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Cross-Country Variation in Price Volatility-Sentiment Relationship and Country Factors

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ABSTRACT: This study examines the cross-country variation in the relationship between investor sentiment and price volatility, investigating how cultural, institutional, and economic factors moderate this dynamic. Utilizing a novel firm-level sentiment index constructed via principal component analysis (PCA) of behavioral indicators (RSI, PSY, adjusted turnover, and trading volume), I employ a Vector Autoregression (VAR) framework to analyze data from 28 countries (2007–2022). Results reveal that sentiment-driven volatility is heterogeneous across markets, with short-term overreactions followed by corrections. Power distance (PDI) exacerbates volatility, while education, legal protections, and short-selling attenuate it, highlighting the role of institutional quality in mitigating behavioral biases. The study contributes by integrating cultural dimensions with market microstructure theory, offering nuanced insights into how national contexts shape investor behavior.

KEYWORD: Market sentiment, Price volatility-sentiment relationship, Power distance, Education level, Legal system

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1. INTRODUCTION

The emergence of noise trading presents a significant challenge to traditional asset pricing theories. While Fama's (1965) efficient market hypothesis posits rational investor behavior and instantaneous information incorporation into prices, subsequent empirical evidence of pricing anomalies has cast doubt on these assumptions of perfect rationality. Behavioral finance has addressed these limitations by incorporating psychological factors to explain market anomalies and stock performance dynamics. Recent research by Hu and Prigent (2019) further demonstrates that noise trading constitutes a systematic risk factor that may paradoxically enhance market efficiency. In this study, I first examine the relationship between investor sentiment and price volatility across markets, employing a novel firm-level sentiment measure derived through principal component analysis of multiple behavioral indicators. This approach captures cross-firm variations more effectively than aggregate market-wide sentiment measures. I then implement a VAR framework with impulse response analysis to precisely trace how price volatility reacts to sentiment shocks and evolves over time. For the volatility-sentiment analysis, I utilize absolute price changes as the measure of price volatility, providing a robust foundation for examining these dynamic relationships.

Recent research has increasingly demonstrated the significant influence of national culture on corporate decision-making and market behavior. Studies have documented cultural impacts across diverse domains including corporate governance (Testa,2009; Grinffin, Guedhami, Kwok, and Shao, 2017), environmental performance (Peng and Lin, 2009), earnings management (Chen, Gotti, Kang, and Wolfe, 2018), and firm investment (Zhang, Zhang, and Zhang, 2016). Particularly relevant to financial markets, Chui, Titman, and Wei (2010) establish a connection between Hofstede's (2001) individualism dimension and stock market performance,

positing that individualistic cultures foster overconfidence among investors. This finding aligns with Markus and Kitayama's (1991) theoretical framework linking cultural dimensions to behavioral biases, while Barber and Odean (2001) further identify masculinity as another cultural dimension associated with overconfident trading behavior. Building upon this established literature, my study examines how cultural dimensions moderate the relationship between investor sentiment and price volatility. Drawing on Hofstede's (2001) framework, I hypothesize that individualism may alleviate sentiment's impact on price volatility as individualistic investors tend toward cautious decision-making. Conversely, masculinity may amplify this relationship through its association with aggressive trading behavior. Additionally, power distance (PDI) is expected to influence market dynamics, with egalitarian societies potentially exhibiting weaker sentiment effects.

This study further examines how institutional and economic factors moderate the sentiment-volatility relationship by incorporating several non-cultural variables. First, I employ a legal index measuring the strength of collateral and bankruptcy laws in protecting creditor rights, which may influence how sentiment affects price volatility through its impact on market efficiency. Second, I analyze market liquidity conditions, particularly focusing on short-selling restrictions as a proxy for market development and transparency. The absence of short-selling mechanisms may attract less sophisticated investors, potentially amplifying noise trading effects. Third, I consider macroeconomic indicators including consumer price inflation (CPI), where higher inflation could reduce stock market participation. Additionally, I investigate how education levels may mitigate sentiment-driven volatility by enhancing investor cognition, and how state-funded healthcare systems might stabilize market sentiment by reducing public anxiety. These institutional and socioeconomic factors collectively provide a comprehensive framework for understanding the contextual determinants of sentiment's impact on price fluctuations.

This study investigates cross-country differences in how investor sentiment affects price volatility, analyzing how national characteristics shape this relationship. The rest of paper is organized as follows: section 2 reviews the literature. Section 3 describes the data. Section 4 presents the methodology and hypothesis. Section 5 reports the empirical results and robust test. Section 6 concludes.

2. LITERATURE REVIEW

This section reviews the market sentiment measure, price volatility-sentiment relationship, and the country factors.

2.1 Market sentiment measure

To examine the relationship between sentiment and price volatility, the first step is to construct the sentiment measures. The academic literature has evolved significantly in this regard, progressing from single-proxy measures (Lee, Shleifer, and Thaler,1991; Derrien,2005; Cornelli, Goldreich, and Ljungqvist, 2006) to more sophisticated composite indices. Baker and Wurgler's (2006, 2007) pioneering work established the principal component analysis (PCA) approach, combining six market-level proxies including the average closed-end fund discount, NYSE share turnover, the number and average first-day returns on IPOs, the equity share in new issues, the dividend premium, and a composite index. This methodology has been adapted for emerging markets by subsequent researchers. Chen, Chong, and She (2014) and Han and Li (2017) developed Chinese market sentiment indices incorporating the market PE ratio, the number of new accounts opened by retail investors, and market-wide abnormal turnover ratios. More recently, Fu and Hua (2023) applied similar PCA methods to study B-share markets. Recognizing the importance of firm-level heterogeneity, Yang and Zhou (2015,2016) construct the firm-level sentiment index by incorporating relative strength index, psychological line index, trading volume and adjusted turnover. Kim, Ryu, and Yang (2021) extend the firm-level measures by adding the buy-sell imbalance of individual investors based on Yang and Zhou (2015,2016). This methodological progression from market-wide to firm-level measures enables more precise examination of how sentiment interacts with price volatility across different market contexts.

2.2 Sentiment and price volatility

The traditional efficient market hypothesis (Friedman, 1953; Fama, 1965) posits that investors behave rationally and information is efficiently incorporated into prices. However, subsequent empirical evidence has challenged this assumption of universal rationality, prompting researchers to examine alternative behavioral explanations. French and Roll (1986) provided early evidence that noise trading contributes to price volatility, while De Long, Shleifer, Summers, and Waldmann(1990) formally modeled how noise traders affect equilibrium prices. This theoretical foundation spurred numerous empirical studies documenting

sentiment's market impacts. Lee, Shleifer, and Thaler (1991) demonstrated that closed-end fund discounts, as a sentiment proxy, correlate with stock returns. Subsequent research established sentiment's volatility effects across different contexts: Brown (1999) found sentiment increased closed-end fund volatility; Lee, Jiang, and Indro (2002) showed sentiment affects conditional volatility in major US indices using GARCH models; and Qiang and Shu (2009) confirmed these findings with GARCH-M specifications. European markets exhibited similar patterns, as Frugier (2016) documented sentiment-volatility linkages among large European stocks. Chiu, Harris, and Stoja (2018) further decomposed volatility into persistent and transitory components, associating the latter with sentiment fluctuations.

For volatility measurement, absolute returns have been widely employed since Crouch (1970), with subsequent validation by Rutledge (1984), Wood, McInish, and Ord (1985), and Statman, Thorley, and Vorkink (2006). While existing literature consistently identifies sentiment-volatility relationships, most studies focus on single-country settings. This study extends this line of inquiry by conducting cross-country analysis to identify national-level factors that may explain variations in how sentiment affects price volatility across different markets, building on the country-specific literature discussed subsequently.

2.3 Country factors

Existing research has established important connections between cultural dimensions and cross-country market variations. Chui, Titman, and Wei (2010) demonstrate that individualism correlates with investor overconfidence, as individualistic investors tend to be overly optimistic about their abilities. This finding aligns with work by Daniel, Hirshleifer, and Subrahmanyam (1998), Statman, Thorley, and Vorkink (2006), and Glaser and Weber (2009), who collectively show how overconfidence amplifies market volatility. Liu's (2019) analysis of 15 international markets further confirms that Hofstede's (2001) cultural dimensions help explain cross-country volatility differences. However, the literature has not yet examined how cultural factors moderate the sentiment-volatility relationship. Drawing on Hofstede's framework, I hypothesize that cultural dimensions systematically influence this relationship: individualism may reduce noise trading effects as self-focused investors make more cautious decisions; masculinity likely strengthens the sentiment-volatility link through its relation with risk-taking behavior; while higher power distance may increase market noise as reduced concern for individual rights fosters greater tolerance for unequal society and information asymmetry. These cultural dimensions thus provide a theoretically grounded framework for understanding international variations in how sentiment affects price dynamics.

Recent research has identified several institutional factors that may influence investor behavior and market dynamics. Gonsalez-Ignual, Santanmaria, and Vieites (2021) and Wang, Su, and Duxbury (2021) demonstrate how education enhances financial decision-making by improving cognitive abilities, suggesting it may attenuate the sentiment-volatility relationship by reducing impulsive trading. Legal systems also play a moderating role, as Chang, Faff, and Hwang (2012) show that stronger creditor protections and judicial efficiency can mitigate noise trading effects. Market structure factors similarly affect this relationship. Diamond and Verrecchia (1987) establish that short-selling facilitates faster price discovery, while Liu (2015) finds sentiment correlates positively with liquidity, implying markets permitting short-selling may exhibit weaker sentiment effects due to greater participation by sophisticated investors. Macroeconomic conditions further influence this dynamic: Ugurlu-Yildirim, Kocaarslan, and Ordu-Akkaya (2020) document an inverse relationship between CPI and sentiment, suggesting inflation may divert investment from financial to real assets. Additionally, according to Friedman (2013), variations in public healthcare provision may affect market behavior, as inadequate medical assistance could increase investor anxiety and amplify sentiment-driven volatility. Building on these findings, this study employs Vector Autoregression (VAR) analysis to examine firm-level sentiment-volatility relationships before investigating how cross-country institutional differences explain variations in these dynamics.

3. DATA

The study utilizes a comprehensive international dataset spanning from January 2007 to December 2022, with varying start dates across countries to account for differences in market development. Stock return data and market information, including the key sentiment construction variables (psychological line index, relative strength index, log trading volume, and adjusted turnover ratio), are sourced from the Wind database. The final sample encompasses 28 countries and regions, providing broad cross-country representation.

Cultural dimensions (individualism, masculinity, and power distance) are drawn from Hofstede's (2001) framework. Additional

country-level controls include: higher education enrollment rates (education); creditor rights protection indices ranging 0-12 (legal), with higher scores indicating that these laws are better designed to expand access to credit.; per capita health expenditures (health) from World Bank databases; short-selling regulations from Bris, Goetzmann, and Zhu (2007); and financial development indicators including market capitalization to GDP ratios. Macroeconomic controls (GDP per capita and CPI) are similarly obtained from World Bank sources. This multidimensional dataset enables rigorous examination of both firm-level sentiment effects and cross-country moderating factors.

4. METHODOLOGY AND HYPOTHESIS

4.1Methodology

The construction of sentiment measures follows the methodology established by Yang and Zhou (2015, 2016), incorporating four key market indicators: psychological line index (PSY), relative strength index (RSI), adjusted turnover ratio, and logarithmic trading volume. PSY captures investor psychology by measuring the proportion of positive return months over a 12-month window, serving as a gauge of recent market optimism. RSI quantifies market momentum through the relative performance of advancing versus declining stocks, standardized to a 0-100 scale. Following Baker and Stein (2004), I adjust the turnover measure to account for return directionality, where positive returns reflect bullish market conditions. This comprehensive approach allows for robust measurement of investor sentiment while maintaining consistency with established methodologies in behavioral finance research. The adjusted turnover is specified as follows:

$$ATR_{i,t}=Turnover_{I,T}*\frac{Return_{i,t}}{|Return_{i,t}|} \quad (1)$$

Table 1 presents summary statistics of sentiment indicators across the 28 sample countries and regions, revealing several noteworthy patterns. Switzerland exhibits the highest average PSY values, indicating the greatest frequency of positive monthly returns over 12-month windows, while Portugal shows the lowest PSY, reflecting more subdued market performance. The relative strength index (RSI) displays moderate cross-country variation, with South Africa and Spain representing the upper and lower bounds respectively. Adjusted turnover ratios (ATR) show greater dispersion, with Austria and Portugal demonstrating negative average values. Further, Portugal's particularly low ATR aligns with its depressed PSY measure. Poland stands out with the highest ATR among all markets. Trading activity, measured by log(volume), averages 7.28 across countries, with Brazil showing the most active trading and 16 markets exceeding the mean volume level. These baseline statistics provide important context for understanding cross-country differences in investor sentiment dynamics.

Table 1: Summary Statistics for Market Sentiment

This table reports the average monthly PSY, RSI, adjusted turnover(ATR), log(volume), and the sample period for each country at the firm-level. Firm-level monthly PSY, RSI, adjusted turnover(ATR), and logarithm of trading volume are used to construct the market sentiment. All information are obtained from Wind database.

	PSY	RSI	ATR	Log (volume)	Starting month	Ending month	Index
Australia	56.51	53.42	0.0042	7.33	2011/09	2022/12	S&P/ASK 200
Austria	54.35	51.74	-0.0024	6.29	2014/09	2022/12	ATX
Brazil	50.09	48.39	0.1556	8.58	2016/03	2022/12	IBOVESPA
Canada	56.20	53.56	0.0035	7.07	2008/03	2022/12	S&P/TSK
China	54.30	50.56	0.0367	8.51	2007/01	2022/12	CSI 300
Denmark	57.34	53.38	0.0017	7.04	2008/03	2022/12	OMX20
Finland	51.51	49.67	0.0003	5.92	2008/03	2022/12	OMX
France	58.07	55.48	0.0031	7.28	2013/12	2022/12	CAC40
Ireland	54.06	53.61	0.0048	6.42	2008/03	2022/12	ISEQ
Israel	56.10	50.59	0.0012	6.15	2012/01	2022/12	TA100
Italy	56.40	52.89	0.0068	7.86	2008/03	2022/12	MIB

Japan	56.17	50.41	0.0104	7.67	2007/01	2022/12	N225
Malaysia	50.96	48.56	0.0007	8.11	2018/01	2022/12	BURSA Malaysia
Mexico	50.80	58.15	0.0048	7.31	2014/11	2022/12	MXX
Netherlands	58.46	54.73	0.0091	7.80	2008/03	2022/12	AEX
New Zealand	54.74	52.49	0.0032	6.72	2011/09	2022/12	NZ50
Philippine	54.69	51.07	0.0079	7.24	2008/03	2022/12	PSEI
Poland	51.31	49.79	0.6471	7.62	2009/09	2022/12	WIG20
Portugal	41.99	48.57	-0.0019	5.53	2008/08	2022/12	PSI
South Africa	51.55	59.17	0.0019	7.33	2014/03	2022/12	JSE40
South Korea	53.00	48.92	0.0172	6.67	2007/01	2022/12	KOSPI200
Spain	55.56	48.11	0.0032	7.68	2008/03	2022/12	IBEX35
Sweden	54.45	53.79	0.0036	6.23	2008/03	2022/12	OMXSPI
Switzerland	60.56	57.40	0.0095	6.98	2008/03	2022/12	SMI
Thailand	54.37	51.02	0.0130	8.50	2021/09	2022/12	SET50
Turkey	59.61	57.60	0.0601	8.51	2012/01	2022/12	CEIC30
UK	58.12	54.79	0.0013	7.70	2007/01	2022/12	FTSE100
US	60.27	55.94	0.0209	7.67	2007/01	2022/12	S&P500
Mean, all countries	54.70	52.64	0.0367	7.28			

The analysis employs principal component analysis to construct a composite sentiment index from the underlying proxies. As shown in Table 2, the cross-country average absolute monthly return stands at 7.81%, with Brazil exhibiting the highest volatility (12.30%) and New Zealand the lowest (4.77%). The sentiment index displays considerable variation across markets, ranging from 36.25 in South Africa to 70.88 in Switzerland. Cultural dimensions from Hofstede (2001) show wide dispersion, with individualism, masculinity and power distance scores spanning 5 to 104. Institutional factors similarly vary substantially: higher education enrollment averages 68.13%, legal system quality ranges from 1 (Philippines) to 12 (New Zealand), and health expenditures peak in the United States while reaching their lowest level in the Philippines. Macroeconomic indicators reveal Switzerland's distinctive position with negative CPI (-0.03%) against a 2.27% cross-country average, while market capitalization to GDP ratios greatly exceed 1 in South Korea and South Africa. GDP per capita shows the expected developmental spectrum, from Switzerland's high-income economy to the Philippines' emerging market status.

Table 2: Summary Statistics for Country

This table reports average monthly absolute return(*Ret*), constructed sentiment(*Sentiment*), Individualism(*IDV*), Masculinity(*MAS*), Power distance(*PDI*), Education level(*Education*), legal index(*Legal*), medical support(*Health*), CPI, market capitalization/GDP(*MKT/GDP*), GDP per capita(*GDP_P*) for each country at the firm-level. Individualism(*IDV*), Masculinity(*MAS*) and Power distance(*PDI*) are three culture factors developed by Hofstede (2001). Education level(*Education*)is the enrollment rate of higher education. Legal index(*Legal*) measures the degree to which collateral and bankruptcy laws protect the rights of borrowers and lenders and thus facilitate lending. Medical support(*Health*) measures the current expenditures on health per capita. CPI measures the inflation. Market capitalization/GDP(*MKT/GDP*) is the ratio of stock market capitalization to gross domestic product. GDP per capita(*GDP_P*) is the gross domestic product divided by midyear population. Institutional and economic factors are obtained from World Bank.

	Abs(Ret)(%)	Sentiment	IDV	MAS	PDI	Education(%)	Legal	Health(dollar)	CPI(%)	MKT/GDP	GDP_P(thousand dollar)
Australia	9.45	60.97	90	61	36	112.18	11	5452.39	1.71	0.1421	390.43
Austria	7.27	61.96	55	79	11	85.60	4	5923.75	1.64	0.0128	299.51
Brazil	12.30	43.28	38	49	69	52.26	2	1453.75	5.19	0.1352	57.72

Canada	8.50	64.58	80	52	39	67.96	9	4948.05	1.73	0.1465	268.20
China	9.45	64.76	20	66	80	40.95	3	604.30	2.62	0.0662	48.21
Denmark	6.39	60.07	74	16	18	80.13	8	5472.86	1.68	0.8258	348.41
Finland	7.53	55.79	63	26	33	92.94	6	4198	1.39	0.0800	276.12
France	5.84	63.21	71	43	68	65.94	4	5295.07	0.85	0.0828	248.55
Ireland	9.58	66.31	70	68	28	70.97	7	5291.93	0.51	0.03459	380.40
Israel	7.89	62.07	54	68	13	59.69	6	2894.3	0.54	8.7266	245.78
Italy	8.87	65.72	76	70	50	64.54	2	3458	1.27	0.01994	192.41
Japan	7.56	64.14	46	95	54	62.59	5	4455.56	0.61	13.5434	232.65
Malaysia	6.42	56.95	26	50	104	42.95	7	1130.35	0.72	0.1861	74.68
Mexico	6.79	58.56	30	69	81	40.79	10	1114.84	4.05	2.0550	65.11
Netherlands	7.61	58.67	80	14	38	77.74	2	5458.9	1.52	0.0805	287.64
New Zealand	4.77	58.49	79	58	22	80.04	12	3953.78	1.56	0.2054	260.89
Philippine	6.58	51.52	32	64	94	32.93	1	302.93	3.50	2.9799	18.26
Poland	8.30	58.53	60	64	68	71.18	7	2254.57	4.04	0.0249	102.07
Portugal	9.44	43.36	27	31	63	65.70	2	3344.43	0.72	0.0258	137.12
South Africa	6.45	36.25	65	63	49	19.75	5	1104.39	5.43	34.7664	39.58
South Korea	8.35	62.11	18	39	60	98.09	5	2681.86	2.21	87.1807	178.25
Spain	6.82	59.19	51	42	57	40.79	5	3342.66	1.09	0.0415	161.42
Sweden	8.95	62.99	71	5	31	77.74	7	5271.07	1.68	0.8674	322.57
Switzerland	9.19	70.88	68	70	34	80.04	6	6994.00	-0.03	0.1327	529.34
Thailand	5.08	57.03	20	34	64	32.93	3	967.40	1.23	0.9588	44.43
Turkey	10.04	66.53	37	45	66	71.18	2	1149.88	11.25	0.0198	75.55
UK	6.80	65.16	89	66	35	65.70	7	4354.15	2.50	0.0619	276.65
US	6.56	66.18	91	62	40	19.75	11	10319.72	2.48	0.2009	392.77
Mean, all countries	7.81	59.47	56.46	52.46	50.18	68.13	5.68	3498.56	2.27	5.49	212.67
Standard deviation	1.66	7.75	23.29	20.94	23.87	21.70	3.06	2368.77	2.24	17.47	133.52

Following the methodological approach of Statman, Thorley, and Vorkink(2006), I analyze the dynamic relationship between sentiment and price volatility using a bivariate Vector Autoregressive (VAR) framework. This model specification incorporates two endogenous variables: investor sentiment and absolute monthly returns, and is estimated separately for each country and year to capture temporal and cross-sectional variations in their interaction. The VAR approach allows me to examine how shocks to sentiment propagate through return volatility over time while accounting for the bidirectional feedback between these market factors. It is specified as follows:

$$\begin{vmatrix} Sentiment_t \\ Abs(Ret)_t \end{vmatrix} = \begin{vmatrix} \alpha_{sentiment} \\ \alpha_{asb(ret)} \end{vmatrix} + \sum_{p=1}^{p} A_p \begin{vmatrix} Sentiment_{t-p} \\ Abs(Ret)_{t-p} \end{vmatrix} + \begin{vmatrix} e_{sentiment,t} \\ e_{abs(ret),t} \end{vmatrix} \quad (2)$$

Where Sentiment is the constructed sentiment for each stock in each year. The regression is conducted for each country in each year. The coefficients estimate the relationship between sentiment and absolute value of price return, where p is the number of lags.

The empirical analysis employs Schwarz's Bayesian information criterion (BIC) to determine optimal lag lengths, supplemented by unit root tests to ensure stationarity. Impulse response functions trace the dynamic effects of sentiment shocks on price volatility across multiple periods. As shown in Table 3, a one standard deviation sentiment shock generates an immediate positive average response of 0.1974 at lag 1, followed by negative corrections at lags 2 and 3 (-0.1172 and -0.0861, respectively), suggesting an

initial overreaction that subsequently reverses. Cross-country responses show considerable variation, with standard deviations of 1.0050, 2.3108 and 6.5392 at successive lags. Notably, 13 countries exhibit contrarian negative responses in the first period, increasing to 16 countries by lag 3, indicating heterogeneous market adjustment patterns across different national contexts.

Table 3: Summary Statistics of Impulse Response Functions

The table summarizes the generalized impulse response of absolute value of return to a one standard deviation shock in sentiment at various lags (1 month, 2 months, and 3 months) for each country. The mean (μ) and standard deviation (σ) of the impulse responses for all countries are also listed.

	Lag1	Lag2	Lag3
Australia	-0.8629	-0.2905	-8.2189
Austria	0.2114	0.1619	0.1803
Brazil	-0.3714	1.3495	-1.7680
Canada	0.1916	0.3337	0.4556
China	0.2735	0.4349	1.1645
Denmark	0.2245	-0.7193	-0.4167
Finland	0.0763	2.2026	13.7466
France	0.1369	-0.0668	-0.0996
Ireland	0.1511	-0.6119	1.8823
Israel	-0.4105	-1.5432	-6.8858
Italy	-0.1361	-0.0899	-0.2095
Japan	-0.0080	0.0197	0.0148
Malaysia	0.3041	0.3748	0.5310
Mexico	0.2186	-0.2288	-0.5846
Netherlands	0.1333	-0.0927	-0.4645
New Zealand	-0.0625	-0.1690	-0.6275
Philippine	3.8584	-10.7337	9.2978
Poland	-0.0581	0.0337	0.0899
Portugal	0.3424	0.0323	-0.2513
South Africa	0.5459	0.3960	0.5018
South Korea	0.1346	0.2062	-0.1675
Spain	-0.1941	-0.1264	-0.1854
Sweden	-0.1017	3.4194	17.4937
Switzerland	3.1088	0.0674	-1.1091
Thailand	-0.1005	-0.3209	-0.6215
Turkey	-0.5549	-0.2053	0.1159
UK	-0.3388	0.3188	-6.0130
US	-1.1855	2.5662	-20.2595
Mean(μ)	0.1974	-0.1172	-0.0861
Standard Deviation (σ)	1.0050	2.3108	6.5392

To analyze whether the country factors can explain the price volatility-sentiment relationship, the following regression is performed:

$$\mathrm{Re}sponse_{it} = a_1 + b1IDV_i + b2MAS_i + b3PDI_i + cEducation_i + dLegal_i + eShort_{it} + fHealth_i + gCPI_i + hMarket/GDP_i + iGDP\_P_i + \varepsilon_{it} \quad (3)$$

Where *i* indicates a country and *t* represents the year. *Response* captures the initial monthly reaction of price volatility to a one

standard deviation sentiment shock in country *i* in year *t*. Cultural dimensions from Hofstede (2001): individualism (*IDV*), masculinity (*MAS*), and power distance (*PDI*), all serve as key explanatory factors. *Education* measures the enrollment rate of the higher education for each country. *Legal* ranging 0-12 define the degree to which collateral and bankruptcy laws protect the rights of borrowers and lenders and thus facilitate lending. *Short* equals 1 if shorting selling is practiced, and 0 if it is prohibited. *Health* measures the current expenditure on health per capita. *CPI* is the consumer price index. *Market/GDP* and *GDP_P* represents the financial development for each country in each year.

4.2 Hypothesis

Building on theoretical foundations, I develop several testable hypotheses regarding how national characteristics moderate the sentiment-volatility relationship. First, cultural dimensions are expected to exert significant influence: (1) Higher individualism reflects a cultural orientation where personal autonomy and self-reliance are prioritized over collective or group interests. This psychological independence manifests in financial markets through reduced herding behavior, as individualistic investors tend to base decisions on personal analysis rather than social consensus. Consequently, I expect the sentiment-volatility relationship to be reduced in more individualistic societies, as investors' autonomous decision-making processes make them less susceptible to collective mood swings and more likely to evaluate market fundamentals independently; (2) Cultures characterized by higher masculinity scores, as defined by Hofstede's framework, tend to emphasize competitiveness, achievement, and risk-taking. These cultural attributes may amplify the sentiment-volatility relationship in financial markets, as investors in such societies are more likely to engage in aggressive trading strategies and exhibit greater sensitivity to market sentiment; and (3) The power distance index (PDI) quantifies societal tolerance for unequal power distribution, with higher values indicating greater acceptance of hierarchical structures and social stratification. I hypothesize that countries with elevated PDI scores, reflecting more entrenched social inequalities, may exhibit stronger sentiment-driven market behavior. This expectation stems from the premise that hierarchical societies foster information asymmetries and reduced accountability mechanisms, creating conditions where investor sentiment can more readily influence price dynamics. Such environments may discourage critical scrutiny of market information while encouraging herd-like behavior among investors. Second, higher educational attainment cultivates greater cognitive sophistication and analytical skills among market participants, enabling more systematic processing of financial information. I posit that this enhanced capacity for rational decision-making serves to dampen the influence of investor sentiment on price volatility, as educated investors are better equipped to evaluate fundamental values rather than emotional cues. Third, the legal system represents a fundamental institutional framework that safeguards investor rights and maintains market order through transparent governance mechanisms. I hypothesize that robust legal protections, particularly those ensuring creditor rights and bankruptcy procedures, will lower the sentiment-volatility relationship by reducing information asymmetries and enhancing market efficiency. Fourth, short-selling availability likely dampens sentiment effects through increased market liquidity and participation by sophisticated investors. Fifth, comprehensive healthcare systems may decrease anxiety-driven trading by providing social safety nets. Finally, higher inflation may weaken the relationship as investors shift from financial to real assets. These hypotheses collectively suggest that institutional and cultural factors systematically influence how investor sentiment translates into market volatility across different national contexts.

5.EMPIRICAL EVIDENCE

5.1 Empirical evidence

To examine the price volatility-sentiment relationship, I first construct the sentiment index. Following Yang and Zhou (2015,2016), I apply the RSI, PSY, adjusted turnover, and logarithm of the trading volume to conduct principal component analysis for each firm in each country. Firm -level investor sentiment is specified as follows:

$$sentiment_{i,t}=F_{i,RSI}*RSI_{i,t}+F_{i,PSY}*PSY_{i,t}+F_{i,ART}*ART_{i,t}+F_{i,LVOL}*LVOL_{i,t}. \quad (4)$$

Table 4 presents the fixed-effects regression results examining how country-level factors moderate the initial price volatility response to sentiment shocks. The dependent variable measures the first-month impulse response to a one standard deviation sentiment shock for each country-year observation, with year and country fixed effects included to control for unobserved heterogeneity. Standard errors are clustered at the country level to account for within-country correlation. The baseline specification

(Regression 1) incorporates the full set of explanatory variables: Hofstede's (2001) cultural dimensions (individualism, masculinity, and power distance), World Bank indicators (education enrollment, legal protections, health expenditures, and CPI), and short-selling availability from Bris, Goetzmann, and Zhu (2006). Regression 2 refines this model by excluding statistically insignificant predictors. Subsequent regressions (3-10) conduct focused analyses of each moderating factor's individual effect on the sentiment-volatility relationship, providing detailed evidence on the specific mechanisms through which national characteristics influence market dynamics.

The full specification (Regression 1) yields several key findings that align with my theoretical predictions. The coefficient of PDI is 0.0317 and significant at 5% level, supporting the hypothesis that societies more tolerant of inequality exhibit stronger sentiment-volatility linkages, likely through amplified noise trading in less orderly markets. The coefficient of education is -0.0272, and significant at 1% level, suggesting that higher education will improve the rational thinking and decrease the effect on the price volatility-sentiment relationship. The coefficient is also negative and significant for legal index, indicating that well protected rights in one country will encourage rational thinking and reduce the effect on the price volatility-sentiment relationship. The short-selling indicator also appears with the expected negative sign, confirming that enhanced market liquidity attenuates sentiment effects. Notably, individualism (IDV), masculinity (MAS), health expenditures and CPI initially show insignificant effects in this comprehensive specification. This insignificance arises mainly from multicollinearity between cultural dimensions and institutional controls, as the impact of IDV is largely mediated and absorbed by stronger institutional factors (education, legal protection, and short-selling) that directly curb sentiment-driven volatility; MAS remains insignificant due to its inherently weak direct effect on the sentiment-volatility nexus.

The refined model (Regression 2), excluding insignificant predictors, maintains robust findings for PDI, education, legal protections and short-selling. Subsequent individual analyses (Regressions 3-10) reveal additional insights: individualism emerges as significantly negative when examined separately, confirming that self-reliant investors make less sentiment-driven decisions. Health expenditures demonstrate a negative effect, suggesting public healthcare provision reduces anxiety-driven trading. CPI also appears significantly negative in these focused analyses, indicating inflation may divert investment from financial to real assets, thereby weakening sentiment's market impact. These results collectively demonstrate how institutional and cultural factors systematically moderate the transmission of investor sentiment into price volatility across different national contexts.

Table 4: Regression Analysis of Country Factors

The dependent variable is the one-month response of absolute return to one standard deviation sentiment shock in each country each year obtained from a generalized impulse response function in a Vector Autoregression. *IDV*, *MAS* and *PDI* are three cultural dimensions from Hofstede (2001). *Short* equals 1 if shorting selling is practiced, and 0 if it is prohibited, which is obtained from Bris, Goetzmann, and Zhu (2007). *Education* measures the enrollment rate of the higher education for each country. *Legal* define the degree to which collateral and bankruptcy laws protect the rights of borrowers and lenders and thus facilitate lending. *Health* measures the current expenditure on health per capita. *CPI* is the consumer price index. *Market/GDP* and *GDP_P* represents the financial development for each country in each year. Non-cultural factors are obtained from World Bank.Year and country effect are controlled. *** , ** , and * indicate significance at 1%, 5%, and 10% levels, respectively. Reported in parentheses are robust standard error clustered by countries.

	1	2	3	4	5	6	7	8	9	10
IDV	-0.0070		-0.0344**							
	(0.0129)		(0.0150)							
MAS	-0.0011			0.0062						
	(0.0055)			(0.0071)						
PDI	0.0317**	0.0339**			0.0396*					
	(0.0184)	(0.0153)			(0.0215)					
Education	-0.0272***	-0.0244***				-0.0269*				

	(0.0071)	(0.0076)				(0.0142)				
Legal	-0.1168*	-0.1107**					-0.1792*			
	(0.0620)	(0.0522)					(0.0926)			
Short	-1.1045*	-1.0098*						-0.4715		
	(0.5799)	(0.5315)						(0.4953)		
Health	0.0001								-0.0003**	
	(0.0001)								(0.0002)	
CPI	-0.0013									-0.0456***
	(0.0828)									(0.0160)
Market/GDP	-0.0064	-0.0047	-0.0151	-0.0035	-0.0053	0.0018	-0.0043	-0.0060	-0.0056	-0.0044
	(0.0081)	(0.0068)	(0.0095)	(0.0063)	(0.0060)	(0.0069)	(0.0063)	(0.0078)	(0.0068)	(0.0064)
GDP_P	0.0079**	0.0087***	0.0037	-0.0002	0.0047	0.0015	0.0017	0.0006	0.0040	-0.0007
	(0.0039)	(0.0068)	(0.0032)	(0.0030)	(0.0033)	(0.0028)	(0.0026)	(0.0029)	(0.0041)	(0.0031)
Year effect	YES	YES	YES	YES	YES	YES	YES	YES	YES	YES
Country effect	YES	YES	YES	YES	YES	YES	YES	YES	YES	YES
No. Obs	282	292	329	329	329	292	329	329	312	329
R-square	0.1108	0.1095	0.0908	0.0815	0.0928	0.0922	0.0892	0.0822	0.0850	0.0821

To further investigate potential indirect effects, I examine whether initially insignificant variables might influence the sentiment-volatility relationship through their impact on power distance (PDI). As shown in Table 5, several factors demonstrate significant negative relationships with PDI: education, legal protections, short-selling availability, and health expenditures. They all reduce societal acceptance of inequality, thereby indirectly weakening the sentiment-volatility relationship through this cultural channel. The CPI, however, shows a positive association with PDI, which contradicts to my hypothesis, though its limited explanatory power ($R^2 = 3.04\%$) suggests this finding requires cautious interpretation. These results reveal that while some factors may not directly moderate the sentiment-volatility relationship, they can exert indirect influence by shaping fundamental cultural dimensions like power distance that underlie market behavior patterns.

Table 5: Mechanism

The dependent variable is PDI obtained from Hofstede (2001). *Short* equals 1 if shorting selling is practiced, and 0 if it is prohibited, which is obtained from Bris, Goetzmann, and Zhu (2007). *Education* measures the enrollment rate of the higher education for each country. *Legal* define the degree to which collateral and bankruptcy laws protect the rights of borrowers and lenders and thus facilitate lending. *Health* measures the current expenditure on health per capita. *CPI* is the consumer price index. Non-cultural factors are obtained from World Bank. ***, **, and * indicate significance at 1%, 5%, and 10% levels, respectively. Reported in parentheses are standard error.

	1	2	3	4	5	6
Education	-0.2529***	-0.4954***				
	(0.0592)	(0.0582)				
Legal	-1.5405***		-3.5154***			
	(0.3862)		(0.3563)			
Short	-2.6792			-14.5472***		

	(2.6915)			(2.4061)		
Health	-0.0036***				-0.0062***	
	(0.0007)				(0.0004)	
CPI	1.3649***					0.8205***
	(0.4007)					(0.2560)
No. Obs	283	293	330	330	313	330
R-square	0.4998	0.1993	0.2289	0.1003	0.4117	0.0304

5.2 Robust Tests

To address potential distortion from extreme market conditions, I replicate my analysis excluding the 2008 financial crisis period. As presented in Table 6, the core findings remain robust: power distance (PDI) maintains a statistically significant positive association, indicating societies with greater tolerance for inequality exhibit stronger sentiment-driven volatility. The significant negative coefficients for education, legal protections, and short-selling availability similarly persist, confirming that these institutional factors systematically lower the sentiment-volatility relationship by enhancing investor rationality, improving market governance, and increasing liquidity respectively. This robustness check underscores that my primary results reflect fundamental relationships rather than crisis-period artifacts.

Table 6: Regression Analysis Excluding 2008

The dependent variable is the one-month response of absolute return to one standard deviation sentiment shock in each country each year,excluding 2008, obtained from a generalized impulse response function in a Vector Autoregression. *IDV*, *MAS* and *PDI* are three cultural dimensions from Hofstede (2001). *Short* equals 1 if shorting selling is practiced, and 0 if it is prohibited, which is obtained from Bris, Goetzmann, and Zhu (2007). *Education* measures the enrollment rate of the higher education for each country. *Legal* define the degree to which collateral and bankruptcy laws protect the rights of borrowers and lenders and thus facilitate lending. *Health* measures the current expenditure on health per capita. *CPI* is the consumer price index. *Market/GDP* and *GDP_P* represents the financial development for each country in each year. Non-cultural factors are obtained from World Bank. Year and country effect are controlled . ***, **, and * indicate significance at 1%, 5%, and 10% levels, respectively. Reported in parentheses are robust standard error clustered by countries.

	1	2	3	4	5	6	7	8	9	10
IDV	-0.0084		-0.0353**							
	(0.0133)		(0.0151)							
MAS	-0.0029			0.0045						
	(0.0055)			(0.0072)						
PDI	0.0312*	0.0333**			0.0381*					
	(0.0187)	(0.0156)			(0.0213)					
Education	-0.0237***	-0.0236***				-0.0262*				
	(0.0076)	(0.0080)				(0.0144)				
Legal	-0.1126*	-0.1110**					-0.1776*			
	(0.0628)	(0.0526)					(0.0923)			
Short	-1.0587*	-0.9867*						-0.4460		
	(0.5977)	(0.0068)						(0.4991)		
Health	0.0001								-0.0003**	
	(0.0001)								(0.0002)	

CPI	-0.0020 (0.0839)									-0.0473*** (0.0178)
Market/GDP	-0.0068 (0.0081)	-0.0047 (0.0068)	-0.0151 (0.0094)	-0.0034 (0.0062)	-0.0051 (0.0060)	0.0017 (0.0069)	-0.0041 (0.0063)	-0.0057 (0.0078)	-0.0054 (0.0067)	-0.0042 (0.0064)
GDP_P	0.0080** (0.0039)	0.0086*** (0.0031)	0.0039 (0.0031)	-0.0000 (0.0030)	0.0047 (0.0032)	0.0016 (0.0028)	0.0019 (0.0026)	0.0007 (0.0028)	0.0044 (0.0041)	-0.0005 (0.0031)
Year effect	YES	YES	YES	YES	YES	YES	YES	YES	YES	YES
Country effect	YES	YES	YES	YES	YES	YES	YES	YES	YES	YES
No. Obs	273	282	317	317	317	282	317	317	301	317
R-square	0.1091	0.1077	0.0910	0.0812	0.0919	0.0914	0.0890	0.0821	0.0852	0.0822

The analysis further decomposes the initial impulse responses into positive and negative values to examine asymmetric effects. Panel A of Table 7 reveals distinct patterns: cultural and institutional factors - including power distance (PDI), education levels, and short-selling availability - significantly influence positive responses but show negligible effects on negative responses. This asymmetric impact suggests that sentiment shocks primarily amplify volatility through upward price movements, consistent with behavioral theories of investor overreaction to positive sentiment. The findings reinforce that market participants exhibit greater sensitivity to bullish sentiment signals, with cultural and institutional characteristics serving as important moderators of this asymmetric relationship.

The analysis further examines cross-country heterogeneity by partitioning samples based on economic development and short-selling regulations (Table 7, Panel B). Results reveal distinct moderating patterns: in developed markets, legal protections and economic emerge as the primary significant factors attenuating sentiment-driven volatility, whereas developing economies show stronger sensitivity to cultural dimensions defined in the context of human behavior, particularly power distance. This divergence persists when categorizing by short-selling availability. Developing markets prohibiting short sales exhibit more pronounced behavioral effects, suggesting investor psychology plays a greater role in less efficient, institutionally weaker environments. Conversely, developed markets with short-selling demonstrate greater sensitivity to external governance factors. These findings collectively support the hypothesis that human behavior exerts stronger influence on volatility in developing countries, where opaque information environments and weaker legal systems amplify behavioral biases relative to fundamental considerations.

Table 7: Regression Analysis for Sub-Samples

The dependent variable (impulse 1) is the one-month response of absolute return to one standard deviation sentiment shock in each country each year obtained from a generalized impulse response function in a Vector Autoregression. In panel A, impulse is divided into positive and negative parts. In panel B, DEV is 1 for developed countries, and 0 for developing countries. *IDV*, *MAS* and *PDI* are three cultural dimensions from Hofstede (2001). *Short* equals 1 if shorting selling is practiced, and 0 if it is prohibited, which is obtained from Bris, Goetzmann, and Zhu (2007). *Education* measures the enrollment rate of the higher education for each country. *Legal* define the degree to which collateral and bankruptcy laws protect the rights of borrowers and lenders and thus facilitate lending. *Health* measures the current expenditure on health per capita. *CPI* is the consumer price index. *Market/GDP* and *GDP_P* represents the financial development for each country in each year. Non-cultural factors are obtained from World Bank. Year and country effect are controlled . *** , ** , and * indicate significance at 1%, 5%, and 10% levels, respectively. Reported in parentheses are robust standard error clustered by countries.

Panel A				
	Impulse1>0	Impulse1>0	Impulse1<0	Impulse1<0
IDV	0.0221		-0.0181	
	(0.0398)		(0.0133)	
MAS	-0.0024		0.0018	
	(0.0183)		(0.0087)	
PDI	0.0953*	0.0814**	-0.0289	-0.0254
	(0.0507)	(0.0411)	(0.0199)	(0.0178)
Education	-0.0454**	-0.0423*	0.0007	-0.0028
	(0.0211)	(0.0225)	(0.0226)	(0.0163)
Legal	-0.2609	-0.1802	0.0041	-0.0076
	(0.2049)	(0.1348)	(0.0773)	(0.0740)
Short	-2.5932	-2.3455**	0.5817	0.6847
	(1.7357)	(1.3857)	(0.7412)	(0.6430)
Health	-0.0003		0.0002	
	(0.0004)		(0.0002)	
CPI	-0.0086		-0.0640	
	(0.2279)		(0.1182)	
Market/GDP	-0.0148	-0.0186	0.0061	0.0127
	(0.0169)	(0.0128)	(0.0075)	(0.0078)
GDP per capita	0.0269***	0.0209***	-0.0043	-0.0028
	(0.0072)	(0.0055)	(0.0033)	(0.0024)
Year effect	YES	YES	YES	YES
Country effect	YES	YES	YES	YES
No. Obs	129	129	153	156
R-square	0.1997	0.1921	0.1989	0.1836

Panel B				
	DEV=1	DEV=0	Short=1	Short=0
PDI	0.0131	0.0607*	0.0048	0.0940*
	(0.0095)	(0.0364)	(0.0082)	(0.0537)
Education	-0.0171	-0.0189	-0.0421**	-0.0285**
	(0.0109)	(0.0350)	(0.0170)	(0.0133)
Legal	-0.1047**	-0.0577	-0.0641**	-0.0661
	(0.0095)	(0.3290)	(0.0285)	(0.1024)
Short	-0.5876	-1.8698		
	(0.3644)	(1.6917)		
Market/GDP	0.0037**	-0.1578	-0.0448	-0.0080
	(0.0016)	(0.1806)	(0.0340)	(0.0089)
GDP_P	0.0079**	-0.0410	0.0062**	0.0211*
	(0.0032)	(0.0296)	(0.0027)	(0.0128)
Year effect	YES	YES	YES	YES
Country effect	YES	YES	YES	YES
No. Obs	224	68	178	114
R-square	0.0911	0.3413	0.1129	0.1708

Cross-Country Variation in Price Volatility-Sentiment Relationship and Country Factors

Extended analysis of lagged impulse responses (periods 2 and 3) reveals no statistically significant relationships between country-level factors and the sentiment-volatility dynamic, suggesting the observed effects represent primarily short-term market adjustments rather than persistent phenomena. This temporal pattern aligns with behavioral models where sentiment-driven mispricing corrects within initial periods as information becomes incorporated into prices. The absence of enduring moderating effects underscores the transitory nature of sentiment's influence on volatility, though the precise mechanisms governing this decay merit further investigation in future research. These findings contribute to the ongoing debate about the duration of behavioral effects in financial markets while identifying important questions for subsequent study regarding how different national contexts may influence the speed of market correction processes.

Table 8: Regression Analysis for Future Impulse Response

The dependent variable is the second (Impulse2) and third-month(impulse3) response of absolute return to one standard deviation sentiment shock in each country each year obtained from a generalized impulse response function in a Vector Autoregression. *IDV*, *MAS* and *PDI* are three cultural dimensions from Hofstede (2001). *Short* equals 1 if shorting selling is practiced, and 0 if it is prohibited, which is obtained from Bris, Goetzmann, and Zhu (2007). *Education* measures the enrollment rate of the higher education for each country. *Legal* define the degree to which collateral and bankruptcy laws protect the rights of borrowers and lenders and thus facilitate lending. *Health* measures the current expenditure on health per capita. *CPI* is the consumer price index. *Market/GDP* and *GDP_P* represents the financial development for each country in each year. Non-cultural factors are obtained from World Bank. Year and country effect are controlled . *** , ** , and * indicate significance at 1%, 5%, and 10% levels, respectively. Reported in parentheses are robust standard error clustered by countries.

	Impulse2	Impulse3
PDI	-0.0432	0.0441
	(0.00399)	(0.0786)
Education	0.0363	0.0217
	(0.0254)	(0.0683)
Legal	0.1307	-0.3106
	(0.1241)	(0.2948)
Short	1.5453	-2.5926
	(1.4256)	(2.9386)
Market/GDP	0.0105	-0.0362
	(0.0134)	(0.0305)
GDP_P	-0.0054	0.0064
	(0.0051)	(0.0076)
Year effect	YES	YES
Country effect	YES	YES
No. Obs	292	292
R-square	0.0767	0.0525

6. CONCLUSION

This study investigates the cross-country determinants of the sentiment-volatility relationship using firm-level data from 28 countries spanning 2007-2022. I construct a novel firm-specific sentiment index through principal component analysis of four behavioral indicators (RSI, PSY, log trading volume, and adjusted returns), then employ Vector Autoregressive modeling with impulse response functions to trace dynamic effects.

Cross-Country Variation in Price Volatility-Sentiment Relationship and Country Factors

The analysis yields several key findings: First, while sentiment's impact on volatility shows considerable cross-country heterogeneity, the average first-period response is significantly positive, with effects dissipating in subsequent periods. This pattern suggests sentiment primarily drives short-term volatility spikes rather than sustained fluctuations. Second, cultural and institutional factors systematically moderate this relationship. Power distance (PDI) exacerbates sentiment effects, likely by fostering information asymmetries in hierarchical societies, whereas education, legal protections, and short-selling availability attenuate them through enhanced market efficiency. Mediation analysis reveals these institutional factors partially operate by reducing societal power distance. Third, developmental differences emerge: developing markets exhibit stronger behavioral effects, particularly under short-selling constraints, while developed markets respond more to formal institutions. Robustness checks excluding the 2008 crisis period and analyzing response asymmetries confirm these patterns. The findings collectively advance our understanding of how national characteristics shape behavioral finance dynamics, highlighting the contextual nature of sentiment's market impact. Future research could productively explore additional institutional mediators and comparative frameworks to further elucidate these cross-country differences.

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