

Do as I Say Not as I Do: Central Bank Communications and Economic Volatility

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Abstract

Central bank speeches and official communications play an important role in financial markets and the real, material economy. Besides explicitly informing markets and the world of the specifics of economic and monetary policy, central bank communications can also implicitly provide valuable insights into monetary authorities' mindset. Capturing those insights and effectively acting on them can potentially be a strategy for significant financial return on investment in financial markets. This research paper uses statistical programming methods to comparatively evaluate the impact of central bank policy and, in particular, rhetoric and communication, on economic and financial outcomes. We perform sentiment and linguistic analyses on central bank speeches and communications and compare financial market performance data across the United States and Brazil, building a regression discontinuity research design to help isolate confounding variables and estimate causal relationships. In the case of the United States, this paper finds a strong correlation between Central Bank communications and financial market performance. Although we are only to an extent able to explicitly establish a causal relationship, our analysis suggests that there is a highly significant relationship between Central Bank rhetoric and short-term economic health in the U.S. Interestingly, the same conclusion cannot be drawn for Brazil. Our regression discontinuities show that, often, financial markets fluctuate in ways that seem uncorrelated to the positivity (or negativity) of Central Bank communications. One possible explanation is that monetary authorities around the world are greatly influenced by the decisions made in the United States by the Fed, and thus perhaps financial markets around the world also only react modestly to non-structural, national macroeconomic and monetary developments.

Introduction

Central bank speeches and official communications play an important role in financial markets and the real, material economy. Besides explicitly informing markets and the world of the specifics of economic and monetary policy, central bank communications can also implicitly provide valuable insights into monetary authorities' mindset. Fundamentally, a significant portion of communication occurs at the non-spoken level, through body language and facial expressions. Most importantly, however, when public officials or private agents communicate, they also put significant effort into choosing their words. Language can possess very real political, juridical, and financial consequences in terms of the commitments it sets, the questions it raises, the information it reveals, and the people it upsets. In the wake of the 2008 financial crisis, then Central Bank chair Ben Bernanke, in his call for quantitative easing, was careful to employ language that stressed the importance of this strategy without causing panic in the markets. Time and again he discussed "prevention", "strength", and "prosperity" while sparingly sprinkling in more dire vocabulary such as "unprecedented" and "crisis" (Bernanke, 2010). This tradition of diction selected with the utmost scrutiny has continued into the present, with great care taken perhaps now more than ever to choose language that sets and maintains healthy expectations.

Capturing the insights hidden underneath official central bank speeches and communications and effectively acting on them can potentially be a strategy for significant financial return on investment in financial markets. Hungarian-American billionaire hedge fund manager and philanthropist George Soros, for example, first became known as "The Man Who Broke the Bank of England" as a result of a massive short sale during the 1992 Black Wednesday UK currency crisis. Soros had been building a huge short position for months having identified the unfavorable position of the United Kingdom in the European Exchange Rate Mechanism: inflation levels were comparatively too high, with British interest rates hurting asset prices. His short sale of US\$10 billion worth of pounds made him a profit of US\$1 billion. Soros' example and many of the most successful investment firms in the world clearly indicate that macro hedging and deciphering Central Bank strategy, activity, and communications are valuable sources of return on investments.

Furthermore, well known is the fact that expectations and the maintenance of expectations are at the heart of thriving economies. Decisions taken by governments, firms and households are more often than not informed by expectations of reality rather than present-day reality itself. From the macroeconomic expectations-augmented Phillips Curve to the myriad price level indicators, it is an expectation of tomorrow that informs the most crucial economic actions of today. Moreover, our economy also takes into account the expectations of yesterday when considering the requisite actions needed to keep the economy in good health. In credit and lending for example, expectations and whether a borrower met with past expected obligations are key factors in risk assessment and credit pricing. At the national macroeconomic level, however, expectations are not solely guided by the so-called invisible hand of the market, but are also pushed along by the policy rhetoric of monetary and fiscal authorities such as the Federal Reserve. Speeches, papers, and daily press briefings are just some of the rhetorical levers that are pulled in order to set, adjust, and maintain expectations in the market. This is true of the United States, and it is true of economies across the globe with a range of different market dynamics, cycles, and industries.

Finally, central banks exercise a particular kind of work that is fundamentally both political and technical. Central bank management is technical because the fluctuations of the economy and, in particular, the management of inflation and exchange rates, require that central bank decision-makers adopt sound, data-backed, model-informed decisions on monetary policy. Independent central banks, in this manner, can be considered both more technical and effective than their politically influenced counterparts. However, even in independent central banks, central bank management is also political because each central bank has its own mandates and those in turn reflect choices of prioritization in political economy. For example, the US Fed mandate is put in place by the Federal Reserve Act, which orders the Fed to conduct monetary policy "as to promote effectively the goals of maximum employment, stable prices, and moderate long-term interest rates" This is known popularly as the dual mandate because it is thought that maximum employment and stable prices moderate long-term interest rates. On the other hand, the Brazilian Central Bank is mandated "to ensure the stability of the currency purchasing power, to foster a sound, efficient and competitive financial system, and to promote the economic well-being of society" by the 1964 Banking Law. Wording and language matter: those different

mandates impose different constraints and leverages for central banks to pull and obey when deciding on monetary policy and the extent of their regulatory work.

This paper aims to disentangle the rhetoric from the returns, and takes a deep dive into the impact of central bank communications on real economic conditions in both the United States and Brazil. Using the daily movements of the S&P 500 financials index and the longest standing Brazilian stock exchange index, Bovespa, we study the six days leading up to a given central bank communication and the six days after said speech to build a regression discontinuity research design. Our goal in doing so is to identify the causal impact of central bank speeches on the short-term performance of the stock market, which we take as a qualitative proxy for how each economy reacts to such communications.

Methodology and Data

This paper aims to understand how central banks use particular wordings or sentences when communicating their monetary policy decisions, and what these choices tell us about present and future economic policy. Our project will also strive to compare financial markets performance data and central bank communications across different countries to understand how disparate markets reacted when faced with similar or dissimilar messaging from their respective central banking authorities.

We use Python, the *de facto* language used in the field of machine learning, the driving force behind speech and sentiment analysis, as the selected programming language. Python's rich ecosystem of libraries includes packages specifically designed for economic analysis and data visualization, amongst other useful tools. It is also an incredibly versatile language, which makes it ideal for a project spanning various modes of analysis and various data inputs. In our analysis we use the following packages: *pandas*, *scikit-learn* and *matplotlib*.

For our sentiment and language analysis, we use a custom layer built on top of the GPT 3.5 Turbo language model - trained specifically to extract sentiment from central bank communications - to subject Central Bank speeches from the United States and Brazil from 2019

to machine learning methods aiming to reveal semantic patterns of particular significance to the financial and economic landscape.

The United States and Brazil Central Bank speeches that we have selected for analysis include: *U.S. Economic Outlook and Monetary Policy (April 11, 2019)*, *Challenges for Monetary Policy (August 23, 2019)*, *The Federal Reserve's Review of Its Monetary Policy Strategy, Tools, and Communication Practices (September 26, 2019)*, for the United States, and *The Global Monetary and Policy Outlook (July 2019)*, *Economic Outlook, Monetary Policy, and the Role of the BCB (April 2019)*, *Capital Markets in Brazil, Recent Developments (September 2019)* for Brazil.

We have specifically selected the year of 2019 in an effort to minimize the impact of unique, global economic phenomena such as the 2009 financial crisis, COVID-19, or the oil crises of the late 20th century. In doing so, we hope to capture more of the short-term, immediate impact of central bank communications and less of the impact of significant, timely interest changes.

For our statistical programming and econometric analysis, we compare six-day moving averages of normalized stock market indices centered around a central bank communication. In order to normalize the data we use a technique called Min-Max Scaling which replaces any given value with a floating point value between $[0, 1]$ where the lowest value in the original range is scored 0 and the highest is scored 1. The S&P 500 data is scaled independently from the BOVESPA data. Min Max scaling is advantageous for our application because it preserves the distribution and embedded information in our dataset while presenting the data in a more interpretable format enabling an easier comparison between markets. When comparing the percent changes in our six-day moving averages, it is important to note that due to the min-max scaling, the percent changes should not be interpreted as raw changes in the data. Instead, they should be interpreted as changes relative to the range of values which occur in 2019. Therefore, a 20% drop in the six day moving average doesn't indicate a loss of 20% of the value but instead, a decrease of 20% of the range of values present in 2019.

To build the regression discontinuity that provides us with methodological robustness to attempt and establish causal relationships, we assume that Central Bank communications are

discontinuous around the date they are released, that is, Central Banks release no other public or private information prior to or immediately after making one such public announcement. Furthermore, as is necessary to the regression discontinuity design, we also assume that the remaining factors influencing the stock market such as the activity or performance of particular companies listed in the index or the national economic conditions are continuous around the date the Central Bank communications are released. In this manner, we satisfy the two basic assumptions of the Regression Discontinuity econometric research design, and move on to using our data to try and find causal relationships between the content of these speeches and the performance of financial market indices.

Finally, we use [the World Bank datasets](#) that provide a number of economic indicators ranging from Gross Domestic Product and Investment to Balance of Payments and Labor Productivity, covering a large share of the global national economics. This in turn will give us flexibility and depth and allow us to provide data-backed background information on the political, economic, and monetary context of our analyses. The dataset also includes consumer price indices which will be helpful to understand the consumer-facing side of our study. As previously mentioned, the heart of our analysis revolves around the S&P 500 and the Brazilian stock index Bovespa as proxies for short-term economic performance and reactivity.

Analysis and Results

In this section we perform a sentiment-based, linguistic analysis of each of our selected central bank communications, employing first a GPT model to rate each speech with a score for optimism between one and ten in each of the following dimensions: inflation, GDP, and unemployment. Then, for each speech, we have extracted key phrases that serve well to help us understand the choice of words for each of the communications in context with the wider economic backdrop at the time. In analyzing these communications at the micro level by focusing on word choices and particular phrases, we intend to shed light on semantic patterns that reveal hidden, valuable insights into monetary authorities' mindset and their take on the macroeconomic outlook. Finally, we turn to our normalized financial market data in an effort to isolate the impact of each speech on short term economic health in Brazil and the United States.

In the case of the United States, the backdrop set for 2019 economic performance was that of the robust growth which characterized 2018. The three speeches analyzed in this section come from the chair of the Federal Reserve, Jerome Powell, as well as his former Vice Chair, Richard H. Clarida. Before diving into the facts and figures obtained from our analysis of each speech, it's key to understand the context and content of each speech.

Our first selection comes from a speech delivered on April 11, 2019 at the Washington Policy Summit sponsored by Institute of International Finance, Washington, D.C. In it, Vice Chair Clarida gives his overview of the current economic outlook for the month of April. The speech emphasizes that while economic performance continues to look strong, noting job gains and low unemployment, there is growing concern about the possibility of slowing GDP growth over the coming year. In terms of monetary policy, the speech made a point of reassuring stakeholders that at the current moment the need for changes in monetary policy is low. Finally, this speech outlines a proactive approach to balance sheet management.

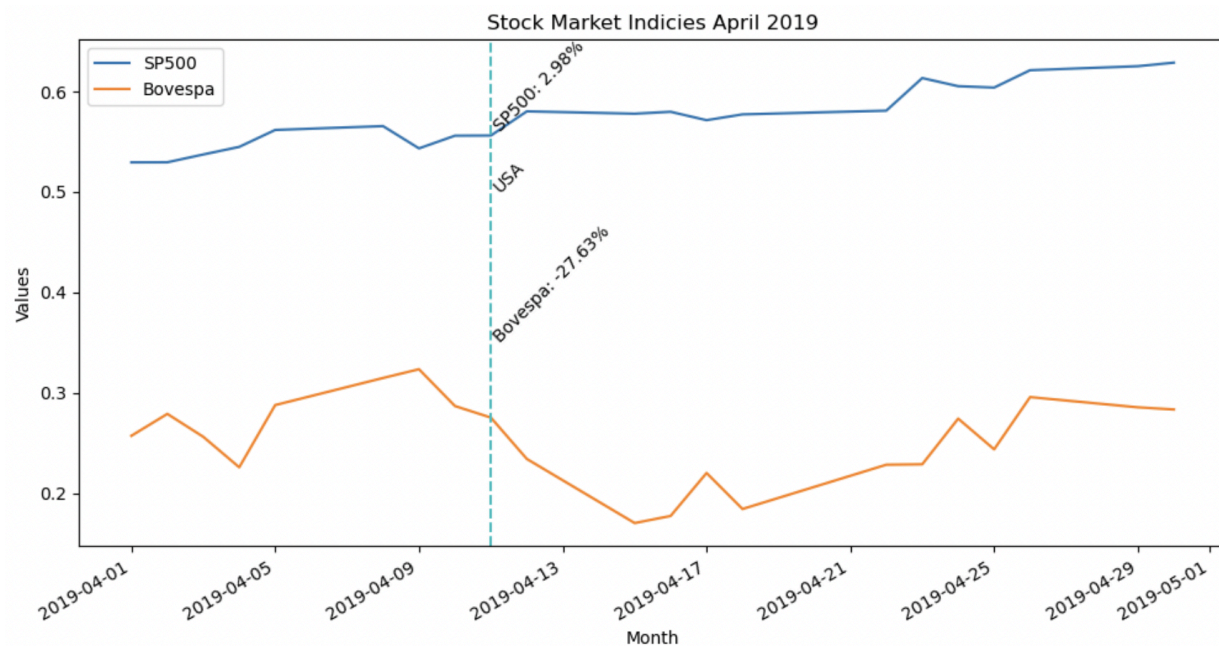
Using a custom layer on top of GPT 3.5 Turbo to perform sentiment analysis relative to GDP, inflation, and unemployment we found largely positive sentiments for each, with GDP rating 7, and inflation and unemployment coming in at 8 and 9 respectively. Beginning with inflation, a qualitative analysis confirms the positive sentiment assigned by the model. The speech outlines a sustained effort to maintain inflation close to the Federal Reserve's 2 percent objective, emphasizing that inflation expectations remain well-anchored. The mention of a flatter Phillips curve indicates that the Federal Reserve can pursue aggressive employment support without triggering significant inflationary pressures, which is a positive note. GDP received a slightly less positive rating, owing to the vice chairman's discussion of the possibility of slowing growth. Nevertheless, discussion of positive signs of full employment and steady inflation both lent to the positive rating. Finally, unemployment received a highly positive rating as the address highlights that the U.S. economy is operating at or near maximum employment, with unemployment rates near 50-year lows. It also notes the increased labor force participation, particularly in prime working ages, and the benefits of strong job gains extending to historically disadvantaged groups in the labor market. In this speech, we identified three keywords that

signal positivity to markets: strong, consistent, and modal. Here, it seems that the speaker is employing extremely clear, simple language when discussing more positive expectations, while reserving slightly more jargon to discuss the perhaps more pessimistic components of the speech. It is the opinion of this paper that such patterns are employed to moderate the extent of negative sentiment, highlighting instead the more positive elements of the economy.

When using neural network-based models to score central bank communications, it's crucial to consider the interpretability of the model's decisions. Although neural networks are often seen as 'black boxes' due to their complex architectures, our model provides some transparency. It highlights which sections of the vocabulary and which communication patterns are crucial for assigning scores. Specifically, as we aim to score communications based on their relevance to inflation, unemployment, and GDP, our model employs sentiment analysis to detect mentions of these metrics. It also incorporates complex pattern recognition to assess the sentiment associated with these economic indicators. This insight is essential for ensuring the model's decisions are reliable and align with our analytical goals.

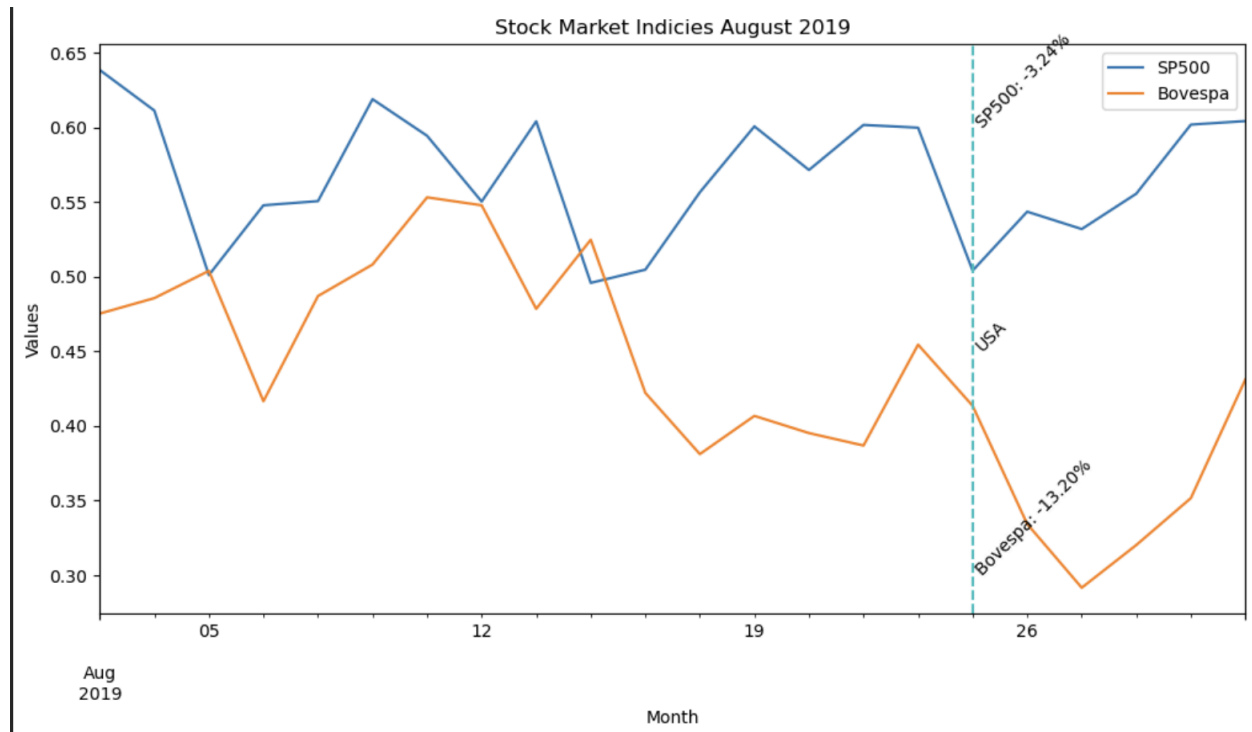
To conclude our analysis of this first U.S. speech, we ran a regression discontinuity looking at the six-day moving average leading up to the date of the speech and the six-day average after the speech, and compared the difference. In the case of the first speech, we see that this speech resulted in a 2.98% increase in the S&P. This is consistent with the semantic strategy discussed above, as the positive nature of the speech drove market confidence, while the negative sentiment was largely obscured by economic jargon. The value found, 2.98% also appears reasonable, as the speech was measured yet largely positive, flashing signs to the market that stability and the possibility of growth are highly plausible for the near and medium term.

Figure 1



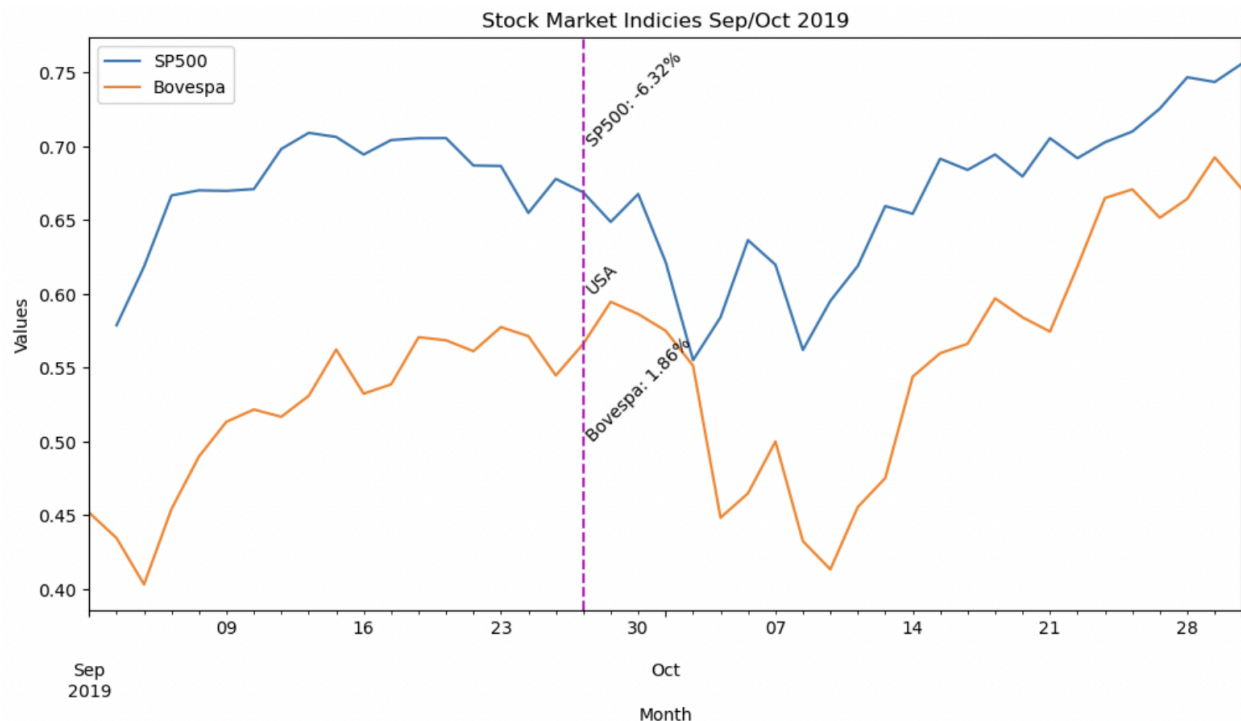
The second U.S. speech directly deals with questions of monetary policy and the mandate of the Fed to ensure maximum employment and stable prices. Upon running this speech through the custom GPT 3.5 Turbo layer, we received similar sentiment results, with the only variation being that inflation was rated 7 instead of 8, marking the subtle shift in messaging from all out confidence to a more measured assessment of where inflation lies with respect to the 2% goal. This speech came at the heels of a brief period of correction in the S&P which fell by about 5% percent in the two weeks leading up to our regression discontinuity analysis. However, owing to the cautious yet largely positive speech from the Fed, the days following the speech were marked by a rebounding S&P. The speech went to great lengths to reassure markets that continued GDP growth could be expected along with record high employment. The market data suggests that the sentiments expressed in this communication were critical to heightened investor and consumer confidence, both key elements of healthy market performance. These sentiments came through the use of highly intentional language; “sustain”, “expand”, and “appropriate” were some of the most used terms in this speech, pushing the notion of stability that shows in the corrective movements of the S&P.

Figure 2



Our final U.S. speech, which discusses at length GDP growth and foreign threats to U.S. economic stability such as Brexit, echoes similar sentiments in the realms of employment and GDP, but again, sentiment surrounding inflation expectations has become even more negative, dropping from a score of 7 to a score of 6. The address acknowledges that inflation remains near the Federal Reserve's 2 percent target, although core personal consumption expenditures (PCE) inflation, which is a better gauge of underlying inflation pressures, has been muted. There's also mention of some indicators of longer-term inflation expectations being at the low end of the range consistent with the price-stability mandate. Reading between the lines, this speech communicates less certainty to markets regarding price stability. Again, looking at the S&P before and after this speech yields an interesting result. Here we see that following the speech, markets turn down around 6%, echoing the uncertainty that was communicated in this speech.

Figure 3

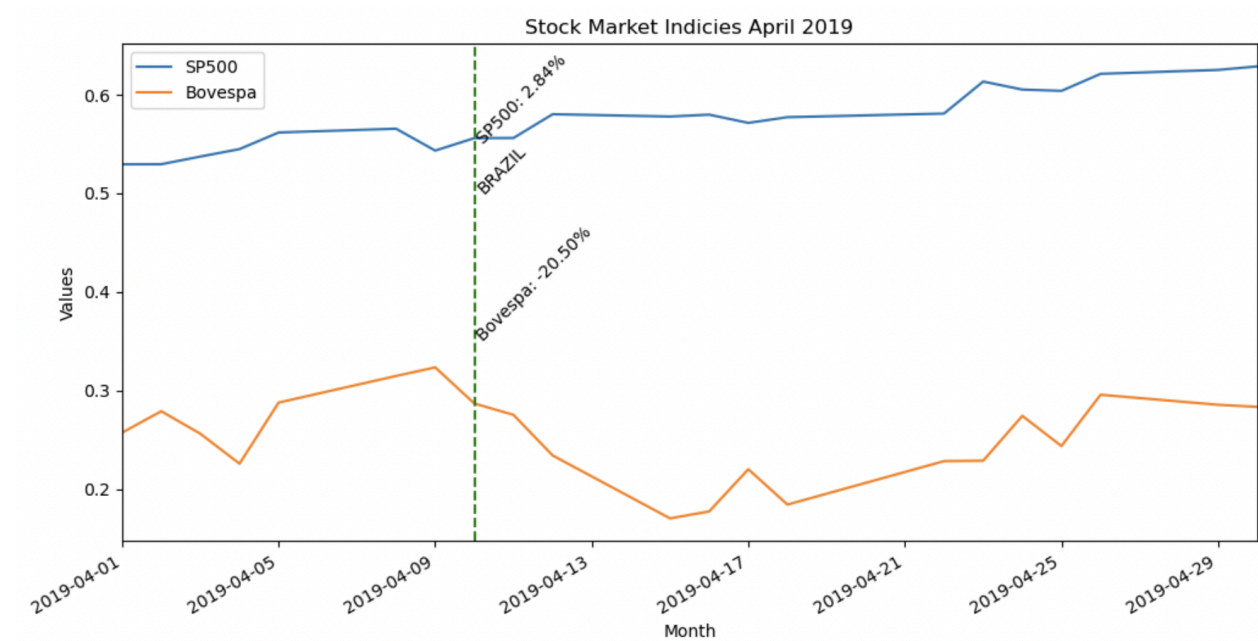


We have also selected three different communications from the Central Bank of Brazil from 2019 to be analysed by our speech analysis models. In April, less than two months after being sworn in as the new President of the Central Bank of Brazil, Roberto Campos Neto, who since the retraction of COVID inflationary pressures has become known for being an orthodox economist who pays little attention to political pressures from the government and civil society, travelled to the United States for work. During the four days (10th of April to 14th of April) that he spent in the country, the Central Bank published one official communication, a speech delivered by Roberto Campos Neto. In Campos Neto's own words, the speech provided "our view on the progress in the economic outlook, the monetary policy and the role of the Central Bank of Brazil, as well as the new priorities of the Agenda BC+". Agenda BC+ the Central Bank's strategic commitment to a broad process of financial democratization, freeing the financial markets from the need to finance the Government and opening up space for private entrepreneurship. This, of course, is an objective imposed by Brazil's distinct Central Bank mandate relative to the US.

For the linguistic analysis of this speech, the same custom layer on top of GPT 3.5 Turbo was used to perform sentiment analysis with regards to inflation, GDP, and unemployment. The model assigns a positive sentiment of rating 9 to the inflation outlook. This is supported by the qualitative analysis that successful measures to control inflation led to a consolidation around the target and anchoring inflation expectations. Interest rates were maintained at historical lows, and various measures of inflation projections are around the targets for the near future. For GDP, the model assigned an intermediate sentiment of rating 7, as indicated by the cautious optimism over GDP growth since recent data on economic activity led to a reduction in growth projections for 2019 from 2.4% to 2.0%. In terms of unemployment, the model's assigned rating of 6 is sustained by the overall tone of the speech, the commitment to the maintenance of low interest rates and economic stability and the revealed concerns about slack and underutilization in the labor market. Phrases and words such as "slowdown of global growth", "normalization of interest rates", and "consolidation around the target" reveal and promote this optimistic sentiment with regards to inflation, as well as the more measured, cautious expectations with regards to GDP and unemployment.

Surprisingly enough, despite the qualitative positive, even if cautious, outlook on the global and national macroeconomic perspectives, running a regression discontinuity that looks at the six-day moving average leading up to the date of the speech and the six-day average after the speech indicates that the Bovespa financial markets index, in reality, saw a -20.5% decrease. Given that we expect a generally positive central bank communication to have a generally positive effect on the financial markets, this sharp reduction in Bovespa's index value indicates perhaps that there are methodological gaps in our research due to inadequate assumptions or failed attempts to control for other confounding variables and changes in the economy. Alternatively, it could also mean that either broadly or in that particular time-space context, central bank communications that are unaccompanied by interest rate changes do not have a tight correlation with the financial markets performance.

Figure 4

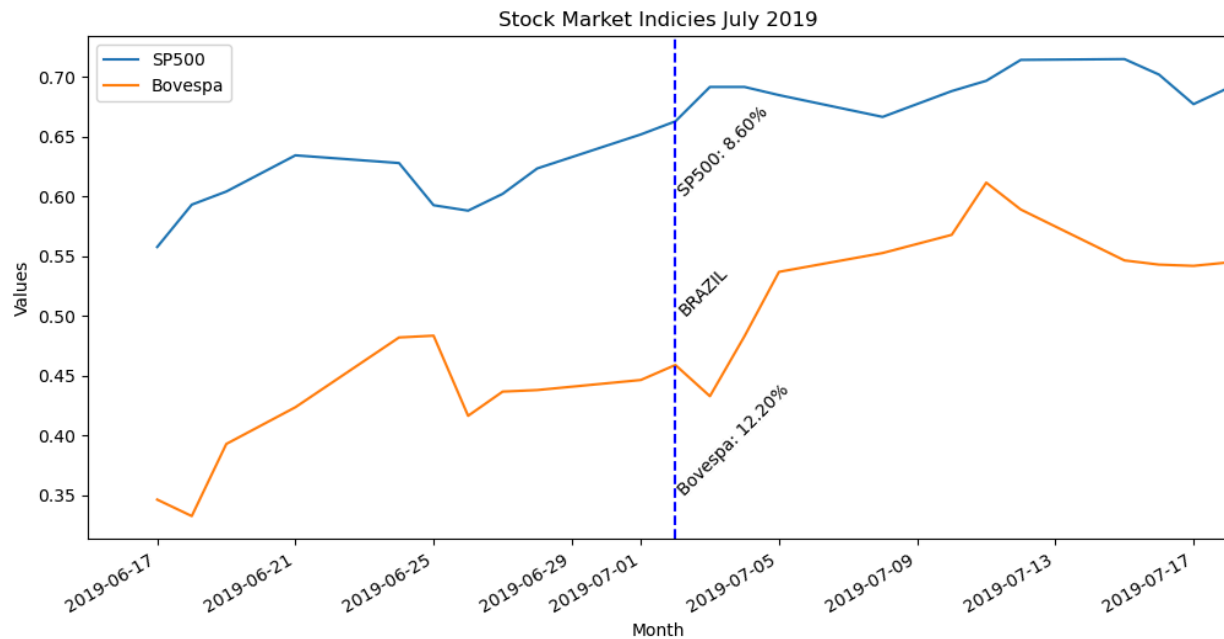


In July of the same year, Roberto Campos Neto traveled to Switzerland to join a UBS macroeconomic outlook event. As the title of the talk delivered on the 2nd of July suggests, ‘The global economic and monetary policy outlook’ is a forecasting piece in which the recently-appointed President of the Central Bank of Brazil discusses his views and perspectives on the global economy, structural reforms and trends in Brazil’s domestic economy. Campos Neto also briefly discussed some of the initiatives that had already been taken or were already underway as part of the Bank’s commitment to tackling the public crowding out of private investment. The speech’s inflation sentiment rate of 8 indicates a positive outlook on inflation, with inflation around the target, anchored expectations, and strong, effective monetary control. For GDP, the assigned rating of 6 suggested a tempered optimism, acknowledging ongoing challenges but maintaining a positive long-term view due to structural reforms and potential improvements. For unemployment, the model’s assigned rating of 5 is supported by high levels of economic slack and little direct optimism expressed about improving employment conditions in the immediate future, but more optimism centred around a general sense of gradual economic

recovery. A key phrase that makes evidence of this less enthusiastic approach to GDP and unemployment informs the markets that “the risks associated with a slowing global economy remain and that economic policy and geopolitical may contribute to an even lower global growth.” On the other hand, with regards to inflation and the drop in optimism relative to the previous speech, the underlying motive seems to be that, despite the “low inflation and well-anchored expectations”, “the high level of economic slack may continue to produce lower-than expected prospective inflation trajectory.”

Turning to the regression discontinuity, we can observe that a comparison between the six-day average before and after the speech delivered by Campos Neto at UBS in Switzerland highlights a significant movement in the Bovespa index of -12.2%. Relative to the April speech which was associated with a sharp decrease, this time we see a financial markets reaction that, despite the lower scores on the GPT model, makes more intuitive sense both in terms of its direction but also in terms of its magnitude. As the Central Bank's leading authority insisted on making explicit, Brazil was “better prepared to withstand a setback in the international scenario” and thus this below-optimal perspective on the global economic outlook should not lead to large negative shocks to the country’s local stock exchange date. Particularly in large, developing economies, it is often inflation and structural reforms that shake and greatly influence the financial and economic systems. The speech seems to provide a certain level of reassurance when it comes to those issues, and since in a global context allocating investments is always a trade-off between asset types and geographies, the fact that Brazil was “better prepared” than other countries may have made local investors enthusiastic.

Figure 5



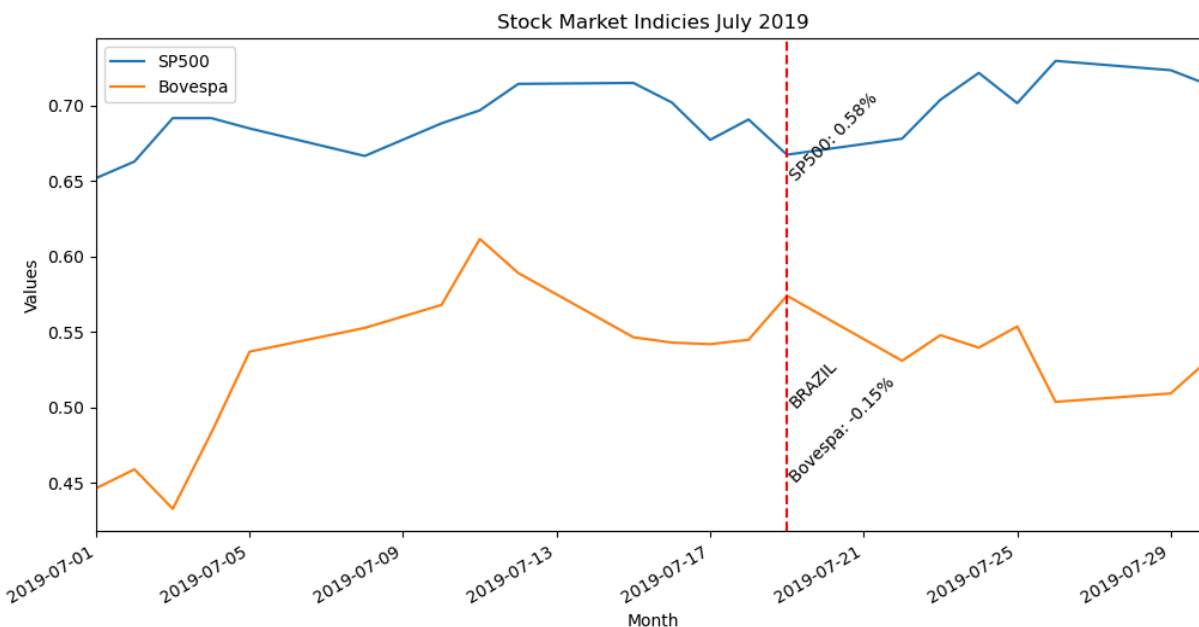
Later that same month, on the 19th of July, Deputy Governor of Licensing and Resolution at the Central Bank of Brazil João Manoel Pinho de Mello delivered a speech entitled “Capital Markets in Brazil: Recent Developments” in which he provided updates on the macroeconomic overview, economic activity, and fiscal indicators in the country, as well as a diagnostic of capital markets and future-oriented strategic guidelines and initiatives. The custom GPT model we built assigned a rating of 9 for inflation, 8 for GDP, and 7 for unemployment. Once again, these ratings were supported by linguistic evidence indicating inflation anchored around the target and effective monetary policy, a gradual recovery of economic activity with an emphasis on the potential of capital markets and infrastructure financing to bolster this growth, and a general trend of optimism with regards to capital markets, job generation, and employment.

Reading between the fine lines and margins of Central Bank language and communication, we can easily note the optimism with regards to the global economic outlook, inflationary pressures, and the gradual recovery of the domestic economy following a troubled few years of recessions

and political crises. That being said, one of the speech's goals is to provide a diagnostic of the capital markets in Brazil, and to outline initiatives that should be taken to address the challenges identified. In particular, Pinho de Mello highlights Brazil's continued struggle with the cost of capital and an underdeveloped, long-term credit market dominated by BNDES, a public player. In terms of the initiatives, however, although the Central Bank commits to "reducing costs, the bureaucracy and improving the allocation of capital" there seems to be no detail on how this would be achieved, which may be associated with a negative impact on the reaction of financial markets.

Despite the overall positive ratings designated by the GPT model, the regression discontinuity that we designed indicates a small, almost insignificant movement in the Bovespa index when comparing the six-day average prior to and after the speech. The decrease of 0.15% suggests perhaps that either, once again, there are flaws in the methodology of this paper, or, perhaps, that the overall optimism concerning the global economic outlook was offset or undermined by the continued national inability to stimulate productivity in the financial sector and greater access to capital and investment. Alternatively, it is also possible that the markets simply did not react in full force neither negatively nor positively because this was a speech delivered by a Deputy Governor rather than the Central Bank's president himself. Whatever the case, it is clear that the private sector, in particular the financial markets, did not share with Central Bank authorities the same level of optimism regarding the global and domestic economic outlook.

Figure 6



Conclusion

In July 2023, the Bank of England announced that Ben Bernanke would lead an independent review into the Bank's forecasting practices for monetary policy-making and communication. The independent review whose conclusions were made public on 12 April provides a thorough assessment of the Bank's current forecasting approach, and the relationship between the forecast, monetary policy decisions, and their communication. Amongst the report's 12 recommendations lies one of the three major strategic themes: "helping the Bank of England communicate its view of the economy, the risks and uncertainties surrounding its outlook, and its policy rationale, to the public."

It becomes almost redundant to state that, as the Bank of England makes it clear, we are not the only ones studying how and what Central Banks communicate. This paper differentiates itself, however, in also focusing on the quantitative impacts of these communications. In this sense, the contributions of this paper are dual. In the case of the United States, this paper finds a strong correlation between Central Bank communications and financial market performance. Although we are only to an extent able to explicitly establish a causal relationship, our analysis suggests that there is a highly significant relationship between Central Bank rhetoric and short term

economic health in the U.S. Interestingly, the same conclusion cannot be drawn for Brazil. The movements in our regression discontinuities show that, often, financial markets fluctuate in ways that seem to be uncorrelated to the content of Central Bank communications in the country..

In both countries, our analysis demands a nuanced reading. While true that a strong correlation between sentiment and market fluctuations in the United States was revealed in the data, this study was not able to attribute these fluctuations with perfect causality to Central Bank communications. Our analysis, while quite thorough in terms of sentiment analysis, left some room for scrutiny with regard to the methodological assumptions that were used. One possibility is that our analysis mistook discrete market shifting events – IPOs, Mergers, etc. – as continuous variables, an assumption that both allowed and guided us towards the use of our chosen method, the regression discontinuity. Nevertheless, the research presented brings us closer to a concrete understanding of the real market impacts of Central Bank rhetoric. Of course, it is crucial to understand that the United States, in large part, looks inward while much of the world, including Brazil, looks outward towards the U.S. when questions of monetary policy, market fluctuations, or economic expectations are raised. This simple fact both lent to a closer approximation of the impact that Central Bank speeches had on U.S. markets and complicated our approximation for the Brazilian economy.

When it comes to Brazil's seemingly unrelated financial market movements and the communications made by the country's Central Bank, there are several possible explanations. The first of them, as usual, is that there are methodological challenges in our research that rendered us unable to capture the real or causal effects of these communications. Our principal hypothesis, however, is rooted in the fact that monetary policy in Brazil - as in most/many other countries - is highly dependent on monetary policy in the United States. Due to the interconnected nature of global supply chains and the international financial trading system, as well as the continuous domination of the United States in the global economy and politics, economic indicators and metrics in Brazil are influenced by the fluctuations in indicators and metrics in the United States. A real estate bubble in the United States is bound to affect real estate prices in Brazil, and whether the Fed cuts or raises its interest rates is bound to influence whether the Brazilian Central Bank cuts or raises its rates. Similarly, if the recorded inflation in

the US has been found at a higher-than-expected level, it is possible that a similar thing will happen in Brazil even if with a delay. In this manner, it is possible that the reason why our research fails to adequately capture a positively correlated, significant effect of Central Bank communications on the performance of financial markets is because perhaps financial markets around the world, but in Brazil especially, react with assertiveness to the novel, financial information released by the United States' Fed and only react modestly to national economic and monetary developments.

While we feel that we have been able to sufficiently explain some of the dynamics behind our observation of quantitative changes in market indices in response to Central Bank communications, we also rely on some key assumptions which may not hold up under scrutiny. We are assuming a level of continuity in other variables such that there are no discrete shocks to the market during the period of interest. We understand that some observers might point out events such as IPOs, executive leadership changes or international conflict. However, for the purpose of our analysis we are operating under the assumption that on the aggregate, these events don't constitute a macroeconomic shift and can therefore be seen as exogenous to our model.

Future analysis could be improved by considering the interplay between changes in individual firms and Central Banks as previously mentioned. We imagine that our analysis could be improved by more rigorous inclusion of confounding variables. Further research could also identify a quantitative link between U.S. communications and Brazilian economic indicators. We feel that this analysis is a great start to understanding the dynamics of Central Bank communications and how they affect actual markets and we believe that it opens a lot of exciting opportunities for further exploration.

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