# The impact of investor sentiment on stock returns in Emerging markets. The case of Central European markets

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**Abstract:**

This paper studies the effect of investor sentiment on stock returns in three Central European markets: the Czech Republic, Hungary and Poland. The results show that sentiment is a key variable in the prices of stocks traded on these markets and its impact is stronger here than in more developed European markets. This effect is linked to stock characteristics, particularly those considered to make stocks more prone to the influences of investor sentiment. The evidence shows that the effect is not uniform across countries, since higher levels are found for Poland and the Czech Republic, thus confirming the role of country-specific factors in the impact of investor sentiment on stock prices. The results also confirm that sentiment is a twofold (global and local) phenomenon, in which the global dimension has much greater impact than the local dimension, at least in the markets considered. Finally, the paper has shown that sentiment does not spread, at least to any significant degree, through the movement of capital between markets. This strengthens the argument that sentiment is transmitted through a behavioral mechanism. If this argument proves correct, there is little likelihood of local regulatory action being very effective in limiting the perverse impact of asset bubbles.

**Keywords:** Investor sentiment, Emerging stock markets, stock characteristics, contagion
**JEL:** G02, G15, G24, M41

## 1. INTRODUCCION

The addition of sentiment to the variables underlying the arguments put forward by finance theory has contributed towards a more integral understanding of investor behavior. The consideration of psychological or behavioral factors broadens the approach to this topic and helps to explain it in rational decision-making terms. Isen (1987), Schwarz (2002) and Au *et al.* (2003), among others, argue that emotions influence information processing, and therefore have a bearing on market-related decisions.

In broad terms, investor sentiment is a belief about future cash flows and investment risks that cannot be justified by the fundamentals (Baker and Wurgler, 2007 or Chan et al, 2012). Baker and Wurgler (2006, 2007) define it more specifically as optimism (high sentiment) or pessimism (low sentiment) about stocks in general, although they also identify it with the propensity to speculate. They assert that there are two potential channels for the influence of investor sentiment on stock prices: limits to arbitrage and difficulty of firm valuation. With respect to the first of these mechanisms, they state that limits to arbitrage vary across stocks, while sentiment is uniform. With respect to the second, they claim that sentiment drives the relative demand for stocks that are vulnerable to speculation thereby causing cross-sectional effects even if arbitrage forces are the same across stocks. Both channels appear to affect the same type of stocks, or, put another way, some assets are more vulnerable than others to speculative demand and are therefore the most strongly influenced by investor sentiment. Assets that are harder to value or more difficult to arbitrage are perfect targets for subjective decision-making and, thereby, more prone to investor sentiment. In general, they tend to be small, volatile, young, non-dividend paying stocks exhibiting extreme book-to-market ratios. The underlying idea in the aforementioned literature is that high/low sentiment periods will lead to over-/under-pricing of more sensitive stocks and subsequently to lower/higher future returns as prices revert to equilibrium.

Research, conducted mainly on the US stock market, has shown that sentiment appears to have the power to predict future returns (Qiu and Welch, 2004; Brown and Cliff, 2005; Lemmon and Portnaiguina, 2006 and Baker and Wurgler, 2006, 2007).

In this conceptual framework, this study aims to analyze the effect of sentiment on stock returns in three emerging Central European markets: the Czech Republic, Poland and Hungary. Furthermore, based on some of the variables used by Schmeling (2009), the countries in question score high on average in power distance, individualism and masculinity, uncertainty avoidance, are more short-term oriented and more restrained than a sample of financially developed European countries. At the same time they score lower on

The Worldwide Governance Indicators[1]. According to Schmeling, all of this is predictive of the sentiment effect being stronger in emerging than in more financially developed markets. In the same vein, greater limits to arbitrage and difficulty of firm valuation should lead to a stronger sentiment effect in emerging markets. It should also be noted that, while the three countries considered are emerging markets they have one feature that sets them apart from other emerging markets: They joined the EU in May 2004 and are the largest in terms of GDP and equity of all the accession countries. The transition process forced by EU entry may have affected the market characteristics of these countries. In addition, their status as emerging markets, along with the European integration process, may distinguish them from other, more established markets, making them especially appealing for research purposes. In particular, this economic and financial integration process has influenced the type of firm listed, such that, along with the usual characteristics found in emerging markets, such as sentiment prone stocks (low number of assets, low mean size, high volatility and low liquidity), we find the effect of privatization programs, which have been particularly intense in the Czech Republic, and the gradual incorporation of foreign stocks.

Furthermore, given the global environment in which these markets are immersed, our study aims to advance further into separating the roles of the global and local components of investor sentiment in the sentiment-return relationship. If global sentiment measures have more ability, overall, to predict future stock returns, the effect should, if anything, be more obvious in these markets.

We contribute in several ways to the growing literature on the role of investor sentiment in capital markets. Whereas the US and other financially-developed markets have been widely analyzed, there is no detailed research on this effect in emerging economies. Furthermore, as already stated, certain features of these emerging markets, deriving from their recent integration into the European Union, make them a particularly appealing subject for research. In order to determine whether sentiment has a stronger impact in these markets, we compare them in this respect with three of the most highly capitalized European stock markets.

Narrowing the focus to the three above-mentioned emerging Central European markets, our second aim is to seek a deeper understanding of the sentiment effect in each one. The first step towards this objective is to analyze the relevance of stock characteristics in these markets. With no wish to negate the already widely documented major impact of

[1] The six aggregate indicators are based on 31 underlying data sources reporting the perceptions of governance of a large number of survey respondents and expert assessments worldwide. The aggregate indicators of six broad dimensions of governance are: Voice and Accountability, Political Stability and Absence of Violence/Terrorism, Government Effectiveness, Regulatory Quality, Rule of Law and Control of Corruption. More details can be found in the WGI methodology (Kaufmann, Kraay and Mastruzzi, 2010).

investor sentiment on assets that are hard to value and arbitrage (see, among others, Baker and Wurgler, 2006, 2007; Baker et al, 2012; Corredor et al, 2013a), we question whether the impact of stock-type differences in these markets is strong enough to result in appreciably divergent sentiment effects. If, due to their young age, these emerging markets are found to be more mutually alike than more consolidated markets, specific stock characteristics would have to be ruled out as a key factor in the return-sentiment relationship.

Thirdly, we examine the relevant impacts of the global and local (country-specific) components of the sentiment variable. Few studies investigate how return predictability is affected by investor sentiment from both the global and the local market perspective and, to our knowledge, none has analyzed the issue in emerging markets, where sentiment effects may be more intense. In fact, as several studies have shown, the dependence of many emerging economies on foreign capital transfers has made them more vulnerable to changes in the international finance scenario. This study is further enhanced by a search for factors to explain the mechanism by which sentiment spreads. In other words, we analyze whether it is generated by real activity, such as cross-country capital flows, or is strictly due to sentiment contagion, independent of existing economic transactions and, thus, more directly influenced by distorted investor expectations.

In the last section of the paper we review and discuss the potential factors (stock characteristics versus country-specific factors) underlying variations in the impact of sentiment on stock returns in the countries considered.

The paper is organized as follows: section two describes the database and characteristics of the markets and assets considered, and the global and local components of the sentiment variable; section three presents the methodology and results. Section four contains a discussion of the possible causes of diversity in the impact of investor sentiment. The fifth and last section summarizes the main conclusions to be drawn from the study.

## 2. DATABASE

### 2.1. MARKETS SELECTED FOR ANALYSIS

The data for the analysis, which refer to three Central European emerging economies: the Czech Republic and Hungary and Poland[2], are sourced from the Datastream (Thomson Financial). The sample period runs from January 2001 to December 2011. These three countries joined the EU in May 2004 and are the largest in GDP and equity market terms of all the accession countries. In recent decades, these countries have undergone structural

[2] The same source provided the foreign exchange quotes of the Hungarian Forint, the Polish Zloty and the Czech Koruna against the Euro (base currency).

changes to enable their entry into the EU. Their transition from communist to market economies has resulted in much closer trading ties with Europe. Specifically, Gilmore et al (2008) state that, in 2004, trade with the EU accounted for 65% of the Czech Republic's exports and 73% of its imports, 79% and 72%, respectively, of Hungary's, and 67% and 74%, respectively, of Poland's. In recent years, roughly 40% of this trade has been with Germany. The three markets analyzed are smaller than the developed financial markets in Europe and certainly smaller than the Anglo Saxon markets commonly studied in the literature. In capitalization terms, these three economies differ from each other, especially during certain sub-periods within the overall sample period (2001-2011). According to data supplied by the FESE (Federation of European Securities Exchanges), average capitalization in constant Euros over the sample period is higher in Poland than in the other two countries. In average terms, it is 3 times higher than in the Czech Republic and 3.93 higher than in Hungary. However, these data varied considerably over the sample period, at the start of which the capitalization of the Polish economy was 3.20 times greater than that of the Czech Republic and 2.49 times greater than that of Hungary. In 2004, the period studied by Gilmore et al (2008), it was 2.38 times greater than that of the Czech Republic and 2.46 times greater than that of Hungary. At the end of the study period, Poland's capitalization stood at 107,482.95 (EurM), which is 3.68 greater than that of the Czech Republic and 7.34 greater than that of Hungary. From 2007 onwards, however, the domestic market capitalization of these three countries took a downward turn, most strikingly that of Hungary in 2011.

Differences in the privatization process of these countries resulted in major changes in their stock market structures. While Hungary remained completely stable in terms of the number of stocks listed, Poland maintained an upward trend and the Czech Republic a declining trend. The relative abruptness of the Czech Republic privatization process led to many newly-listed companies gradually fading from the scene.

In specific figures, Poland has the largest average number of companies listed in the stock market (364.55). This, however, is largely due to the growth that took place after 2008, particularly in 2011, when a total of 777 companies (757 domestic and 20 foreign companies) became listed at year's end. It nevertheless has the smallest average firm size of the three. That is, 23% that of Hungary and only 14% that of the Czech Republic. The number of firms listed on the Hungarian market remained almost stable throughout the entire sample period, at an average of 47.45. In terms of average size, its firms fall between those of the other two markets, albeit with wide variation. Finally, in complete contrast to the growing trend of Poland, and despite having an average of 35.91 firms, the number of companies listed on the Czech market dropped from 47 in December 2001 to 26 by December 2011. Its

listed companies are the largest on average and show the lowest size dispersion of all three markets analyzed.

Foreign firm penetration varies across these three markets. Based on the average ratio of foreign stocks trading volume (fstv) to domestic stocks trading volume (dstv), the Czech market not only has the highest number of foreign firms, it also has the highest fstv/dstv ratio, (approximately 24% of the total). This is 13.5 times more than Poland. Hungary, meanwhile, scores very low on both these indicators[3]. Nor did the economic crisis have equal impact across all these countries. While the Czech Republic and Poland remained relatively stable throughout the sample period, in Hungary, the crisis somewhat destabilized the banking sector and caused exchange rates to fluctuate.

Culturally speaking, meanwhile, although these countries differ in some ways from the Anglo Saxon markets that provide the traditional financial research setting, they are fairly homogeneous among themselves. The Hofstede index (2001) is a combination of dimensions enabling comparison between different cultures. According to this index, our countries of interest rank above the European average in uncertainty avoidance and power distance and near to average in collectivism versus individualism. In comparison with Anglo Saxon countries, however, they have much higher levels of uncertainty avoidance, power distance and collectivism. Their scores on the Worldwide Governance Indicators show that these three countries generally rank well below the rest of the Euro Area in terms of corruption control and rule of law.

Thus, these three countries differ culturally and/or institutionally from the average European country and even more so from the Anglo Saxon countries on which most studies of market sentiment have been conducted, and therefore provide a worthwhile alternative research setting that might reveal different sentiment effects from those found in more developed markets.

### 2.2. STOCK CHARACTERISTICS

In this paper we use a series of variables that enable us to measure the sensitivity of stocks to investor sentiment. According to Baker and Wurgler (2006), stocks that are hard to value, and therefore vulnerable to speculation, will be more sensitive to the sentiment effect. The same can be said of stocks that are more difficult and more costly to arbitrage. These two stock characteristics tend, furthermore, to occur in conjunction. The aforementioned authors identify the sentiment sensitivity variables as size, age, volatility, unprofitability,

[3] According to FESE data, the average ratio of foreign stock trading volume to domestic stock trading volume over the period 2003-2011 is 29.64% for the Czech market, 2.21% for the Polish market and 0.14% for the Hungarian market.

tangibility of assets, dividend payouts, growth opportunities and default risk. Baker et al (2012) use volatility, size, book-to-market and sales growth and Corredor et al (2013a) use volatility, book-to-market, size and dividend per share.

In line with the same authors, the stock characteristics to be analyzed in this study are volatility (VOL) measured as the standard deviation of its past twelve month returns, the book-to-market ratio (BTM)[4], stock size (SIZ) measured as its market cap value, and the dividend ratio (DPS)[5]. Volatility is strongly associated with uncertainty, and is therefore considered a good indicator for difficulty of valuation. With respect to BTM, a high level of growth opportunities encourages unsophisticated traders to make a wide range of highly sentiment–driven firm valuations. Extreme growth stocks (low BTM) and distress stocks (high BTM) are also costly and difficult to arbitrage. A firm's size is directly related to its ability to access information, to its liquidity, and to its trading capacity, all of which are associated with difficulty of valuation and arbitrage. Lastly, steady dividend yields offer investors security and reduce their uncertainty with regard to firm valuation. In short, stocks with high volatility, extreme BTM ratios, low size, and low dividend payouts are commonly considered the hardest to value and the most difficult to arbitrage. Thus, as the literature has shown, these stock characteristics, volatility in particular, make suitable proxies for sensitivity to investor sentiment. In fact, Chang et al (2012), Joseph et al (2011), Baker et al (2012) and Corredor et al (2013a, b) use volatility portfolios to proxy for hard-to-value and difficult-to-arbitrage stocks, because the observed effects are stronger than for other characteristics. The data, which were sourced from Datastream (Thomson Financial), cover all stocks currently or previously listed on the stock markets being analyzed. Table 1 shows the main descriptive statistics of the three selected stock markets, including year-by-year number of stocks, number of foreign stocks listed, percentage of foreign stocks listed and the sample statistics of the stock characteristics, such as size, book-to-market, volatility and dividend yields.

The database has been checked and corrected according to the recommendations of Ince and Porter (2006). Specifically, we have removed all entries showing zero returns on delisted stock, all non-domestic stocks, all listings other than those on the primary exchange and all listings with Type not equal to Equity. Stocks showing no price variation for a period of 3 consecutive months have been dropped from the sample, under the premise that their inclusion would skew the portfolio construction and return estimates. These adjustments

[4] Negative values of the book-to-market ratio have been omitted.
[5] As already mentioned, other studies include another stock characteristics indicating profitability or tangibility of assets, age, sales growth, R&D investment and external funding, which are not analyzed in this study due to data availability issues.

have substantially reduced the average number of stocks considered in relation to the total number of companies with listed shares according to FESE data. The average sample sizes are as follows: Czech Republic: 31.36; Hungary, 33.55; and Poland, 177.64. Their characteristics are summarized in Table I.

To study the effect of sentiment on future stock returns, we create long-short strategies (self-financed portfolios) based on the volatility, BTM ratio, size, and dividends per share. Given that the aim is to analyze the performance of aggregate portfolios over a specific holding period, we follow Chang et al (2012) and Corredor et al (2013a) by using the calendar time procedure used by Jegadeesh and Titman (2001) (described in section 3.2 ) in order, as far as possible, to avoid self-correlation.

### 2.3. INVESTOR SENTIMENT

Investor sentiment is a difficult variable to measure because it involves a certain degree of subjectivity. In fact, the literature has so far failed to develop a generally accepted investor sentiment measure and therefore features various different approaches. Current studies of the effect of sentiment on stock returns tend either to search for a common element comprising several variables using principal components analysis, in line with Baker and Wurgler (BW2006, 2007) and Baker *et al.* (2012) or to use the Consumer Confidence Index (Lemmon and Portniaguina, 2006, Schmeling, 2009 and Chang et *al.,* 2012, among others).

Baker and Wurgler's (2006, 2007) proposal constructs an index from a series of sentiment-revealing variables. Its main drawback is that it was created for the US market and any attempt to replicate it in another market involves searching for variables that are difficult to find. This study, therefore, takes the alternative option, that is, the Consumer Confidence Index (CC), which is a measure of optimism/pessimism about current and future economic conditions. This index is a summary of information on planned household spending and saving and an evaluation of the underlying economic factors as perceived by market agents. Its main advantage is the availability of long periods of data covering practically every country in the world, which enables cross-country comparison while also providing a non-market indicator[6]. It is also widely used in the literature on market sentiment including Jansen and Nahuis (2003), Brown and Cliff (2004, 2005), Lemmon and Portniaguina (2006), Schmeling (2009), Antoniou, *et al.* (2013), Chang, *et al.* (2012) and Zouaoui *et al.* (2011). A CC

[6] Although the CC index may differ from the average investor index, accurate approximation of the latter is complex.

index for every EU member state is published on the last working day of every month by the European Commission[7].

In order to analyze the investor sentiment effect both from a local and a more global perspective, we use several CC indices. To address the issue from the local viewpoint, we use country-specific CC data for each country of interest (HU denotes the CC index for Hungary, PO that for Poland, and CR that for the Czech Republic). The comparative analysis with the European countries is also based their respective CC indices (UK for the United Kingdom, GE for Germany, FR for France). These local indices are orthogonalized, in line with Baker and Wurgler (2007) and Schmeling (2009), by regressing the raw indices on their four monthly macroeconomic ($M_s$), variables: the industrial production index, durable and non-durable goods consumption, and the unemployment rate, in order to eliminate potential business cycle effects[8]. The residuals from these regressions ($SENTC^{\perp}$) are proxies of local sentiment free of the effect of their respective business cycle components. Our global analysis uses a set of alternative indices: two European indices (EU, which denotes the CC index for the European Union 27 Member States; and EA (Euro Area) for the 13 Member States who have adopted the single currency[9]) and two worldwide CC indices formed from the first principal component of the American[10] and European (EU and EA) Consumer Confidence Indicators (WEU and WEA). We construct the worldwide sentiment proxy based only on these series because of the prominence of these economies on the global stage, and because they are the longest time series available[11]. The global sentiment indices are orthogonalized

[7] The CC data used herein were accessed through the European Commission website at http://ec.europa.eu/economy_finance/db_indicators/surveys/index_en.htm

[8]The correlation coefficients between the indices orthogonalized and non-orthogonalized to macroeconomic variables are: 0.856 for Hungary, 0.772 for Poland, and 0.990 the Czech Republic, with a p-value of 0.00 in all three cases.

[9] The European Commission states that "calculating EU and euro-area aggregates: one of the main tasks of the Commission services (DG ECFIN) is the production of aggregate surveys for the EU and the euro area on the basis of the aggregate results received from the Member States. EU and euro-area aggregate replies to the questionnaires are calculated as weighted averages of the country-aggregate replies. The weights are the shares of each of the Member States in an EU (euro-area) reference series, and are smoothed by calculating a two year-moving average. The weights are usually updated every year in August. The reference series are extracted from AMECO and for the most recent period, where yearly reference series are not available, the Commission forecast is used."

[10] The measure is the University of Michigan Consumer Confidence Index, as an equivalent of the European Commission Consumer Confidence Index available at: http://research.stlouisfed.org/fred2/series/UMCSENT/downloaddata?cid=98

[11] More specifically, the worldwide indexes were constructed by the procedure used in Baker et al. (2012) and Chan et al (2012), which is to use principal component analysis to construct a worldwide indicator combining European and US sentiment data. The index thus calculated uses the first principal component of US and Europe sentiment as a measure of investor sentiment worldwide and this index captures the commonality between investor sentiment in European stock markets and that in the US market. Given that, as already stated, two different European sentiment indices are used, their combination with the US sentiment index results in two worldwide sentiment indices. The index scores for these Worldwide Sentiment indicators are as follows: Worldwide EU (WEU) = 0.524*US Consumer Confidence + 0.524*EU Consumer Confidence and Worldwide EA (WEA) = 0.533*US Consumer Confidence + 0.533*EA Consumer Confidence. This first factor explains 91.19% of the variance in the first equation and 87.87% in the second equation.

not only to their respective macroeconomic variables but also to the local macroeconomic variables in the three emerging countries[12]. Lastly, the indices were standardized to facilitate comparison of the results.

A summary of the descriptive statistics of the various indices used as sentiment proxies is given in Table 2 Panel A. The coefficients of correlation between the country-specific and the European, and worldwide indices, all orthogonal with the respective macroeconomic variables are shown in Table 2 Panel B. As can be seen, while there is positive and significant correlation (0.64) between Poland and the Czech Republic, and no significant correlation between either of these and Hungary, whose correlation with the worldwide WEU and WEA indices is also much lower than that of Poland or the Czech Republic. Lastly, we should note the very high positive significant correlation that exists between the European (EU and EA) and worldwide indices (WEU and WEA).

## 3. THE EFFECT OF SENTIMENT ON STOCK RETURNS

### 3.1. PREDICTING MARKET RETURNS

Our first aim is to examine the effect of investor sentiment on stock returns in the three selected markets and test whether it is stronger than in the three most capitalized European markets.

We begin by running the following regression using the local sentiment indices:

$$R_t^{i,M} = \alpha_i + \beta_i SENTC_{t-1}{}^{\perp} + \varphi_i SMB_t + \lambda_i HML_t + u_t^i \quad (1)$$

where $R_t^{i,M}$ is the return of the market (selective index) portfolio of the i[th] country in month t. $SENTC_{t-1}{}^{\perp}$ is the local sentiment index of each country, based on its value at the beginning-of-year orthogonalized to macroeconomic variables. The model estimation also includes as explanatory variables the SMB and HML risk factors described by Fama and French (1993)[13], since the results could be influenced by significant exposure of the portfolios to the classic risk factors. The estimation procedure is the ordinary least squares regression of the pool equation with cross-section fixed effects and year dummies. The estimator is designed to accommodate arbitrary heteroscedasticity and within cross-section serial correlation (cross-section clustered). This estimation imposes the condition that the coefficients are equal across all countries ($\theta_k^i = \theta_k \forall i, \theta$).

We expect to find a negative relationship between sentiment and future returns, indicating that, when sentiment is high/low, future returns will revert and therefore be

[12] We are grateful to referee for this suggestion.

[13] For details of the construction of these factors, see Fama-French (1993). For obvious reasons, the market factor (RMRF) is omitted from this regression.

lower/higher. The initial results of this estimation using local sentiment indices, summarized in Table 3, do not confirm expectations because this sentiment measure has no predictive capacity for selective index returns. This does not imply that investor sentiment has no predictive power, however. The result could be due to the failure of local indices to capture the full effect of investor sentiment, which tends to be of a more global nature.

Indeed, due to the globalized environment in which investors and analysts operate, recent literature on investor sentiment has given increasing importance to the use of global measures. In the specific case that concerns us, moreover, the focus is on emerging markets, which are more sensitive to, and dependent upon, variables relating to global settings. Thus there is a clear need to examine the possible effect of so-called global sentiment. Some studies using global sentiment indices include Baker et al. (2012), which uses investor sentiment indices for six major stock markets; and Chang et al. (2012) which uses the first principal component of U.S., UK, French, and German sentiment as a measure of global investor sentiment. In our paper, however, the choice of global sentiment index is less obvious because the countries we are dealing with have different areas of reference or influence.

We will consider two European indices of reference, EU and EA, and, two worldwide indices (WEU or WEA, according to the European index considered in each case) which merge European market information with that of the US. The purpose of this analysis is to determine whether there is a global (external) sentiment index affecting stock returns in the countries analyzed.

The model to be estimated is the same as the one shown in equation (1) except that, in each case, the sentiment proxy is a different one of the four global sentiment indices. The estimation based on the global sentiment proxies produces very different results from those obtained using the local indices (see Table III). As can be seen, the predictive power of investor sentiment for returns in these markets is significant and of the expected sign.

Table 3 also summarizes the results of the individual estimations of equation 1 for each of the three selected countries using OLS with Newey and West (1987) standard errors, to control for heteroscedasticity and serial correlation. As in the joint analysis, the global indices indicate a significant impact of investor sentiment on market returns in all three countries, whereas the local indices fail to do so.

This raises the interesting issue mentioned earlier, namely, the apparent greater vulnerability of these emerging markets (versus more developed ones) to the impact of investor sentiment. This issue is addressed by means of a comparative analysis with the

three most capitalized markets in Europe at the time of the study period: France, Germany and the United Kingdom.

The arguments to support the notion of a stronger investor sentiment effect in emerging markets include several different perspectives. For instance, there are limited opportunities for arbitrage, which is one of the channels through which sentiment can affect prices, particularly in securities that are subject to speculation. Meanwhile, average volatility, a proxy for difficulty of valuation and another channel for the investor sentiment effect, also tends to be higher in emerging markets. Specifically, World Bank data for the period 2000-2011 report average volatility for the three emerging markets in the analysis as being 25.48%, whereas the average for the other three (more developed) European markets is 22.07 %(approximately 15.47% lower). Further support is provided by the cultural status of the countries considered, which score higher in power distance, individualism, masculinity, and uncertainty avoidance, and are also more short-term oriented and more restrained than the three more developed markets with which we compare them. They also perform less well in governance indicators. Based on the results of Schmeling (2009), therefore, we can expect the emerging markets to exhibit a stronger sentiment effect.

Prior to the comparative analysis, we perform a joint estimation of the selective indices of all six markets (Hungary, Poland and the Czech Republic together with France, Germany and the United Kingdom) and estimate equation (1) to check whether the effect is significant. The results, both for the local and the global indices, indicate the same as in the analysis for the three emerging markets. Global sentiment has a significant negative impact, while local sentiment appears to have no significant impact at all.

Having found a significant sentiment effect in market returns, we try to determine whether it is stronger in the emerging markets than in the benchmark markets by estimating the following pool equation:

$$R_t^{i,M} = \alpha + \beta_1 . SENTC_{t-1}{}^{\perp} + \beta_2 . D_{CEE} . SENTC_{t-1}{}^{\perp} + \varphi . SMB_t + \lambda . HML_t + u_t^i \qquad (2)$$

where $D_{CEE}$ is a dummy variable that is unity for the 3 Central European countries considered (Hungary, Poland and the Czech Republic) and 0 for the rest. If expectations are fulfilled, that is, if the investor sentiment effect on market returns is stronger in the first 3 countries, $\beta_2$ should be significant and negative. The estimation procedure is an ordinary least squares pool regression with cross-section fixed effects and year dummies. As in equation (1), the estimator is designed to accommodate arbitrary heteroscedasticity and within cross-section serial correlation (cross-section clustered).

Table 3 displays the results for the various estimations using all the local and global sentiment indices considered. In line with the previous analysis, the results show that, when

global indices are used, coefficient $\beta_1$ is significant with a negative sign, indicating that investor sentiment has a significant negative impact on (and therefore capacity to predict) market returns. This contrasts with the results using the local indices, where the coefficient has no significance. The most interesting issue to be determined in this analysis, however, is the sign of coefficient $\beta_2$, which, in line with the arguments given above, is significant and negative with the global indices, but lacks significance with the local indices. This result allows us to conclude that investor sentiment in the CEE markets is stronger than that observed in the more developed European markets. The reasons behind this result are twofold and, in this case, complementary: they are due, firstly, to the degree of market development (and thereby the characteristics of the listed stocks); and secondly to legal-institutional or cultural variables. All these factors will be explored and weighed up in subsequent sections of the paper.

### 3.2. THE ROLE OF STOCK CHARACTERISTICS

Focusing on the countries selected for analysis, this section examines the role of stock characteristics, which previous literature has identified as a key factor in explaining the impact of investor sentiment on market returns. Narrowing the focus on these emerging markets, and following Baker and Wurgler (2006), we analyze the predictive power of sentiment for returns to long-short portfolios based on characteristics associated with stocks' susceptibility to sentiment (volatility, book-to-market, size, and dividend per share) for a given holding period. For easier interpretation of the results, we use self-financed portfolios of the aforementioned characteristics, in order to incorporate the highest possible exposure to sentiment, that is, high-low volatility, low-high BTM[14], small-big in size and low-high dividend yield.

The procedure used to avoid overlapping observations and potential self-correlation in the portfolio construction for different holding periods and stock characteristics was that proposed by Chang *et al.* (2012), which uses the calendar-time approach used by Jegadeesh and Titman (2001) for examination of the momentum effect. These authors base their approach on the analysis of a set of long-short strategies, using the following procedure. At a particular point in the sample period, the stocks for each country are ranked according to the corresponding $j^{th}$ characteristic and then grouped into portfolios based on the resulting ranking (in our case, 5 equally-weighted portfolios). The long-short strategy is created by

[14] Although the results are not shown in the tables, given that the stocks with greatest growth potential and highest default risk are in the extreme quintiles, we followed Baker and Wurgler (2006) by creating 3 BTM portfolios: high-to-low, high-to-medium for stocks with higher default risk and medium-to-low for stocks with high growth potential. The results reveal no significant impact of sentiment on the returns to any of these portfolios.

going long on the top sensitivity-to-sentiment quintile portfolio and going short on the bottom one[15]. These sensitivity-to-sentiment portfolios are held for a horizon of K months (from month t + 1 to t + k) following their formation (the holding period). A new formation period begins the following month. New portfolios are constructed and new long-short strategies are implemented. Since the strategies implemented in the previous period will be held for the K months following portfolio formation, the portfolios for a given calendar month are formed from returns to the K long-short strategies that remain open at that point in time. Finally, the return to the long-short portfolio in a given month t is derived from the average return to the K long-short portfolios open at that point in time. Through this procedure, it is possible to avoid problems arising from autocorrelation in long-short strategy returns. For all estimations made with this type of portfolios, therefore, we will use estimators robust to heteroscedasticity[16].

To assess the explanatory capacity of investor sentiment in the characteristic-based portfolios, we begin by estimating the following pool equation for each holding period k and for all three markets jointly (this time, equation 3 is estimated imposing the condition that the coefficients are equal across all countries, $\theta_k^{i,j} = \theta_k^j \forall i, \theta$) with cross-section fixed effects and year dummies. We use the White cross-section estimator, which is robust to cross-equation (contemporaneous) correlation and heteroscedasticity.

Moreover, to obtain individual country coefficients, we also estimate for each holding period k country regressions by using seemingly unrelated regression (SUR)):

$$R^{i,j}_{high,t+k} - R^{i,j}_{low,t+k} = \alpha^{i,j}_k + \beta^{i,j}_k SENTC_t^{\perp} + \delta^{i,j}_k RMRF_t + \varphi^{i,j}_k SMB_t + \lambda^{i,j}_k HML_t + u^{i,j}_{k,t} \quad (3)$$

where $R^{i,j}_{high,t+k} - R^{i,j}_{low,t+k}$ is the return to the self-financed portfolio of the i$^{th}$ country based on the j$^{th}$ characteristic for a holding period of k=3, 6, 12 or 24 months. $SENTC_t^{\perp}$ is the orthogonalized sentiment index. The analysis uses both the local and the global index, and the explanatory variables for the model estimation are the RMRF, SMB and HML risk factors described by Fama and French (1993)[17], since the results could be influenced by significant exposure of the portfolios to the classic risk factors.

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[15] The differential portfolio is the return spread between the stocks in the top quintile (or 20%) based on sensitivity to sentiment (the smallest, most volatile stocks, with the lowest dividend payment and BTM ratios) and those in the bottom quintile. Baker and Wurgler (2006) and Chang *et al.* (2012) use the top and bottom 30%, while Baker *et al.* (2012) use the top and bottom 10%. By using a lower percentage we are able to focus on the most extreme and differentiated stocks, where we can expect the sentiment effect to be stronger. The analysis using the top and bottom 30% revealed less sentiment effect than the one using the extreme quintile portfolios, as per expectations.

[16] Value-weighted portfolios were also formed, following the suggestion of an anonymous referee to whom we are grateful. Given that size is a key characteristic in sentiment-prone stocks, investor sentiment will predictably have less impact on the value-weighted portfolios, as reflected in the results. In any event, the main conclusions hold. The results for the volatility characteristic are available upon request.

[17] For details of the construction of these factors, see Fama-French (1993). In the estimation of the stock characteristic portfolios, the respective associated risk factor is omitted in each case.

Table 4 displays the results in four panels, one for each of the stock characteristics used to form the portfolios (Panel A: volatility; Panel B: BTM; Panel C: size; and Panel C: dividend). Estimations both with local and global indices are included. For the sake of clarity, only the EU and WEU index results are shown[18].

Analysis by stock characteristic shows that the main impact of the sentiment effect is found in the volatility portfolio returns. When the local sentiment proxy is used, it is found to have a modest impact on the results of the pool equation, since it is concentrated entirely in short holding periods (3 months). This is nuanced by the individual country results, however, because the analysis of the differential volatility portfolio reveals a significant impact on returns in Poland (for the 3- and 6-month holding periods) and in the Czech Republic (for all the holding periods analyzed). Stronger results emerge when the return performance is examined using global indices. The EU and the WEU sentiment indices show significance for Poland and the Czech Republic for all of the holding periods considered, but not for Hungary, which appears unaffected by the sentiment indices. The exception of Hungary in this respect appears consistent with the low correlation of its sentiment index orthogonalized with respect to the orthogonal worldwide sentiment indices. Although not shown in the table, the results for the remaining global indices are similar overall to those shown here. As far as the rest of the stock characteristics are concerned, although significant effects emerged in some size and btm portfolios, they are much less pronounced than in the volatility portfolio.

Overall, the above results show that local investor sentiment has an impact, albeit modest, on future returns to stocks posing valuation difficulties and arbitrage limits, particularly when volatility is the proxy for stock sensitivity to sentiment. This is a contrast with the tenor of the results obtained in the analysis of returns to the selective indices of the three markets analyzed. It could be due to the fact that it is easier to observe the sentiment effect in the extreme characteristic portfolios; that is, through the return differential. The results for global sentiment, meanwhile, clearly support the presence of a sentiment effect in the volatility portfolio. In high/low sentiment periods, the future returns to high volatility stocks will decrease/increase due to over-/under-pricing and subsequent reversion to fundamentals in the countries analyzed. In fact, volatility has been widely used for its relative advantage over other proxies for hard-to-value assets when it comes to exploring sentiment effects on future stock returns (see Baker and Wurgler, 2006, Joseph et al, 2011 and Corredor et al., 2013a), analysts' forecast errors (Hribar and McInnis, 2012) and analysts' recommendations (see Corredor et al., 2013b).

[18] Given the similarity of the results obtained for the EU and EA sentiment indices, and the WEU and WEA indices, respectively, the following analyses will use the EU and WEU indices, which cover more countries including those selected for the present study.

The lack of the observed effect in Hungary is in line with the findings of Röckinger and Urga (2001) an analysis of the influence of German stock market returns in these three markets, which finds that German market returns affect the Czech and Polish markets but not the Hungarian market. It is also in line with the fact that the Hungarian market lists a scant number of foreign stocks with almost negligible relative trading volume.

These results, point us towards another apparently important source of information on these countries, which is unrelated to the specific characteristics (volatility, book-to-market, size, and dividend per share).

In summary, the results of these analyses have shown that stock characteristics do play a role, but also that some differences between countries remain to be explained. These issues, which include the aforementioned case of Hungary, will be discussed in more detail in the final section of the paper. In any event, the results of the country-by-country analysis point to the possible role of market-specific cultural or institutional factors in generating cross country differences in the impact of sentiment on asset prices[19].

### 3.3. INVESTOR SENTIMENT: IS THERE A ROOM FOR A LOCAL EFFECT?

Following Baker *et al.,* 2012; and Chang *et al.,* 2012, in an attempt to unite the results obtained using the local index in each market with those provided by the global indices, our next objective is to determine whether the local effect in each market holds or fades when the global effect is also considered. Given the results described above, it appears reasonable to suppose that the local sentiment effect may be, at least in part, the result of a global phenomenon, and that the information captured by the local indices may already be included in the global index. Given this context, this section aims to analyze the potential impact of the global sentiment effect together with a more specific or local sentiment effect on the future stock returns of each market of interest. For each holding period k, we estimate the following pool regression of long-short portfolios (with fixed cross-section effects and year dummy variables) and also the individual estimation per country using SUR. The pool equation imposes the condition that the coefficients are equal across all countries, $\theta_k^i = \theta_k \forall i, \theta$:

$$R^i_{high,t+k} - R^i_{low,t+k} = \alpha^i_k + \beta^i_k GLOBAL^{\perp}_t + \mu^i_k RESSENTC^{\perp}_t + \delta^i_k RMRF_t + \varphi^i_k SMB_t + \lambda^i_k HML_t + u^i_{k,t} \quad (4)$$

where $R^i_{high,t+k} - R^i_{low,t+k}$ is the return to the self-financed volatility-based portfolio of the i[th] country for a holding period of k=3, 6, 12 or 24 months, $GLOBAL^{\perp}_t$ is the orthogonalized

[19] As Corredor et al (2013a) shows, these results could also be due to country-specific differences in stock characteristics potentially causing different levels of exposure to investor sentiment, irrespective of other variables, such as cultural or institutional factors.

global sentiment index (in our case we use EU index and WEU although we have also estimated the model using the other global sentiment indices used in section 3.1), and $RESSENTC_t^{\perp}$ is the index of local sentiment independent of global sentiment. Since it is reasonable to suppose that a good deal of the information captured by these indices will be common to both indices, we leave the respective country-specific information in each case in the local component residual. RMRF, SMB and HML are the Fama-French (1993) risk factors for each market.

Table 5 shows the impact of the global and local indices. Since the volatility portfolio exhibits much clearer local and global sentiment effects than the rest, we will continue, by reporting only the volatility portfolio returns[20]. From the results of the pool equation, it can be seen that the global sentiment index remains significant, as in the previous estimations, while the residual of the local index shows no significant impact. The country-by-country analysis reveals a significant negative impact of the global sentiment index for Poland and the Czech Republic. This general effect does not hold for Hungary, however, (not surprisingly, in light of the results based exclusively on the global index). In overall terms, the results of the global indices are in line with those obtained previously. However, the explanatory capacity of local sentiment has decreased across all countries and holding periods. In the case of Czech Republic the specific local sentiment component continues to show significance for 24-month holding period, in the case of the EU index, and for 6-month, 12 month and 24-month holding periods, in the of WEU index.

In any event, these results highlight the role of global sentiment in stock returns in these countries, most notably in the Czech Republic and Poland, and show consistency with the arguments of Chang *et al* (2012) that local sentiment effect is just an empirical manifestation of the global effect.

Our findings also suggest, however, the presence of a (weaker) local sentiment effect that could be due either to institutional or cultural factors pertaining to the individual domestic markets, a possibility that will be discussed in section 4. Arguments centering on the presence of country-specific factors appear in Schmeling (2009), who claims that sentiment returns vary significantly with the institutional quality or cultural factors specific to each market. Chang *et al.* (2012) also emphasize the role played by country-specific factors, particularly legal, information and trading environments.

In summary, it should be noted that our results are in line with those of Baker *et al.* (2012), since both global and local sentiment can be said to have some influence on the

[20] The remaining portfolio results, which show no significant sentiment effect overall, are available from the authors upon request.

returns to sentiment-sensitive stocks as proxied by high volatility, except, as mentioned, in the case of Hungary. It is worth noting, however, that the role of local sentiment in these emerging markets has been shown to be much less important than observed by these authors in more developed markets.

### 3.4. MECHANISM FOR THE SPREAD OF SENTIMENT ACROSS MARKETS.

Another aspect worth examination is the mechanism by which investor sentiment spreads across markets. Chang et al (2012) argue that the physical spread of investor sentiment is from flows of capital due to direct trading by foreign investors influenced by the level of sentiment in their own markets, which then becomes reflected in the stock prices of the other country. The mechanism for the spread of sentiment due to psychological factors is based on imitation or transfer of optimism from the benchmark markets and is therefore not directly related to cross-country capital flows.

Without claiming to settle this complex issue, we follow the way the problem is set out in Baker *et al.* (2012), by taking the regression in equation (4) and adding two variables: one to measure flows of foreign capital to the three domestic markets, and a second to measure the interaction of foreign capital flows with investor sentiment. If significant positive interaction were to be found, we would be reasonably justified in stating that sentiment spreads via investment activity through international capital flows. This can be written as follows:

$$R^{i}_{high,t+k} - R^{i}_{low,t+k} = \alpha^{i}_{k} + \beta^{i}_{k} GLOBAL^{\perp}{}_{t} + \mu^{i}_{k} RESSENTC^{\perp}_{t} + \varphi^{i}_{k} \ |FC_t| + \eta^{i}_{k} |FC_t| * GLOBAL^{\perp}{}_{t} + \\ + \delta^{i}_{k} RMRF_t + \varphi^{i}_{k} SMB_t + \lambda^{i}_{k} HML_t + u^{i}_{k,t} \quad (5)$$

where $R^{i}_{high,t+k} - R^{i}_{low,t+k}$ is the return to the long-short portfolio based on volatility of the i[th] country, for a holding period of k= 3, 6, 12 or 24 months, $GLOBAL^{\perp}{}_{t}$ is the orthogonalized global sentiment index, defined earlier, $RESSENTC^{\perp}_{t}$ is the index of local sentiment independent of global sentiment, and FC the flow of capital invested in each market by investors from the area associated with the sentiment index used in each case[21]. RMRF, SMB

[21] This is calculated by finding the standardized absolute value of the cash flows after normalization by market value. The Coordinated Portfolio Investment Survey (CPIS) is an annual voluntary portfolio investment data collection exercise conducted under the auspices of the IMF. To participate, an economy must provide data on its year-end holdings of securities (data are separately requested for equity, long-term debt instruments, and short-term debt instruments). We include the sum total which worked better than using equity alone. All economies are encouraged to participate. The purpose of the CPIS is to improve statistics of holdings of portfolio investment assets in the form of equity, long-term debt, and short-term debt. The national survey must cover equity securities, debt securities with an original maturity of over one year (long-term), and debt securities with an original maturity of one year or less (short-term) issued by nonresidents and owned by residents of the compiling economy. To be specific, what we care about is the round-trip flow of capital, both from the European Union/Euro

and HML are the Fama-French (1993) risk factors for each market. As before, for each holding period k, we estimate a pool equation (with cross-section fixed effects and year dummy variables) and an individual estimation by country using SUR.

The results of the pool equation are given in Table 6, where the levels of significance of both the local and global sentiment effects ($RESSENTC^{\perp}$ and $GLOBAL^{\perp}$, respectively) are seen to be in line with those observed in the previous one. The international capital flow coefficient is not significant and nor is that of the interaction of foreign capital flows with investor sentiment. The results of the by-country analysis using SUR also indicate no explanatory power for capital flows or the interaction between these and sentiment in the three markets considered.

Thus, cross-market capital flows do not significantly explain how sentiment spreads from one market to another, suggesting that the capital-flow-based argument is not totally accurate, and that some credit can be given to explanations based on investor behavior factors.

Linking the above results with those for movements of capital flows and their impact on sentiment, we are inclined to believe that the explanation for the stronger effect of global sentiment lies in the nature of the sentiment spread mechanism, which is behavioral and non-related to capital flows. The role played by word of mouth or the media is stronger in the spread of global (versus local) sentiment between neighboring-countries.

## 4. DISCUSSION: COUNTRY FACTORS VERSUS STOCK CHARACTERISTICS

The results presented in the above section provide evidence of the role played by stock characteristics in the impact of investor sentiment on market returns, particularly in the case of stocks with greater sentiment sensitivity, as proxied by volatility. Clearly, however, despite the apparent similarity of the countries selected for analysis (they are all emerging markets undergoing the intense pressure of European integration) the findings are not the same for them all. This combination of results prompts further examination of stock characteristics and individual country factors as potential determining variables in the impact of investor sentiment. We address this issue with two complementary analyses. The aim of the first is to see whether the determining factor is stock characteristics by comparing the impact of sentiment in two separate samples: one using portfolios formed from the most extreme possible quintiles of a given characteristic by pooling the stocks of all the countries

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Area to another country in our sample (Poland/Czech Republic/Hungary) and back to the European Union/Euro Area. Countries with high absolute flows, we hypothesize, will be subject to sentiment propagation. The data on capital flows come from the Coordinated Portfolio Investment Survey-International Monetary Fund and are normalized by the market value of the foreign stock market.

(full unrestricted sample) and another sample designed to control for the potential country effect (country-neutral sample). If the key variable is country factors affecting stock characteristics, we can expect to find that sentiment has a notably smaller, and potentially non-significant, impact in the country-neutral samples than in full unrestricted sample. The second analysis examines the role of cultural factors (based on Hofstede's cultural dimensions), or institutional factors (The Worldwide Governance Indicators) in explaining the observed differences between the countries considered.

### 4.1 The role of stock characteristics

The first step in the analysis is to create portfolios for the full unrestricted sample and the country-neutral portfolios. For the first portfolio, we pool the stocks of all three markets (full unrestricted sample) and follow the procedure described in section 3.2. The purpose of this is to assess the role played by stock characteristics in the sentiment effect. If they play a key role, the sentiment effect in this long-short portfolio formed from the full unrestricted sample should be very similar to that observed for the country-neutral portfolios. In line with Corredor et al (2013a), we use two different strategies to compute the long-short country-neutral portfolios. In the first, we construct the top quintile (bottom quintile) by randomly selecting the same number of securities as in the top quintile (bottom quintile) of each country, thus giving them all equal weight. In the other, we construct the top quintile (bottom quintile) from a number of stocks randomly selected from the top (bottom) quintile of each domestic market and proportional to its share in the overall sample of stocks (three markets). Going long on each of the new top quintiles and short on the respective bottom quintiles, we compute the country-neutral long-short portfolios. The use of two different construction procedures for the country-neutral portfolios is purely for the sake of robustness.

We address these issues by estimating the following equation using SUR:

$$R^{p}_{high,t+k} - R^{p}_{low,t+k} = \alpha^{p}_{k} + \beta^{p}_{k} SENTC_{t}^{\perp} + \delta^{p}_{k} RMRF_{t} + \varphi^{p}_{k} SMB_{t} + \lambda^{p}_{k} HML_{t} + u^{p}_{k,t} \quad (6)$$

where $R^{p}_{high,t+k} - R^{p}_{low,t+k}$ is the return to the long-short portfolio p (where p is the full unrestricted sample portfolio, the country-neutral portfolio formed with the same number of stocks from each country, and the country-neutral portfolio in which the number of stocks from each country is proportional to its share in the full sample of listed stocks for all 3 countries). $SENTC_t^{\perp}$ is the orthogonalized global sentiment index. The other explanatory variables for the model estimation are the RMRF, SMB and HML risk factors.

The results for the first analysis (long-short strategy computed using the full unrestricted sample) are given in table 7. The results show that sentiment has a significant negative impact in all the periods analyzed. The results of the country-neutral strategies are also given in Table 7. There is virtually no difference between the results of the long-short strategy computed using the full unrestricted sample and those of the country-neutral strategies. In fact, the Wald test of the coefficient on investor sentiment in long-short strategies indicates no significant difference between the first strategy and either of the two country-neutral strategies (the p-values from the Wald test for $\beta_k^1 = \beta_k^2$ range from 0.5787 for K=6 to 0.8389 for K=12 and the p-values from the Wald test for $\beta_k^1 = \beta_k^3$ range from 0.6444 for K=12 to 0.9728 for K=6). These findings enable us to confirm that stock characteristics play an important role in explaining the impact of investor sentiment on stock returns, which continues to hold after controlling for the country effect.

The observed differences between markets, particularly that between Hungary and the other two countries of interest (Czech Republic and Poland), suggest that cultural or institutional factors can play a key role in determining the impact of investor sentiment on stock returns. Nevertheless, the differences may also be due entirely to variation in the stock characteristics of these markets. We explore this possibility by calculating the means and coefficients of variation for volatility in each country to check whether the level of volatility and its coefficient of variation are lower in Hungary than in Poland and the Czech Republic, which, if it were the case, could explain why its stocks might be less prone to investor sentiment. According to World Bank data, however, the mean level of volatility for Hungary during our sample period is between those of the other two countries (Czech Republic=23.54%, Hungary=26.32 and Poland=26.58%). Thus, we are also unable to assert that there is less relative dispersion between the extreme portfolios used in the long-short strategy based on volatility. This result tells us that, although stock characteristics play an important role in explaining the impact of investor sentiment on stock returns, the observed differences in the findings between countries are not due to differences in their stock characteristic profiles, and could be attributable to some other effect.

These results coincide with those of Corredor et al (2013a) in showing that the effect of sentiment on stock prices is influenced not only by the characteristics of the stocks themselves but also by the cultural and institutional factors of the markets in which they are traded. This country effect appears even more salient in the case that concerns us.

### 4.2 Cultural dimensions and institutional factors

Given that the above results reveal a country effect, possibly linked to cultural or institutional factors, we now assess the impact of the former based on Hofstede's cultural measures and the latter based on the Worldwide Governance Indicators.

We begin by estimating a pool equation for the differential portfolios of the three countries of interest including Hofstede's cultural dimensions, which is written as follows:

$$R^{i}_{high,t+k} - R^{i}_{low,t+k} = \alpha_k + \beta^1_k SENTC_t^{\perp} + \beta^2_k SENTC_t^{\perp}.DH_l + \delta_k RMRF_t + \varphi_k SMB_t + \lambda_k HML_t + u_{k,t} \quad (7)$$

where $R^{i}_{high,t+k} - R^{i}_{low,t+k}$ is the return of the self-financed portfolio of the i$^{th}$ country based on volatility for a holding period of k=3, 6, 12 or 24 months. $SENTC_t^{\perp}$ is the orthogonalized global sentiment index (the tables show the results with the EU index, which are consistent with those obtained with the other global indices used in this paper). We also include the interaction between investor sentiment and $H_l$, which is the measure of cultural dimension "l" according to Hofstede (2010). The dimensions are Power Distance Index (PDI), Individualism versus Collectivism (IDV), Masculinity versus Femininity (MAS), Uncertainty Avoidance Index (UAI), Long Term Orientation versus Short Term Normative Orientation (LTO) and Indulgence versus Restraint (IND). The other explanatory variables for the model estimation are the RMRF, SMB and HML risk factors. As in the previous cases, for each holding period k, we estimate the pool equation with cross-section fixed effects and year dummies. We use the White cross-section method to obtain estimators robust to cross-equation (contemporaneous) correlation and heteroscedasticity.

Table 8 shows the coefficients on investor sentiment ($\beta^1_k$) and the interaction between this and the selected cultural variables ($\beta^2_k$) for the various time horizons considered. The picture which emerges from all the estimations is quite clear: while investor sentiment remains significant and negative, the cultural variables show no significant effects at all.

Given the lack of observable effects due to differences between the three countries based in terms of Hofstede's (2001) dimensions, we need to turn our attention to their institutional characteristics, which we explore using 6 aggregate indicators based on the Worldwide Governance Indicators: Voice and Accountability, Political Stability and Absence of Violence/Terrorism, Government Effectiveness, Regulatory Quality, Rule of Law and Control of Corruption.

Once more, we estimate the pool equation (7), using the countries' scores on the aggregate indicator ($WGI_l$) instead of the Hofstede's cultural dimensions ($H_l$) as the interaction variable.

The results, shown in Table 8, reveal that none of the indicators affects the impact of investor sentiment on the long-short strategies, which suggests that institutional factors, at least individually, also play no key role in explaining the impact of investor sentiment in these countries and are therefore not the underlying cause of the observed differences between the findings for Hungary, and those for the Czech Republic and Poland.

It must not be overlooked, however, that our analysis considers only 3 countries, which makes it difficult to separate "country-only" effects from whatever cultural or institutional effect is under scrutiny. These results do, however, suggest the value of investigating these variables further to gain a better understanding of the impact of investor sentiment on asset prices.

Finally, another institutional factor that we find might differentiate the three markets of interest is stock market openness, measured as the volume of foreign stock trading on the domestic market over the period of analysis. As already noted, the share of foreign stock trading in Hungary is practically negligible. Since our analysis is based on only three markets, we cannot test this hypothesis in isolation from other possible explanations, but this looks like an interesting issue for future research. At this point, it might be worth noting that the observed differences in the behavior of Hungary with respect to the Czech Republic and Poland are not exclusive to this paper. In fact, its peculiarities had already been pointed out in previous studies, such as Röckinger and Urga (2001).

To these issues, one has to add the distinct macroeconomic environment surrounding these three countries during the period of analysis, particularly since the financial crash of 2008, which might explain the observed difference in the sentiment effect for Hungary. Indeed, the financial crisis of 2008 led Hungary into severe recession, and despite an agreement in October 2008 with the IMF and EU for a rescue package of US$25 billion, the economy showed no signs of recovery until 2011, that is, the end of the sample period for this study. The Czech Republic, on the other hand, was not greatly affected by this crisis, probably due to its stable banking sector, although it did suffer somewhat from the European crisis which came later, mainly due to a fall in demand from Germany. Meanwhile, due to major reforms undertaken in the 90s, Poland experienced major economic growth during the period of this analysis, registering positive growth in GDP even in 2009, when the rest of Europe was in economic decline.

## 5. CONCLUSIONS

Policy makers and researchers are interested in understanding stock return performance and how this may interact with return prediction variables. In emerging markets, the range

of explanatory variables is wider due to their greater dependence on foreign capital flows and the effects of these on their domestic markets.

This paper studies the effect of investor sentiment on stock returns in three Central European markets: the Czech Republic, Hungary and Poland. The results show that, in overall terms, sentiment is a key variable in the prices of stocks traded on these markets, especially highly sentiment-sensitive stocks. In fact, the power of this variable to predict stock returns is significantly greater than that observed in the 3 most developed markets in Europe selected in this study as a benchmark. We have shown that the impact on stock prices is significantly linked to characteristics that proxy for difficulty of valuation and arbitrage (particularly volatility), but that it is also clearly associated with a country effect. The observed impact is clear in Poland and the Czech Republic but less so in the case of Hungary, despite the fact that it differs little from the other two countries in terms of dispersion in stock characteristics, or cultural, institutional and legal dimensions.

A complementary analysis has enabled us to confirm that sentiment has a two-sphere (global and local) impact. The much more notable global effect highlights the importance of international variables in emerging markets. This shows that most of the impact of sentiment on prices is due to a variable with components reaching beyond the domestic market environment and, thus, unrelated to its inner workings.

Finally, the paper has shown that the sentiment transmission mechanism is not driven, at least to any significant degree, by the movement of capital between markets. This strengthens the argument that the contagion occurs through a behavioral mechanism, by which investors copy the strategies they observe in other markets (herding tendencies, etc.). If this argument proves correct, there is little likelihood of local regulatory action being very effective in limiting the perverse impact of asset bubbles.

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**Table 1. CEE stock Markets. Number of companies with listed shares and stock characteristics by year.**
Sources: FESE (Federation of European Securities Exchanges), Global Financial Development Database and Thomson Reuters (Datastream). VOL (volatility) is measured as the standard deviation of its past twelve month returns, BTM is the book-to-market ratio, SIZ is the stock size measured as its market cap value, and DPS is the dividend per share ratio

| | | 2001 | 2002 | 2003 | 2004 | 2005 | 2006 | 2007 | 2008 | 2009 | 2010 | 2011 | Total | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | | | | | | | Nº OF COMPANIES WITH LISTED SHARED (DEC) | | | | | | |
| **CR** | **Domestic** | 47 | 44 | 37 | 53 | 35 | 26 | 24 | 19 | 16 | 16 | 15 | 64 | |
| | **Foreign** | 0 | 1 | 1 | 2 | 4 | 6 | 8 | 10 | 9 | 11 | 11 | 13 | |
| **HU** | **Domestic** | 55 | 47 | 50 | 45 | 44 | 41 | 39 | 40 | 42 | 48 | 52 | 79 | |
| | **Foreign** | 1 | 1 | 1 | 1 | 0 | 0 | 2 | 3 | 4 | 4 | 2 | 5 | |
| **PO** | **Domestic** | 216 | 202 | 188 | 211 | 234 | 253 | 352 | 432 | 470 | 570 | 757 | 820 | |
| | **Foreign** | 0 | 0 | 1 | 5 | 7 | 12 | 23 | 26 | 16 | 15 | 20 | 34 | |
| | | | | | | | | **VOL** | | | | | | |
| | | **2001** | **2002** | **2003** | **2004** | **2005** | **2006** | **2007** | **2008** | **2009** | **2010** | **2011** | **Mean** | **St.Dev** |
| | | | | | | | | **VOL** | | | | | | |
| | **CR** | 24.20 | 22.97 | 19.95 | 15.97 | 16.94 | 18.50 | 19.00 | 25.11 | 45.20 | 31.74 | 20.49 | 23.55 | 21.14 |
| | **HU** | 25.93 | 23.00 | 21.83 | 18.57 | 19.50 | 24.10 | 22.63 | 24.25 | 43.27 | 36.21 | 26.08 | 26.32 | 18.00 |
| | **PO** | 31.25 | 28.63 | 23.93 | 22.16 | 17.47 | 20.97 | 24.49 | 27.07 | 38.39 | 31.78 | 20.65 | 26.59 | 23.82 |
| | | | | | | | | **BTM** | | | | | | |
| | **CR** | 6.93 | 6.16 | 2.50 | 2.02 | 1.60 | 1.42 | 1.12 | 1.25 | 1.38 | 1.25 | 1.19 | 2.44 | 8.17 |
| | **HU** | 1.52 | 1.54 | 1.70 | 1.83 | 1.65 | 1.03 | 0.78 | 0.92 | 1.12 | 1.36 | 2.42 | 1.44 | 2.09 |
| | **PO** | 1.33 | 1.59 | 1.63 | 0.86 | 0.81 | 0.63 | 0.50 | 1.29 | 1.49 | 0.88 | 1.08 | 1.10 | 3.05 |
| | | | | | | | | **SIZE** | | | | | | |
| | **CR** | 98.90 | 128.49 | 196.86 | 278.71 | 511.73 | 785.78 | 1307.99 | 1828.29 | 1416.24 | 2016.52 | 1964.90 | 957.67 | 2274.51 |
| | **HU** | 400.81 | 460.28 | 425.06 | 578.22 | 857.91 | 816.63 | 928.90 | 638.91 | 409.95 | 483.76 | 402.16 | 582.05 | 1598.01 |
| | **PO** | 15.50 | 12.60 | 14.47 | 99.62 | 152.18 | 208.11 | 254.32 | 177.87 | 122.73 | 237.81 | 224.84 | 138.19 | 869.51 |
| | | | | | | | | **DPS** | | | | | | |
| | **CR** | 1.17 | 1.68 | 2.09 | 3.32 | 4.79 | 5.45 | 4.19 | 3.80 | 2.91 | 3.80 | 9.26 | 3.86 | 7.13 |
| | **HU** | 0.50 | 0.49 | 0.46 | 0.49 | 0.50 | 0.49 | 0.69 | 0.70 | 0.62 | 0.57 | 0.46 | 0.54 | 1.62 |
| | **PO** | 0.02 | 0.01 | 0.02 | 0.02 | 0.02 | 0.03 | 0.04 | 0.05 | 0.04 | 0.05 | 0.05 | 0.03 | 0.17 |

**Table 2. Sentiment Indices**
**Panel A: Orthogonal Sentiment Indices. Descriptive Statistics.**

| | Mean | Standard Deviation | Min | Median | Max |
|---|---|---|---|---|---|
| **CC_HU** | -0.022 | 14.124 | -29.406 | 1.599 | 27.199 |
| **CC_PO** | 0.131 | 8.147 | -22.325 | -1.423 | 13.832 |
| **CC_CR** | -0.035 | 7.879 | -21.898 | 1.014 | 13.102 |
| **CC_EU** | -0.323 | 4.548 | -16.039 | 0.071 | 8.700 |
| **CC_WEU** | -0.038 | 0.697 | -1.903 | 0.029 | 1.675 |
| **CC_EA** | -0.354 | 4.887 | -16.912 | -0.497 | 9.211 |
| **CC_WEA** | -0.045 | 0.794 | -2.130 | 0.025 | 1.893 |

**Panel B: Orthogonal Sentiment Indices Correlation Matrix**

| | | HU | PO | CR | EU | WEU | EA | WEA |
|---|---|---|---|---|---|---|---|---|
| **HU** | **Coef.** | 1.00 | | | | | | |
| | **p-value** | | | | | | | |
| **PO** | **Coef.** | -0.14 | 1.00 | | | | | |
| | **p-value** | 0.13 | | | | | | |
| **CR** | **Coef.** | 0.10 | 0.62 | 1.00 | | | | |
| | **p-value** | 0.26 | 0.00 | | | | | |
| **EU** | **Coef.** | 0.31 | 0.35 | 0.45 | 1.00 | | | |
| | **p-value** | 0.00 | 0.00 | 0.00 | | | | |
| **WEU** | **Coef.** | 0.25 | 0.25 | 0.50 | 0.90 | 1.00 | | |
| | **p-value** | 0.00 | 0.01 | 0.00 | 0.00 | | | |
| **EA** | **Coef.** | 0.30 | 0.29 | 0.36 | 0.98 | 0.87 | 1.00 | |
| | **p-value** | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | | |
| **WEA** | **Coef.** | 0.26 | 0.21 | 0.45 | 0.90 | 0.99 | 0.91 | 1.00 |
| | **p-value** | 0.00 | 0.02 | 0.00 | 0.00 | 0.00 | 0.00 | |

**Table 3. Investor sentiment and index returns**

Regressions of index returns on investor sentiment. Different proxies of sentiment are used: local consumer confidence indices and global consumer confidence indices (European Union (EU), Euro Area (EA) and the worldwide consumer confidence index as given by the first factor of the US and EU indices (WEU) and the WEA which is the principal component of the US and EA indices). The analysis includes the Fama-French risk factors (SMB and HML). The estimation procedure for the regressions on all countries is the OLS regression of the pool equation with cross-section fixed effects and year dummies. All3 is the joint estimation of the selective indices of three markets (Hungary, Poland and the Czech Republic). All6 is the joint estimation of the selective indices of six markets (Hungary, Poland, the Czech Republic, France, Germany and the United Kingdom) The estimator accommodates arbitrary heteroskedasticity and within cross-section serial correlation (cross-section clustered). $D_{CEE}$ is a dummy variable which is equal to 1 for the CEE stock markets and 0 otherwise. To obtain individual country coefficients, we use OLS with Newey and West (1987) standard errors. The table reports the estimated coefficients and the corresponding p-values based on robust standard errors. R squared ranges between 0.12-0.60.

Model 1: $R_t^{i,M} = \alpha_i + \beta_i\, SENTC_{t-1}{}^{\perp} + \varphi_i\, SMB_t + \lambda_i\, HML_t + u_t^i$

Model 2: $R_t^{i,M} = \alpha + \beta_1 .SENTC_{t-1}{}^{\perp} + \beta_2 .D_{CEE} .SENTC_{t-1}{}^{\perp} + \varphi .SMB_t + \lambda .HML_t + u_t^i$

| | Local | | EU | | WEU | | EA | | WEA | |
|---|---|---|---|---|---|---|---|---|---|---|
| | Coef β | P-value | Coef β | P-value | Coef β | P-value | Coef β | P-value | Coef β | P-value |
| | | | | | Equation 1 | | | | | |
| **ALL3** | 0.011 | 0.87 | -4.033 | 0.00 | -3.347 | 0.00 | -4.132 | 0.00 | -3.588 | 0.00 |
| **CR** | -0.097 | 0.18 | -0.464 | 0.01 | -5.040 | 0.00 | -0.394 | 0.01 | -3.889 | 0.00 |
| **HU** | -0.015 | 0.84 | -0.556 | 0.01 | -6.137 | 0.01 | -0.474 | 0.02 | -4.757 | 0.01 |
| **PO** | -0.097 | 0.23 | -0.449 | 0.03 | -5.063 | 0.03 | -0.425 | 0.02 | -4.300 | 0.01 |
| **ALL6** | -0.017 | 0.72 | -3.334 | 0.00 | -2.644 | 0.00 | -3.541 | 0.00 | -2.936 | 0.00 |
| All6 | | | | | Equation 2 | | | | | |
| **Sent** | -0.048 | 0.29 | -2.794 | 0.00 | -2.402 | 0.00 | -3.033 | 0.00 | -2.077 | 0.00 |
| **Sent*Dummy** | 0.039 | 0.37 | -1.076 | 0.00 | -1.064 | 0.00 | -1.011 | 0.00 | -1.128 | 0.00 |

**Table 4. Investor sentiment and long-short portfolio returns.**
Regressions of returns to the long-short portfolios on investor sentiment. Long-short portfolios for volatility (VOL), book-to-market ratio (BTM), size (SIZ) and dividends (DPS) are constructed following the approach used by Jegadeesh and Titman (2001) for horizons of 3, 6, 12 and 24 months. Various sentiment proxies are used: local consumer confidence indices and global consumer confidence indices (European Union (EU) and the worldwide consumer confidence index as given by the first factor of the US and EU indices (WEU)). The analysis includes the Fama-French risk factors (market risk premium (RMRF) and (SMB and HML). The estimation procedure for the regressions on all countries is the OLS regression of the pool equation with cross-section fixed effects and year dummies. We use the White cross-section method to obtain estimators robust to cross-equation (contemporaneous) correlation and heteroskedasticity. Individual country coefficients are obtained by using seemingly unrelated regression (SUR). The table reports the estimated coefficients and the corresponding p-value based on robust standard errors. R squared ranges between0.06-0.56. Coefficients are multiplied by 100.
Model: $R^{i,j}_{hight+k} - R^{i,j}_{lowt+k} = \alpha^{i,j}_{k} + \beta^{i,j}_{k} SENTC_t^{\perp} + \delta^{i,j}_{k} RMRF_t + \varphi^{i,j}_{k} SMB_t + \lambda^{i,j}_{k} HML_t + u^{i,j}_{k,t}$

**Panel A Volatility Portfolio**

| | | ALL | | CR | | HU | | PO | |
|---|---|---|---|---|---|---|---|---|---|
| | | Coef β | P-value | Coef β | P-value | Coef β | P-value | Coef β | P-value |
| **Local** | 3M | -1.116 | 0.05 | -0.856 | 0.03 | -1.175 | 0.34 | -1.036 | 0.03 |
| | 6M | -0.943 | 0.11 | -1.012 | 0.00 | -1.189 | 0.33 | -0.827 | 0.10 |
| | 12M | -0.789 | 0.17 | -0.911 | 0.01 | -0.989 | 0.40 | -0.641 | 0.19 |
| | 24M | -0.796 | 0.14 | -1.156 | 0.00 | -0.649 | 0.57 | -0.575 | 0.21 |
| **EU** | 3M | -2.236 | 0.01 | -1.035 | 0.01 | -1.197 | 0.35 | -1.596 | 0.00 |
| | 6M | -2.106 | 0.01 | -1.122 | 0.00 | -0.998 | 0.43 | -1.547 | 0.00 |
| | 12M | -2.074 | 0.01 | -1.087 | 0.00 | -1.092 | 0.37 | -1.456 | 0.00 |
| | 24M | -1.496 | 0.02 | -1.099 | 0.00 | -0.539 | 0.65 | -1.329 | 0.01 |
| **WEU** | 3M | -1.487 | 0.07 | -0.469 | 0.24 | -0.669 | 0.61 | -1.311 | 0.01 |
| | 6M | -1.345 | 0.09 | -0.574 | 0.09 | -0.393 | 0.76 | -1.228 | 0.02 |
| | 12M | -1.346 | 0.08 | -0.608 | 0.09 | -0.444 | 0.72 | -1.341 | 0.01 |
| | 24M | -0.944 | 0.20 | -0.696 | 0.03 | -0.140 | 0.91 | -1.380 | 0.00 |

**Panel B BTM Portfolio**

| | | ALL | | CR | | HU | | PO | |
|---|---|---|---|---|---|---|---|---|---|
| | | Coef β | P-value | Coef β | P-value | Coef β | P-value | Coef β | P-value |
| **Local** | 3M | 0.742 | 0.17 | -1.569 | 0.01 | -0.055 | 0.98 | 2.743 | 0.03 |
| | 6M | 0.613 | 0.24 | -1.627 | 0.01 | 0.483 | 0.78 | 1.346 | 0.24 |
| | 12M | 0.390 | 0.43 | -1.669 | 0.00 | 0.325 | 0.85 | 0.440 | 0.71 |
| | 24M | -0.410 | 0.39 | 0.001 | 0.19 | -0.444 | 0.79 | 0.316 | 0.79 |
| **EU** | 3M | 0.488 | 0.41 | -0.702 | 0.20 | 1.292 | 0.39 | 0.620 | 0.45 |
| | 6M | 0.191 | 0.73 | -0.971 | 0.07 | 1.141 | 0.46 | 0.141 | 0.85 |
| | 12M | -0.010 | 0.99 | -1.125 | 0.03 | 0.653 | 0.66 | 0.066 | 0.93 |
| | 24M | 0.014 | 0.98 | 0.008 | 0.11 | -0.435 | 0.76 | -0.265 | 0.73 |
| **WEU** | 3M | 0.231 | 0.73 | -1.043 | 0.06 | 1.426 | 0.36 | 0.312 | 0.71 |
| | 6M | -0.053 | 0.94 | -1.198 | 0.03 | 1.485 | 0.35 | -0.401 | 0.59 |
| | 12M | -0.220 | 0.73 | -1.245 | 0.02 | 1.023 | 0.50 | -0.490 | 0.53 |
| | 24M | 0.268 | 0.67 | 0.007 | 0.17 | -0.735 | 0.62 | 0.365 | 0.64 |

**Panel C Size Portfolio**

| | | ALL | | CR | | HU | | PO | |
|---|---|---|---|---|---|---|---|---|---|
| | | Coef β | P-value | Coef β | P-value | Coef β | P-value | Coef β | P-value |
| **Local** | 3M | -0.473 | 0.39 | 0.356 | 0.59 | -0.835 | 0.71 | -1.449 | 0.23 |
| | 6M | -0.506 | 0.37 | 0.357 | 0.60 | -0.895 | 0.69 | -1.545 | 0.18 |
| | 12M | -0.538 | 0.34 | 0.463 | 0.49 | -0.789 | 0.72 | -1.473 | 0.22 |
| | 24M | -0.469 | 0.39 | 0.565 | 0.39 | -0.518 | 0.81 | -0.894 | 0.45 |
| **EU** | 3M | -1.386 | 0.02 | 0.534 | 0.34 | -3.091 | 0.12 | -1.158 | 0.12 |
| | 6M | -1.377 | 0.02 | 0.496 | 0.39 | -3.090 | 0.12 | -1.024 | 0.15 |
| | 12M | -1.238 | 0.03 | 0.348 | 0.55 | -2.592 | 0.18 | -0.915 | 0.21 |
| | 24M | -0.943 | 0.09 | 0.489 | 0.38 | -2.199 | 0.25 | -0.545 | 0.45 |
| **WEU** | 3M | -0.835 | 0.30 | 0.704 | 0.21 | -2.235 | 0.27 | -0.852 | 0.26 |
| | 6M | -0.912 | 0.25 | 0.597 | 0.30 | -2.363 | 0.25 | -0.771 | 0.30 |
| | 12M | -0.819 | 0.30 | 0.385 | 0.50 | -1.846 | 0.36 | -0.758 | 0.31 |
| | 24M | -0.582 | 0.45 | 0.502 | 0.37 | -1.566 | 0.43 | -0.423 | 0.57 |

**Panel D Dividend Portfolio**

| | | ALL | | CR | | HU | | PO | |
|---|---|---|---|---|---|---|---|---|---|
| | | Coef β | P-value | Coef β | P-value | Coef β | P-value | Coef β | P-value |
| **Local** | 3M | -0.546 | 0.19 | 0.018 | 0.98 | -0.889 | 0.57 | -0.869 | 0.39 |
| | 6M | -0.514 | 0.21 | 0.036 | 0.96 | -0.870 | 0.57 | -0.883 | 0.37 |
| | 12M | -0.567 | 0.17 | 0.128 | 0.87 | -0.987 | 0.52 | -1.093 | 0.27 |
| | 24M | -0.597 | 0.15 | 0.111 | 0.89 | -0.802 | 0.60 | -0.936 | 0.36 |
| **EU** | 3M | 0.280 | 0.56 | 0.082 | 0.85 | 0.061 | 0.95 | 0.695 | 0.11 |
| | 6M | 0.228 | 0.64 | 0.123 | 0.78 | 0.094 | 0.92 | 0.671 | 0.11 |
| | 12M | 0.070 | 0.89 | 0.149 | 0.73 | -0.009 | 0.99 | 0.526 | 0.22 |
| | 24M | 0.011 | 0.98 | 0.046 | 0.91 | 0.049 | 0.96 | 0.460 | 0.28 |
| **WEU** | 3M | 0.476 | 0.44 | 0.234 | 0.58 | 0.153 | 0.87 | 0.564 | 0.19 |
| | 6M | 0.409 | 0.50 | 0.252 | 0.55 | 0.191 | 0.84 | 0.566 | 0.18 |
| | 12M | 0.194 | 0.75 | 0.271 | 0.52 | 0.038 | 0.97 | 0.394 | 0.36 |
| | 24M | 0.034 | 0.96 | 0.176 | 0.67 | -0.120 | 0.99 | 0.257 | 0.54 |

**Table 5. Global and Orthogonal Local Sentiment and long-short portfolio returns.**
Regressions of the long-short volatility portfolio returns on investor sentiment. The long-short volatility portfolio is constructed following the approach used by Jegadeesh and Titman (2001) for horizons of 3, 6, 12 and 24 months. Global EU (WEU) is the first principal component of the US and EU (WEU) indices. Orthogonal local sentiment (RESSENT$^{\perp}$) is the local sentiment index (PO/CR/HU, respectively) orthogonal with respect to the Global$^{\perp}$ index and macroeconomic variables. The analysis includes the Fama-French risk factors (market risk premium (RMRF) and (SMB and HML). The estimation procedure for the regressions on all countries is the OLS regression of the pool equation with cross-section fixed effects and year dummies. We use the White cross-section method to obtain estimators robust to cross-equation (contemporaneous) correlation and heteroskedasticity. Individual country coefficients are obtained by using seemingly unrelated regression (SUR). The table reports the estimated coefficients and the corresponding p-values based on robust standard errors. R squared ranges between 0.08-0.42. Coefficients are multiplied by 100.
Model: $R^{i,j}_{high,t+k} - R^{i,j}_{low,t+k} = \alpha^{i,j}_{k} + \beta^{i,j}_{k} GLOBAL^{\perp}{}_{t} + \mu^{i,j}_{k} RESSENTC^{\perp}_{t} + \delta^{i,j}_{k} RMRF_{t} + \varphi^{i,j}_{k} SMB_{t} + \lambda^{i,j}_{k} HML_{t} + u^{j}_{k,t}$

| | | | ALL | | CR | | HU | | PO | |
|---|---|---|---|---|---|---|---|---|---|---|
| | | | Coef β | P-value | Coef β | P-value | Coef β | P-value | Coef β | P-value |
| **EU** | 3M | Global | -2.337 | 0.01 | -1.045 | 0.01 | -1.170 | 0.36 | -1.551 | 0.00 |
| | | Local | -0.077 | 0.18 | -0.042 | 0.45 | -0.068 | 0.46 | -0.066 | 0.30 |
| | 6M | Global | -2.188 | 0.01 | -1.137 | 0.00 | -0.979 | 0.44 | -1.537 | 0.00 |
| | | Local | -0.062 | 0.29 | -0.058 | 0.22 | -0.067 | 0.46 | -0.039 | 0.55 |
| | 12M | Global | -2.131 | 0.00 | -1.099 | 0.00 | -1.084 | 0.38 | -1.433 | 0.01 |
| | | Local | -0.044 | 0.45 | -0.052 | 0.31 | -0.045 | 0.61 | -0.019 | 0.77 |
| | 24M | Global | -1.560 | 0.01 | -1.118 | 0.00 | -0.528 | 0.65 | -1.320 | 0.01 |
| | | Local | -0.048 | 0.37 | -0.087 | 0.05 | -0.039 | 0.65 | -0.016 | 0.79 |
| **WEU** | 3M | Global | -1.593 | 0.07 | -0.480 | 0.23 | -0.618 | 0.64 | -1.263 | 0.01 |
| | | Local | -0.094 | 0.10 | -0.086 | 0.15 | -0.093 | 0.33 | -0.089 | 0.15 |
| | 6M | Global | -1.323 | 0.10 | -0.583 | 0.09 | -0.370 | 0.78 | -1.197 | 0.02 |
| | | Local | -0.079 | 0.15 | -0.101 | 0.05 | -0.081 | 0.39 | -0.065 | 0.31 |
| | 12M | Global | -1.325 | 0.09 | -0.613 | 0.09 | -0.428 | 0.74 | -1.338 | 0.01 |
| | | Local | -0.060 | 0.27 | -0.089 | 0.10 | -0.055 | 0.54 | -0.042 | 0.51 |
| | 24M | Global | -1.013 | 0.20 | -0.705 | 0.03 | -0.129 | 0.92 | -1.367 | 0.00 |
| | | Local | -0.059 | 0.28 | -0.121 | 0.01 | -0.046 | 0.59 | -0.030 | 0.61 |

**Table 6. Investor Sentiment Contagion.**
Regressions of the long-short volatility portfolio returns on investor sentiment and capital flows. The long-short volatility portfolio is constructed following the approach used by Jegadeesh and Titman (2001) for horizons of 3, 6, 12 and 24 months. Global EU (WEU) is the first principal component of the US and EU (WEU) indices. Orthogonal local sentiment ($RESSENT^{\perp}$) is the local sentiment index (PO/CR/HU, respectively) orthogonal with respect to the $Global^{\perp}$ index and macroeconomic variables. FC is the flow of capital invested in the PO/CR/HU markets by EU investors. This is calculated from the standardized absolute value of the cash flows after normalization by market value. The analysis includes the Fama-French risk factors (market risk premium (RMRF) and (SMB and HML). The estimation procedure for the regressions on all countries is the OLS regression of the pool equation with cross-section fixed effects and year dummies. We use the White cross-section method to obtain estimators robust to cross-equation (contemporaneous) correlation and heteroskedasticity. Individual country coefficients are obtained by using seemingly unrelated regression (SUR). The table reports the estimated coefficients and the corresponding p-values based on robust standard errors. R squared ranges between 0.08-0.42. Coefficients are multiplied by 100.
Model $R^{i,j}_{high,t+k} - R^{i,j}_{low,t+k} = \alpha^{i,j}_{k} + \beta^{i,j}_{k} GLOBAL^{\perp}_{t} + \mu^{i,j}_{k} RESSENTC^{\perp}_{t} + \varphi^{i,j}_{k} |FC_t| + \eta^{i,j}_{k} |FC_t| * GLOBAL^{\perp}_{t} + \delta^{i,j}_{k} RMRF_t + \varphi^{i,j}_{k} SMB_t + \lambda^{i,j}_{k} HML_t + u^{i,j}_{k,t}$

| | | | ALL | | CR | | HU | | PO | |
|---|---|---|---|---|---|---|---|---|---|---|
| | | | Coef. | P-value | Coef. | P-value | Coef. | P-value | Coef. | P-value |
| **EU** | 3M | Global | -2.104 | 0.02 | -1.702 | 0.03 | -1.555 | 0.76 | -1.072 | 0.09 |
| | | Local | -0.079 | 0.17 | -0.035 | 0.54 | -0.067 | 0.49 | -0.086 | 0.20 |
| | | FC | -0.008 | 0.96 | 5.197 | 0.31 | -0.539 | 0.88 | -0.064 | 0.55 |
| | | FC*Global | -0.119 | 0.31 | 4.883 | 0.30 | 0.177 | 0.96 | -0.120 | 0.20 |
| | 6M | Global | -1.941 | 0.02 | -1.972 | 0.00 | -0.945 | 0.85 | -0.950 | 0.14 |
| | | Local | -0.063 | 0.29 | -0.052 | 0.27 | -0.068 | 0.48 | -0.063 | 0.35 |
| | | FC | 0.006 | 0.97 | 5.459 | 0.21 | -0.029 | 0.99 | -0.067 | 0.54 |
| | | FC*Global | -0.123 | 0.32 | 6.110 | 0.13 | -0.026 | 0.99 | -0.142 | 0.14 |
| | 12M | Global | -1.921 | 0.02 | -1.793 | 0.01 | -1.701 | 0.73 | -0.767 | 0.22 |
| | | Local | -0.041 | 0.47 | -0.043 | 0.39 | -0.050 | 0.58 | -0.043 | 0.51 |
| | | FC | 0.067 | 0.70 | 7.141 | 0.12 | -0.229 | 0.95 | -0.047 | 0.66 |
| | | FC*Global | -0.093 | 0.48 | 5.281 | 0.21 | 0.363 | 0.91 | -0.148 | 0.12 |
| | 24M | Global | -1.281 | 0.05 | -1.311 | 0.03 | -1.182 | 0.80 | -0.391 | 0.50 |
| | | Local | -0.048 | 0.38 | -0.083 | 0.06 | -0.042 | 0.63 | -0.044 | 0.47 |
| | | FC | 0.032 | 0.84 | 3.660 | 0.37 | 0.221 | 0.95 | -0.054 | 0.59 |
| | | FC*Global | -0.135 | 0.23 | 1.601 | 0.67 | 0.441 | 0.88 | -0.203 | 0.02 |
| **WEU** | 3M | Global | -1.449 | 0.09 | -0.807 | 0.04 | -1.905 | 0.72 | -0.759 | 0.27 |
| | | Local | -0.091 | 0.22 | -0.079 | 0.18 | -0.083 | 0.38 | -0.109 | 0.09 |
| | | FC | -0.150 | 0.93 | 3.340 | 0.50 | 0.464 | 0.90 | -0.058 | 0.59 |
| | | FC*Global | -0.106 | 0.25 | 2.132 | 0.61 | 0.868 | 0.80 | -0.091 | 0.29 |
| | 6M | Global | -1.213 | 0.14 | -1.094 | 0.08 | -1.070 | 0.84 | -0.668 | 0.35 |
| | | Local | -0.074 | 0.31 | -0.097 | 0.05 | -0.087 | 0.36 | -0.082 | 0.22 |
| | | FC | 0.028 | 0.87 | 3.478 | 0.41 | 1.029 | 0.78 | -0.034 | 0.76 |
| | | FC*Global | -0.085 | 0.35 | 3.181 | 0.37 | 0.569 | 0.87 | -0.085 | 0.33 |
| | 12M | Global | -1.170 | 0.14 | -0.930 | 0.19 | -1.489 | 0.77 | -0.638 | 0.36 |
| | | Local | -0.054 | 0.45 | -0.083 | 0.12 | -0.069 | 0.44 | -0.059 | 0.36 |
| | | FC | 0.059 | 0.72 | 5.000 | 0.26 | 0.931 | 0.80 | -0.036 | 0.74 |
| | | FC*Global | -0.090 | 0.32 | 2.143 | 0.57 | 0.785 | 0.81 | -0.107 | 0.21 |
| | 24M | Global | -0.777 | 0.31 | -0.549 | 0.38 | -0.568 | 0.91 | -0.246 | 0.70 |
| | | Local | -0.056 | 0.41 | -0.119 | 0.01 | -0.049 | 0.57 | -0.061 | 0.31 |
| | | FC | 0.032 | 0.84 | 2.087 | 0.59 | 0.758 | 0.83 | -0.066 | 0.50 |
| | | FC*Global | -0.120 | 0.18 | -0.764 | 0.81 | 0.370 | 0.91 | -0.180 | 0.31 |

**Table 7. Stock characteristics versus country effect and Sentiment Effect.**
Regressions of the long-short volatility portfolio returns on investor sentiment using 3 different strategies. Strategy 1: full sample unrestricted (FSU), Strategy 2 country-neutral sample with the same number of stocks from each country (CN1), Strategy 3: country-neutral portfolio using a number of stocks from each country proportional to its share in the overall sample of stocks (CN2). The long-short volatility portfolio is constructed following the approach used by Jegadeesh and Titman (2001) for horizons of 3, 6, 12 and 24 months. Orthogonal sentiment ($SENT^{\perp}$) is the global sentiment index (European Union (EU)) orthogonal with respect to macroeconomic variables. The analysis includes the Fama-French risk factors (market risk premium (RMRF) and (SMB and HML). The estimation procedure for the regressions on all countries is the OLS regression of the pool equation with cross-section fixed effects and year dummies. We use the White cross-section method to obtain estimators robust to cross-equation (contemporaneous) correlation and heteroskedasticity. The table reports the estimated coefficients and the corresponding p-values based on robust standard errors. R squared ranges between 0.25-0.70. Coefficients are multiplied by 100.

$$R^{p}_{high,t+k} - R^{p}_{low,t+k} = \alpha^{p}_{k} + \beta^{p}_{k} SENTC_t^{\perp} + \delta^{p}_{k} RMRF_t + \varphi^{p}_{k} SMB_t + \lambda^{p}_{k} HML_t + u^{p}_{k,t}$$

| | **Strategy 1:FSU** | | **Strategy 2:CN1** | | **Strategy 3:CN2** | |
|---|---|---|---|---|---|---|
| | **Coef β** | P-value | **Coef β** | P-value | **Coef β** | P-value |
| **3M** | -1.079 | 0.00 | -0.835 | 0.06 | -1.09 | 0.00 |
| **6M** | -1.172 | 0.00 | -0.944 | 0.02 | -1.163 | 0.00 |
| **12M** | -1.028 | 0.00 | -0.951 | 0.02 | -1.083 | 0.00 |
| **24M** | -0.637 | 0.02 | -0.499 | 0.19 | -0.748 | 0.02 |
| **3M** | | | **H0:$\beta_{FSU}=\beta_{CN1}$** | 0.59 | **H0: $\beta_{FSU}=\beta_{CN2}$** | 0.97 |
| **6M** | | | | 0.58 | | 0.97 |
| **12M** | | | | 0.84 | | 0.83 |
| **24M** | | | | 0.68 | | 0.64 |

**Table 8. Cultural dimensions, Institutional factors and Investor Sentiment**
Regressions of the long-short volatility portfolio returns on investor sentiment and cultural dimensions/Institutional factors. The long-short volatility portfolio is constructed following the approach used by Jegadeesh and Titman (2001) for horizons of 3, 6, 12 and 24 months. Orthogonal sentiment ($SENT^{\perp}$) is the global sentiment index (European Union (EU)) orthogonal with respect to macroeconomic variables. The cultural dimensions (DH) are Power Distance Index (PDI), Individualism versus Collectivism (IDV), Masculinity versus Femininity (MAS), Uncertainty Avoidance Index (UAI), Long Term Orientation versus Short Term Normative Orientation (LTO) and Indulgence versus Restraint (IND). Institutional Factors (WGI): Voice and Accountability, Political Stability and Absence of Violence/Terrorism, Government Effectiveness, Regulatory Quality, Rule of Law and Control of Corruption. The analysis includes the Fama-French risk factors (market risk premium (RMRF) and (SMB and HML). The estimation procedure for the regressions on all countries is the OLS regression of the pool equation with cross-section fixed effects and year dummies. We use the White cross-section method to obtain estimators robust to cross-equation (contemporaneous) correlation and heteroskedasticity. The table reports the estimated coefficients and the corresponding p-values based on robust standard errors. R squared ranges between 0.10-0.13. Coefficients are multiplied by 100.

$$R^{i}_{high,t+k} - R^{i}_{low,t+k} = \alpha_k + \beta_k^1 SENT\, C_t^{\perp} + \beta_k^2 SENT\, C_t^{\perp}.DH_l(WGI_l) + \delta_k RMRF_t + \varphi_k SMB_t + \lambda_k HML_t + u_{k,t}$$

**Panel A Hofstede Indices**

| | | 3M | | 6M | | 12M | | 24M | |
|---|---|---|---|---|---|---|---|---|---|
| | | Coef. | p-value | Coef. | p-value | Coef. | p-value | Coef. | p-value |
| **Individualism** | **Sent** | -2.239 | 0.01 | -2.113 | 0.01 | -2.081 | 0.00 | -1.511 | 0.02 |
| | **Index*Sent** | 0.006 | 0.57 | 0.008 | 0.47 | 0.008 | 0.47 | 0.013 | 0.21 |
| **Uncertainty Avoidance** | **Sent** | -2.270 | 0.02 | -2.168 | 0.03 | -2.274 | 0.01 | -1.765 | 0.02 |
| | **Index*Sent** | -0.051 | 0.95 | -0.040 | 0.96 | -0.305 | 0.67 | -0.381 | 0.60 |
| **Power Distance** | **Sent** | -2.245 | 0.01 | -2.146 | 0.01 | -2.129 | 0.01 | -1.582 | 0.01 |
| | **Index*Sent** | -0.157 | 0.73 | -0.227 | 0.62 | -0.521 | 0.24 | -0.791 | 0.06 |
| **Masculinity** | **Sent** | -2.236 | 0.01 | -2.108 | 0.01 | -2.076 | 0.01 | -1.505 | 0.02 |
| | **Index*Sent** | 0.004 | 0.58 | 0.006 | 0.48 | 0.006 | 0.47 | 0.009 | 0.21 |
| **Long-term Orientation** | **Sent** | -2.242 | 0.01 | -2.112 | 0.01 | -2.077 | 0.01 | -1.500 | 0.02 |
| | **Index*Sent** | 0.002 | 0.61 | 0.002 | 0.63 | 0.001 | 0.75 | 0.001 | 0.74 |
| **Indulgence** | **Sent** | -2.242 | 0.01 | -2.115 | 0.01 | -2.083 | 0.00 | -1.515 | 0.01 |
| | **Index*Sent** | 0.070 | 0.56 | 0.090 | 0.46 | 0.086 | 0.47 | 0.134 | 0.21 |

**Panel B Worldwide Governance Indicators**

| | | 3M | | 6M | | 12M | | 24M | |
|---|---|---|---|---|---|---|---|---|---|
| | | Coef. | p-value | Coef. | p-value | Coef. | p-value | Coef. | p-value |
| **Control of Corruption** | **Sent** | -2.212 | 0.01 | -2.079 | 0.01 | -2.051 | 0.01 | -1.455 | 0.02 |
| | **Index*Sent** | 0.331 | 0.68 | 0.406 | 0.61 | 0.340 | 0.65 | 0.718 | 0.30 |
| **Rule of Law** | **Sent** | -2.238 | 0.01 | -2.109 | 0.01 | -2.078 | 0.01 | -1.502 | 0.02 |
| | **Index*Sent** | 0.449 | 0.38 | 0.521 | 0.33 | 0.514 | 0.35 | 0.506 | 0.31 |
| **Voice and Accountability** | **Sent** | -2.225 | 0.01 | -2.094 | 0.01 | -2.066 | 0.01 | -1.479 | 0.02 |
| | **Index*Sent** | 0.196 | 0.84 | 0.245 | 0.80 | 0.111 | 0.91 | 0.524 | 0.56 |
| **Government Effectiveness** | **Sent** | -2.248 | 0.01 | -2.119 | 0.01 | -2.083 | 0.01 | -1.512 | 0.02 |
| | **Index*Sent** | 0.477 | 0.36 | 0.470 | 0.39 | 0.350 | 0.52 | 0.502 | 0.31 |
| **Political Stability and Absence of Violence** | **Sent** | -2.289 | 0.01 | -2.157 | 0.01 | -2.120 | 0.00 | -1.534 | 0.01 |
| | **Index*Sent** | 0.488 | 0.31 | 0.471 | 0.34 | 0.423 | 0.39 | 0.338 | 0.45 |
| **Regulatory Quality** | **Sent** | -2.254 | 0.01 | -2.130 | 0.01 | -2.092 | 0.00 | -1.517 | 0.01 |
| | **Index*Sent** | 0.386 | 0.43 | 0.470 | 0.35 | 0.361 | 0.47 | 0.381 | 0.40 |