are positively correlated with the regional index confirming that surprises tend to follow the level factors. We notice that Brazil and Russia show a positive correlation between growth surprises and actuals, concluding that surprises are big during economic expansion when the actual growth indexes are also high. Moreover, the correlation between inflation actuals and surprises is positive in the three countries.

We find that Russia's growth and inflation factor are uncorrelated, with values ranging from -0.78 to -0.16. China presents a negative correlation between growth actual and inflation surprise. However, this country shows a positive but weak correlation between growth surprise and inflation actuals. To conclude, globally, the correlation between actuals and surprises is 0.37 for the growth factors, while 0.44 for the inflation.

**Table 2: Factor correlations over categories within regions.** The first column shows the autocorrelation plots for the actual series. The second column shows the autocorrelation plots for the surprise series.

| BR | $G_{act}$ | $G_{sur}$ | $I_{act}$ | $I_{sur}$ | $Global_{BR}$ |
|---|---|---|---|---|---|
| $G_{act}$ | 1 | | | | |
| $G_{sur}$ | 0.38 | 1 | | | |
| $I_{act}$ | 0.10 | 0.14 | 1 | | |
| $I_{sur}$ | 0.06 | 0.07 | 0.49 | 1 | |
| $Global_{BR}$ | 0.33 | 0.78 | 0.42 | 0.65 | 1 |
| CH | $G_{act}$ | $G_{sur}$ | $I_{act}$ | $I_{sur}$ | $Global_{CH}$ |
| $G_{act}$ | 1 | | | | |
| $G_{sur}$ | -0.08 | 1 | | | |
| $I_{act}$ | 0.31 | 0.02 | 1 | | |
| $I_{sur}$ | -0.26 | 0.28 | 0.59 | 1 | |
| $Global_{CH}$ | -0.16 | 0.56 | 0.21 | 0.56 | 1 |
| RU | $G_{act}$ | $G_{sur}$ | $I_{act}$ | $I_{sur}$ | $Global_{RU}$ |
| $G_{act}$ | 1 | | | | |
| $G_{sur}$ | 0.73 | 1 | | | |
| $I_{act}$ | -0.26 | -0.16 | 1 | | |
| $I_{sur}$ | -0.78 | -0.55 | 0.48 | 1 | |
| $Global_{RU}$ | 0.15 | 0.66 | 0.24 | 0.25 | 1 |
| GL | $G_{act}$ | $G_{sur}$ | $I_{act}$ | $I_{sur}$ | $Global_{GL}$ |
| $G_{act}$ | 1 | | | | |
| $G_{sur}$ | 0.37 | 1 | | | |
| $I_{act}$ | -0.05 | -0.05 | 1 | | |
| $I_{sur}$ | -0.39 | -0.13 | 0.44 | 1 | |
| $Global_{GL}$ | 0.09 | 0.84 | 0.21 | 0.41 | 1 |

Adapted source: Bloomberg data.

We also document the correlation of each index across countries. Table 3 shows how local factors within categories are correlated across regions. We observe a positive correlation in the growth actual levels between the countries (ranging from 0.31 to 0.86), indicating that a global business factor is a common source in explaining the variation in local macroeconomics aggregates. Moreover, the local growth indexes are strongly correlated with the global growth factors ranging from 0.64 to 0.86. Regarding inflation, the actual factors are less robust than the growth, sometimes presenting negative values. Under this factor, the correlation range between -0.11 and 0.83. However, as for the growth levels, the correlation with the global inflation factors is positive (ranging from 0.14 to 0.83).

**Table 3: Factor correlations over regions within categories.** The table reports the correlation estimates of the global, growth, and inflation levels and surprises across regions.

| $Global_{act}$ | BR | CH | RU | GL |
|---|---|---|---|---|
| BR | 1 | | | |
| CH | 0.20 | 1 | | |
| RU | 0.34 | 0.45 | 1 | |
| GL | 0.62 | 0.82 | 0.77 | 1 |
| $Growth_{act}$ | BR | CH | RU | GL |
| BR | 1 | | | |
| CH | 0.31 | 1 | | |
| RU | 0.42 | 0.52 | 1 | |
| GL | 0.64 | 0.86 | 0.82 | 1 |
| $Inflation_{act}$ | BR | CH | RU | GL |
| BR | 1 | | | |
| CH | -0.11 | 1 | | |
| RU | 0.34 | -0.06 | 1 | |
| GL | 0.83 | 0.14 | 0.75 | 1 |

| $Global_{sur}$ | BR | CH | RU | GL |
|---|---|---|---|---|
| BR | 1 | | | |
| CH | 0.04 | 1 | | |
| RU | -0.04 | -0.13 | 1 | |
| GL | 0.69 | 0.55 | 0.38 | 1 |
| $Growth_{sur}$ | BR | CH | RU | GL |
| BR | 1 | | | |
| CH | 0.11 | 1 | | |
| RU | 0.03 | -0.06 | 1 | |
| GL | 0.64 | 0.56 | 0.58 | 1 |
| $Inflation_{sur}$ | BR | CH | RU | GL |
| BR | 1 | | | |
| CH | -0.07 | 1 | | |
| RU | -0.08 | -0.23 | 1 | |
| GL | 0.78 | 0.06 | 0.49 | 1 |

Adapted source: Bloomberg data.

On the other hand, surprises tend to be less correlated with inflation and growth factors. However, we observe a strong correlation with the global factor for the growth surprise, ranging from 0.58 to 0.64. We document the same pattern for the inflation surprise across countries, with a strong correlation between regions and global factors (from 0.06 to 0.78). To conclude, according to Baltussen and Soebhag (2020), this table aims to stress the importance of global standard components in local macroeconomic levels and surprises.

# 5 Economic surprise momentum in the Emerging Markets

In chapter four, we show that surprises do not appear randomly but exhibit a positive autocorrelation. Moreover, we find a strong correlation between local and global surprises, highlighting the importance of a global factor. At this point, we want to investigate whether our index can be used to predict risk premium across asset classes. Therefore, this paragraph is structured as follows. First, we assess the link between economic surprises and asset returns by a simple sorting procedure. Second, to investigate the relation between surprises and market returns, we run multiple regressions introducing also different control variables. Lastly, we run a simple investment strategy with the macroeconomic surprises in the equity markets.

## 5.1 Sorting surprises and returns

We sort the global surprise index, the growth, and inflation surprise index in increasing order and split them into equal-sized quintiles. In each bucket, we calculate the future average monthly asset return. To this end, we consider three main asset classes: equity, bond, and exchange rate. Regarding equity, we provide results both with local return and global return.

Table 4 provides the results for the equity market. With the global index, the future equity premium is generally higher if the surprises at the start of the period take a higher value. We can see that in the lowest global index quintile (1), the average monthly excess equity returns range from 1.01 (BR) to 1.45 (RU) with the global return, while from -0.75 (CH) to 1.05 (BR) with the local return. However, both the panels show a monotonically increase from the lowest to the highest quintile. The resulting top minus bottom quintile spread, in the last column, ranges from 0.30 (RU) to 0.82 (BR) with the global return and from 0.09 (RU) to 1.49 (CH) with the local returns. Therefore, we find that higher global surprise indexes predict higher subsequent monthly excess returns in our sample period.

The panels 3 and 4 show the results obtained by the sorting procedure with the growth surprise index. We notice many differences compared to the previous results.

**Table 4: Sorting surprise and asset return (equity).** We sort surprises in five buckets. We show the global index surprises with the global (1) and regional (2) returns. Subsequently, we sort the growth index surprise with regional (3) and global (4) returns. Lastly, we sort the inflation index surprise with regional (5) and global (6) returns.

| (1) | Q1 | Q2 | Q3 | Q4 | Q5 | Q5-1 |
|---|---|---|---|---|---|---|
| BR | 1.01 | -0.18 | 0.53 | 0.02 | 1.84 | 0.82 |
| CH | 1.09 | 1.04 | 0.56 | -1.12 | 1.62 | 0.51 |
| RU | 1.45 | 1.34 | 1.43 | 0.47 | 1.75 | 0.30 |
| (2) | Q1 | Q2 | Q3 | Q4 | Q5 | Q5-1 |
| BR | 1.05 | -0.37 | 0.79 | -0.27 | 1.46 | 0.41 |
| CH | -0.75 | 1.46 | 0.30 | 0.82 | 0.73 | 1.49 |
| RU | 0.27 | 1.01 | 0.22 | 1.29 | 0.37 | 0.09 |

| (3) | Q1 | Q2 | Q3 | Q4 | Q5 | Q5-1 |
|---|---|---|---|---|---|---|
| BR | 2.23 | -0.03 | 1.47 | 0.61 | 1.55 | -0.68 |
| CH | -0.39 | 2.72 | 0.96 | 0.24 | 0.51 | 0.89 |
| RU | 3.20 | 0.27 | 1.51 | 1.93 | -0.52 | -3.73 |
| (4) | Q1 | Q2 | Q3 | Q4 | Q5 | Q5-1 |
| BR | 1.34 | -0.38 | 0.22 | 1.88 | 0.08 | -1.26 |
| CH | 0.24 | 0.34 | -0.06 | 1.63 | 1.01 | 0.76 |
| RU | 1.86 | 0.13 | 0.49 | 1.45 | -0.80 | -2.67 |

| (5) | Q1 | Q2 | Q3 | Q4 | Q5 | Q5-1 |
|---|---|---|---|---|---|---|
| BR | 0.77 | 1.42 | 1.92 | 0.04 | 1.68 | 0.91 |
| CH | 2.44 | 2.90 | 1.71 | -1.86 | -1.16 | -3.60 |
| RU | -0.19 | 1.78 | 1.79 | 0.60 | 2.49 | 2.68 |
| (6) | Q1 | Q2 | Q3 | Q4 | Q5 | Q5-1 |
| BR | 0.65 | -0.23 | 2.30 | -0.42 | 0.93 | 0.28 |
| CH | 1.55 | 2.11 | 1.02 | -1.14 | -0.38 | -1.93 |
| RU | -0.33 | 1.29 | 0.91 | -0.43 | 1.78 | 2.11 |

Adapted source: Bloomberg data.

Indeed, the monotonical increase seems to disappear for some regions (Brazil and China) while remaining significant for others (Russia).

On the other hand, we notice that results obtained in panels 5 and 6 are opposite to those in panels 3 and 4. With the growth factor, Brazil and China decrease from the first to the last quintile, while with the inflation factor, they increase. Vice versa for Russia, which rises with the growth factor and falls with the inflation. The conclusive result is a trade-off between growth and inflation that allows higher global index surprises to predict higher monthly expected equity returns.

The pooled results for the remaining asset classes are provided in Table 5. For bonds, we find that higher global index surprises are associated with higher future bond returns in all three regions. We also notice that the magnitude of the effect is more significant than with the equity market. Indeed, the top minus bottom spreads from 1.19% to 1.77% per month for bonds. Regarding the exchange rate market, the effect is the opposite of that with bonds. Unlike Russia, we find decreasing monthly returns from the first to the last quintile.

**Table 5: Sorting surprise and asset return (bond and currency).** We sort the global index surprises into five buckets. The first panel shows the results of the sorting with the local bond returns (10-government bonds). While the second panel shows the results of the sorting with the exchange rate returns. Exchange rates are calculated as the ratio between the local currency and the U.S. dollar.

| Bond | Q1 | Q2 | Q3 | Q4 | Q5 | Q5-1 |
|---|---|---|---|---|---|---|
| BR | -0.61 | 1.83 | -1.02 | 0.67 | 0.58 | 1.19 |
| CH | -0.79 | -0.28 | 1.19 | -1.28 | 0.98 | 1.77 |
| RU | -0.61 | 0.64 | 0.21 | -1.19 | 0.97 | 1.58 |
| Currency | Q1 | Q2 | Q3 | Q4 | Q5 | Q5-1 |
| BR | 0.01 | -0.12 | -0.02 | -0.22 | -0.23 | -0.24 |
| CH | 0.81 | 0.98 | 1.09 | 1.24 | -0.93 | -1.74 |
| RU | 0.01 | 0.14 | 1.58 | -0.46 | 1.24 | 1.23 |

Adapted source: Bloomberg data.

Table 6 shows the bonds and currencies distinguishing between growth and inflation factors. The first panel shows a similar result to that obtained with the global index.

Growth factors surprise shows a higher (smaller) bond return in the highest (lowest) quintile in the three regions. However, it does not present the same conclusions when we sort the currency returns.

With Inflation, we find different results depending on the risky asset and region. For example, Brazil and Russia present a positive top minus bottom quintile considering bond returns, while China is negative. Instead, considering currency, these values result to be positive for Brazil and China and negative for Russia. Therefore, we do not find an explanation as significant as those found with the equity markets in this last scenario. Most of the results are dependent on their local factor and returns.

**Table 6: Sorting surprise and asset return (bond and currency).** We sort the growth and inflation index surprises into five buckets. The panels (1) and (2) show the results from the growth index surprises and the bond and currency returns. On the other hand, panels (3) and (4) do the same with the inflation index surprise.

| (1) Bond | Q1 | Q2 | Q3 | Q4 | Q5 | Q5-1 |
|---|---|---|---|---|---|---|
| BR | -1.20 | 1.07 | 0.03 | 0.99 | 0.55 | 1.75 |
| CH | -1.03 | -0.24 | -0.57 | 0.86 | 0.75 | 1.78 |
| RU | -0.35 | 0.31 | -0.01 | -0.48 | 0.53 | 0.88 |
| (2)Currency | Q1 | Q2 | Q3 | Q4 | Q5 | Q5-1 |
| BR | -0.09 | 0.15 | -0.05 | -0.34 | -0.25 | -0.15 |
| CH | 0.68 | 1.82 | 1.47 | -0.37 | -0.40 | -1.08 |
| RU | -0.35 | 0.21 | 1.29 | -0.02 | 1.39 | 1.75 |
| (3) Bond | Q1 | Q2 | Q3 | Q4 | Q5 | Q5-1 |
| BR | -1.09 | -0.01 | 2.39 | 0.35 | -0.26 | 0.83 |
| CH | 1.38 | -1.23 | 0.95 | -1.67 | 0.36 | -1.03 |
| RU | -1.34 | -0.81 | -0.48 | 0.93 | 1.73 | 3.07 |
| (4)Currency | Q1 | Q2 | Q3 | Q4 | Q5 | Q5-1 |
| BR | -0.02 | 0.02 | -0.27 | -0.38 | 0.07 | 0.10 |
| CH | 0.17 | 0.91 | 1.54 | 0.34 | 0.32 | 0.14 |
| RU | 0.43 | 0.67 | -0.10 | 1.22 | 0.30 | -0.12 |

Adapted source: Bloomberg data.

## 5.2 Regression between surprises and returns

To analyze the relationship between surprises and market returns, we use the following regression:

$$R_{t:t+h} = \alpha + \beta_{Xt} + \epsilon_{t:t+h} \qquad \forall t = 1,\cdots,T-h$$

Where $R_{t:t+h} = (R_{t+1} + 1) \times \cdots \times (R_{t+h} + 1) - 1$. $R_t$ represents the excess return of a market index at day $t$. $Xt$ denotes the surprise index at time $t$. Following a similar methodology of Baltussen and Soebhag (2020), we estimate this equation by OLS using a daily forecast horizon and frequency. $\epsilon_{t:t+h}$ represents the prediction error, which is assumed to follow a normal distribution with mean equal to zero. The null hypothesis ($\beta = 0$) implies no predictive ability of the surprise index. On the other hand, the alternative hypothesis ($\beta \neq 0$) implies predictive power.

Table 7 presents the results from the regression. At the global level, we find that global surprise and growth surprises positively predict future equity market return (Columns 1 and 2), even though the general index is not significant. Instead, the inflation surprise index predicts negatively future equity market returns. Therefore, a general conclusion obtained from this first plot of regression is that when announcements values regarding economic growth exceed their corresponding forecasts, expectations of the future state of the economy will improve, vice versa for inflations announcements values. However, we can also conclude that the state of the economy improves in the emerging markets when the announcements values exceed their expectations. Indeed, the index that merges the growth and inflation variables has a positive predictive power (column 1). Further results can be obtained by introducing the control variable. In this case, we use the Cboe Volatility Index in the Emerging Markets as the control variable. We notice that the results do not remarkably change. However, for the general index, the regression result became significant, increasing the predictive power of the variable.

At the regional level (Table 8), only Brazil's surprise indexes positively predict future equity market return. The value is significant for the global brazil index at the 5% significance level with a t-statistic of 2.152. On the other hand, China and Russia negatively predict future returns. China's global index is significant at a 10% significance level (with a t-statistic of -1.868), while Russia is not significant. Even with the introduction of the control variables, the result slightly changes. In this case, we use the Cboe local volatility index for controlling. We notice that global Brazil's value remains significant at a 5% level and positive (Column 4). China loses its significance but continue to have negative predictive power over its future equity market returns. At the same time, Russia presents an opposite result with the control variable. Indeed, it positively predicts future equity return even though the value and the impact of the surprises do not seem particularly significant on the returns.

Investigating the impact of the regional growth factor on the future equity returns, we notice that only Brazil presents a positive predictive power on its equity return. However, the value becomes significant at the 10% level introducing the control variable. For China and Russia, the growth index surprise negatively predicts future equity returns (Columns

2 and 3). Also, with the control variable, the values do not change particularly, unlike the China growth index that became significant (Columns 5 and 6).

Moreover, we find a positive and significant relation between surprises and future returns for Brazil with the inflation factors. The value is significant at 10%, with t-statistics of 1.671. This value loses significance once we introduce the control variable. China's inflation surprise index predicts negatively, and significantly future equity returns. The variable is significant at a 1% level with a t-statistic of -4.01. Lastly, Russia presents an inflation index that predicts the equity returns negatively, but it is not significant.

**Table 7: In-sample regressions (Equity).** The table shows the results of regressing the global index, global growth, and global inflation surprise index on future excess equity market returns. We control for the Cboe Volatility Index in the Emerging Markets. A one-day implementation lag for predicting future returns is assumed. Shown are the in-sample regressions estimates, its corresponding t-value (in parentheses), and the adjusted $R^2$. Asterisks are used to indicate significance at a 10% (*), 5% (**) or 1% (***) level.

| | Pooled Equity Returns | | | |
|---|---|---|---|---|
| | (1) | (2) | (3) | (4) |
| $Global_{Index}$ | 0.194 | | | 0.269* |
| | (1.298) | | | (1.923) |
| $Global_{growth}$ | | 0.334** | | 0.339** |
| | | (2.115) | | (2.257) |
| $Global_{inflation}$ | | | -0.114 | 0.018 |
| | | | (-0.539) | (0.101) |
| Controls | NO | NO | NO | YES |
| Obs. | 3678 | 3678 | 3678 | 2295 |
| Adj.$R^2$ | 0.0002 | 0.0009 | -0.0002 | 0.1734 |

Adapted source: Bloomberg data.

We run these regressions also with the bond and currency markets but only considering the global emerging markets and not the individual countries. We find different results for the bond and the currency. Firstly, we notice that the global index, the growth surprise index, and the inflation surprise index positively predict the future excess return on the bond market. However, this effect is slight and not significant for all the variables. Regarding the exchange rate market, we find a negative relation between surprises and returns both for the global index and the global growth surprise index. The impact is

significant at 5% and 10%, respectively. In contrast, the inflation factor positively impacts the future return but not significantly. We show these results in Appendix C and D.

To summarize, we notice that factors surprises predict the future daily equity returns positively in Brazil while negatively in China and Russia. Moreover, aggregating the three countries under a unique global index, we find that global announcement surprises tendentially predict future returns. The same is true for the surprises deriving from the global growth macroeconomic variables. Instead, the inflation surprise index presents a negative predictive power on the returns at the global level.

**Table 8: In-sample regressions at regional level (Equity).** The table shows the results of regressing the global index, growth, and inflation surprise index on future excess equity market returns at regional level. We control for the regional Cboe Volatility Index. A one-day implementation lag for predicting future returns is assumed. Shown are the in-sample regressions estimates, its corresponding t-value (in parentheses), and the adjusted $R^2$. Asterisks are used to indicate significance at a 10% (*), 5% (**) or 1% (***) level.

| | Pooled Equity Returns | | | | | |
|---|---|---|---|---|---|---|
| | (1) | (2) | (3) | (4) | (5) | (6) |
| $Brazil_{global}$ | 0.220** | | | 0.198** | | |
| | (2.152) | | | (2.103) | | |
| $Brazil_{growth}$ | 0.173 | | | 0.221* | | |
| | (1.298) | | | (1.669) | | |
| $Brazil_{inflation}$ | 0.198* | | | 0.099 | | |
| | (1.671) | | | (0.966) | | |
| $China_{global}$ | | -0.187* | | | -0.157 | |
| | | (-1.868) | | | (-1.572) | |
| $China_{growth}$ | | -0.082 | | | -0.198* | |
| | | (-0.698) | | | (-1.737) | |
| $China_{inflation}$ | | -1.261*** | | | -0.060 | |
| | | (-4.01) | | | (-0.177) | |
| $Russia_{global}$ | | | -0.094 | | | 0.028 |
| | | | (-0.720) | | | (0.232) |
| $Russia_{growth}$ | | | -0.028 | | | -0.019 |
| | | | (-0.252) | | | (-0.201) |
| $Russia_{inflation}$ | | | -0.068 | | | 0.070 |
| | | | (-0.468) | | | (0.526) |
| Controls | NO | NO | NO | YES | YES | YES |
| Obs. | 3678 | 3678 | 3678 | 2295 | 2295 | 2295 |
| Adj.$R^2$ | 0.0009 | 0.0007 | -0.0002 | 0.2144 | 0.018 | 0.057 |

Adapted source: Bloomberg data.

## 5.3 Look Back period and forecast horizon in growth and inflation surprise indexes

In this section, we want to investigate the short-run and long-run predictive power that global growth and inflation surprise indexes can have on equity returns. In the regression shown in table 7 and 8, we only used one forecast horizon (one day). Therefore, we rerun the predictive regressions for several forecast horizons. We also consider different look-back periods. As we noticed in chapter 4, surprises exhibit short-run momentum (up to 2 months). Based on this result, we expect that historical surprises also show predictive power beyond one business day. Therefore, we use different look-back periods in these new regressions ranging from one day to six months.

For global growth surprise, we find that return based on a daily forecast-horizon can be predicted by past surprises ranging from the previous day up to the last month. Table 9 shows the estimated slope coefficients of the predictive regressions. We notice that all the slope coefficients are significant and positive up to one month look-back period. However, we lose significance when we look back for one week.
For the return based on three-day forecast, we find that surprises have positively impact them. The coefficients range between 0.339 to 0.271 from one day up to one month of look back. However, these new results do not have the same significance as those obtained with the daily forecast. Only the coefficient with one look-back day is significant at a 5% level with a t-statistic of 2.149. Increasing the forecast horizon, we observe a decrease in the predictive power that surprises have on the returns. In general, we do not find that global growth surprises can predict returns on a longer forecast horizon than one week. However, we observe a negative and significant surprises predictability with three and six months of forecast returns and six months of surprises look-back period.

As regards the inflation surprise index, we find different and significant conclusions. Most of the slope coefficients are negative. Moreover, we observe the most robust predictability when we consider surprises look-backed one month and with returns forecast one day. Unlike global growth surprises, the inflation surprise index seems to have a longer period of predictability. We find that this index can negatively predict

future returns up to one month of forecast horizon and up to one month of look-back lag. As with the growth surprises, we obtain the opposite sign in the surprises' predictability power using a forecast horizon of three and six months and a look-back lag of six months.

**Table 9: Different forecast horizons and look-back periods.** The table shows the results of regressing the global growth (panel A) and the global inflation surprise index (panel B) on future excess equity market returns for various look back periods (L) and forecast horizons (F). Shown are the in-sample regressions estimates and their corresponding t-value in parentheses. Asterisks are used to indicate significance at a 10% (*), 5% (**), or 1% (***) level.

| | Growth Surprise (A) | | | | | |
|---|---|---|---|---|---|---|
| | *F = 1d* | *F = 3d* | *F = 1w* | *F = 1m* | *F = 3m* | *F =6m* |
| *L = 1d* | 0.371** | 0.339** | 0.206 | 0.227 | 0.096 | -0.006 |
| | (2.352) | (2.149) | (1.301) | (1.435) | (0.605) | (-0.040) |
| *L = 3d* | 0.294* | 0.215 | 0.229 | 0.177 | 0.129 | 0.003 |
| | (1.801) | (1.313) | (1.403) | (1.079) | (0.783) | (0.019) |
| *L = 1w* | 0.179 | 0.186 | 0.154 | 0.194 | -0.024 | -0.095 |
| | (1.070) | (1.115) | (0.921) | (1.122) | (-0.139) | (-0.528) |
| *L = 1m* | 0.302* | 0.271 | 0.262 | 0.205 | 0.089 | -0.062 |
| | (1.688) | (1.512) | (1.458) | (1.145) | (0.490) | (-0.337) |
| *L = 3m* | 0.097 | 0.093 | -0.021 | 0.038 | -0.183 | -0.322 |
| | (0.525) | (0.505) | (-0.115) | (0.203) | (-0.945) | (-1.583) |
| *L = 6m* | -0.164 | -0.223 | -0.230 | -0.115 | -0.480** | -0.494** |
| | (-0.762) | (-1.037) | (-1.071) | (-0.533) | (-2.191) | (-1.967) |

| | Inflation Surprise (B) | | | | | |
|---|---|---|---|---|---|---|
| | *F = 1d* | *F = 3d* | *F = 1w* | *F = 1m* | *F = 3m* | *F =6m* |
| *L = 1d* | -0.124 | -0.176 | -0.168 | -0.271 | -0.118 | 0.057 |
| | (-0.588) | (-0.835) | (-0.794) | (-1.271) | (-0.533) | (0.229) |
| *L = 3d* | -0.468* | -0.511** | -0.448* | -0.923*** | -0.454* | -0.153 |
| | (-1.882) | (-2.048) | (-1.782) | (-3.630) | (-1.736) | (-0.571) |
| *L = 1w* | -0.647* | -0.588** | -0.677** | -1.025*** | -0.551* | -0.542* |
| | (-2.410) | (-2.189) | (0.012) | (-3.760) | (-1.926) | (-1.846) |
| *L = 1m* | -0.894*** | -0.993*** | -0.990*** | -0.771*** | -0.392 | -0.149 |
| | (-3.065) | (-3.402) | (-3.386) | (-2.619) | (-1.320) | (-0.495) |
| *L = 3m* | -0.650** | -0.690** | -0.601* | -0.379 | -0.316 | 0.132 |
| | (-2.055) | (-2.176) | (-1.886) | (-1.173) | (-0.974) | (0.389) |
| *L = 6m* | -0.50 | -0.559 | -0.744 | -0.221 | 0.211 | 0.205 |
| | (-1.410) | (-1.574) | (-2.096) | (-0.620) | (0.556) | (0.425) |

Adapted source: Bloomberg data.

## 5.4 Momentum investment strategy with surprise index

In paragraph 5.2, we run separate regressions between surprises and returns. The results have shown that global growth surprise positively and significantly predicts future excess returns, while the inflation surprise index does the opposite. We have also investigated that global growth surprise indexes can predict equity return in the short run using past surprise information up to the previous month. Moreover, the inflation surprise index is even better because able to predict equity return using past surprises up to the previous three months, even though the index has a negative predictive power. Lastly, the regression at the regional level has shown positive and significant predictability on the future excess return for Brazil and negative predictability for China and Russia.

These regressions results help us to elaborate an investment strategy in the equity market using past surprises. Therefore, we consider simple investments strategies using global growth and inflation surprise indexes. We also obtain the cumulative return and the Sharpe ratio from these strategies. Lastly, we adopt the same methodology at the regional level, not distinguishing between growth and inflation index but using the global surprise index of each country.

Our strategy uses the momentum effect that surprises have in the short-run period. Therefore, we take positions in the equity market, with weights size equal to the 1-day lagged value of the global growth (or inflation) surprise index, and we go in long when the surprise is positive and in short when it is negative. This position has a holding period of 1 month, which will be updated every day with the new surprise index. Further, we compute the annualized return in %, the Sharpe ratio, the total sample standard deviation, the CAPM alpha, and beta using the MSCI Emerging market as a proxy for the market. In addition, we compare this strategy with a classic buy-hold strategy, where we invest in the market at the start of the sample period and hold this position until the end of the sample period.

The strategy results with global growth and inflation surprise indexes are shown in Table 10. In panel A (B), we report the growth (inflation) surprise strategy results.

**Table 10: Performance global growth and inflation surprise strategy.** Panel A (B) provides the results for an investment strategy using global growth (inflation) surprises as positions. We provide the annualized return in % (R), the standard deviation in % ($\sigma$), and the Sharpe ratio. Moreover, we report the annualized $\alpha$ in % and the market exposure ($\beta$) of each investment strategy relative to the corresponding equity market. The sample period ranges from 2005-05-02 to 2020-12-31. Results of the momentum strategy are shown in panels A and B, while those for the buy-hold strategy are in the brackets.

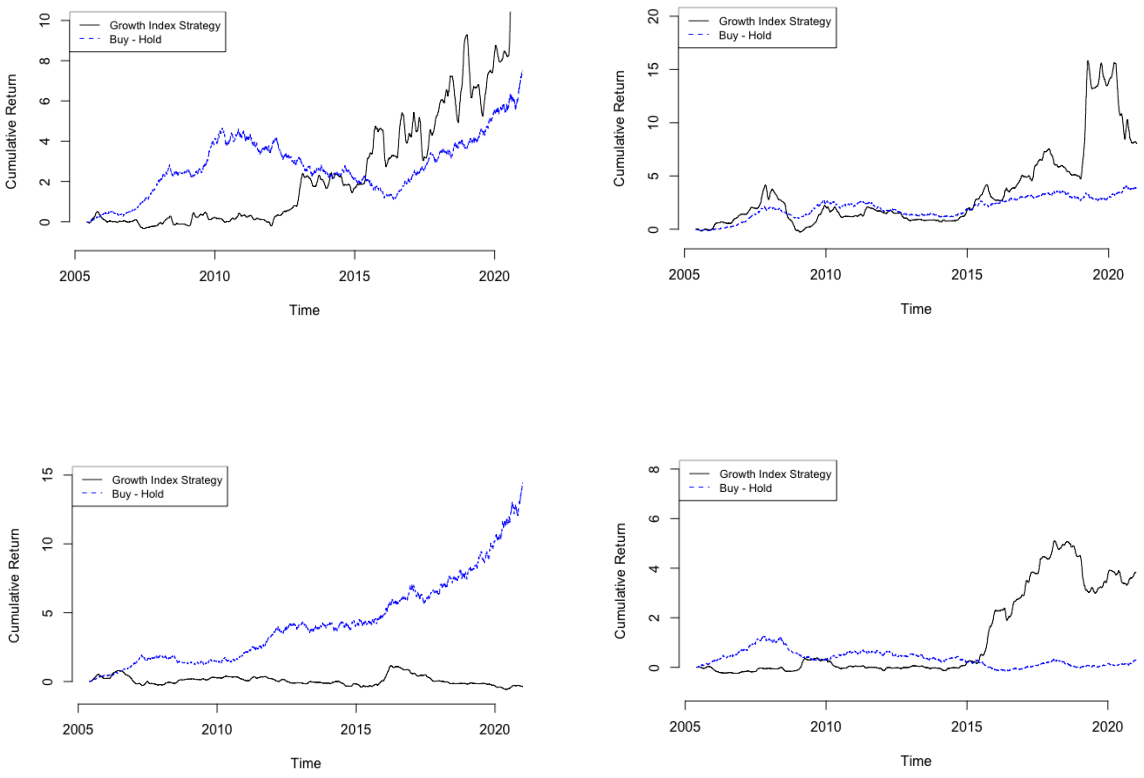
| | Growth Surprise (A) | | | | | Inflation Surprise (B) | | | | |
|---|---|---|---|---|---|---|---|---|---|---|
| | *R* | $\sigma$ | *Sharpe* | $\alpha$ | $\beta$ | *R* | $\sigma$ | *Sharpe* | $\alpha$ | $\beta$ |
| BR | 1.24 | 10.56 | 1.87 | 1.66 | 1.35 | 1.58 | 12.43 | 2.01 | 4.54 | 2.35 |
| | [1.02] | [17.56] | [0.93] | [1.24] | [1.27] | [1.02] | [17.56] | [0.93] | [1.24] | [1.27] |
| CH | 1.42 | 10.49 | 2.15 | 5.53 | 4.35 | 0.71 | 3.73 | 3.00 | -0.44 | 0.73 |
| | [1.16] | [14.98] | [1.23] | [3.04] | [1.92] | [1.16] | [14.98] | [1.23] | [3.04] | [0.31] |
| RU | -0.18 | 8.28 | -0.34 | 0.25 | 1.21 | 0.84 | 6.76 | 1.97 | 0.71 | 1.13 |
| | [1.26] | [15.71] | [1.28] | [0.98] | [1.07] | [1.26] | [15.71] | [1.28] | [0.98] | [1.07] |
| GL | 0.69 | 5.29 | 2.07 | 0.89 | 1.26 | -0.24 | 3.59 | -1.07 | -0.36 | -1.00 |
| | [0.16] | [12.36] | [0.21] | [-1.43] | [0.45] | [0.16] | [12.36] | [0.21] | [-1.43] | [0.45] |

Adapted source: Bloomberg data.

Panel A of Table 10 shows the results obtained with the growth surprise index. For Brazil (BR), we find that the average annualized return for the growth surprise strategy (1.24%) is higher than that of the buy-and-hold strategy (1.02%). Furthermore, the growth surprise strategy presents lower volatility (10.56%) than the buy-hold strategy (17.56%), resulting in an annualized Sharpe ratio of 1.87, which is higher than that of the market (0.93). Thus, the growth momentum surprise strategy outperforms the buy-and-hold substantially. For China (CH), we find that the average annualized return for the growth strategy (1.42%) is higher than that of the buy-hold strategy (1.16%). China also presents a lower standard deviation than the market, outperforming the market and obtaining a Sharpe ratio of 2.15 compared to the market (1.23). On the other hand, the momentum investment strategy does not outperform the buy-hold strategy in Russia. The annualized return and standard deviations are 0.18% and 8.28%, while for the market, we obtain 1.26% and 15.71%, respectively. Lastly, for the global growth momentum strategy (GL), we find that the average annualized return (0.69%) is higher than the market (0.16%). This strategy also presents a lower standard deviation, outperforming the market and obtaining a Sharpe ratio of 2.07 compared to its market (0.21).

Figure 3 shows the cumulative return between the regions' growth momentum investment strategy and buy-hold strategy.

**Figure 3: Cumulative Return (growth).** The figure plots the cumulative return for the growth investment strategy and for the buy-and-hold strategy for each region. The plots are provided for the Brazil (top-left), China (top-right), Russia (bottom-left), and Global (bottom-right).



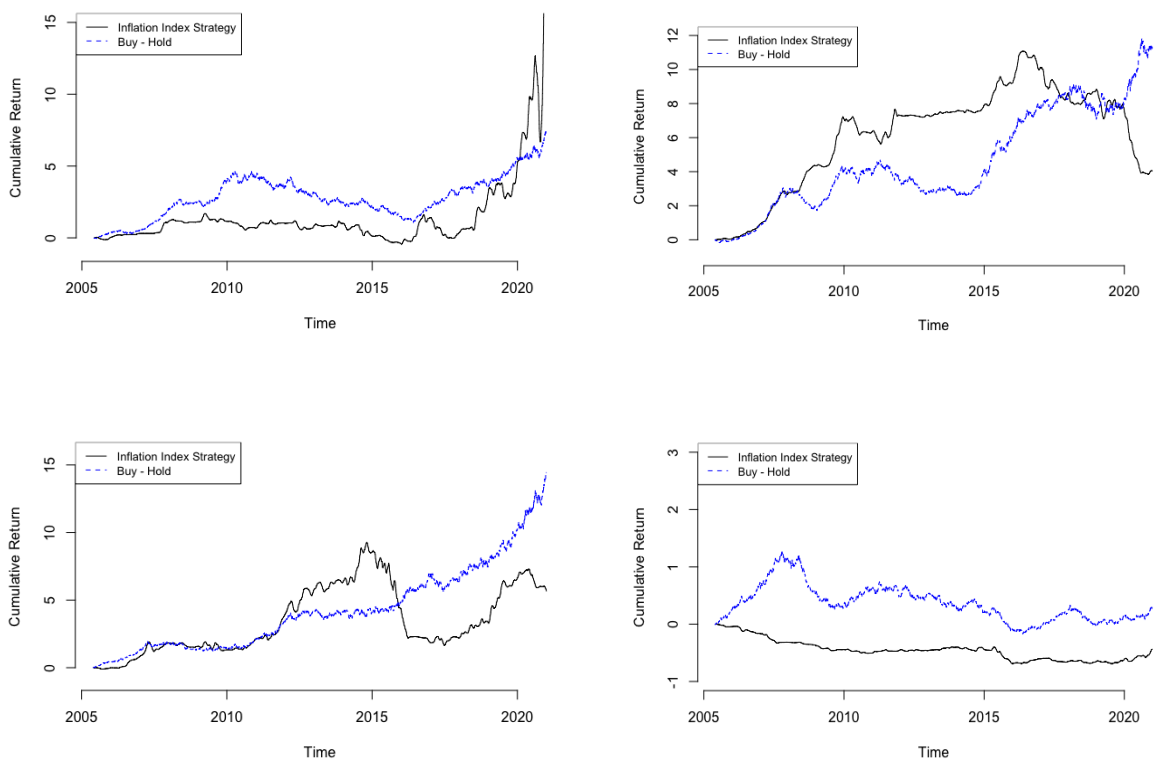

Adapted source: Bloomberg data.

Panel B of Table 10 presents the results obtained with the inflation surprise strategy. For Brazil, we find that the annualized return is higher than that obtained with a growth investment strategy. This result has sense because, through the regression results shown in Table 8, we obtain that inflation surprises have a more significant and positive impact on the future return than growth surprises. In addition, we find that all the markets present a higher Sharpe ratio than those obtained with the growth investment strategy. For China, the inflation investment strategy significantly outperforms the market, confirming the importance of the inflation surprise on the return, as shown in Table 8. Indeed, its Sharpe ratio increases from

2.15 (growth momentum investment strategy) to 3.00 (inflation momentum investment strategy), outperforming the buy-and-hold strategy (1.23). Lastly, we observe worst results with the inflation index than with the growth one. This result makes sense because the inflation surprises index has a weak and negative impact on the returns, as seen in Table 7.

As done for the growth investment strategy, Figure 4 plot the cumulative return of the inflation investment strategy and buy-hold strategy for each region.

**Figure 4: Cumulative Return (inflation).** The figure plots the cumulative return for the inflation investment strategy and for the buy-and-hold strategy for each region. The plots are provided for Brazil (top-left), China (top-right), Russia (bottom-left), and Global (bottom-right)




Adapted source: Bloomberg data.

Table 11 provides the results of our investment strategies but with the global surprise index of each region. Indeed, we use again a momentum strategy where we go in long with the positive surprise index and short with the negative, and with the position size equals to the amount of the surprise.

**Table 11: Performance global surprise strategy.** The panel provides the results for an investment strategy using global surprises as positions. We provide the annualized return in % (R), the standard deviation in % ($\sigma$), and the Sharpe ratio. Moreover, we report the annualized $\alpha$ in % and the market exposure ($\beta$) of each investment strategy relative to the corresponding equity market. The sample period ranges from 2005-05-02 to 2020-12-31. Results of the momentum strategy are shown in the panels, while those for the buy-hold strategy are in the brackets.

| | Global Surprise | | | | |
|---|---|---|---|---|---|
| | *R* | $\sigma$ | *Sharpe* | $\alpha$ | $\beta$ |
| BR | 2.40 | 14.39 | 2.65 | 3.55 | 2.17 |
| | [1.02] | [17.56] | [0.93] | [1.24] | [1.27] |
| CH | 2.13 | 11.64 | 2.90 | 2.41 | 1.29 |
| | [1.16] | [14.98] | [1.23] | [1.00] | [1.12] |
| RU | -0.17 | 17.97 | -0.15 | -5.42 | -1.02 |
| | [0.93] | [29.60] | [0.50] | [0.66] | [1.07] |
| GL | 0.42 | 5.09 | 1.32 | 0.50 | 1.28 |
| | [0.16] | [12.36] | [0.21] | [-1.43] | [0.45] |

Adapted source: Bloomberg data

We find that most of the regions outperform their market. For Brazil, we find that the average annualized return for the global surprise index (2.40%) is higher than that of the buy-hold strategy (1.02%). Furthermore, the global surprise strategy also presents a lower standard deviation (14.39%) than its market (17.56%). These result in a higher Sharpe ratio (2.65) with the active strategy than with the buy-and-hold strategy (0.93). For China, the results are mostly identical to those obtained with Brazil. On the other hand, Russia's global surprise index does not outperform its market. Its average annualized return is -0.17% compared to 0.93% obtained from the market. Moreover, even though the standard deviation of the strategy is lower than its market, the global surprise strategy's Sharpe ratio remains lower than the market. Lastly, for the global, we find an outperformance compared to its market, with a higher average annualized returns and lower standard deviation, which leads to a Sharpe ratio of 1.32 for the global surprise strategy and 0.21 for the market.

# 6 Cross-section of economic surprise

In this chapter, we want to investigate further the role of economic surprises and their impact on equity returns. We do a cross-section analysis between the surprises and the equity returns for investigating though a higher exposure to surprise also brings higher returns. We adopt a similar methodology used by Bali et al. (2017) for this research.

Starting from the regressions, we estimate the uncertainty beta between the global surprises, growth surprises, and inflation surprises indexes and the respective equity return for each region. Therefore, we run a daily rolling regression of excess stock returns (*R*) on the economic surprises (SUR) over one-month fixed windows, as represented in the following formula:

$$R_{i,t} = \alpha_{i,t} + \beta_{i,t}^{SUR} + \epsilon_{i,t}$$

The exposure of regional equity returns to economic surprises is obtained from daily rolling regressions of excess stock returns on the one-day-ahead surprise index using a one-month fixed window estimation. Compared to Bali et al. (2017), we use a short-run estimation window because surprises in the emerging markets present a significant predictability power in the short period, as shown in Table 9. The uncertainty betas and their relative returns are successively sorted in ten equal-weighted buckets. Then, we calculate the average daily future return of each bucket.

Table 12 presents the results obtained between the global surprise index and the equity returns, distinguished in the three regions (Brazil, China, and Russia). For each day, we form decile portfolios by sorting individual stock returns based on their surprise beta ($\beta^{SUR}$), where decile 1 contains stocks with the lowest $\beta^{SUR}$ during the past days, and decile 10 contains stocks with the highest $\beta^{SUR}$ during the previous days.

As the beta's column shows, moving from decile 1 to decile 10, we notice a significant cross-sectional variation in the average values of $\beta^{SUR}$. For Brazil, the average surprise beta increases from -1.33 to 0.98. For China and Russia, from -1.13 to 1.26 and from -1.76 to 0.59,

respectively. Another notable point in Table 12 is that for the equal-weighted portfolio, the next-day average excess return decreases monotonically in all the markets. Indeed, the average return difference between decile 10 (high-$\beta^{SUR}$) and decile 1 (low-$\beta^{SUR}$) is negative in all the regions. For Brazil, this result indicates that stock in the lowest $\beta^{SUR}$ decile generates 0.10% higher daily returns compared to stocks in the highest $\beta^{SUR}$ decile. The same is true for China and Russia, which generate 0.42% and 0.12% higher daily returns.

**Table 12: Univariate portfolios stocks sorted by surprise beta (global).** For each day, decile portfolios are formed by sorting individual stocks based on their surprise betas ($\beta^{SUR}$), where decile 1 (10) contains stocks with the lowest (highest) $\beta^{SUR}$ during the previous day. The columns report the average surprise beta of individual stocks in each $\beta^{SUR}$ decile and the average excess return, for Brazil, China, Russia, and Global. The last row presents the difference between decile 1 (low) and decile 10 (high). The sample period ranges from 2005-05-02 to 2020-12-31.

| | Global Surprise | | | | | | | |
|---|---|---|---|---|---|---|---|---|
| | Brazil | | China | | Russia | | Global | |
| Decile | $\beta^{SUR}$ | R | $\beta^{SUR}$ | R | $\beta^{SUR}$ | R | $\beta^{SUR}$ | R |
| Low | -1.33 | -0.002 | -1.13 | 0.14 | -1.76 | 0.17 | -2.54 | 0.02 |
| 2 | -0.08 | -0.01 | -0.14 | 0.18 | -0.12 | 0.14 | -0.16 | 0.12 |
| 3 | -0.03 | 0.17 | -0.05 | 0.14 | -0.04 | -0.06 | -0.06 | 0.01 |
| 4 | -0.02 | 0.04 | -0.02 | 0.12 | -0.01 | -0.05 | -0.02 | 0.15 |
| 5 | -0.01 | 0.14 | -0.004 | 0.10 | 0.01 | 0.05 | 0.01 | 0.09 |
| 6 | 0.01 | 0.11 | 0.01 | 0.04 | 0.03 | 0.15 | 0.03 | 0.10 |
| 7 | 0.02 | 0.13 | 0.04 | 0.07 | 0.03 | 0.02 | 0.08 | 0.06 |
| 8 | 0.04 | -0.05 | 0.08 | -0.01 | 0.05 | 0.07 | 0.14 | -0.03 |
| 9 | 0.09 | 0.11 | 0.17 | -0.02 | 0.09 | 0.14 | 0.28 | -0.02 |
| High | 0.98 | -0.10 | 1.26 | -0.28 | 0.59 | 0.05 | 2.03 | -0.18 |
| High-Low | | -0.10 | | -0.42 | | -0.12 | | -0.20 |

Adapted source: Bloomberg data

We replicate the same analysis distinguishing between growth and inflation surprise index. Table 13 shows the results obtained sorting the growth surprise beta (panel A) and inflation surprise beta (panel B). For Brazil, we find that there is a significant cross-sectional variation in the average values of $\beta^{SUR}$ both in panels A and B. The average surprise betas increase from -1.37 to 1.16 for the growth surprise and from -5.05 to 2.93 for the inflation surprise. As regards the returns, we find that the next-day average excess return increase (decrease) for

**Table 13: Univariate portfolios stocks sorted by surprise beta (growth and inflation).** For each day, decile portfolios are formed by sorting individual stocks based on their surprise betas ($\beta^{SUR}$), where decile 1 (10) contains stocks with the lowest (highest) $\beta^{SUR}$ during the previous day. The columns report the average surprise beta of individual stocks in each $\beta^{SUR}$ decile and the average excess return, for Brazil, China, Russia, and Global. Panel A shows the results obtained with the growth surprises, while Panel B those obtained with the inflation surprises. The last row presents the difference between decile 1 (low) and decile 10 (high). The sample period ranges from 2005-05-02 to 2020-12-31.

| | Growth Surprise (A) | | | | | | | |
|---|---|---|---|---|---|---|---|---|
| | Brazil | | China | | Russia | | Global | |
| Decile | $\beta^{SUR}$ | R | $\beta^{SUR}$ | R | $\beta^{SUR}$ | R | $\beta^{SUR}$ | R |
| Low | -1.37 | -0.02 | -2.58 | -0.05 | -1.33 | 0.09 | -1.58 | 0.02 |
| 2 | -0.12 | 0.04 | -0.16 | 0.16 | -0.12 | 0.06 | -0.21 | 0.004 |
| 3 | -0.06 | 0.11 | -0.08 | 0.19 | -0.04 | 0.07 | -0.12 | 0.06 |
| 4 | -0.03 | 0.02 | -0.03 | 0.07 | -0.02 | 0.05 | -0.06 | 0.05 |
| 5 | -0.02 | 0.12 | -0.01 | 0.09 | -0.001 | 0.08 | -0.02 | 0.18 |
| 6 | -0.004 | 0.19 | 0.004 | 0.10 | 0.01 | 0.07 | 0.01 | 0.02 |
| 7 | 0.01 | 0.01 | 0.02 | 0.08 | 0.02 | 0.07 | 0.03 | 0.11 |
| 8 | 0.04 | 0.10 | 0.06 | 0.10 | 0.04 | 0.06 | 0.07 | 0.004 |
| 9 | 0.09 | -0.12 | 0.15 | -0.16 | 0.09 | -0.01 | 0.19 | -0.02 |
| High | 1.16 | 0.08 | 3.26 | -0.19 | 0.49 | 0.11 | 0.97 | -0.08 |
| High-Low | | 0.10 | | -0.24 | | 0.02 | | -0.10 |

| | Inflation Surprise (B) | | | | | | | |
|---|---|---|---|---|---|---|---|---|
| | Brazil | | China | | Russia | | Global | |
| Decile | $\beta^{SUR}$ | R | $\beta^{SUR}$ | R | $\beta^{SUR}$ | R | $\beta^{SUR}$ | R |
| Low | -5.05 | 0.08 | -1.65 | -0.04 | -2.10 | -0.01 | -1.10 | 0.08 |
| 2 | -0.21 | 0.15 | -0.73 | 0.10 | -0.28 | 0.16 | -0.43 | 0.04 |
| 3 | -0.13 | 0.08 | -0.58 | 0.30 | -0.15 | 0.12 | -0.19 | 0.06 |
| 4 | -0.07 | 0.03 | -0.35 | 0.09 | -0.08 | -0.08 | -0.09 | 0.05 |
| 5 | -0.02 | 0.19 | -0.10 | -0.06 | -0.03 | -0.01 | -0.04 | 0.15 |
| 6 | 0.003 | -0.01 | 0.01 | 0.03 | 0.01 | -0.02 | -0.01 | 0.07 |
| 7 | 0.02 | -0.03 | 0.17 | 0.05 | 0.08 | 0.13 | 0.03 | 0.05 |
| 8 | 0.08 | 0.04 | 0.44 | -0.06 | 0.19 | -0.02 | 0.08 | 0.11 |
| 9 | 0.21 | 0.07 | 0.82 | -0.09 | 0.34 | 0.21 | 0.22 | 0.01 |
| High | 2.93 | -0.05 | 2.61 | -0.03 | 1.45 | 0.09 | 0.67 | -0.23 |
| High-Low | | -0.13 | | 0.01 | | 0.10 | | -0.31 |

Adapted source: Bloomberg data

the growth surprise index (inflation surprise index) from the lowest to the highest surprise beta. This result indicates that stocks in the lowest inflation $\beta^{SUR}$ decile generate 0.13% higher daily returns compared to stocks in the highest inflation $\beta^{SUR}$ decile. While stocks in the lowest growth $\beta^{SUR}$ decile generate 0.10% lower daily returns compared to stock in the highest growth $\beta^{SUR}$ decile.

For China, we find that both the growth and inflation $\beta^{SUR}$ present a significant cross-sectional variation. The betas range from -2.58 (-1.65) to 3.26 (2.61) with the growth (inflation) surprise. The next day returns increase (decrease) for the growth (inflation) surprises from the lowest to the highest betas. These results are opposite to those obtained with Brazil, but they confirm the negative and significant predictability that China's surprise indexes have on the returns.

Even for Russia, we observe a significant cross-sectional variation between the growth and inflation surprise betas. However, we find that returns increase both for the growth and inflation surprise index from the lowest to the highest betas. These results show that stocks in the lowest growth (inflation) $\beta^{SUR}$ decile generates 0.02% (0.10%) lower daily returns compared to stocks in the highest growth (inflation) $\beta^{SUR}$ decile.

## Conclusion

This research aims to explore macroeconomic surprises' impact on emerging markets. We investigate the role of surprises in pricing risky assets and predicting future returns. To this end, we use a simple methodology inspired by Beber et al. (2015). Firstly, we examine the behavior of these surprises, and we find that macroeconomic surprises do not appear randomly, but instead, they show a short-term positive autocorrelation structure. This effect, called "economic surprise momentum", is adopted to construct an investment strategy that outperforms the markets. In addition, we analyze whether macroeconomic surprises can predict risk premia in the emerging markets across our three central regions (Brazil, China, and Russia) and asset classes (Equity, Bonds, And Currencies). We find that surprises can forecast future equity market returns across major developing countries. These findings remain true also with the inclusion of control variables as the volatility index of each region. Splitting the macroeconomic variables into two main factors (growth and inflation), we find that they can predict (both positively and negatively) future equity returns, depending on the considered country. Globally, we find that growth surprises positively predict future returns, while negatively for inflation surprises. However, we find that global inflation surprises present a longer forecast horizon than global growth surprises through a forecast analysis. Indeed, growth surprise can significantly predict the equity return up to one week, while inflation surprises up to one month.

Further, we apply a momentum investment strategy with equity returns and the growth and inflation surprise indexes at the regionals and global levels. We find that most of the time, the investments strategy outperforms the market with the growth index. This result confirms the economic momentum that surprises have on the short-run period. Lastly, we investigate the role of these surprises in the cross-sectional pricing of equity returns. We find that returns decrease from the lowest to the highest beta decile, showing that higher exposure to the surprise effect does not necessarily bring a higher return.

To conclude, these findings have an important implication for economic theory and investors. For theory, our results stress the importance of surprises and news shocks for asset pricing in emerging markets. Any literature provides similar research on these three specific regions

and risky assets. For investors, risk premia are predictable by surprises in macroeconomic growth variables at the global level. A simple momentum strategy based on economic growth surprises can consistently outperform the market, yielding annualized alpha's ranging between 0.25% and 5.53%.

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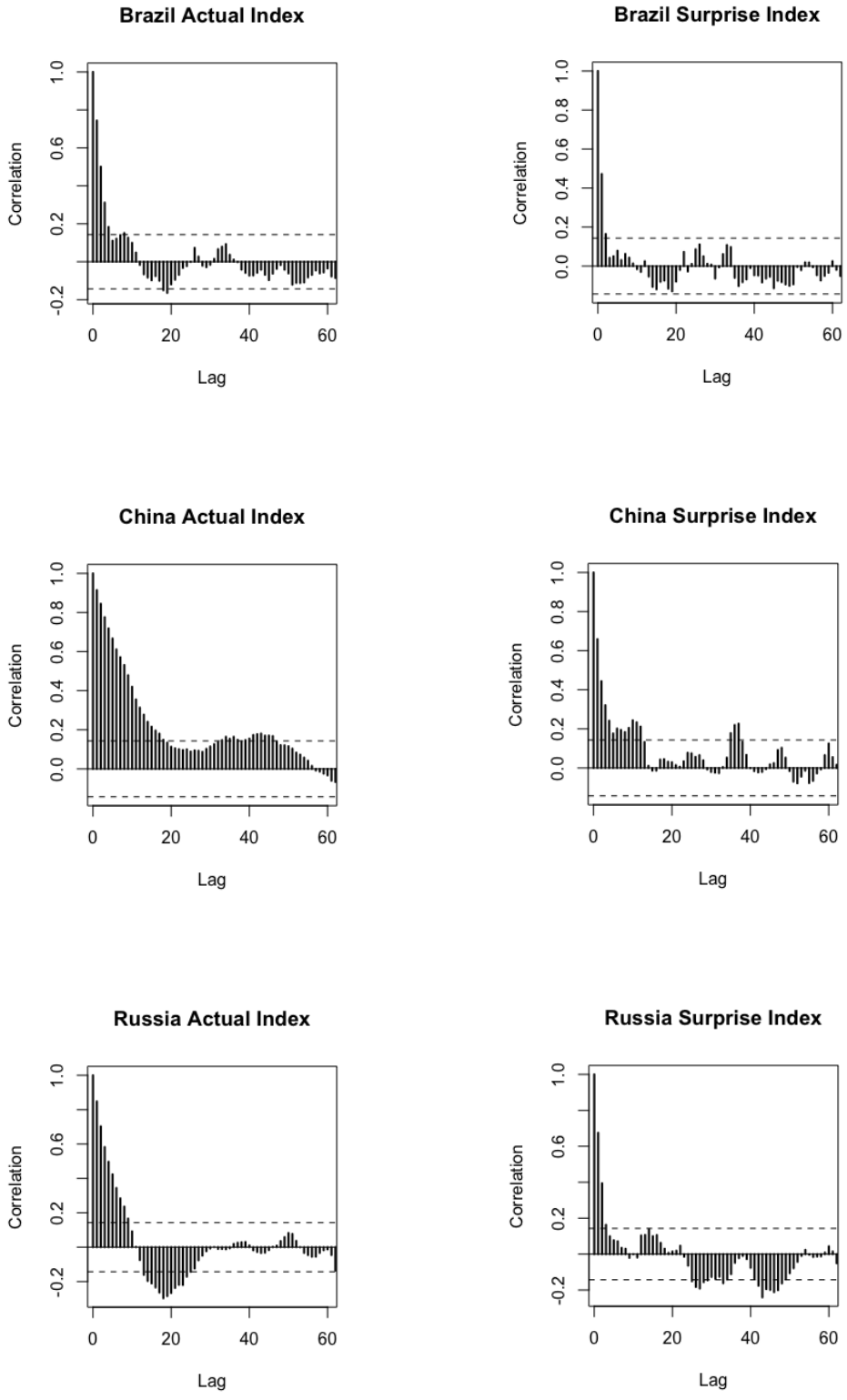
# Appendix

**Appendix A: Total amount of macroeconomic variables and released surprises.** We represent the total amount of macroeconomic variables and released surprise for each region. The table represent the values, distinguishing by global, growth and inflation factors. The sample period ranges from 2005-05-02 to 2020-12-31.

| | Macroeconomic Variables | | | Surprise | | |
|---|---|---|---|---|---|---|
| | $Global$ | $Growth$ | $Inflation$ | $Global$ | $Growth$ | $Inflation$ |
| *Brazil* | 43 | 30 | 13 | 4383 | 3120 | 1263 |
| *China* | 25 | 23 | 2 | 2346 | 2076 | 270 |
| *Russia* | 25 | 19 | 6 | 2649 | 1936 | 713 |
| *Global* | 93 | 72 | 21 | 9378 | 7132 | 2246 |

Adapted source: Bloomberg data

**Appendix B: Autocorrelation function plots.** The first column shows the autocorrelation plots for the actual series in Brazil, China, and Russia. The second column shows the autocorrelation plots for the surprise series in the same regions.




Adapted source: Bloomberg data

**Appendix C: In-sample regressions (Bond).** The table shows the results of regressing the global index, global growth, and global inflation surprise index on future excess bond market returns. We control for the Cboe Volatility Index in the Emerging Markets. A one-day implementation lag for predicting future returns is assumed. Shown are the in-sample regressions estimates, its corresponding t-value (in parentheses), and the adjusted $R^2$. Asterisks are used to indicate significance at a 10% (*), 5% (**) or 1% (***) level.

| Pooled Bond Returns | | | | |
|---|---|---|---|---|
| | (1) | (2) | (3) | (4) |
| $Global_{Index}$ | 0.018 | | | -0.021 |
| | (0.678) | | | (-0.689) |
| $Global_{growth}$ | | 0.013 | | -0.034 |
| | | (0.080) | | (-1.136) |
| $Global_{inflation}$ | | | 0.042 | 0.031 |
| | | | (1.110) | (0.824) |
| Controls | NO | NO | NO | YES |
| Obs. | 3678 | 3678 | 3678 | 2295 |
| Adj.$R^2$ | -0.003 | -0.005 | 0.0014 | 0.065 |

Adapted source: Bloomberg data

**Appendix D: In-sample regressions (Currency).** The table shows the results of regressing the global index, global growth, and global inflation surprise index on future excess currency market returns. We control for the Cboe Volatility Index in the Emerging Markets. A one-day implementation lag for predicting future returns is assumed. Shown are the in-sample regressions estimates, its corresponding t-value (in parentheses), and the adjusted $R^2$. Asterisks are used to indicate significance at a 10% (*), 5% (**) or 1% (***) level.

| Pooled Currency Returns | | | | |
|---|---|---|---|---|
| | (1) | (2) | (3) | (4) |
| $Global_{Index}$ | -0.051** | | | -0.062** |
| | (-2.355) | | | (-2.433) |
| $Global_{growth}$ | | -0.061*** | | -0.072*** |
| | | (-2.873) | | (-2.827) |
| $Global_{inflation}$ | | | 0.020 | 0.010 |
| | | | (0.668) | (0.307) |
| Controls | NO | NO | NO | YES |
| Obs. | 3678 | 3678 | 3678 | 2295 |
| Adj.$R^2$ | 0.028 | 0.044 | -0.0036 | 0.114 |

Adapted source: Bloomberg data