University of Pretoria
Department of Economics Working Paper Series

Presidential Approval Ratings and Stock Market Performance in Latin America

Yuvana Jaichand
University of Pretoria
Reneé van Eyden
University of Pretoria
Rangan Gupta
University of Pretoria
Working Paper: 2024-11
March 2024

Department of Economics
University of Pretoria
0002, Pretoria
South Africa
Tel: +27 12 420 2413

Presidential Approval Ratings and Stock Market Performance in Latin America

Yuvana Jaichand*, Reneé van Eyden** and Rangan Gupta***

Abstract

This paper examines the time-varying causality between presidential approval ratings and stock market performance, as measured by stock returns and realised volatility, in Latin America over the monthly period 1990M01 to 2016M05. Our study focuses on four prominent Latin American countries, Brazil, Chile, Colombia, and Mexico. While the standard constant parameter causality test does not reveal significant evidence of causality, the time-varying analysis uncovers bidirectional causal relationships persisting throughout the sample period. Moreover, our results remain robust when controlling for macroeconomic conditions and presidential approval ratings in other Latin American countries, using principal component analysis to construct these control variables. Furthermore, we explore the impact of US presidential approval ratings on Latin American stock market performance and presidential approval ratings. Our analysis reveals a significant causal impact of US presidential approval ratings on both Latin American presidential approval ratings and stock market performance. Our findings underscore the significant role of country-specific and US presidential approval ratings in understanding global stock market dynamics and contagion effects.

Keywords: Presidential approval ratings; stock returns; stock market volatility; time-varying causality.

JEL codes: C32; G10; G17.

* Department of Economics, University of Pretoria, Private Bag X20, Hatfield 0028, South Africa. Email address: u19120232@tuks.co.za.

** Department of Economics, University of Pretoria, Private Bag X20, Hatfield 0028, South Africa. Email address: renee.vaneyden@up.ac.za.

*** Corresponding author. Department of Economics, University of Pretoria, Private Bag X20, Hatfield 0028, South Africa. Email address: rangan.gupta@up.ac.za.

1. Introduction

The stock market is notoriously difficult to predict due to its complex and unpredictable nature. However, recent research suggests that presidential approval ratings (PAR) may hold valuable insights, serving as a barometer of stock market movements as it provides a gauge of the overall state of the economy. Consequently, leveraging PAR to predict stock market returns may be valuable as firms' apparent alignment with the presidency influences investors' expectations.

The significance of this study is underscored by its potential to leverage the 'catch-all' variable PAR to aid financial consultants in effectively allocating assets by modelling stock returns in Latin America. Moreover, our examination of stock market volatility is pivotal, given its role as a fundamental component in asset valuation, hedging strategies, and portfolio diversification models. Gupta et al. (2023) emphasised the importance of accurately modelling stock market volatility, as incorrect modelling in financial markets may result in pricing inaccuracies, over- or under-hedging investments, and inaccurate capital budgeting decisions, thereby impacting earnings and cash flows in the long term. It is worth noting that modelling stock returns and volatility has been a significant concern for policymakers since the Mexican Peso crisis in 1994-1995, followed by the Asian and Russian financial crises in 1997 and 1998, as well as the Global Financial Crisis of 2008-2009 and the subsequent European sovereign debt crisis in 2010. Naturally, accurate modelling of stock market variables is poised to wield substantial influence in shaping policy decisions, particularly in times of adverse financial shocks.

Considering the predominant focus of current research on the United States, our contribution is twofold. Firstly, we aim to characterise the direction of causality between presidential approval ratings and stock market variables. Secondly, we seek to enrich the existing literature by examining the causal relationship between presidential approval ratings and emerging stock markets, focusing particularly on Brazil, Chile, Colombia and Mexico. This gap in the literature is unexpected given the lucrative nature of emerging markets, as noted by Garten (1996). Stock market variables, including stock market returns (SR) and realised volatility (RV), will serve as the primary metrics to explore the causal link between PAR and stock market movements, covering the period 1990M01 to 2016M05, with the final period of the sample constrained by the availability of PAR data for Latin American countries.

Berlemann et al. (2015), Choi et al. (2016), Dickerson (2016), Gupta et al. (2021), Chen et al. (2023) and Gupta et al. (2023) have highlighted that presidential approval ratings demonstrate nonlinearity and are influenced by a variety of macroeconomic variables. Hence, depending solely on Granger's (1969) standard constant parameter causality test may yield unreliable results, especially when analysing time-series data from financial markets prone to structural breaks or regime changes which are frequently seen among Latin American countries.

Notably, studies by Gupta et al. (2021) and Gupta et al. (2023) have revealed feedback from PAR to SR and RV, indicating the importance of considering an endogenous setup. Therefore, to address this challenge and test the hypothesis of in-sample predictability of PAR, SR, and RV, we employ the vector autoregressive-based time-varying causality test developed by Rossi and Wang (2019).[1] The Rossi-Wang (2019) causality test demonstrates robustness to the presence of nonlinearities and structural breaks in the relationship, as identified by the Brock et al., (1996, BDS) nonlinearity test and the Bai and Perron (2003) breakpoint test. We take advantage of the multivariate nature of the Rossi-Wang (2019) test to ensure robustness by incorporating macroeconomic conditions, represented by the principal component MACRO, into our analysis. This component is closely linked to both PAR and stock market variables. Considering political-economic dynamics, it is reasonable to expect that the presidential approval rating would mirror fluctuations in macroeconomic indicators. Therefore, it may absorb or even enhance the predictive capacity for stock market variables. Similarly, we incorporate the principal component, LATAM PAR, to address potential contagion effects from other Latin American countries. Lastly, acknowledging the significant influence of politics in the United States (US) on the global financial system, we delve into investigating the potential causal relationship between US presidential approval ratings and Latin American stock markets. Our objective is to explain the evolution of global stock market linkages and potential spillover effects.

The remainder of the paper is structured as follows. Section two offers a review of the literature concerning presidential approval ratings and stock market performance. Section three outlines the data and econometric methodology. Section four offers an analysis and discussion of the empirical results. Section five presents the conclusion.

2. Literature Review

A substantial body of literature examines the relationship between presidential approval ratings and stock market performance, where an approval rating reflects the percentage of respondents in an opinion poll who express their approval of politicians or a political party. Multiple empirical studies have investigated the causal link between these two variables. These studies establish a compelling connection between a politician's success and the overall state of the economy, which can be effectively gauged through stock market performance.

Chong et al. (2011) use a market volatility index, which measures investor expectations of volatility, to recognise which aspects relate to presidential approval by examining the economic and non-economic components of market volatility. This study expands on the limited scope of previous literature that only

[1] In this regard, note that, Chen et al. (2023) propose the presidential economic approval rating (PEAR) index as an alternative to the commonly used presidential approval ratings (PAR) index. Their analysis reveals that the PEAR index provides more robust cross-sectional asset pricing results compared to the PAR index. By indicating a firm's alignment with the incumbent president's economic policies, the PEAR index exposes investor mispricing, highlighting its importance in assessing the relationship between presidential economic approval and asset pricing.

considered two macroeconomic predictors, unemployment, and inflation (e.g., Fox, 2009; Wisniewski et al., 2009; Mcavoy & Enns, 2010), by exploring a broader range of economic variables with the aid of a model, referred to as the Eta model[2]. The findings of Chong et al. (2011) diverge from those of Schwartz et al. (2008), as the latter study suggested a significant positive relationship between US presidential approval ratings and market volatility. However, Chong et al.'s (2011) conclusions align with the majority of studies conducted in this field.

Similarly, Fauvelle-Aymar and Stegmaier (2013) delve into the impact of macroeconomic outcomes and stock market movements on US approval ratings. Rather than testing specific connections (e.g., Chong et al., 2011; Dicle & Dicle, 2011) between the market and popularity, their study takes a broader perspective by assessing the overall influence of stock market performance on approval ratings within the standard popularity function framework. While their approach focuses on a limited set of macroeconomic predictors, it ensures a robust estimation of the sequential development of presidential popularity by incorporating additional political control variables. To account for the level of the president's popularity during a specific period, they consider the previous popularity rating as the first control variable. This lagged dependent variable serves as a crucial and robust political control in their estimation, providing valuable insights. In line with the established practice in numerous studies on presidential popularity, the second political control variable accounts for the occurrence of the presidential honeymoon period. This variable, denoted as "Honeymoon," is represented by a dummy variable that takes the value of one during the quarter when a new president assumes office. This variable helps account for the initial period of elevated popularity that presidents often experience at the beginning of their tenure. Additionally, several dummy variables were included in the estimation to account for major political events.

Building upon earlier research, the study incorporates variables that consider the influence of major political events on presidential job approval ratings. Various studies account for significant political events including Watergate, the Gulf War, the Iraq War, Irangate, the Vietnam War, and September 11, encompassing their adverse political, financial, and economic implications (Dicle & Dicle, 2011; Berlemann et al., 2015; Dickerson, 2016; Wisnieski, 2016). Fauvelle-Aymar and Stegmaier's (2013) empirical findings substantiate their hypothesis, indicating that it is not merely market fluctuations that hold significance, but rather the rate of market growth or decline that bears greater importance when determining presidential approval.

Berlemann et al. (2015) build upon the approach of Fauvelle-Aymar and Stegmaier (2013) by conducting a comprehensive investigation of the conventional popularity function, specifically focusing on the influence of nonlinear parameters. They employ a semiparametric estimation approach, departing

[2] Using the Eta model allows for extracting distinct economic and non-economic components from the market volatility index. This methodology enables a robust investigation of the interplay between approval ratings, the stock market volatility index, and the extracted portions.

from the prevalent practice in the empirical literature that assumes a linear popularity function estimated through ordinary least squares (OLS). By avoiding specific functional form assumptions and allowing for a data-driven and a priori unspecified linkage between presidential approval and its determinants, Berlemann et al. (2015) provide a more flexible analysis. To capture potential nonlinear relationships, the study includes quadratic (or other polynomial) covariates in linear equations. Furthermore, to account for the clarity of responsibility of the incumbent president, as suggested by Powell and Whitten (1993), a dummy variable for divided governments is utilised. Although their findings do not strongly support the existence of nonlinearities in the relationship between macroeconomic variables and presidential popularity, they reveal significant interaction effects among these economic variables. Similarly, Choi et al. (2016) argue for a nonlinear relationship between macroeconomic variables and presidential approval in the US. Using threshold regression analysis to assess this relationship, they find that the political economy of presidential approval essentially contains nonlinear elements.

Likewise, Gómez-Méndez and Hansen (2021) explored a nonlinear framework using a panel vector autoregressive model estimated using the GMM method to analyse the joint dynamics of presidential approval ratings, macroeconomic variables, and economic policy uncertainty in Latin America, treating all variables as endogenous. Their findings indicate that an uncertainty shock stemming from economic adversity and unexpected events notably diminishes presidential approval ratings, highlighting the importance of macroeconomic predictors in estimating approval ratings. This highlights the limitation of relying solely on additive (or linear) effects when studying the determinants of presidential approval. Berlemann et al. (2015), Choi et al. (2016) and Gómez-Méndez and Hansen (2021) present compelling evidence for a nonlinear pattern in approval ratings and macroeconomic variables, challenging the specific assumptions made in previous literature.

3. Data and Methodology

3.1 Data

Presidential approval ratings for Latin American countries that are members of the Organisation for Economic Co-operation and Development (OECD), namely Brazil, Chile, Colombia, and México, are sourced from the Executive Approval Database 1.0 (EAD 1.0). The EAD 1.0 is an extensive database that amalgamates 11,246 survey margins from 324 distinct time-serial indicators of presidential approval, encompassing 18 Latin American countries (Stimson, 1999). Its reliability and consistency lie in its ability to merge several distinct popularity series into a single, unidimensional approval series. The Latin American presidential approval ratings (PAR) are available from 1990M01 to 2016M05 for most Latin American countries. Notably, Chile and Colombia are the exceptions, with PAR data available from 1990M05 to 2016M05 and 1994M02 to 2016M05, respectively. Additionally, the United States presidential approval rating (US PAR) data is obtained to explore the relationship between US PAR and Latin American stock markets. These ratings are sourced from surveys administered by Gallup and are characterised by consistently posing the same approval question, "Do you approve or disapprove of the way [enter president name] is handling his job as president". The dataset is compiled from published sources reporting public approval, disapproval, and the proportion of respondents who express uncertainty or hold no opinion. US PAR data spans from 1941M07 until 2023M07.

Considering data availability, our analysis focuses on four countries: Brazil and Chile, for which stock price data is available from 1990M01, and Colombia and Mexico, with available data starting from 1991M01. Stock price data is available up to 2023M07. We use principal component analysis (PCA) to derive the first principal component (MACRO) from a set of additional predictors to control for various macroeconomic factors previously identified as predictors of PAR. The data for these macroeconomic variables cover the period from 1990M01 to 2023M07. Furthermore, the PCA includes macroeconomic variables such as industrial production (*IP*), inflation (*INFL*), the interest rate (*IR*), the unemployment rate (*UNEMP*), the uncertainty index (*UNC*) and the bilateral nominal US dollar-based exchange rate (*EXCH*). These macroeconomic variables have been sourced from the OECD database and incorporated into the four countries' principal component analysis. Similarly, a PCA approach is utilised to derive the first principal component (LATAM PAR) from the PAR data of additional Latin American nations not included in the primary analysis.

3.2 Realised Volatility

The stock market's performance, gauged through stock returns (SR) and volatility, stands as a key predictor in establishing a causal relationship with presidential approval ratings. The stock price data is sourced from the OECD database and converted to log returns by computing the first differences of the natural logarithmic values, multiplied by 100 to represent percentages. Monthly realised volatility (RV) is calculated based on the daily returns of stock prices, with the underlying data obtained from the Bloomberg terminal. It involves squaring stock returns and summing up these squared values over each monthly interval (Andersen & Bollerslev, 1998). As a robustness check, generalised autoregressive conditional heteroskedasticity (GARCH) modelling techniques are used to derive the conditional volatility. This analytical framework builds upon prior research by Chong et al. (2011), Dicle and Dicle (2011), and Fauvelle-Aymar and Stegmaier (2013). Both measures of volatility are used, and their predictive performance is compared.

3.3 Time-varying Granger Causality Tests for Presidential Approval Ratings and Stock Market Volatility

This analysis utilises the method introduced by Rossi and Wang (2019) to characterise the dependence between stock market performance and PAR. This approach employs a causality test within a vector autoregressive (VAR) framework, particularly relevant due to its ability to account for nonlinearities and the changing nature of explanatory variables over time. In contrast to the traditional Granger (1969) causality test that considers causality over the entire period, this method takes into consideration potential instabilities or regime changes that are often observed in the context of Latin American countries, rendering it more robust.

$$\boldsymbol{y_t} = K_{1,t}y_{t-1} + K_{2,t}y_{t-2} + \cdots + K_{p,t}y_{t-p} + \varepsilon_t \quad (1)$$

where $K_{j,t},\ j = 1, \ldots, p$ are time-varying coefficient matrices of dimension (s $\times$ s), $\boldsymbol{y_t} = \left[y_{1,t}, y_{2,t}, \ldots, y_{s,t}\right]'$ is an (s × 1) vector, and ε_t is the idiosyncratic error. The model involves two endogenous variables – firstly, using PAR and SR, and secondly, using PAR and RV in a bivariate setting for each of the four Latin American countries. Similarly, a bivariate format is employed to explore the relationship between US PAR and Latin American stock markets. As a robustness check, the MACRO term obtained from principal component analysis will be included as a control variable to account for macroeconomic conditions. Likewise, the incorporation of LATAM PAR, derived through principal component analysis, will be employed in a similar robustness check.

The four null hypotheses tests to be considered include (i) SR does not Granger cause PAR in the presence of instabilities or regime change; (ii) PAR does not Granger cause SR in the presence of instabilities or regime change; (iii) RV does not Granger cause PAR in the presence of instabilities or regime change, and (iv) PAR does not Granger cause RV in the presence of instabilities or regime change. The null is formalised $H_0\colon K_t = 0$ for all $t = 1, \ldots, T$, given that K_t is a suitable subset of $vec(K_{1,t}, K_{2,t}, \ldots, K_{p,t})$. Following the work of Rossi and Wang (2019), this analysis employs four test statistics, including the exponential Wald (*ExpW*) test, the mean Wald (*MeanW*) test, the Nyblom (*Nyblom*) test, and the Quandt Likelihood Ratio (*QLR*) test. The two-variable VAR model in equation (1) is estimated with a lag length of p chosen via the Akaike Information Criterion (AIC). This selection minimises the need for excessive endpoint trimming and validates extended data coverage for the time-varying test statistic. To maximise data coverage, we use an endpoint trimming of 10%, diverging from the conventional 15% utilised in structural break literature.

4. Empirical results

4.1 Main results

Table 1 presents descriptive statistics for the variables used in the time-varying causality tests. Presidential approval ratings average 48.40% in Brazil, 48.37% in Chile, 55.20% in Colombia, and 57.90% in Mexico. Notably, these estimates exhibit greater variability in Brazil and Colombia, characterised by standard deviations of 15.56% and 15.20% respectively. Regarding stock returns, Brazil demonstrates the highest average followed by Mexico, Colombia, and Chile within our sample. It is noteworthy that Brazil displays the highest level of realised volatility at 0.014, compared to comparatively lower values observed in Chile, Colombia, and Mexico. The variability of Brazil's stock returns is the most pronounced, with a minimum of -82.11 and a maximum of 418.00, surpassing those of other Latin American countries included in our analysis.

Following the necessity for stationary data in the time-varying causality tests we initiate our study by employing the ADF-GLS unit root test by Elliot et al. (1996), to determine the order of integration of each series. The unit root tests reveal that we fail to reject the null hypothesis of a unit root for the series PAR[3], IP, INFL, and IR. Consequently, the first difference is employed in the principal component analysis, as well as in the constant and time-varying causality tests. Conversely, the variables SR, RV, and US PAR exhibit stationarity. Unit root test results are presented in Table A1 in Appendix A.

[INSERT TABLE 1 HERE]

To characterise dependence between SR and PAR and RV and PAR, we apply Granger's (1969) standard causality test in a bivariate setting. Results are reported in Table 2. Our findings reveal a lack of evidence supporting causality across all cases. Based on the Akaike Information Criterion (AIC), the VAR model is estimated with two lags. We fail to reject the null of Granger non-causality, with the reported test statistics χ^2 distributed with 2 degrees of freedom. Rossi (2005) attributed the weakened predictive efficacy of the constant parameter test to its simplistic setup, which assumes stationarity throughout the entire observation period, rendering it unreliable in the presence of instabilities and regime changes frequently seen among Latin American countries.

[INSERT TABLE 2 HERE]

Consequently, the BDS test (Brock et al., 1996) is employed to investigate potential model misspecification stemming from nonlinearities and structural breaks. This analysis is particularly pertinent when a standard VAR framework assumes a linear relationship. Building upon the work of Brock et al. (1987), Brock et al. (1996) introduced a non-parametric method to test for serial dependence and nonlinear structure within time series data. These results are presented in Table 3. The null hypothesis that the time series of the residuals recovered from the equations involving the test of causality originates from an independent and identically distributed (IID) data-generating process is overwhelmingly rejected. Overall, this provides compelling evidence of nonlinearity in the relationships among the variables PAR, SR, and RV.

[INSERT TABLE 3 HERE]

Additionally, the Bai and Perron (2003) tests are applied to examine multiple structural breaks in the relationship between SR and PAR, as well as RV and PAR, across all four Latin American countries. These results are presented in Tables 4 and 5. This procedure accommodates heterogeneous error

[3] We do reject the null of a unit root for Brazil and Columbia at the 10% level of significance, while failing to reject the null for Chile and Mexico. Subsequently we treat PAR for all four LATAM countries as nonstationary, based on the 5% level of significance.

distributions across the breaks and incorporates trimming percentages based on lag selection to impose a minimal length for each regime, enabling the detection of one to five breaks in each series. The UDmax and WDmax tests confirm the existence of structural breaks.

[INSERT TABLE 4 HERE]

Given that a constant parameter model is inadequate for capturing time-varying relationships marked by structural breaks underscores the necessity to explore alternative approaches. Through the BDS test (1996) and the Bai and Perron (2003) test, we confirm that the relationship between PAR and its predictors exhibits a nonlinear relationship, consistent with existing literature. The evidence of nonlinearities and structural breaks suggests that the constant parameter VAR model is misspecified and the result of no predictability between SR and PAR and RV and PAR cannot be deemed reliable. This facilitates the use of the ExpW, MeanW, Nyblom, and SupLR tests introduced by Rossi and Wang (2019), which allows for the dependence among time series to change over time and to account for the possibility of parameter instabilities within a time-varying VAR framework with a horizon (h) of one, where ($h > 0$) assumes heteroskedastic and serially correlated idiosyncratic shocks and a ($h+1$)-step ahead forecasting model[4]. These results are detailed in Table 6 and Table 7. A truncation lag of 2 is assumed in the VAR.

[INSERT TABLE 5 HERE]

Based on the time-varying causality tests presented in Table 6, the null hypotheses of Granger non-causality from SR to PAR and vice versa are rejected at the 1% significance level in at least three of the four tests. This contrasts the comparatively weaker evidence of predictability observed in the constant parameter causality test detailed in Table 2.

[INSERT TABLE 6 HERE]

Similarly, Table 7 presents the time-varying causality tests between RV and PAR where the null hypotheses of no-Granger causality from RV to PAR and vice versa are rejected at the 1% significance level in at least three of the four tests, barring the Nyblom test statistic for Chile and Mexico, where the null hypothesis that RV does not Granger cause PAR is rejected at a 1% level of significance. As a robustness check, we apply the univariate GARCH (1,1) model (as proposed by Bollerslev, 1986) for stock returns and incorporate the fitted variance series into the VAR model. These results are detailed in Table A2, conclusively confirming the consistent evidence of in-sample predictability using the conditional volatility measure.

[4] Note that a horizon (h) of zero reduces to the reduced form VAR model specified in (1).

[INSERT TABLE 7 HERE]

Figures 1 (a)-(h) report the Wald statistics over time, indicating when the Granger causality occurs from SR to PAR and from PAR to SR for the four Latin American countries. As can be seen, stock returns consistently predict presidential approval ratings over the entire sample period. This observation aligns with expectations, considering that stock returns capture elements of national and household well-being as stated by Fauvelle-Aymar and Stegmaier (2013) which in turn influences presidential approval ratings. To account for the strength of predictability at specific points in time we relate the size of the Wald test statistic to the peaks of SR, RV and PAR illustrated in Figure A1. We begin our examination of the evidence from the time-varying causality test by focusing on SR as the predictor. In general, we observe that the time-varying Wald statistic exhibits peaks at the beginning of the sample period, as well as over the periods 1997-1998 and 2008-2010.

Upon analysing the peaks of the test statistic, which indicate higher evidence of predictability, we observe that the higher values at the beginning correspond to the contagion of the Mexican devaluation crisis in 1994 to other Latin American financial markets. The high values of the Wald statistic observed over 1997-1998 coincide with the Asian and Russian Financial crises where a cascade of crises was triggered across emerging markets. This turmoil particularly affected Latin America as foreign investors heightened their scrutiny of the region's imbalances which amplified market stress (Naím & Lozada, 2001). In addition, the other strong evidence of predictability, over 2008-2009, corresponds to the Global Financial Crisis, marked by hedge fund overleveraging and subsequent withdrawal of institutional investors from emerging markets.

Overall, while peaks are evident at the beginning of the sample period, Mexico's SR notably exhibits its highest Wald statistic towards the end. This phenomenon is attributed to the discovery of oil in the Gulf of Mexico in 2012 and the subsequent economic reform policy introduced by President Enrique Peña Nieto in 2013. This reform allowed foreign companies direct involvement in the oil and gas industry (Lopez-Velarde & Vasquez, 2014). Given Mexico's significant position as a major oil-exporting nation, oil-specific shocks have demonstrably positive effects on oil-exporting stock returns (Mokni, 2020). The period characterised by a lack of causality coincides with the period of stable investor sentiment observed within Mexico's stock market from 2002 to 2007, prior to the onset of the US Financial Crisis (Liston & Huerta, 2012).

The Wald tests corresponding to the null hypotheses that RV does not Granger cause PAR and PAR does not Granger cause RV are presented in Figures 2 (a)-(h). We observe that the time-varying Wald statistic exhibits peaks at the beginning or end of the sample period, as well as over 2008-2010. Stock market volatility often mirrors the underlying vulnerability of the financial system. Consequently, the peaks in Wald statistic values at the beginning of the sample period can be attributed to the contagion effect of the Mexican devaluation crisis in 1994, as well as the East-Asian and Russian Financial crises in 1997-1998. Moreover, the pronounced peaks observed during 2008-2009 align with the Global Financial Crisis. Finally, the values of the Wald statistic at the end of the sample period are influenced by the European sovereign debt crisis between 2010 and 2012.

The significant period demonstrating a lack of causality corresponds with Colombia's stock market dynamics between 2000 and 2006, characterised by sustained growth in stock prices. However, a significant change occurred post-2006, as indicated by the rising Wald Statistic, aligning with a pronounced decline in stock prices. These declines were largely attributed to increased exposure of the financial system to market risk, worsened by the lack of available hedging instruments against market instability induced by rising sovereign risk premia (Vargas & Varela, 2008).

Similarly, our examination of the time-varying causality test, with PAR as the predictor in Figures 1 (a)-(h) and Figures 2 (a)-(h), reveals compelling evidence. In general, we observe that, the Wald statistic peaks at the beginning or end of the sample period. These peaks coincide with significant political events across Latin America. For instance, they align with the election of Dilma Rousseff as president of Brazil in 2011, followed by her impeachment in 2016 on charges of criminal administrative misconduct causing economic turmoil. Similarly, in Chile during 1990-1995, the transition from Patricio Aylwin to Eduardo Frei as president marked the transition into a democracy and a period where the military's influence began to wane on the government. The period exhibiting a lack of causality coincides with the sustained high presidential approval ratings during the socialist administrations of Presidents Ricardo Lagos (2000-2006) and Michelle Bachelet (2006-2010), where macroeconomic stability in Chile was credited to the strong liberal democratic institutions and the implementation of various social welfare policies (Posner, 2023).

Furthermore, our observations extend to the enduring challenges within the Colombian political landscape, perpetuated by ongoing violence attributed to guerrilla factions, the Fuerzas Armadas Revolucionarias de Colombia (FARC) and the Ejercito de Liberación Nacional (ELN). The peace initiatives between the Pastrana government and the FARC, which began in 1998, were abruptly halted by the government in 2002. Consequently, the period marked by a lack of causality aligns with this termination, sparking an escalation of conflict that affected both the congressional and presidential elections in 2002. Lastly in Mexico, the Institutional Revolutionary Party faced significant public discontent, resulting in heavy losses during the 1997 elections. This discontent ultimately contributed to their defeat in the 2000 presidential elections, marking the end of their 71-year uninterrupted rule.

Essentially, our empirical evidence of predictability aligns with the peaks observed in SR, RV and PAR. This alignment indicates that our findings not only possess statistical validity but also underscore the economic significance of our econometric framework.

[INSERT FIGURE 1 HERE]

[INSERT FIGURE 2 HERE]

Subsequently, we proceed with robustness checks and supplementary analyses. As a part of the robustness check, we incorporate the variables MACRO and LATAM PAR in the model, which are derived from principal component analysis. Furthermore, to examine the causal relationship between US Presidential Approval Ratings (US PAR) and Latin American stock market variables, we employ the time-varying Granger causality test in a bivariate setting. The decision to utilise this approach was driven by the multivariate nature of the Rossi-Wang (2019) test. While alternative methods for conducting time-varying Granger causality analysis do exist, it is pertinent to highlight that these tests are confined to a bivariate setup (e.g., Lu et al., 2014).

The decision to incorporate macroeconomic conditions (MACRO) into the model serves the purpose of controlling for potential omitted variable bias. This choice is informed by the extensive literature that explores the relationship between stock market performance and presidential approval ratings, both of which are evaluated within the context of macroeconomic conditions. Furthermore, the inclusion of LATAM PAR in the model is motivated by the interdependence and contagion effects observed among Latin American countries (e.g., Frankel & Schmukler, 1996; Chen et al., 2002; Barba & Ceretta, 2011; Davidson, 2020). Finally, our decision to investigate the relationship between US PAR, Latin American presidential approval ratings and stock market variables is underpinned by the recognition that Latin American economies are susceptible to fluctuations in US political dynamics. We take advantage of the catch-all variable, US PAR, which encapsulates economic conditions in the US and serves as a proxy for its global influence. Understanding this connection is pivotal for comprehending global stock market dynamics and contagion effects, as market integration is heightened during financial crises (Hassan & Robayo, 2013).

In Table A3 and Table A4, we present the findings of the time-varying causality test, where the first principal component, MACRO, is utilised as a control variable within a trivariate framework. The results exhibit a high degree of consistency with those obtained in the bivariate analysis, further affirming the robustness of the observed relationships between SR and PAR, as well as RV and PAR. Likewise, in Table A5 and Table A6, we report the results of the time-varying causality test, employing the principal component, LATAM PAR[5], as a control in a trivariate setup. These results echo the conclusions drawn from the previous analysis, underscoring the evidence of in-sample predictability. Our findings demonstrate robustness even with the inclusion of macroeconomic conditions and the

[5] 18 Latin American countries were considered in constructing the principal component for LATAM PAR, namely Argentina, Bolivia, Brazil, Chile, Colombia, Costa Rica, Dominican Republic, Ecuador, El Salvador, Guatemala, Honduras, Mexico, Nicaragua, Panama, Paraguay, Peru, Uruguay, and Venezuela. The presidential approval rating of country of interest (from which the PAR, SP and RV were drawn) was excluded in the principal component analysis to construct the relevant LATAM PAR to be included as control variable.

approval ratings of other Latin American countries. Consequently, we can assert that there is no concern regarding potential omitted variable bias in our results.

In Table A7, we outline the results of the time-varying causality test covering the period 1990M01 to 2023M07. The results overwhelmingly reject the null hypothesis of Granger non-causality from US Presidential Approval Ratings (US PAR) to Latin American stock market variables and presidential approval ratings at a 1% level of significance across all four tests. This finding is in line with expectations, considering the significant influence of US politics on the global financial system. Consequently, we can infer that US PAR serves as a valuable factor in elucidating the dynamics of stock market linkages and contagion effects. Notably, Barba & Ceretta (2011) found evidence of spillover effects between the United States and Latin American countries, particularly heightened after the Global Financial Crisis in 2008-2009. Their study reveals that Latin American stock markets are significantly impacted by the US financial market, indicative of heightened market integration. Overall, we can affirm the robustness of our results further accentuating the evidence of in-sample predictability.

5. Conclusion

Despite the extensive literature exploring the causal relationship between stock market variables and PAR, much of the focus has been on the United States, overlooking the potential insights from emerging markets. This oversight is particularly surprising given the lucrative nature of emerging markets (Garten, 1996). Therefore, our study aims to address the gap in the literature by investigating the causal relationship between SR and PAR, as well as RV and PAR, across four Latin American countries, Brazil, Chile, Colombia, and Mexico from 1990M01 to 2016M05. Our analysis reveals significant bivariate causal relationships, indicating in-sample predictability. Importantly, the strength of our empirical evidence aligns with peaks in the variables PAR, SR and RV, hence our findings not only maintain statistical significance but also underscore the economic framework value of our econometric approach.

We employ the time-varying causality test developed by Rossi and Wang (2019) to investigate this causal relationship, to ensure the robustness of our findings against regime changes and structural breaks, which we show statistically, using the Bai and Perron (2003) structural breakpoint test, does exist. In contrast to the focus on unidirectional relationships in existing studies, we offer comprehensive evidence of time-varying bidirectional causality, notably overlooked by the constant-parameter-based standard Granger causality test which fails to capture the nonlinear relationship between PAR and its predictors.

Moreover, we capitalise on the multivariate nature of the Rossi and Wang (2019) test to ensure our results were found to be robust to the inclusion of the macroeconomic conditions represented by the first principal component MACRO, as the literature highlights that it is strongly related both to PAR and stock market variables. Similarly, we include the first principal component, LATAM PAR, to account for the potential contagion effects from other Latin American countries. Our findings align with the conclusions drawn from the bivariate analysis, further reinforcing the evidence of in-sample predictability. Hence, we can assert that our findings are not susceptible to omitted variable bias.

Furthermore, we recognise the substantial impact of US politics on the global financial system. Consequently, we investigate the potential in-sample predictability of US presidential approval ratings on Latin American stock markets and presidential approval ratings. We discover that US presidential approval ratings contribute to understanding the evolution of global stock market linkages and contagion effects. Our analysis reveals that US approval ratings influence Latin American stock market variables, affecting stock returns, realised volatility and presidential approval ratings. This finding underscores the heightened market integration during financial crises.

Our findings carry significant implications for researchers, investors, and policymakers alike. Firstly, we demonstrate the importance of considering structural breaks and nonlinearities when analysing causal relationships between PAR and stock market performance. Incorporating these factors into modelling frameworks with time-varying parameters ensures accurate statistical inference, crucial for deriving appropriate insights. Secondly, from the standpoint of financial consultants, our research provides valuable guidance for effective asset allocation and the implementation of asset valuation, hedging strategies, and portfolio diversification models. Finally, policymakers stand to benefit from our results, as stock market variables play a pivotal role in shaping policy decisions, particularly in times of negative financial shocks.

In future research, it would be beneficial to expand the time-varying analysis beyond Latin America to include other emerging markets, such as Asia and Africa. Exploring the dynamics of presidential approval ratings and stock market variables in these regions could provide valuable insights into global financial linkages and patterns.

Furthermore, investigating the out-of-sample predictability of presidential approval ratings for stock market variables, and vice versa, presents an intriguing avenue for study. By examining whether these indicators can forecast each other's movements ex-ante, based on ex-post findings, researchers can deepen their understanding of the predictive power of both political sentiment and market behaviour. Such research could have implications for investors, policymakers, and analysts seeking to anticipate market trends and political developments in emerging economies.

References

Andersen, T. G., & Bollerslev, T. (1998). Answering the Skeptics: Yes, Standard Volatility Models do Provide Accurate Forecasts. *International Economic Review*, 39(4), 885-905.

Bai, J., & Perron, P. (2003). Computation and analysis of multiple structural change models. *Journal of Applied Econometrics*, 18(1), 1-22.

Barba, F. G., & Ceretta, P. S. (2011). Risk transmission between Latin America stock markets and the US: impacts of the 2007/2008 Crisis. *Economics Bulletin*, 31(2), 1025-1037.

Berlemann, M., Enkelmann, S., & Kuhlenkasper, T. (2015). Unraveling the Relationship between Presidential Approval and the Economy - A Multi-Dimensional Semi-Parametric Approach. *Journal of Applied Econometrics*, 30(3), 468-486.

Bollerslev, T. (1986). Generalized autoregressive conditional heteroskedasticity. *Journal of Econometrics*, 31 (3), 307–327.

Brock, W., Dechert, W., & Scheinkman, J. (1987). A Test for Independence Based on the Correlation Dimension. *Department of Economics. University of Wisconsin at Madison, University of Houston, and University of Chicago*.

Brock, W., Dechert, W., LeBaron, B., & Scheinkman, J. (1996). A test of independence based on correlation dimension. *Econometric Reviews*, 15(3), 197-235.

Chen, G.-m., Firth, M., & Rui, O. M. (2002). Stock market linkages: Evidence from Latin America. *Journal of Banking & Finance*, 26, 1113-1141.

Chen, Z., Huang, D., & Wang, L. (2023). Presidential economic approval rating and the cross-section of stock returns. *Journal of Financial Economics*, 147(1), 106–131.

Choi, S.-W., James, P., Li, Y., & Olson, E. (2016). Presidential approval and macroeconomic conditions: evidence from a nonlinear model. *Applied Economics*, 48(47), 4558–4572.

Chong, J., Halcoussis, D., & Phillips, M. (2011). Does market volatility impact presidential approval? *Journal of Public Affairs*, 11(4), 387–394.

Davidson, S. N. (2020). Interdependence or contagion: A model switching approach with a focus on Latin America. *Economic Modelling*, 85, 166-197.

Diamandis, P. F., & Drakos, A. A. (2011). Financial liberalization, exchange rates and stock prices: Exogenous shocks in four Latin America countries. *Journal of Policy Modeling*, 33, 381-394.

Dickerson, B. (2016). Economic Perceptions, Presidential Approval, and Causality: The Moderating Role of the Economic Context. *American Politics Research*, 44(6), 1037–1065.

Dicle, B., & Dicle, M. F. (2011). Presidential approval models revisited: A new perspective. *Working paper Available at: SSRN. http://dx.doi.org/10.2139/ssrn.1927985 (accessed 29.05.23)*.

Elliot, G., Rothenberg, T. J., & Stock, J. H. (1996). Efficient tests for an autoregressive unit root. *Econometrica*, 64(5), 813-836.

Fauvelle-Aymar, C., & Stegmaier, M. (2013). The stock market and U.S. presidential approval. *Electoral Studies*, 32, 411–7.

Fox, G. T. (2009). Partisan divide on war and the economy: presidential approval of G.W. Bush. *Journal of Conflict Resolution*, 53(6), 905–933.

Frankel, J. A., & Schmukler, S. L. (1996). Crisis, contagion, and country funds: effects on East Asia and Latin America. *Federal Reserve Bank of San Francisco*, Pacific Basin Working Paper Series 96-04.

Garten, J. E. (1996). The big emerging markets. *The Columbia Journal of World Business*, 31(2), 6-31.

Gomez-Mendez, M., & Hansen, E. (2021). Economic policy uncertainty and presidential approval: Evidence from Latin America. *PLoS One*, 1-17.

Granger, C. (1969). Investigating causal relations by econometric models and cross-spectral methods. *Econometrica*, 37, 424–438.

Granger, C. W. (1969). Investigating causal relations by econometric models and cross-spectral methods. *Econometrica*, 37, 424-438.

Gupta , R., Jaichand , Y., Pierdzioch, C., & van Eyden, R. (2023). Realized Stock-Market Volatility of the United States and the Presidential Approval Rating. *Mathematics, MDPI*, 11(13), pages 1-27.

Gupta, R., Nel, J., & Pierdzioch, C. (2023). Investor Confidence and Forecastability of US Stock Market RealizedVolatility: Evidence from Machine Learning. *Journal of Behavioral Finance*, 111-122.

Hassan, A. R., & Robayo, J. P. (2013). Co-movements between Latin American and U.S. stock markets: convergence after the financial crisis. *Center for Research in Economics and Finance*, Working Papers, No. 13-26,.

Liston, D. P., & Huerta, D. (2012). Does investor sentiment affect Mexican stock market returns and volatility? *The Global Journal of Finance and Economics*, 9(2), 121-132.

Lopez-Velarde , A., & Vasquez, P. D. (2014). Historic Break with the Past: The New Foreign Investment Possibilities in the Mexican Oil and Gas Industry Possibilities in the Mexican Oil and Gas Industry. *Natural Resources Journal*, 55(1), 153-180.

Lu, F.-b., Hong, Y.-m., Wang, S.-y., Lai, K.-k., & Liu, J. (2014). Time-varying Granger causality tests for applications in global crude oil markets. *Energy Economics*, 42, 289-298.

Mokni, K. (2020). Time-varying effect of oil price shocks on the stock market returns Evidence from oil-importing and oil-exporting countries. *Energy Reports*, 6, 605-619.

Naím, M., & Lozada, C. (2001). Latin American Economies: The Good, the Bad, and the Ugly. *In R. L. Kugles & E. L. Frost (Eds.), The Global Century: Globalization and National Security*, 875-894.

Posner, P. W. (2023). Social Welfare Policy in Post-Transition Chile: Social Democratic or Neoliberal? *Critical Sociology*, 1-16.

Rossi, B. (2005). Optimal tests for nested model selection with underlying parameter instability. *Econometric Theory*, 21, 962-990.

Rossi, B., & Wang, Y. (2019). VAR-Based Granger-Causality Test in the Presence of Instabilities. *The Stata Journal*, 19(4), 883-899.

Stimson, J. A. (1999). *Public Opinion in America: Moods, Cycles, and Swings.* Westview Press.

Vargas, H., & Varela, C. (2008). Capital flows and financial assets in Colombia: recent behavior, consequences and challenges for the central bank. *Borradores de Economía*, 502.

Wikansari, R., Ausat, A. A., Gadzali, S. S., Suherlan, S., & Azzaakiyyah, H. K. (2023). Understanding the Meaning of Well-being in the Perspective of Psychological Science: A Literature Review. *Communnity Development Journal*, 702-707.

Wisniewski, T. P., Lightfoot, G., & Lilley, S. (2009). Speculating on presidential success: exploring the link between the price-earnings ratio and approval ratings. *Journal of Economics and Finance, forthcoming.*, 36, 106–122.

Tables

Table 1. Descriptive statistics

	PAR	SR	RV
Brazil			
Mean	48.397	6.134	0.014
Median	48.613	2.804	0.008
St. Dev.	15.559	28.081	0.021
Min.	21.755	-82.112	0.001
Max.	92.634	418.004	0.209
Chile			
Mean	48.368	0.970	0.004
Median	47.350	0.863	0.002
St. Dev.	11.144	4.734	0.006
Min.	25.190	-17.169	0.000
Max.	78.289	18.332	0.091
Colombia			
Mean	55.195	0.939	0.005
Median	61.106	0.772	0.003
St. Dev.	15.196	6.384	0.009
Min.	20.947	-25.587	0.000
Max.	81.457	18.460	0.091
Mexico			
Mean	57.904	1.460	0.007
Median	58.470	2.222	0.004
St. Dev.	7.956	6.219	0.012
Min.	38.935	-23.009	0.001
Max.	72.864	18.491	0.110

Table 2. Standard bidirectional Granger non-causality tests

	Test statistic			
Country	Brazil	Chile	Colombia	Mexico
SR $\nRightarrow$ PAR	3.079	0.730	0.575	0.374
PAR $\nRightarrow$ SR	4.251	1.497	3.023	2.174
RV $\nRightarrow$ PAR	0.709	2.247	0.769	3.885
PAR $\nRightarrow$ RV	1.124	0.476	1.078	0.317

Note: $\nRightarrow$ implies the non-causality null hypothesis. Entries correspond to the test statistics. ***, ** and * represents a significance of 1%, 5% and 10% respectively.

Abbreviations: SR, stock returns; PAR, differenced presidential approval ratings; RV, realised volatility.

Table 3. Brock et al., (1996, BDS) test of nonlinearity.

		Dimension (m)				
		2	3	4	5	6
Brazil	SR ⇒ PAR	50.515***	53.595***	56.595***	61.649***	68.221***
	PAR ⇒ SR	11.701***	13.273***	14.917***	16.192***	17.550***
	RV ⇒ PAR	54.393***	57.838***	61.412***	66.719***	73.933***
	PAR ⇒ RV	8.944***	8.018***	7.203***	6.574***	6.081***
Chile	SR ⇒ PAR	37.909***	39.970***	42.228***	45.500***	49.814***
	PAR ⇒ SR	4.946***	6.675***	7.599***	8.109***	8.640***
	RV ⇒ PAR	43.032***	45.255***	47.670***	51.467***	56.712***
	PAR ⇒ RV	7.895***	8.586***	9.438***	9.712***	9.612***
Colombia	SR ⇒ PAR	58.623***	61.996***	66.256***	73.170***	82.825***
	PAR ⇒ SR	3.381***	3.887***	4.034***	4.202***	4.641***
	RV ⇒ PAR	57.959***	61.683***	66.601***	73.708***	83.427***
	PAR ⇒ RV	5.754***	6.030***	5.801***	5.806***	5.712***
Mexico	SR ⇒ PAR	49.074***	51.702***	55.010***	59.840***	66.546***
	PAR ⇒ SR	4.792***	5.018***	6.087***	7.132***	8.099***
	RV ⇒ PAR	48.906***	51.534***	54.753***	59.448***	65.937***
	PAR ⇒ RV	8.462***	9.160***	9.684***	10.050***	10.327***

Note. ⇒ implies the assumed causality direction. Entries correspond to the test statistics. ***, ** and * represents a significance of 1%, 5% and 10% respectively.
Abbreviations: SR, stock returns; RV, realised volatility; PAR, presidential approval ratings.

Table 4. Bidirectional Bai and Perron (2003) test of multiple structural breaks: SR and PAR

Country		UDmax	WDmax
Brazil	SR ⇒ PAR	2006:10, 2012:07	1994:07, 1999:01, 2003:01, 2008:03, 2012:07
	PAR ⇒ SR	1994:09	1994:09
Chile	SR ⇒ PAR	2011:05	1994:12, 2011:04
	PAR ⇒ SR	1994:08, 1998:10	1994:08, 1998:10, 2002:11, 2007:08, 2011:10
Colombia	SR ⇒ PAR	1997:07, 2002:09, 2013:02	1997:07, 2002:09, 2013:02
	PAR ⇒ SR	2006:05, 2009:08	1998:06, 2001:09, 2005:06, 2008:09, 2011:12
Mexico	SR ⇒ PAR	1994:12, 1998:11, 2012:08	1994:12, 1998:11, 2012:08
	PAR ⇒ SR	1994:03, 1998:10	1994:03, 1998:10, 2009:04

Note. ⇒ implies the assumed causality direction. Structural breaks detected from the dependent variable equation.

Table 5. Bidirectional Bai and Perron (2003) test of multiple structural breaks: RV and PAR

Country		UDmax	WDmax
Brazil	RV ⇒ PAR	2003:01, 2012M07	1994:08, 1999:01, 2003:01, 2008:03, 2012:07
	PAR ⇒ RV	1995:04	1994:07, 2004:08, 2009:02
Chile	RV ⇒ PAR	1995:01, 2011:04	1995:01, 2011:04
	PAR ⇒ RV	2008:01, 2011:12	2008:01, 2011:12
Colombia	RV ⇒ PAR	1997:07, 2002:09, 2012:11	1997:07, 2002:09, 2012:11
	PAR ⇒ RV	1997:06	1997:06
Mexico	RV ⇒ PAR	1994:12, 1998:11, 2012:08	1994:12, 1998:11, 2012:08
	PAR ⇒ RV	1994:12, 1998:11	1994:12, 1998:11

Note. ⇒ implies the assumed causality direction. Structural breaks detected from the dependent variable equation.

Table 6. Rossi-Wang (2019) Time-varying parameter bidirectional Granger causality tests: SR and PAR.

Country	Null hypothesis	*ExpW*	*MeanW*	*Nyblom*	*SupLR*
Brazil	SR $\nRightarrow$ PAR	265.528***	86.136***	2.487	541.769***
	PAR $\nRightarrow$ SR	133.808***	120.694***	2.832	277.480***
Chile	SR $\nRightarrow$ PAR	614.578***	255.976***	3.315*	1239.869***
	PAR $\nRightarrow$ SR	246.535***	35.951***	1.615	503.782***
Colombia	SR $\nRightarrow$ PAR	277.785***	131.282***	4.553**	566.157***
	PAR $\nRightarrow$ SR	206.879***	158.319***	2.231	424.453***
Mexico	SR $\nRightarrow$ PAR	423.059***	152.231***	3.861**	856.831***
	PAR $\nRightarrow$ SR	308.113***	128.263***	2.037	626.939***

Note: $\nRightarrow$ implies the non-causality null hypothesis. Entries correspond to the test statistics. ***, ** and * represents a significance of 1%, 5% and 10% respectively.
Abbreviations: SR, stock returns; PAR, first-differenced presidential approval ratings.

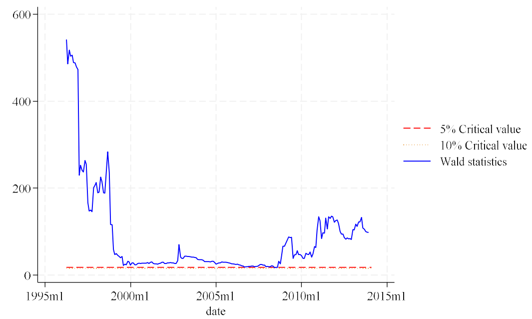
Table 7. Time-varying parameter bidirectional Granger causality tests: RV and PAR.

Country	Null hypothesis	*ExpW*	*MeanW*	*Nyblom*	*SupLR*
Brazil	RV $\nRightarrow$ PAR	-	366.677***	3.544*	4190.350***
	PAR $\nRightarrow$ RV	624.825***	145.630***	4.571**	1260.363***
Chile	RV $\nRightarrow$ PAR	-	805.484***	22.750***	5755.753***
	PAR $\nRightarrow$ RV	111.976***	78.695***	2.684	233.541***
Colombia	RV $\nRightarrow$ PAR	235.022***	67.458***	4.417**	480.750***
	PAR $\nRightarrow$ RV	108.330***	72.040***	1.316	227.367***
Mexico	RV $\nRightarrow$ PAR	-	683.249***	7.952***	2666.700***
	PAR $\nRightarrow$ RV	302.835***	108.863***	4.062**	616.384***

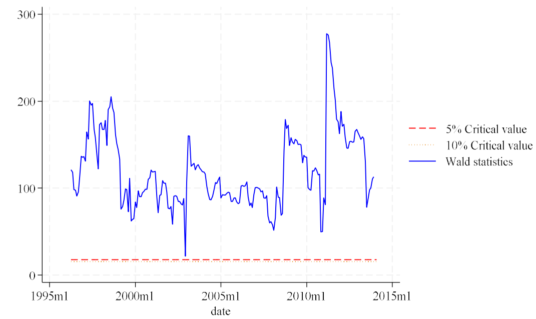
Note: $\nRightarrow$ implies the non-causality null hypothesis. Entries correspond to the test statistics. ***, ** and * represents a significance of 1%, 5% and 10% respectively.
Abbreviations: RV, realised volatility; PAR, first-differenced presidential approval ratings.

Figures

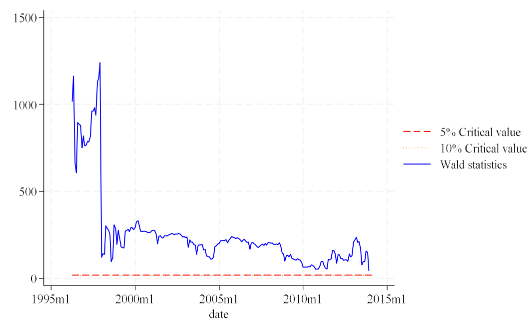
(a) Brazil: SR GC PAR



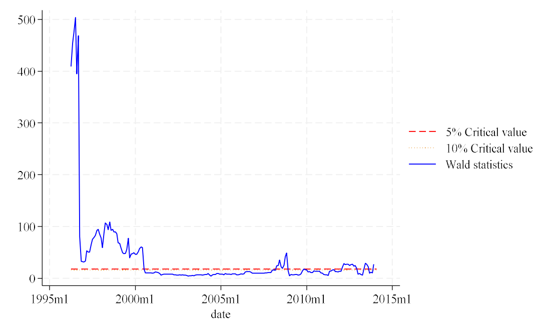
(b) Brazil: PAR GC SR



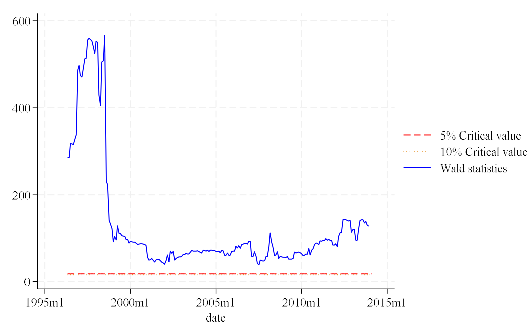
(c) Chile: SR GC PAR



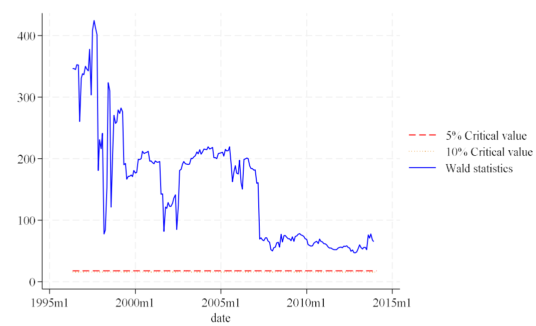
(d) Chile: PAR GC SR



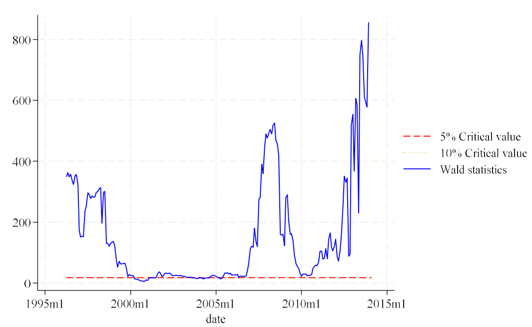
(e) Colombia: SR GC PAR



(f) Colombia: PAR GC SR



(g) Mexico: SR GC PAR



(h) Mexico: PAR GC SR

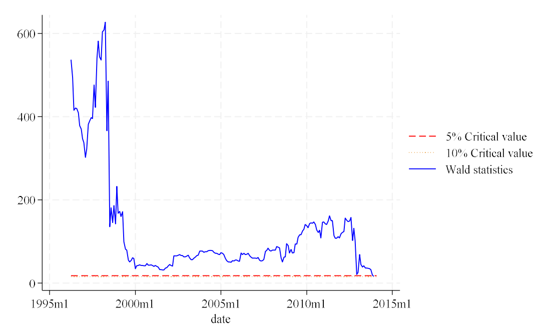


Figure 1. Time-varying Granger causality tests between SR and PAR. Note: Time is reflected on the x-axis. The time-varying Wald statistic is presented on the y-axis.

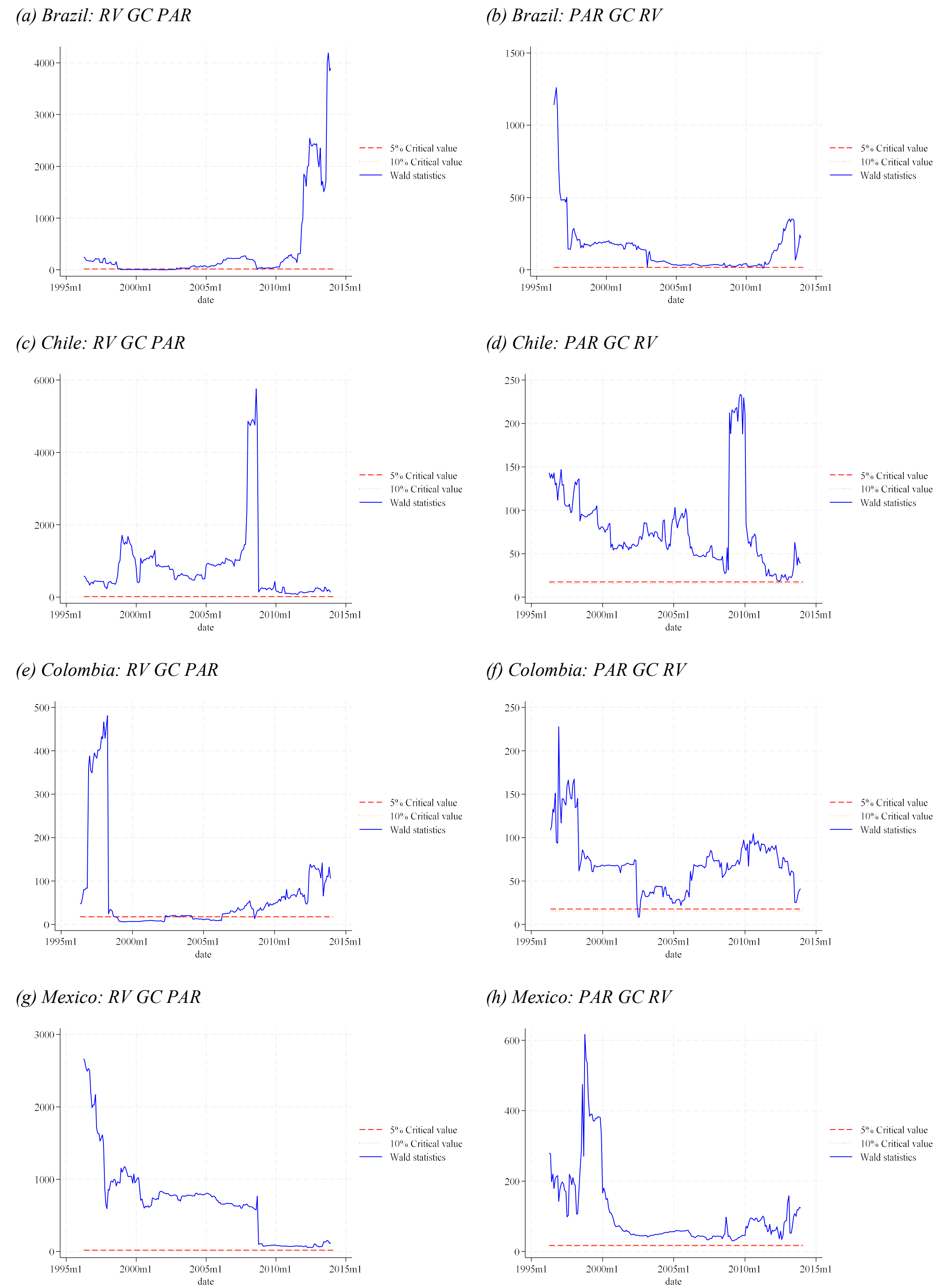


Figure 2. Time-varying Granger causality tests between RV and PAR. Note: Time is reflected on the x-axis. The time-varying Wald statistic is presented on the y-axis.

Appendix A

Figure A1. Plot of PAR, SR and RV for four Latin American countries.

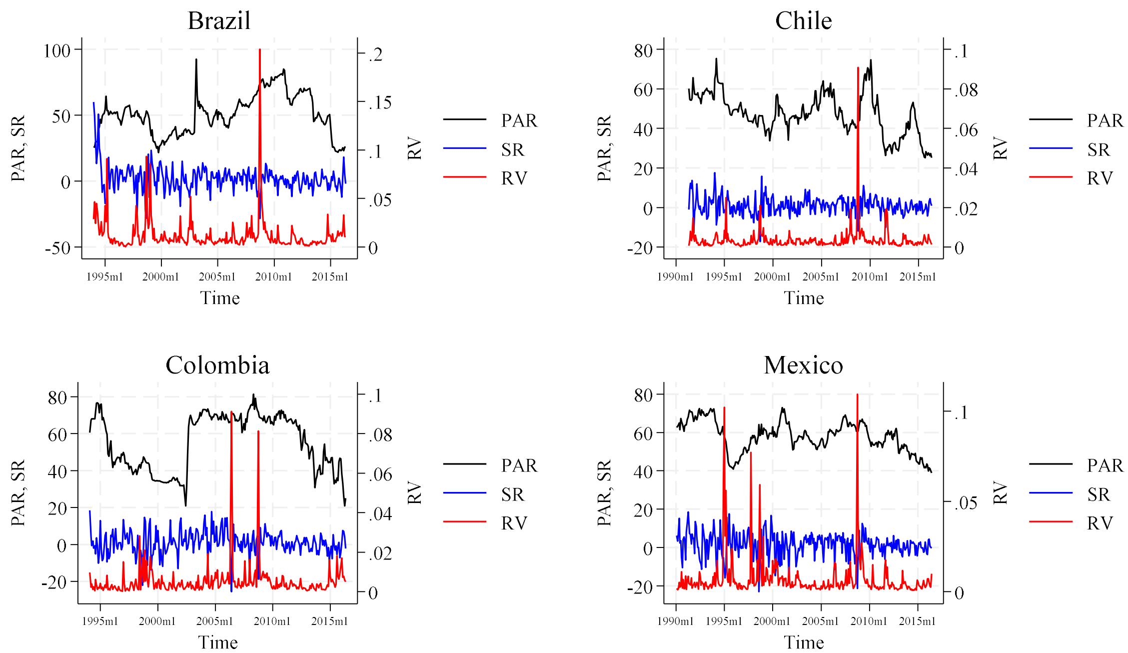


Table A1. Augmented Dickey-Fuller-GLS unit root tests.

	Country				
	Brazil	Chile	Colombia	Mexico	United States
Variable					
PAR	-1.641*	-0.219	-1.631*	-1.072	-2.672***
SR	-1.964**	-11.272***	-3.708***	-5.208***	-
RV	-4.176***	-17.956***	-17.958***	-17.958***	-
IP	-0.832	1.574	0.660	1.492	-
INFL	-0.340	0.495	0.982	-0.164	-
IR	-1.044	-1.125	0.150	-0.297	-

Entries correspond to the test statistics. ***, ** and * represents a significance of 1%, 5% and 10% respectively.

Table A2. Standard and time-varying parameter bidirectional Granger causality tests: VOL and PAR

Country	Null hypothesis	*ExpW*	*MeanW*	*Nyblom*	*SupLR*
Brazil	VOL ⇏ PAR	114.762***	159.966***	35.172***	238.004***
	PAR ⇏ VOL	308.894***	143.335***	2.247	626.296***
Chile	VOL ⇏ PAR	218.699***	94.838***	18.506***	445.905***
	PAR ⇏ VOL	198.865***	132.456***	1.779	406.238***
Colombia	VOL ⇏ PAR	151.513***	64.471***	13.806***	311.535***
	PAR ⇏ VOL	204.621***	70.986***	2.184	417.750***
Mexico	VOL ⇏ PAR	-	413.366***	12.087***	6621.891***
	PAR ⇏ VOL	109.966***	51.528***	1.725	228.434***

Note: ⇏ implies the non-causality null hypothesis. Entries correspond to the test statistics. ***, ** and * represents a significance of 1%, 5% and 10% respectively.
Abbreviations: VOL, GARCH volatility; PAR, differenced presidential approval ratings.

Table A3. Standard and time-varying parameter bidirectional Granger causality tests in a trivariate setting: SR and PAR (control variable: MACRO)

Country	Null hypothesis	$\chi^2(2)$	*ExpW*	*MeanW*	*Nyblom*	*SupLR*
Brazil	SR ⇏ PAR	4.074	155.579***	77.710***	14.027***	321.258***
	PAR ⇏ SR	12.642**	248.499***	169.632***	2.281	507.454***
Chile	SR ⇏ PAR	4.293	228.841***	132.918***	3.261*	468.215***
	PAR ⇏ SR	0.923	57.197***	39.262***	3.534**	124.906***
Colombia	SR ⇏ PAR	0.653	90.529***	67.310***	3.723**	191.240***
	PAR ⇏ SR	7.285	353.140***	162.531***	1.484	716.489***
Mexico	SR ⇏ PAR	4.748	631.278***	167.382***	5.140**	1273.609***
	PAR ⇏ SR	7.254	103.376***	69.035***	1.842	217.804***

Note: ⇏ implies the non-causality null hypothesis. Entries correspond to the test statistics. ***, ** and * represents a significance of 1%, 5% and 10% respectively. The standard Granger causality test is reported using the χ^2 test statistic.
Abbreviations: SR, stock returns; PAR, first-differenced presidential approval ratings.

Table A4. Standard and time-varying parameter bidirectional Granger causality tests a trivariate setting: RV and PAR (control variable: MACRO)

Country	Null hypothesis	$\chi^2(2)$	*ExpW*	*MeanW*	*Nyblom*	*SupLR*
Brazil	RV ⇏ PAR	1.214	-	747.991***	5.133**	4626.418***
	PAR ⇏ RV	6.839	206.062***	115.655***	8.324***	422.327***
Chile	RV ⇏ PAR	5.811	-	919.924***	31.447***	5117.695***
	PAR ⇏ RV	0.097	116.472***	95.754***	6.239***	242.499***
Colombia	RV ⇏ PAR	0.627	200.716***	108.059***	6.426***	411.640***
	PAR ⇏ RV	1.682	218.544***	49.980***	5.875***	447.298***
Mexico	RV ⇏ PAR	6.340	-	680.344***	7.779***	1561.618***
	PAR ⇏ RV	4.485	155.697***	77.968***	5.426***	322.356***

Note: ⇏ implies the non-causality null hypothesis. Entries correspond to the test statistics. ***, ** and * represents a significance of 1%, 5% and 10% respectively. The standard Granger causality test is reported using the χ^2 test statistic.
Abbreviations: RV, realised volatility; PAR, first-differenced presidential approval ratings.

Table A5. Standard and time-varying parameter bidirectional Granger causality tests in a trivariate setting: SR and PAR (control variable: LATAM PAR)

Country	Null hypothesis	$\chi^2(2)$	*ExpW*	*MeanW*	*Nyblom*	*SupLR*
Brazil	SR $\nRightarrow$ PAR	6.283	295.243***	128.976***	7.096***	600.345***
	PAR $\nRightarrow$ SR	4.629	601.055***	353.184***	2.425	1211.971***
Chile	SR $\nRightarrow$ PAR	7.344	129.717***	96.799***	10.395***	269.294***
	PAR $\nRightarrow$ SR	1.103	445.354***	112.109***	1.924	900.568***
Colombia	SR $\nRightarrow$ PAR	2.277	129.544***	78.280***	3.630**	268.946***
	PAR $\nRightarrow$ SR	3.101	378.612***	387.616***	1.332	766.647***
Mexico	SR $\nRightarrow$ PAR	2.287	217.438***	116.645***	5.277***	444.728***
	PAR $\nRightarrow$ SR	0.723	107.569***	94.918***	2.386	224.999***

Note: $\nRightarrow$ implies the non-causality null hypothesis. Entries correspond to the test statistics. ***, ** and * represents a significance of 1%, 5% and 10% respectively. The standard Granger causality test is reported using the χ^2 test statistic. Abbreviations: SR, stock returns; PAR, first-differenced presidential approval ratings.

Table A6. Standard and time-varying parameter bidirectional Granger causality tests in a trivariate setting: RV and PAR (control variable: LATAM PAR)

Country	Null hypothesis	$\chi^2(2)$	*ExpW*	*MeanW*	*Nyblom*	*SupLR*
Brazil	RV $\nRightarrow$ PAR	2.265	-	649.858***	6.772***	5585.963***
	PAR $\nRightarrow$ RV	0.861	516.753***	170.010***	8.977***	1043.366***
Chile	RV $\nRightarrow$ PAR	8.615*	-	1601.237***	40.441***	6439.655***
	PAR $\nRightarrow$ RV	1.344	339.924***	97.301***	4.154**	689.708***
Colombia	RV $\nRightarrow$ PAR	1.814	50.343***	54.859***	13.803***	110.541***
	PAR $\nRightarrow$ RV	4.095	32.023***	38.702***	3.289*	72.030***
Mexico	RV $\nRightarrow$ PAR	5.001	660.591***	310.660***	8.991***	1331.042***
	PAR $\nRightarrow$ RV	0.359	-	193.617***	7.235***	2354.698***

Note: $\nRightarrow$ implies the non-causality null hypothesis. Entries correspond to the test statistics. ***, ** and * represents a significance of 1%, 5% and 10% respectively. The standard Granger causality test is reported using the χ^2 test statistic. Abbreviations: RV, realised volatility; PAR, first-differenced presidential approval ratings.

Table A7. Standard and time-varying parameter Granger causality tests: US PAR and LATAM variables, PAR, SR and RV

Country	Null hypothesis	$\chi^2(2)$	*ExpW*	*MeanW*	*Nyblom*	*SupLR*
Brazil	US PAR $\nRightarrow$ PAR	1.512	369.944***	104.321***	28.319***	750.940***
	US PAR $\nRightarrow$ SR	1.042	375.878***	135.383***	17.221***	763.207***
	US PAR $\nRightarrow$ RV	1.073	109.939***	104.564***	60.161***	231.125***
Chile	US PAR $\nRightarrow$ PAR	0.575	269.870***	227.566***	52.963***	550.257***
	US PAR $\nRightarrow$ SR	0.983	133.449***	59.789***	17.580***	277.818***
	US PAR $\nRightarrow$ RV	2.956	191.658***	50.144***	223.403***	394.456***
Colombia	US PAR $\nRightarrow$ PAR	0.992	425.469***	120.753***	386.616***	861.643***
	US PAR $\nRightarrow$ SR	8.517**	257.927***	150.088***	50.827***	527.298***
	US PAR $\nRightarrow$ RV	4.516	276.682***	145.337***	464.320***	564.808***
Mexico	US PAR $\nRightarrow$ PAR	0.103	147.937***	123.589***	39.198***	306.933***
	US PAR $\nRightarrow$ SR	10.069***	202.402***	135.041***	412.769***	416.310***
	US PAR $\nRightarrow$ RV	0.553	254.420***	117.547***	13.787***	520.346***

Note: $\nRightarrow$ implies the non-causality null hypothesis. Entries correspond to the test statistics. ***, ** and * represents a significance of 1%, 5% and 10% respectively. The standard Granger causality test is reported using the χ^2 test statistic. Abbreviations: PAR, LATAM presidential approval ratings; RV, realised volatility; SR, stock returns; US PAR, United States presidential approval ratings.