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Stock prices, uncertainty and risks: Evidence from developing and advanced economies

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Abstract. This paper studies the relationship between stock prices and three types of uncertainty: economic policy uncertainty, stock market volatility, and geopolitical risks. In particular, our aim is to determine whether these forms of uncertainty play the same role in developed and developing countries. With this purpose, we take Spain and Brazil as representative cases. In order to provide new insights into the abovementioned relationship, a cointegration approach is applied, specifically an ARDL model, using monthly data from the period January 2006-December 2019 for a series of financial and macroeconomic variables. The results obtained reveal that there is no uniform effect of uncertainty in stock markets of developing and developed countries. First, in Spain, there is a high perception of uncertainty in economic policy and stock market volatility, which impact negatively in share prices, both in the short and long term. Regarding Brazil, the global uncertainty in the stock markets has effects on share prices, in both time horizons. By contrast, geopolitical risks do not show any significant impact on Brazilian and Spanish share returns.

Keywords. economic policy uncertainty; geopolitics; stock markets; uncertainty; volatility

JEL Codes. C22; G12; G18

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1. Introduction

The main objective of this paper is to determine the relationship between uncertainty and the performance of stock market indices in the long term, to measure its effects and evaluate the possible differential impacts depending on the type of economy.

According to literature, one would expect an increase in uncertainty to be associated in the long term with a decrease in stock market indices (Malkiel & Xu, 2006; Durnev, 2010; Caldara & Iacoviello, 2019), in other words, the uncertainty-price ratio would be negative. Therefore, the initial hypothesis we analyse is to what extent uncertainty (considered according to three perspectives that are explained afterwards) could affect stock prices. In addition, we study whether those different perspectives of uncertainty have different effects depending on the type of economy. Likewise, the level of the short-term impact of an uncertainty shock on the stock market is analysed, as well as the adjustment time required to return to the previous situation in the stock markets.

To study this relationship, as a novel aspect in the analysis, as far as uncertainty is concerned, we use three representative indicators at a world level, rarely taken into account together: economic policy uncertainty, stock markets volatility and geopolitical risks.

This way, we can study the impact of this uncertainty at a global level on two economies with different features (a developed country and a developing country) and evaluate the possible differential impacts depending on the type of economy.

Uncertainty in the markets has often been seen as a factor affecting the functioning of the economy as a whole. Among the main drivers of this uncertainty both market volatility and policymakers' decisions are usually considered (Carney, 2016). There is a strong tendency towards financial instability, which has made globalisation a phenomenon highly determined by uncertainty.

In order to fill the gap, this paper analyses the importance of uncertainty in the evolution of stock market indices, more specifically the possible long-term relationship between uncertainty and two relevant indices, corresponding to a representative developing country and a representative developed country, respectively: BOVESPA [from Brazil, which has the largest capitalization of Latin American stock markets (Coleman, Leone & Medeiro, 2018; OECD, 2019)] and IBEX 35, which is the main stock index of Spain. Thus, we can compare the results obtained for these two cases and determine whether uncertainty has different effects in both stock markets, corresponding to two different economies in terms of degree of development.

This paper is organized as follows. In section 2, to contextualise the object of study, we begin by considering the relationship between uncertainty and stock markets. In section 3, we present and justify the data, variables and econometric methods used, and we also show and discuss the results of our analysis. Finally, the main conclusions of this paper are summarised.

2. Literature review

The relationship between uncertainty and the economy is not a new issue to be studied. Uncertainty has intensified in the wake of the global financial crisis, crises in the euro area and partisan political disputes. Evidence of this is provided by the research of the International Monetary Fund (IMF, 2012 and 2013) and the Federal Open Market Committee (2009), which highlight that uncertainty about fiscal, regulatory and monetary policies in the United States and Europe contributed to a sharp economic decline in the years of the financial crisis in 2008 and a slowdown in the subsequent economic recovery.

Due to the negative impact of economic policy uncertainty on the stock markets, it is important to include it in this section. Both in the US and in Europe it has been found that it leads to a worsening of macroeconomic performance, in addition to effects on the volatility of share prices (Baker, Bloom & David, 2016).

Furthermore, Carney (2016) includes geopolitical risk, together with the economic and political uncertainty, in an "uncertainty trinity", as these three factors could have significant adverse economic effects. In recent years, the European Central Bank - in the Economic Bulletin -, the International Monetary Fund and the World Bank - in the World Economic Outlook - have systematically highlighted and monitored these risks to the outlook posed by geopolitical uncertainties.

In this respect, authors such as Erb, Harvey and Viskanta (1996) find a relationship between political risk, as measured by the International Country Risk Guide, and future stock returns. It is also important to note the abnormally bullish stock market in the weeks leading up to major elections, especially those characterised by high levels of uncertainty (Pantzalis, Stangeland & Turtle, 2000; Li & Born, 2006).

This evidence is consistent with a positive relationship between risk premium and political uncertainty. In this sense, we must expect a positive relationship between the risk premium and their measure of economic policy based on uncertainty in an international scenario (Brogaard & Detzel, 2015) and relate the risk premium to political cycles (Santa-Clara & Valkanov, 2003; Belo, Gala & Li, 2013). In addition, some authors (Bittlingmayer, 1998; Voth, 2003; Boutchkova, Doshi, Durnev & Molchanov, 2012) have studied the relationship between political uncertainty and volatility in stock markets.

Therefore, three perspectives are taken into account together throughout this paper: economic policy uncertainty, geopolitical risk and stock market volatility.

Firstly, economic policy uncertainty provide additional information on the stock market effects. This economic policy uncertainty comprises the actions and decisions that the authorities of each country take within the scope of the economy.

Focusing explicitly on the existing literature on policy uncertainty, we find, for example, Friedman (1968), Rodrik (1991), Higgs (1997) and Hassett and Metcalf (1999), who consider the detrimental economic effects of uncertainty on monetary, fiscal and regulatory policies.

More recently, Born and Pfeifer (2014) and Fernández-Villaverde, Guerrón-Quintana, Kuester and Rubio-Ramírez (2015) study policy uncertainty by means of DSGE (Dynamic Stochastic General Equilibrium) models, finding moderately negative effects, whereas Pastor and Veronesi (2012, 2013) model the theoretical links between their fluctuations, policy uncertainty and stock market volatility.

Accordingly, some recent papers studied the negative relationship between economic policy uncertainty and economic activity (Bloom, 2009; Giavazzi & McMahon, 2012; Julio & Yook, 2012; Bloom, 2014; Leduc & Liu, 2015; Koijen, Philipson & Uhlig, 2016; Scotti, 2016; Basu & Bundick, 2017).

Secondly, geopolitical risks owe its relevance to the fact that entrepreneurs, market participants and central banks have in recent years considered geopolitical risks to be key determinants of investment decisions and stock market dynamics. Investors express concern about the economic impact of the various military and diplomatic conflicts around the world, even indicating increased concern in this area with regard to political and economic uncertainty (Carney, 2016).

The study of the influence of the geopolitical environment on the economy has not been widely analised because of the limitation resulting from the absence of an indicator of geopolitical risk that is consistent with the perception of press, public, investors and policy makers. These issues were taken into account by Caldara and Iacoviello (2019), who constructed a geopolitical risk index from 1985 and show that a negative geopolitical shock induces persistent declines in investment, employment, consumer confidence and stock market price returns.

The decline in equity prices is slightly larger than that in investment, suggesting that risk premia are increasing, although only to a limited extent. These results are supported by theoretical models such as those of Ilut and Schneider (2014) and others in which high levels of uncertainty lead to declines in employment and investment, e.g. Dixit and Pindyck (1994) and Bloom, Bond and Van Reenen (2007).

Thirdly, stock market volatility is a measure of uncertainty in the equity markets. Volatility is one way of measuring this price risk, probably the most widely used. In fact, this dispersion of the prices on an asset has long been considered an indicator of risk since Markowitz (1959). In this line and taking the CAPM model as a reference, some authors (Merton, 1973; Campbell, 1993, 1996; Chen, 2003; Ang, Hodrick, Xing & Zhang, 2006 and 2009; Malkiel & Xu, 2006; Chen, Ghysels & Wang, 2015; Farago & Tédongap, 2018; Hollstein & Prokopczuk, 2018; Kaeck, 2018) argue that an increase in volatility can be interpreted as a worsening of overall investment opportunities and this predicts a negative relationship.

Although there is a growing body of literature regarding the adverse influence of uncertainty on stock markets, to the best of our knowledge, there is not a joint analysis of the three most studied uncertainty forms. Furthermore, it is interesting to compare whether the influence of uncertainty behaves in the same way in developed and developing countries.

3. Empirical analysis

3.1. Data and variables

In the study of the literature, it was possible to clearly see the relationship of the stock markets with macroeconomic variables, and several necessary control variables were taken into account. In this research, such variables are represented by the Gross Domestic Product at Market Prices (GDP), the Consumer Price Index (CPI), the Interest Rate of the 12-month National Bond (IR) and the Real Effective Exchange Rate index (ER) of Brazil and Spain respectively.

In addition, uncertainty is represented by the following variables, respectively: the EPU or Economic Policy Uncertainty (Baker et al., 2016), the GPR or Geopolitical Risk Index (Caldara & Iacovello, 2019) and the VIX or Chicago Board Options Exchange Market Volatility Index (CBOE, 2019).

The choice of the EPU for our study is due to the fact that, on the one hand, the macroeconomic factor increasingly seeks to anticipate investors' expectations regarding the evolution of fundamental economic variables. It is therefore not surprising that this variable associated with macroeconomic fundamentals has been the main determinant of European stock market dynamics over the last two decades (CaixaBank Research, 2016).

Furthermore, although the GPR is correlated with the EPU, it shows a remarkable amount of additional and independent variation that predicts a lower percentage of economic activity. In relation to existing proxy indicators of uncertainty that tend to increase during recessions, this index points to episodes that are independent of the economic cycle. And we have to take into account the benchmark indicator in the major stock markets around the world, the VIX. Although it is linked to the S&P 500 index, its use is increasing due to the importance of the US index in the rest of the world's stock markets. Therefore, it should be pointed out that in both global situations, it seems plausible to argue that the direction of causality ranges from geopolitical events to stock market volatility and political uncertainty.

They do not all have to behave in the same way in the face of geopolitical risks. For example, the invasion of Iraq by the United States in 2003 appears to cause increased economic policy uncertainty, although it does not induce financial volatility. Furthermore, the three indices also show a large number of independent variations, as the GPR index does not vary much during periods of economic and financial difficulties, as can be seen in the period of the dot-com bubble (1997-2001) and during the world financial crisis in 2007, when the VIX and the EPU showed increases. The GPR index also does not move around the presidential elections, periods characterised by high political uncertainty.

Therefore, compared to the VIX and the EPU, the GPR index captures those events that are most likely to be exogenous to business and financial cycles, and could lead to greater financial volatility and policy uncertainty.

The monthly time series used in our empirical analysis covers the period from January 2006 to December 2019 and thus consists of 156 data for each variable. This is due to the availability of consistent data for all variables.

A descriptive statistic of the data, as well as their sources, is presented in Table 1. It gives an initial idea of the data to be analysed. First and secondly, appear the minimum and maximum value that the variables have had throughout the period of study. In third and fourth place, respectively, are the mean and standard deviation of the variables over the 14 years observed.

As we can see, the variables with the greatest standard deviations and extreme values are those of uncertainty. It is also worth mentioning the values of the interest rate for the case of Spain, since in certain periods it has a very marked variation.

Table 1. Descriptive statistics and data sources.

Variables	Max.	Min.	Mean	SD	Source
EPU	57.099	-39.112	1.5366	17.192	https://www.policyuncertainty.com/
VIX	90.751	-38.490	1.8067	21.725	EIKON
GPR	120.71	-58.516	3.4295	30.581	https://www.matteoiacoviello.com/gpr.htm
BRAZIL					
BOVESPA	24.918	-26.636	0.7316	8.7593	EIKON
GDP	2.6903	-2.5557	0.7255	1.2277	https://www.ibge.gov.br/
IR	12.337	-15.391	-0.6538	4.5457	EIKON
ER	10.167	-13.901	0.0038	3.1427	https://ec.europa.eu/eurostat/data/database
CPI	1.3472	-0.3339	0.4412	0.2947	https://ec.europa.eu/eurostat/data/database
SPAIN					
IBEX	16.625	-17.033	0.0612	5.4932	EIKON
GDP	3.1493	-3.5299	0.1912	1.8530	https://ec.europa.eu/eurostat/data/database
IR	1347.4	-1340.0	-0.6800	154.27	EIKON
ER	2.6182	-3.1091	-0.0012	0.8454	https://ec.europa.eu/eurostat/data/database
CPI	1.4106	-1.9070	0.1298	0.6060	https://ine.es/

3.2. Methodology

As we have been pointing out, in this study, an approach based on econometric techniques of co-integration was adopted. In particular, we used the ARDL (or Pesaran-Shin-Smith) method, since as we will see in our case, it is preferable to other methodologies, such as that of Engle and Granger (1987) or that of Gregory and Hansen (1996). In this method, a bound test is first carried out to determine the direction of co-integration [which variable(s) could act as a dependent], and, once the optimum equation has been selected, the estimation of the equilibrium model is carried out in both the short and long term.

Since the possibilities of using the different methods of co-integration depend on the characteristics of the variables in relation to their stationarity or non-stationarity, before proceeding with the application of such methods, we must determine these characteristics, a task that we will address in the following section.

3.2.1. Unit root test

To try to make our analysis more robust, we opted to apply different methods, such as the Dickey-Fuller test (ADF) and Kwiatkowski-Phillips-Schmidt-Shin test (KPSS), to level values. In this case, an analysis with constant has been used and 12 lags have been selected due to the monthly periodicity of the data; it should also be noted that these tests have been carried out using Akaike information criterion (AIC).

Table 2. Results of unit root tests.

Variables	ADF levels	KPSS levels
EPU	I(0)	I(0)
VIX	I(0)	I(0)
GPR	I(0)	I(0)
BRAZIL		
BOVESPA	I(0)	I(0)
GDP	I(1)	I(1)
IR	I(0)	I(0)
ER	I(0)	I(0)
CPI	I(1)	I(0)
SPAIN		
IBEX	I(0)	I(0)
GDP	I(1)	I(0)
IR	I(0)	I(0)
ER	I(0)	I(0)
CPI	I(1)	I(0)

Considering all the information provided by the unit root tests (Table 2), it can be seen that the results do not coincide optimally between both tests. The only non-stationary variable in all the tests would be safely the GDP in the Brazil case. Therefore, we see contradictory outcomes with respect to CPI (Brazil and Spain) and GDP (Spain).

When carrying out the co-integration analysis, these results should be taken into account, as different methods could be applied depending on the stationary properties of our variables.

The ARDL (Autoregressive Distributed Delays) method, also called PSS (Pesaran-Shin-Smith) test (Pesaran & Shin, 1999; Pesaran, Shin & Smith, 2001), differs from other methods in that it allows a more in-depth study, in a less restrictive way.

For this reason, in the present study, an empirical analysis will be carried out applying the ARDL method, among other reasons because the Engle-Granger and Gregory-Hansen methods, require that to carry out the co-integration analysis absolutely all the variables considered (dependent and regressors) are integrated of order 1, I(1), that is, they have a unitary root.

3.2.2. Optimal number of lags

Before applying the ARDL method, the number of lags with which to work must be established. A priori, according to Pesaran and Pesaran (2009), as these are monthly data, the recommended number of lags would be 12, which for our model would imply that the number of regressions required would be no less than 815.73 million by each country, which would be unmanageable in practice.

Therefore, we decided to use the procedure followed by Khan and Khan (2018), in order to know the number of optimum lags. According to this procedure, for this case the appropriate number of lags would be 12 according to AIC and R2 criteria, whereas according to FPE (Final Prediction Error) and HQ (Hannan-Quinn Information Criterion) criteria this number would be 1. Given that, as we have seen above, in our model it is very complicated in practice to work with 12 lags, according to these results we opted to establish a maximum of 1 lag.

3.2.3. Bound test

As the unit-root analysis was already carried out previously, we can now continue with the next phase of the estimation of the ARDL models, which is the bound test by means of an F-statistic. This test analyses the causality of the variables, that is, whether and how (dependent/explanatory variable) each of the variables considered should be included in the model. Its null hypothesis is the non-existence of cointegration.

We must point out that when analysing the results of the corresponding statistics, there are problems due to their non-standard distribution, a situation that Toda and Yamamoto (1995) have tried to justify and for which Pesaran et al. (2001) indicate a special method to carry out the test with two theoretical values, a lower limit (Li) and an upper limit (Ls). Both limits must be sought in the tables provided by Pesaran and Pesaran (2009, p. 300), the search criteria being the number of variables of the model to be studied (in our case, k=8: BOVESPA or IBEX, EPU, VIX, GPR, GDP, IR, ER and CPI), the characteristics of the model (intercept, trend) and the significance level we want to apply.

In addition to contrasting the F-statistic, whose null hypothesis would indicate the non-existence of joint significance of the first lag of the variables in levels used in the analysis, a complementary test could be made in the event that the F- statistic does not give conclusive results: a t-test, which would contrast the individual significance of the first lag of the variables. Since we are contrasting whether or not there is a long-term relationship between the variables, it must be taken into account that if we reject the null hypothesis, it would imply the existence of co-integration.

Table 3. PSS test.

Dependent variable	F-*test*		t-*test*		Regressors
BOVESPA	17.550		140.403		EPU, VIX, GPR, GDP, IR, ER, CPI
Significance level	I(0)	I(1)	I(0)	I(1)	
5%	2.3907	3.6049	19.1256	28.8395	
10%	2.0812	3.2004	16.6500	25.6036	
Dependent variable	F-*test*		t-*test*		Regressors
IBEX	18.732		149.855		EPU, VIX, GPR, GDP, IR, ER, CPI
Significance level	I(0)	I(1)	I(0)	I(1)	
5%	2.3907	3.6049	19.1256	28.8395	
10%	2.0812	3.2004	16.6500	25.6036	

The result of the bound test for our models can be seen in Table 3, where the BOVESPA and IBEX indexes are the dependent variable (the regressors of the model being the variables EPU, VIX, GPR, GDP, IR, ER and CPI). The critical values of the intervals in the contrast of F and t come from the tables of Pesaran et al. (2001) for unrestricted constant and without trend (k = 8). In addition, it should be noted that the results reflected in Table 3 point out that there is no evidence against co-integration with a significance level of 5%, so we can proceed to the analysis of the ARDL models (Castellanos-García, Pérez-Díaz-del-Río & Sánchez-Santos, 2014).

3.2.4. Model estimation

Once having applied the bound test, in which we have contrasted the relationship of our variables over time, the estimation of the unrestricted error correction model will be carried out. In this way, the ARDL model for the case of Brazil, could be expressed as follows:

$$BOVESPA_t = \alpha_0 + \sum_{i=0}^{1} \omega_i \, BOVESPA_{t-i} + \sum_{i=0}^{1} \delta_i \, EPU_{t-i} + \sum_{i=0}^{1} \beta_i \, VIX_{t-i} + \sum_{i=0}^{1} \eta_i \, GPR_{t-i} + \sum_{i=0}^{1} \gamma_i \, GDP_{t-i} + \sum_{i=0}^{1} \psi_i \, IR_{t-i} + \sum_{i=0}^{1} \varphi_i \, ER_{t-i} + \sum_{i=0}^{1} \varpi_i \, CPI_{t-i} + \varepsilon_t$$

Where the variables have already been defined, ε_t would correspond to the random disturbance, α_0 to the independent term of the equation and ω_i, δ_i, β_i, η_i, γ_i, ψ_i, φ_i and ϖ_i to the regressor coefficients.

Once the estimation of the band test is done, we obtain the estimation of the ARDL method, being the optimal model for the case of Brazil [ARDL(1, 0, 0, 1, 1, 0, 0)].

We will replicate the model for the case of Spain, which could be expressed as follows:

$$IBEX_t = \alpha_0 + \sum_{i=0}^{1} \omega_i \, IBEX_{t-i} + \sum_{i=0}^{1} \delta_i \, EPU_{t-i} + \sum_{i=0}^{1} \beta_i \, VIX_{t-i} + \sum_{i=0}^{1} \eta_i \, GPR_{t-i} + \sum_{i=0}^{1} \gamma_i \, GDP_{t-i} + \sum_{i=0}^{1} \psi_i \, IR_{t-i} + \sum_{i=0}^{1} \varphi_i \, ER_{t-i} + \sum_{i=0}^{1} \varpi_i \, CPI_{t-i} + \varepsilon_t$$

Where all variables have been previously defined: ε_t would correspond to the random disturbance, α_0 to the independent term of the equation and ω_i, δ_i, β_i, η_i, γ_i, ψ_i, φ_i and ϖ_i to the regressor coefficients.

Knowing the optimal ARDL model, it is carried out a diagnostic of autocorrelation, adequate specification, normality and heteroscedasticity of the residuals is carried out below, using the Akaike criterion (AIC).

Once the different tests of the ARDL model have been calculated, there are two versions (LM and F), the first being suitable for large samples, as is the case of this study. The results are shown in Table 4 below.

Table 4. Results of the different tests of the ARDL model.

Statistical tests	LM version	F version
Brazil		
Lagrange test	CHSQ (12) = 10.978 [.531]	F(12, 141) = .84296 [.606]
RESET test	CHSQ (1) = 3.6438 [.056]	F(1, 152) = 3.4539 [.065]
Heteroscedasticity test	CHSQ (1) = 0.4605 [.497]	F(1, 162) = .45618 [.500]
Normality test	CHSQ (2) = 1.4133 [.493]	Not applicable
Spain		
Lagrange test	CHSQ (12) = 10.056 [.611]	F(12, 141) = 0.7676 [.683]
RESET test	CHSQ (1) = 1.0724 [.300]	F(1, 152) = 1.0005 [.319]
Heteroscedasticity test	CHSQ (1) = 0.4724 [.492]	F(1, 162) = 0.4680 [.495]
Normality test	CHSQ (2) = 3.3103 [.191]	Not applicable

Note. In brackets, p-values.

In the Lagrange test, the null hypothesis that the residuals are not correlated is contrasted. In this case, it is observed that, at the 5% significance level, H_0 is not rejected so both models would be valid from the point of view of the existence of autocorrelation, that is, there would be no autocorrelation.

Ramsey's test contrasts the null hypothesis that the model is well specified. Here it turns out that, at the 5% significance level, H_0 is not rejected, which would indicate that both models are well specified.

The heteroscedasticity test contrasts the null hypothesis of homoscedasticity; in this case, H_0 is not rejected, so both models are homoscedastic at the 5% significance level.

Going on to develop the study of co-integration itself, below we estimate, on the one hand, by ordinary least squares (OLS), the long-term model in which the variables are included in levels. As its own name points out, this model indicates us the equilibrium relationship in the long term between the variables.

On the other hand, we estimate, also by OLS, an error correction model (ECM), now using the first differences of the variables; this model represents the dynamics of the short-term relationships between the variables studied.

- *Long-term model*

The main issue studied in this paper is the co-integration (that is, the long-term relationship) between the uncertainty variables and the returns of the quotations of both stock market indexes. The long-term model coefficients obtained for each of the estimates are shown in Table 5.

Table 5. Long-term ARDL model coefficients.

Regressor	Coefficient	t-*Statistic*	p-value
BRAZIL			
C	2.2630	2.4744	0.014
EPU	-0.0101	-0.4103	0.682
VIX	-0.0782	-4.0090	0.000
GPR	-0.0059	-0.2689	0.788
GDP	-0.3375	-0.8521	0.396
IR	-0.0947	-0.9916	0.323
ER	1.5795	11.6093	0.000
CPI	-2.5474	-1.7327	0.085
SPAIN			
C	0.4929	1.1792	0.240
EPU	-0.0851	-3.6358	0.000
VIX	-0.1312	-6.1142	0.000
GPR	0.0328	1.6703	0.097
GDP	-0.0906	-0.3615	0.718
IR	0.0004	0.1594	0.874
ER	0.3983	0.6880	0.492
CPI	-1.5811	-1.2630	0.209

Table 5 shows that the global uncertainty generated in the stock markets (VIX) has a negative influence on both economies, but this influence would have a greater weight in the second country. Specifically, in the face of a unitary increase in such uncertainty, in the long term, such yields would decrease by 0.0782 units in the case of Brazil, as opposed to the 0.1312 decrease in the yields of the Spanish index.

Uncertainty in economic policy would have a long-term negative influence on IBEX 35 returns, whereas in the case of BOVESPA it would not be significant. In the case of Spain, specifically, if there were a unitary increase in this economic policy uncertainty, in the long term, these yields would decrease by 0.0851 units. It should be noted that volatility in the stock markets would have a greater long-term effect on the national index than the uncertainty derived from economic policy.

In contrast, the third indicator of uncertainty, the GPR, is not at all significant in either case.

With respect to the control variables, at 5% only the ER is significant in the case of Brazil, with a positive sign. Specifically, in the face of a unit increase in the Brazilian real effective exchange rate, such yields would increase by 1.5795 units in the case of Brazil.

This currency appreciation makes investors in international stock markets very aware of the currency in which they will be investing and how it is expected to behave over the investment horizon.

- *Short-term model*

Finally, the results of the error correction model (ECM) are shown to determine the short-term relationship of the variables included in the analysis. This ECM allows to analyse the impact of a shock on the model variables as well as the adjustment time needed to return to the initial equilibrium situation.

First, it should be verified that in the estimation results of this model the error correction coefficient (which shows the speed of adjustment toward equilibrium after the short-term impact) is statistically significant and is negative. As we can see in Table 6, both requirements are met, and the speed of adjustment is very fast in the both cases.

Table 6. Short-term ARDL model coefficients (ECM).

Regressor	Coefficient	t-*Statistic*	Probability
BRAZIL			
dEPU	-0.0121	0,0247	0.682
dVIX	-0.0934	0,0205	0.000
dGPR	0.0244	0,0132	0.137
dGDP	0.7045	0,4903	0.161
dIR	-0.1131	0.1134	0.319
dER	1.8870	0.1804	0.000
dCPI	-3.0434	1,7528	0.087
ecm(-1)	-1.1947	-19.278	0.000
SPAIN			
dEPU	-0.0809	-3.5634	0.000
dVIX	-0.1248	-7.3291	0.000
dGPR	0.0165	1.3705	0.172
dGDP	0.2819	0.8464	0.399
dIR	0.0004	0.1595	0.874
dER	0.3787	0.6869	0.493
dCPI	-1.5033	-1.2853	0.201
ecm(-1)	-0.9508	-13.945	0.000

Observing the results for the uncertainty variables, we can indicate that, as in the previous analysis, the VIX has a significantly negative relationship with the returns of BOVESPA and IBEX quotations, being higher in the latter. The EPU is significant for the Spanish case and has a negative sign. Thirdly, the geopolitical risk would not be significant, so we could not indicate a clear inverse relationship between this uncertainty and stock market prices.

The variables of uncertainty considered are therefore inversely related in the short term to stock market returns, i.e., increases in uncertainty from an economic policy and financial market point of view are associated with decreases in the quotations of the Brazilian and Spanish reference indices, BOVESPA and IBEX 35.

4. Conclusions

In this paper, we explore the relevance of economic policy, geopolitical decisions and stock markets volatility in the stock markets returns, comparing the results obtained for a developed and developing country. The main conclusions of this paper can be summarized as follows.

In the long term, we conclude that uncertainty would cause decreases in the quotations of BOVESPA (Brazilian Index) and IBEX 35 (Spanish Index). More specifically, uncertainty in economic policy would negatively influence stock returns in the long term only for the case of the Spanish index.

Moreover, the uncertainty stemming from the volatility of the stock markets exerts a negative influence on both stock market indexes. Therefore, in the long term, when faced with an increase in the VIX, the returns on the BOVESPA and IBEX 35 share prices decrease. Furthermore, it should be noted that volatility in the stock markets would have a greater long-term effect on the Spanish national index than on the Brazilian index. Our findings also show that for the Spanish case, the uncertainty derived from economic policy is less than that produced by fluctuations in the financial markets.

Finally, the third indicator taken into account in terms of measuring uncertainty in the global geopolitical sphere (GPR) is not at all significant in any case. This situation could be due to the low long-term influence of events that generate global geopolitical risks on these stock market indexes, since the countries in which they are listed would not be involved in such events. However, this risk could cause relevant shocks in very short periods, where the monthly periodicity of our data implies that its influence cannot be appreciated.

In the short-term, we have obtained empirical evidence suggesting the existence of a significant relationship between economic policy uncertainty and volatility in the financial equity markets with respect to the IBEX 35 and between financial market volatility with respect to BOVESPA stock prices. In other words, they have a negative relationship in the short term, so increases in uncertainty would translate into decreases in stock price returns, with the speed of adjustment of the uncertainty shock to return to the initial equilibrium situation within a period of approximately one month.

These results may be useful for investors when analysing their financial planning, as they must adopt optimal investment strategies that take into account these uncertainties, since their capital would be affected by fluctuations in these areas at a global level. In addition, they must take into account in a complementary manner that in developed countries, this global uncertainty affects to a greater extent than in emerging or developing countries.

It should be noted that policymakers must take into account their decisions in the field of economic policy, since in countries like Spain, these decisions will have an effect on stock market performance over time.

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