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The Effects of Confidence Index-Based Investor Sentiments Conditional upon Market Movements on European Stock Market Returns

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Piyasa Hareketlerine göre Koşullu Güven Endeksine Dayalı Yatırımcı Duyarlılıklarının Avrupa Hisse Senedi Piyasası Getirilerine Etkisi	**The Effects of Confidence Index-Based Investor Sentiments Conditional upon Market Movements on European Stock Market Returns**
Öz Bu çalışmanın amacı, yatırımcıların piyasa hareketlerine bağlı olarak makroekonomik gelişmelere verdikleri asimetrik tepkileri dikkate alarak oluşturulan rasyonel ve irrasyonel yatırımcı duyarlılıklarının 13 Avrupa borsasında getiri oranları üzerindeki etkilerini analiz etmektir. Şubat 2005 ile Aralık 2024 arasındaki örnek döneme ait aylık verilerin kullanılması ile uygulanan panel veri analizi sonuçları, koşullu modellerden türetilen yatırımcı duyarlılıklarının piyasa getirilerini açıklamada istatistiksel olarak anlamlı olduğunu ve koşullu yöntemin uygulanmasının modellerin açıklama gücünü artırdığını göstermektedir. Çalışma sonucunda ayrıca piyasa getirileri ve irrasyonel duygular arasında çift yönlü nedenselliklerin yanı sıra anlamlı karşılıklı tepkilere dair bulgular elde edilmiştir.	**Abstract** The aim of this research is to analyze the effects of rational and irrational investor sentiments on 13 European stock markets by considering the asymmetric reactions of the investors to macroeconomics developments conditional upon market movements. We use monthly data over the sample period of February 2005 to December 2024 and implement panel data analyses. The results show that all investor sentiments derived from conditional models are statistically significant in explaining market returns and implementing conditional method increases the explanation power of the models. We find the evidence of bilateral causal relations as well as significant reciprocal responses among market returns and irrational sentiments.
Anahtar Kelimeler: Yatırımcı duyarlılığı, Güven endeksi, Panel veri analizi	**Keywords:** Investor sentiment, Confidence index, Panel data analysis
JEL Kodları: G12, G14, G15	**JEL Codes:** G12, G14, G15

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1. Introduction

The behavioral approach of Kahneman and Tversky (1979) brought a new perspective in the investment theory by explaining the role of investor psychology on asset prices. The behavioral finance literature started to grow further with the concept of noise trader risk in the financial markets which is presented by Black (1986) and De Long et al. (1990). An increasing amount of research provides evidence of the significance of noise on asset returns as a result of irrational investor behavior. The conclusions reveal that investor sentiment as a result of noise trading should also be considered along with the fundamental risk factors in the pricing mechanism of asset returns (Ramiah et al., 2015; Sakariyahu et al., 2024, p. 138). However, investor sentiment is not a directly observable factor, but several proxies are derived to reflect its effects. The most common proxies are closed end fund discount (Zweig, 1973; Lee et al., 1991), market-based sentiment indexes (Baker & Wurgler, 2006; Chen, 2012; He et al., 2019; Paterson et al., 2024), social media-based measures (Schumaker & Chen, 2009; Rao & Srivastava, 2012; Oliveira et al., 2013; Uhl, 2014; and Dosumu, 2023), trading activity-based measures (Brown & Cliff, 2004; Neal & Wheatley, 1998), derivative variables (Brown & Cliff, 2004), dividend premium (Baker & Wurgler, 2006), IPO-related measures (Baker & Wurgler, 2006; Brown & Cliff, 2004) and survey-based confidence indexes (see Lemmon & Portniaguina, 2006; Chen, 2011; Finter et al., 2012; Dalika & Seetharam, 2015, and Salhin et al., 2016).

Besides the continuing debate on generating the most convenient sentiment proxy, among the others, confidence indexes are widely used in the financial markets (see De Bondt, 1993; Fisher & Statman, 2000; Fisher & Statman, 2003; Brown & Cliff, 2004; Qiu & Welch, 2004; Verma et al., 2008; Calafiore et al., 2010; Stambaugh et al., 2012; Bayram, 2017). Consumer and business confidence indexes are generated from the surveys which measure the consumers' and businesses' perceptions on current economic conditions and future expectations. Kadilli (2015) argues the advantages of confidence indexes as that they cover the investor sentiment at the aggregate level, and they do not reflect only financial stock markets. Qiu and Welch (2004) state that consumer confidence index is a convenient proxy because it correlates well with the investor sentiment.

Investor sentiment is generally considered as a reflection of solely the irrationality of the investors in classical view. However, Verma et al. (2008) point out another perspective of investor sentiment by proposing a method for distinguishing the rational and irrational investor sentiments. Their method enables to analyze the source of the sentiment effect on asset returns whether it is arising from rational or irrational behavior. They test their model by implementing consumer and business confidence indexes in the US market. Tetlock et al. (2008), Bollen et al. (2011), and Bartov et al. (2018) also find that information-based investor sentiment contains relevant information for stock returns contrary to the general consideration about investor sentiment as a source of irrational noise trading.

Another aspect of investor behavior can be considered as its asymmetric structure under different conditions. Prospect theory of Kahneman and Tversky (1979) is an important cornerstone of finance theory that presents the significance of different states on investor behavior. According to the theory, investors are risk averse in the profit area and risk seeker in the loss area. Therefore, their reactions and investment decisions may differ according to different conditions. Conditional pricing models also consider different phases of markets. In their research, Pettengill et al. (1995) test Sharpe-Lintner-Black model conditional to market movements. Their findings propose a positive risk premium in up-markets and a negative risk

premium in down-markets. Altay et al. (2024) also present the significance of considering different conditions of market in testing pricing models. On the other hand, Levy (1974) and Fabozzi and Francis (1977) suggest separate CAPM betas during up and down-markets. Hence, it is relevant to analyze the relations in the market under different conditions like up and down-markets.

In this research we contribute to the literature by analyzing the effects of conditional rational and irrational investor sentiments on market returns to reveal a deeper understanding of the fundamental and noise trading in 13 European markets. We generate rational and irrational investor sentiments by implementing a conditional version of the approach of Verma et al. (2008) which employs consumer and business confidence indexes. The paper is organized as follows: the next section summarizes the related literature; Section 3 presents the data and methodology. Empirical findings are reported in Section 4 and conclusions are presented in Section 5.

2. Literature Review

The seminal works of Black (1986) and DeLong et al. (1990) reveal the significance of noise trading and investor sentiment in the financial markets with important implications for asset pricing. Following the theoretical framework describing the importance of investor sentiment on the pricing mechanism, empirical research focuses on the convenience of different sentiment measures and the significance of their effects on market returns.

A group of studies analyze the predicting power of investor sentiment on asset returns by testing the relation between confidence and stock market indexes. Research by Brown and Cliff (2004) presents evidence that pricing market errors are positive whereas future returns are negatively related with investor sentiment in the US market. The results support the hypothesis that current high sentiment is followed by low long-run returns due to the reversion of market prices to their fundamental values. Another research by Jansen and Nahuis (2003) analyzes the relation between stock market returns and consumer confidence index and finds positive relations for 9 out of 11 European countries. The research of Lemmon and Portniaguina (2006) also implements consumer confidence data as a proxy for sentiment and finds that investor sentiment affects stock returns in the US market. They show that during high consumer confidence periods, investors appear to overvalue small stocks relative to large stocks. Solt and Statman (1988), De Bondt (1993), Clarke and Statman (1998), Fisher and Statman (2000), and Brown and Cliff (2004) also examine the effects of investor sentiments on stock returns and provide evidence of strong co-movements between investor sentiments and stock returns in US markets.

Following the above stated research, Verma et al. (2008) contribute to the literature by decomposing sentiment into rational and irrational components and employ individual as well as institutional confidence indexes. The results reveal that both components of sentiments are significant but rational sentiments have a larger impact on stock market returns than that of irrational sentiments in the US market.

The effect of investor sentiment is also analyzed in emerging markets. Among the others, research by Korkmaz and Çevik (2009), Köse and Akkaya (2016), Koy and Akkaya (2017), Eyüboğlu and Eyüboğlu (2017), Usul et al. (2017), Canöz (2018), Münyas (2019), and Kocabıyık and Alptürk (2020) reveal significant relations between confidence and Borsa Istanbul indexes. Calafiore et al. (2010) analyze the sentiment effect in the Brazilian stock market and find

significant results. Da et al. (2014) study the impact of household sentiments on short term return reversals and volatility. They show that the sentiment proxies broadly predict aggregate market returns with a mean reversal. Verma and Soydemir (2006) conduct a cross-country analysis and examine the effect of US individual and institutional sentiment on the stock markets of US, UK, Mexico, Brazil and Chile. They find that US sentiment significantly affects US, UK, Mexico and Brazil but not market returns of Chile. Alajekwu et al. (2017), Yadav and Chakraborty (2022), Chen (2024) and Moodley et al. (2025) examine Nigerian, Indian, Chinese and South African stock markets respectively and find the evidence that investor sentiment has significant effects on stock market returns.

The effect of investor sentiment is also analyzed during the COVID-19 pandemic as a global stress period. The research of Cevik et al. (2022) reveals significant relations between positive and negative investor sentiments and the returns as well as volatilities of 20 stock markets. Ernawati et al. (2022), Ahmed and Henchiri (2025), and Sun and Yang (2025) provide evidence of statistically significant relation between investor sentiment and stock market returns in the Indonesian, USA, French, and Chinese stock markets during the COVID-19 pandemic, respectively. Moreover, Singh & Dubey (2025) also finds significant effects of sentiment on stock market volatility.

Another group of research analyses the effect of investor sentiment as a risk factor in the framework of asset pricing models. Ho and Hung (2009) examine significance of sentiment proxies on risk adjusted returns of individual stocks in US market. They reveal that incorporating sentiment augments the pricing models and explains the stock anomalies. The research by Yang and Zhang (2013), Das et al. (2015), and Bathia and Bredin (2018) also provide the evidence of significant contribution of sentiment-augmented asset pricing models in explaining some anomalies in the US market. Another research by Sakariyahu et al. (2024) finds that sentiment-augmented asset pricing model explains the excess portfolio returns in the UK market. There is also evidence from the Chinese stock market. Liang et al. (2017) employ sentiment in the asset pricing model and conclude that a bullish market sentiment increases stock demand and prices. On the other hand, Xu and Green (2013) test the impact of investor sentiment on stock returns in China by implementing the three-factor Fama–French model. The results reveal that sentiment appears to affect smaller companies than the larger ones.

The research of Gervais and Odean (2001), Nofsinger (2005) and Li and Luo (2017) propose that investors present asymmetric behaviors in different market regimes. Zou and Sun (2012) structure a model of distinguished investor behavior under different market conditions such as bull and bear markets. Chung et al. (2012) present the significance of investor sentiment on asset returns only during economic expansions. Kadilli (2015) investigate the impact of investor sentiment on asset returns during crisis and normal times and finds significant differences during different states. Wang et al. (2022) also examined the impact of turnover as the investor sentiment proxy on asset returns conditional to market regimes by applying GARCH-type models. There is also significant research testing the conditional asset pricing models which present the distinguished behavior of asset returns. Pettengill et al. (1995) propose a conditional asset pricing model considering the asymmetric characteristics of the asset returns under up and down-markets. They define up-markets as the period when market returns are greater than risk free rate. In this research we also aim to contribute to the literature by reflecting the asymmetry in investor sentiments on rational and irrational sentiment generating procedure. We implement the method of Pettengill et al. (1995) to estimate investor sentiments

to capture the possible differences in different market conditions and present how this distinction produces different results from the unconditional sentiment generation process.

3. Data and Methodology

We use monthly data of 13 European countries over the sample period of February 2005 to December 2024. We analyze a heterogeneous sample which includes both emerging and developed countries. The sample countries and their market indices are presented in Table 1. We get the macroeconomic data and confidence index from OECD data explorer and Turkish Republic Central Bank EVDS data central. We employ Composite consumer confidence and Composite business confidence indexes as two proxies of individual and institutional sentiment indexes (see Brown & Cliff, 2004; Fisher & Statman, 2000; De Bondt, 1993; Verma et al., 2008 and Calafiore et al., 2010).

Table 1: Countries and Market Indexes

Country	Stock Market Index	Country	Stock Market Index
Austria	ATX	Netherlands	AEX
Belgium	BEL20	Poland	WIG20
Czechia	PX	Spain	IBEX 35
France	CAC 40	Sweden	OMX S30
Germany	DAX	Turkiye	BIST 100
Greece	ATG	United Kingdom	FTSE 100
Italy	FTSE Italia All Share		

At the beginning of our analysis, we decompose investor sentiments into rational and irrational parts indicating the sentiments related to fundamentals and noise respectively following the procedure of Verma et al. (2008). The rational and irrational components of individual and institutional investor sentiments are generated by estimating the following two unconditional regression models (Verma et al., 2008, p. 1306):

$$S^{u}_{ind,it} = \gamma_0 + \gamma_j \sum_{j=1}^{J} F_{j,it} + \zeta_{it} \quad (1)$$

$$S^{u}_{ins,it} = \theta_0 + \theta_j \sum_{j=1}^{J} F_{j,it} + \xi_{it} \quad (2)$$

where $S^{u}_{ind,it}$ and $S^{u}_{ins,it}$ are the logarithmic changes in consumer confidence index and business confidence index of country i at month t respectively, $F_{j,it}$ is the logarithmic change in fundamental factor j of country I at month t, ζ_{it} and ξ_{it} are the error terms. The fitted values of regressions in equations (1) and (2) are considered as rational sentiment components whereas residuals are the irrational sentiment components of individual and institutional investors respectively.

We implement the method of Pettengill et al. (1995) to capture the possible differences in different market conditions. They define up-markets as the months when stock market returns exceed risk-free rates. We also implement the same method by employing monthly interbank rates from OECD data explorer as risk-free rates of each country (we use short term interest rates for the missing data in data explorer).

The estimated conditional panel regression models can be shown as:

$$S^{c}_{ind,it} = \gamma_0 + \gamma_1 \delta_t + \gamma_j \sum_{j=2}^{J} \delta_t F_{j,it} + \gamma_j \sum_{j=2}^{J} (1 - \delta_t) F_{j,it} + \varepsilon_{it} \quad (3)$$

$$S^{c}_{ins,it} = \theta_0 + \theta_1\delta_t + \theta_j \sum_{j=2}^{J} \delta_t F_{j,it} + \theta_j \sum_{j=2}^{J} (1-\delta_t) F_{j,it} + \vartheta_{it} \quad (4)$$

$$\delta_t = \begin{cases} 1 \; if \; R^{M}_{it} > R^{rf}_{it} \\ 0 \; if \; R^{M}_{it} < R^{rf}_{it} \end{cases}$$

where, $S^{c}_{ind,it}$ and $S^{c}_{ins,it}$ are the logarithmic changes in consumer confidence index and business confidence index of country i at month t respectively, ε_{it} and ϑ_{it} are error terms, δ_t is the dummy variable, R^{M}_{it} is the return of the market index of country i at month t and R^{rf}_{it} is the risk free rate of country i at month t. We can rewrite Equations (3) and (4) as:

$$S^{c}_{ind,it} = \gamma_0 + \gamma_1\delta_t + \gamma_j \sum_{j=2}^{J} F^{up}_{j,it} + \gamma_j \sum_{j=2}^{J} F^{dw}_{j,it} + \varepsilon_{it} \quad (5)$$

$$S^{c}_{ins,it} = \theta_0 + \theta_1\delta_t + \theta_j \sum_{j=2}^{J} F^{up}_{j,it} + \theta_j \sum_{j=2}^{J} F^{dw}_{j,it} + \vartheta_{it} \quad (6)$$

Previous studies provide evidence about the significant relation between various macroeconomic variables and confidence index. These are inflation rates (see Fuhrer, 1993; Acemoğlu & Scott, 1994; Golinelli & Parigi, 2004; and Çetin, 2021), industrial production index (see Çelik, Aslanoğlu & Uzun, 2010; Arısoy, 2012; Kılıç & Çankaya, 2016; and Küçükçaylı & Akıncı, 2018), interest rates (see Throop, 1992; Fuhrer, 1993; Acemoğlu & Scott, 1994; Çelik & Özerkek, 2009; and Küçükçaylı & Akıncı, 2018), and unemployment rate (see Throop, 1992; Fuhrer, 1993; Ludvigson, 2004; Golinelli & Parigi, 2004; Caleiro, 2006; Arısoy, 2012 and Beşel & Yardımcıoğlu, 2016). Following the previous research we employ logarithmic change in consumer price index, logarithmic change in industrial production index, short-term interest rates, economic risk premium (difference between long and short-term interest rates, see Verma et al., 2008) and unemployment rate to generate fundamental variables in the models.

We employ major stock market index returns of sample countries to test the significance of rational and irrational investor sentiments. We utilize Refinitive database for monthly stock market index data of 13 European countries and generate market returns by taking their first logarithmic differences as follows:

$$R^{M}_{it} = \ln(P^{M}_{it}) - \ln(P^{M}_{it-1}) \quad (7)$$

where R^{M}_{it} is the market return of stock market i at month t and P^{M}_{it} is the stock market index value of market i at month t. Descriptive statistics of the variables are presented in Table 2.

The positive mean values of percentage changes in consumer confidence indexes suggest that only the individual investors of Germany, Netherlands, Poland and institutional investors of Greece and Netherlands are bullish on the average during the sample period. When we compare the bullishness of two types of investors, institutional investors seem to be more bearish in Austria, Belgium, Czechia, Germany, Poland and Sweden. Although there is a general pessimism in the sample period, average bullishness and bearishness distinguishes among countries and investor types. The standard deviations of confidence indexes are the highest in Turkiye. Belgium has the lowest variation in individual investor sentiment and Italy has the lowest variation in institutional investment sentiment. Figure 1 and Figure 2 plot the cross-sectional features of both investor sentiments by countries.

Table 2: Descriptive Statistics

		Sind	*Sins*	*Rcpi*	*Rind*	*EcnRP*	*STint*	*UEmp*	R^M
Austria	Mean	-0.00005	-0.00014	0.00209	0.00237	0.00917	0.00096	0.05495	0.00147
	Std.Dev.	0.00216	0.00309	0.00417	0.10169	0.00951	0.00140	0.00680	0.06632
	Skewness	-0.83540	-0.76198	0.47836	0.11593	0.18383	0.82531	0.32510	-1.36726
	Kurtosis	2.05345	3.47411	2.23928	-0.51457	-0.28523	-0.71681	-0.10148	5.54383
	Jarque-Bera	69.498	142.720	58.803	3.159	2.147	32.114	4.295	378.933
	Probability	0.00000	0.00000	0.00000	0.20609	0.34177	0.00000	0.11680	0.00000
Belgium	Mean	-0.00005	-0.00010	0.00201	0.00200	0.01085	0.00096	0.07163	0.00144
	Std.Dev.	0.00210	0.00333	0.00379	0.09382	0.01065	0.00140	0.01217	0.04814
	Skewness	-0.05568	-0.93809	1.49413	-0.09714	0.20762	0.82531	-0.23748	-1.06552
	Kurtosis	0.68676	5.56528	7.09072	0.49685	-0.72364	-0.71681	-1.39616	4.25206
	Jarque-Bera	4.800	342.049	587.146	2.822	6.903	32.114	21.567	224.328
	Probability	0.09071	0.00000	0.00000	0.24386	0.03170	0.00000	0.00002	0.00000
Czechia	Mean	-0.00005	-0.00017	0.00270	0.00218	0.00687	0.00174	0.04741	0.00180
	Std.Dev.	0.00270	0.00437	0.00669	0.09646	0.01455	0.00164	0.02055	0.05641
	Skewness	-0.62450	-0.16098	3.88497	-0.53803	-0.76058	1.27314	0.08328	-1.30711
	Kurtosis	2.22925	7.18904	25.86544	0.37376	0.28282	0.69545	-1.57911	6.19659
	Jarque-Bera	64.752	513.544	7233.146	12.868	23.740	69.091	25.003	448.550
	Probability	0.00000	0.00000	0.00000	0.00161	0.00001	0.00000	0.00000	0.00000
France	Mean	-0.00008	-0.00004	0.00136	-0.00043	0.00956	0.00096	0.08830	0.00258
	Std.Dev.	0.00277	0.00299	0.00368	0.13110	0.00940	0.00140	0.01041	0.04853
	Skewness	-0.37071	-1.40056	-0.06506	0.29973	-0.06559	0.82531	-0.09301	-0.44465
	Kurtosis	1.14282	7.51399	1.13917	1.01263	-0.50797	-0.71681	-1.20451	1.43729
	Jarque-Bera	18.403	637.705	13.037	13.732	2.729	32.114	14.731	28.328
	Probability	0.00010	0.00000	0.00148	0.00104	0.25545	0.00000	0.00063	0.00000
Germany	Mean	0.00004	-0.00009	0.00165	0.00065	0.00526	0.00096	0.05278	0.00642
	Std.Dev.	0.00223	0.00237	0.00395	0.09018	0.00905	0.00140	0.02354	0.05197
	Skewness	-0.38549	-0.52480	0.31683	-0.23310	-0.15515	0.82531	1.08307	-0.76145
	Kurtosis	2.04930	2.88235	2.57929	0.10718	0.15130	-0.71681	0.11686	2.08543
	Jarque-Bera	47.541	93.312	69.955	2.269	1.182	32.114	46.666	66.127
	Probability	0.00000	0.00000	0.00000	0.32155	0.55383	0.00000	0.00000	0.00000
Greece	Mean	-0.00014	0.00009	0.00150	0.00023	0.05385	0.00096	0.16537	-0.00290
	Std.Dev.	0.00336	0.00532	0.01163	0.08575	0.05723	0.00140	0.06625	0.08648
	Skewness	-0.39991	-0.96632	0.51883	-0.41642	1.65416	0.82531	0.28136	-0.70454
	Kurtosis	1.59473	2.55174	-0.27593	-0.20482	3.10626	-0.71681	-1.34541	1.55261
	Jarque-Bera	31.564	101.611	11.433	7.294	204.223	32.114	21.091	43.595
	Probability	0.00000	0.00000	0.00329	0.02606	0.00000	0.00000	0.00003	0.00000

Table 2: Descriptive Statistics (continued)

		Sind	Sins	Rcpi	Rind	EcnRP	STint	UEmp	RM
Italy	Mean	-0.00003	-0.00003	0.00156	-0.00041	0.02137	0.00096	0.09286	0.00051
	Std.Dev.	0.00316	0.00229	0.00346	0.24632	0.01400	0.00140	0.02064	0.05822
	Skewness	-0.43469	-0.91699	3.65628	-0.27563	0.25820	0.82531	0.17336	-0.49350
	Kurtosis	3.22224	5.03385	31.48696	1.97326	-0.54632	-0.71681	-1.24069	1.83581
	Jarque-Bera	110.458	284.639	10361.948	41.626	5.604	32.114	16.457	43.082
	Probability	0.00000	0.00000	0.00000	0.00000	0.06068	0.00000	0.00027	0.00000
Netherlands	Mean	0.00000	0.00000	0.00190	0.00051	0.00756	0.00096	0.05703	0.00376
	Std.Dev.	0.00216	0.00234	0.00625	0.07039	0.00932	0.00140	0.01492	0.04839
	Skewness	-0.56925	-2.41724	0.35796	0.32322	0.05364	0.82531	0.24080	-1.06994
	Kurtosis	1.16565	15.97078	6.36458	-0.38162	-0.14849	-0.71681	-0.91488	3.39057
	Jarque-Bera	26.328	2761.177	406.785	5.588	0.333	32.114	10.600	159.411
	Probability	0.00000	0.00000	0.00000	0.06117	0.84671	0.00000	0.00499	0.00000
Poland	Mean	0.00007	-0.00005	0.00277	0.00425	0.00804	0.00292	0.07377	0.00063
	Std.Dev.	0.00271	0.00320	0.00499	0.07059	0.00826	0.00158	0.04023	0.06267
	Skewness	-1.95348	-2.48135	1.97541	-0.08205	-0.43025	0.03309	0.76618	-0.37739
	Kurtosis	11.47090	20.53372	6.97497	0.80717	-0.72869	-1.07880	0.18998	1.18792
	Jarque-Bera	1456.222	4425.431	637.237	6.728	12.609	11.585	23.644	19.644
	Probability	0.00000	0.00000	0.00000	0.03460	0.00183	0.00305	0.00001	0.00005
Spain	Mean	-0.00002	-0.00002	0.00177	-0.00048	0.01772	0.00096	0.16400	0.00098
	Std.Dev.	0.00422	0.00307	0.00624	0.14501	0.01580	0.00140	0.05461	0.05591
	Skewness	-1.09306	-1.44518	0.04219	-0.37596	0.65452	0.82531	0.19686	-0.38819
	Kurtosis	4.50853	12.99226	1.94196	1.03689	-0.10945	-0.71681	-1.04335	2.88653
	Jarque-Bera	248.967	1756.767	37.468	16.268	17.112	32.114	12.332	88.604
	Probability	0.00000	0.00000	0.00000	0.00029	0.00019	0.00000	0.00210	0.00000
Sweden	Mean	-0.00002	-0.00004	0.00170	0.00087	0.00854	0.00087	0.07670	0.00513
	Std.Dev.	0.00422	0.00302	0.00485	0.12023	0.01009	0.00128	0.00866	0.04637
	Skewness	-1.09306	-0.34501	0.03124	-0.69379	-0.19671	0.67539	-0.06124	-0.65791
	Kurtosis	4.50853	2.86986	2.33861	0.53967	0.62780	-0.79525	-0.73364	1.83239
	Jarque-Bera	248.967	86.396	54.274	21.981	5.443	24.366	5.486	50.466
	Probability	0.00000	0.00000	0.00000	0.00002	0.06576	0.00001	0.06437	0.00000
Turkiye	Mean	-0.00035	-0.00002	0.01321	0.00467	-0.00848	0.01151	0.10461	0.01498
	Std.Dev.	0.00499	0.01016	0.01771	0.10825	0.05797	0.00703	0.01598	0.08006
	Skewness	-0.73863	-0.31151	2.91199	-0.45172	-2.80248	2.40468	0.74814	-0.11774
	Kurtosis	1.92878	9.73777	12.37883	0.45191	8.25723	6.28931	-0.49624	0.57473
	Jarque-Bera	58.533	944.188	1855.944	10.119	987.675	621.630	24.644	3.825
	Probability	0.00000	0.00000	0.00000	0.00635	0.00000	0.00000	0.00000	0.14767

Table 2: Descriptive Statistics (continued)

		Sind	Sins	Rcpi	Rind	EcnRP	STint	UEmp	RM
UK	Mean	-0.00010	-0.00008	0.00228	-0.00002	0.00676	0.00166	0.05532	0.00225
	Std.Dev.	0.00409	0.00458	0.00341	0.06747	0.01229	0.00173	0.01491	0.03780
	Skewness	-0.56274	-0.00773	0.67570	-0.36050	0.27271	0.86396	0.63802	-0.72161
	Kurtosis	2.83119	3.85681	4.71820	1.32166	-0.58671	-1.03559	-1.03216	1.63474
	Jarque-Bera	92.050	147.512	238.870	22.478	6.364	40.244	26.712	47.156
	Probability	0.00000	0.00000	0.00000	0.00001	0.04151	0.00000	0.00000	0.00000
Observations		238	238	238	238	238	238	238	238
CD-test		65.51	96.50	41.41	83.39	93.90	113.74	42.83	92.44
p-value		0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000
CADF-test		-6.190	-6.190	-6.190	-6.190	-2.918	-3.132	-2.581	-6.190
p-value		0.000	0.000	0.000	0.000	0.000	0.000	0.001	0.000

Notes: *Sind* is the monthly log return of consumer confidence index as the proxy of individual investor sentiment, *Sins* is the monthly log return of business confidence index as the proxy of institutional investor sentiment, *Rcpi* is the monthly log change in consumer price index, *Rind* is the monthly percentage in industrial production, *EcnRP* is the economic risk premium measured by the difference between long and short-term interest rates, *UEmp* is the unemployment rate and R^M is the monthly return of stock market index. CD-test is the Pesaran cross dependence test statistics under the null hypothesis of cross-section independence. CADF-test is the Pesaran's second generation panel unit root test t-bar statistics.

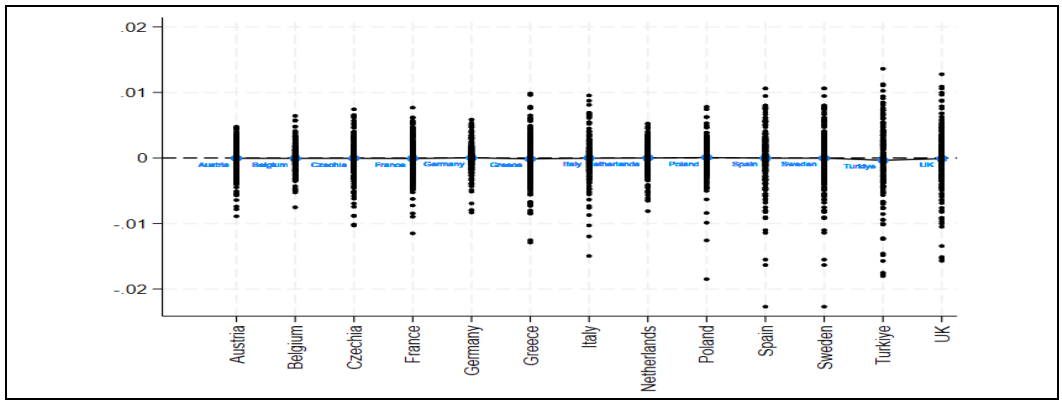
Descriptive statistics show that France has the lowest (0.00136) and Turkiye has the highest (0.01321) average inflation rates. The average industrial production rates of France, Italy, Spain and UK are negative. On the other hand, Sweden has the lowest (0.00087) and Turkiye has the highest (0.01151) average short-term interest rates. Unemployment statistics show that Greece has the highest (0.16537) and lowest (0.04741) unemployment rates respectively. Greece also experienced the lowest average stock market return (-0.00290) and highest standard deviation (0.08648) for the period. The market return of Turkiye is the highest (0.01498) during the sample period. The results of Pesaran's CD test reject the null hypothesis of cross-sectional independence for all variables. Therefore the significant cross-sectional dependence across countries require implementing second-generation panel unit root tests. The results of Pesaran's CADF tests indicate that all variables are stationary.

We analyze the effects of rational and irrational investor sentiment on stock returns by estimating the significance of the fitted values and residuals of unconditional models in Equations (1) and (2).

$$R_{it}^{M} = \lambda_0 + \lambda_1 \hat{S}_{ind,it}^{u} + \lambda_2 \hat{S}_{ins,it}^{u} + \lambda_3 \zeta_{it} + \lambda_4 \xi_{it} + \epsilon_{it} \quad (8)$$

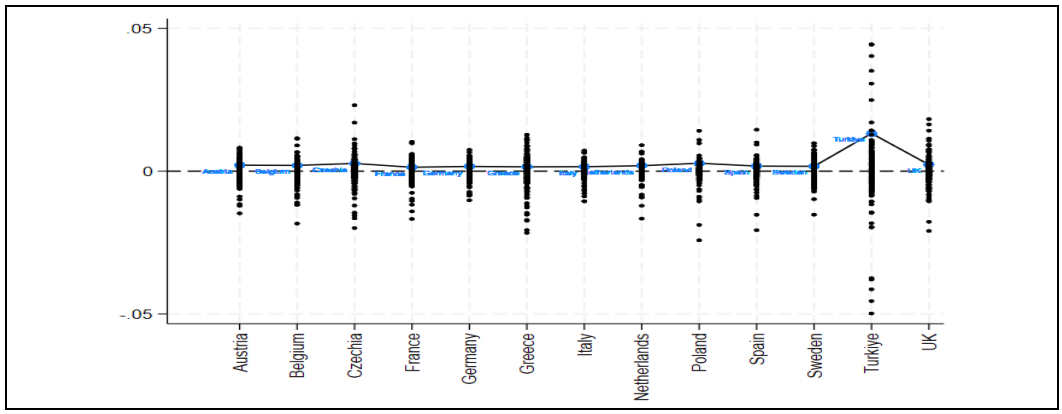
where λ_0 is the constant term, λ_1 and λ_2 are the parameters capturing the effects of individual and institutional rational sentiments on market returns, λ_3 and λ_4 are the parameters capturing the effects of individual and institutional irrational sentiments on market returns. $\hat{S}_{ind,it}^{u}$ and $\hat{S}_{ins,it}^{u}$ are the fitted values of Equations of (1) and (2) indicating individual and institutional rational investor sentiments respectively, ζ_{it} and ξ_{it} are the residuals of Equations (1) and (2) indicating individual and institutional irrational investor sentiments respectively.

Figure 1: Monthly Logarithmic Change in Individual Investor Sentiments by Countries



Note: Consumer confidence index is used as Individual investor sentiment.

Figure 2: Monthly Logarithmic Change in Institutional Investor Sentiments by Countries



Note: Consumer confidence index is used as Individual investor sentiment.

We also estimated the parameters of the following panel regression model by employing the fitted values and residuals of conditional models (Equations (3) and (4)):

$$R_{it}^{M} = \lambda_0 + \lambda_1 \hat{S}_{ind,it}^{c} + \lambda_2 \hat{S}_{ins,it}^{c} + \lambda_3 \varepsilon_{it} + \lambda_4 \vartheta_{it} + \varsigma_{it} \quad (9)$$

where $\hat{S}_{ind,it}^{c}$ and $\hat{S}_{ins,it}^{c}$ are the fitted values of Equations of (3) and (4), ε_{it} and ϑ_{it} are the residuals of Equations (5) and (6). These models allow us to analyze the effects of sentiments stimulated by fundamental and noise trading.

4. Empirical Findings

4.1. Rational and Irrational Investment Sentiments

In our main analysis, we first implement unconditional models as depicted in Equations (1) and (2) to derive rational and irrational investor sentiments. We estimated 2 fixed effect panel regression models of individual and institutional investment sentiments to capture the heterogeneity. The results are summarized in Table 3 and Table 4.

Table 3: Unconditional Individual Investor Sentiment Estimations

$$S^{u}_{ind,it} = \gamma_0 + \gamma_1 Rind_{it} + \gamma_2 STint_{it} + \gamma_3 EconRP_{it} + \gamma_4 Rcpi_{it} + \gamma_5 UEmp_{it} + \zeta_{it}$$

	Panel A		Panel B		
	Coefficient	p-value	Coefficient	p-value	Robust model p-value
Rind	0.00083	0.088	0.00084	0.087	0.018
STint	-0.02951	0.353			
EcnRP	-0.00926	0.006	-0.00736	0.006	0.012
Rcpi	-0.05963	0.000	-0.06080	0.000	0.000
UEmp	0.01533	0.000	0.01498	0.000	0.000
c	-0.00103	0.000	-0.00108	0.000	0.001
R-squared Within	0.0355		0.0352		
R-squared Between	0.0013		0.0054		
R-squared Overall	0.0210		0.0206		
Mod.Bhargava et al. DW	0.4318		0.4324		
Modified Wald test	44.35	0.000	45.45	0.000	
			Hausman test chi2(4)=31.09		Prob > chi2=0.0000

Notes: S^{u}_{ind} is the unconditional monthly log return of consumer confidence index as the proxy of individual investor sentiment, *Rind* is the monthly log change in industrial production, *Stint* is the monthly log change in short-term interest rates, *EcnRP* is the economic risk premium measured by the difference between long and short-term interest rates, *Rcpi* is the monthly log change in consumer price index and *UEmp* is the unemployment rate, *c* is the constant term. Fixed effect panel regression model is estimated.

Panel regression estimates summarized in Table 3, Panel A show that only short term interest *rate (STint) is* statistically insignificant on explaining individual investor sentiment. The statistics of Modified Bhargaya et al. Durbin Watson test and Modified Wald test in Table 3 show that there are autocorrelation and heteroscedasticity in the residuals of all models. Therefore, we also present the p-values derived from White-Huber robust standard errors of the final models (Panel B). The results confirm that industrial production (*Rind*), economic risk premium (*EcnRP*), inflation rate (*Rcpi*) and unemployment rate (*UEmp*) have statistically significant effects on consumer confidence indexes. Among the others, previous findings by Ramalho et al. (2011) and Raaij (2012) document significant effects of inflation and unemployment rates on consumer confidence, Paradiso et al. (2014) and Ghosh (2021) present the influence of interest rates on consumer confidence index, Çelik and Deniz (2017) document the significance of inflation and interest rates on confidence indexes. On the other hand, Kilic and Cankaya (2016) provide evidence of strong relation between consumer confidence index and industrial production. The significant and positive relation between industrial production and confidence can be attributed to the possibility of increase in employment and income for individuals that results in increased welfare and decrease in economic uncertainty. However, the effect of unemployment rate on individual confidence is unexpectedly positive. Expansionary fiscal and monetary policies during high unemployment periods may be the result of increase in confidence for individuals. Our findings also present inconsistent results with the insignificant influence of short-term interest rates on individual consumer confidence. Although the parameter estimation is negative, short-term interest rates do not seem to effect individual confidence. The negative relations between confidence and economic risk premium as well as inflation rate are consistent with the

theoretical expectations. Increase in economic risk premium and inflation deteriorates current economic conditions as well as economic expectations.

Table 4: Unconditional Institutional Investor Sentiment Estimations

$$S^{u}_{ins,it} = \theta_0 + \theta_1 Rind_{it} + \theta_2 STint_{it} + \theta_3 EconRP_{it} + \theta_4 Rcpi_{it} + \theta_5 UEmp_{it} + \xi_{it}$$

	Panel A		Panel B		
	Coefficient	p-value	Coefficient	p-value	Robust model p-value
Rind	0.00277	0.000	0.00277	0.000	0.051
STint	-0.19965	0.000	-0.18923	0.000	0.028
EcnRP	-0.00264	0.554			
Rcpi	-0.00717	0.509			
UEmp	0.01588	0.000	0.01520	0.000	0.018
c	-0.00095	0.000	-0.00096	0.000	0.119
R-squared Within	0.0315		0.0313		
R-squared Between	0.2310		0.2537		
R-squared Overall	0.0173		0.0176		
Mod.Bhargava et al. DW	0.4602		0.4632		
Modified Wald test	298.53	0.000	301.03	0.000	
			Hausman test chi2(3)=39.55		Prob > chi2=0.0000

Notes: S^{u}_{ins} is the unconditional monthly log return of business confidence index as the proxy of institutional investor sentiment, *Rind* is the monthly log change in industrial production, *Stint* is the monthly log change in short-term interest rates, *EcnRP* is the economic risk premium measured by the difference between long and short-term interest rates, *Rcpi* is the monthly log change in consumer price index and *UEmp* is the unemployment rate, *c* is the constant term. Fixed effect panel regression model is estimated.

The results in Table 4 also demonstrate that the production confidence index is influenced by another set of fundamental factors. Industrial production, short-term interest rates and unemployment rates are significant on the business confidence index. The negative relationship between short-term interest rates and business confidence can be explained by the adverse effects of higher interest rates on the cost of capital.

These results can be interpreted as individual and institutional sentiments are generated by different dynamics. The model is reestimated by excluding insignificant variables to generate rational and irrational components of investor sentiments. We also demonstrate the p-values of the robust estimation in Panel B, due to the presence of autocorrelation and heterogeneity in residuals.

Table 5: Conditional Individual Investor Sentiment Estimations

$$S^{c}_{ind,it} = \gamma_0 + \gamma_1\delta_t + \gamma_2 Rind^{up}_{it} + \gamma_3 STint^{up}_{it} + \gamma_4 EconRP^{up}_{it} + \gamma_5 Rcpi^{up}_{it} + \gamma_6 UEmp^{up}_{it} + \gamma_7 Rind^{dw}_{it} + \gamma_8 STint^{dw}_{it} + \gamma_9 EconRP^{dw}_{it} + \gamma_{10} Rcpi^{dw}_{it} + \gamma_{11} UEmp^{dw}_{it} + \zeta_{it}$$

	Panel A		Panel B		
	Coefficient	p-value	Coefficient	p-value	Robust model* p-value
δ	0.00119	0.000	0.00113	0.000	0.008
$Rind^{up}$	0.00190	0.003	0.00191	0.003	0.015
$STint^{up}$	-0.04521	0.242			
$EconRP^{up}$	-0.00954	0.032			
$Rcpi^{up}$	-0.05621	0.000	-0.05692	0.000	0.002
$UEmp^{up}$	0.01420	0.000	0.01105	0.000	0.027
$Rind^{dw}$	-0.00016	0.824			
$STint^{dw}$	0.01826	0.621			
$EconRP^{dw}$	-0.00590	0.176			
$Rcpi^{dw}$	-0.06673	0.000	-0.05840	0.000	0.022
$UEmp^{dw}$	0.01444	0.000	0.01219	0.000	0.000
c	-0.00164	0.000	-0.00151	0.000	0.000
R-squared Within	0.0620		0.0591		
R-squared Between	0.0000		0.0000		
R-squared Overall	0.0459		0.0447		
Mod.Bhargava et al. DW	0.4829		0.4786		
Modified Wald test	43.54	0.000	44.41	0.000	
			Hausman test chi2(6)=24.76		Prob > chi2=0.0004

Notes: S^{c}_{ind} is the conditional monthly log return of consumer confidence index as the proxy of individual investor sentiment, *Rind* is the monthly log change in industrial production, *Stint* is the monthly log change in short-term interest rates, *EcnRP* is the economic risk premium measured by the difference between long and short-term interest rates, *Rcpi* is the monthly log change in consumer price index and *UEmp* is the unemployment rate, *c* is the constant term. The superscripts ^{up} and ^{dw} indicate that the corresponding variables are conditioned on the up and down markets, respectively. Fixed effect panel regression model is estimated.

* $EconR^{dup}$ Is excluded from the model due to its insignificant parameter at 10% level (p-value is 0.115).

Table 5 and Table 6 report the outcomes of conditional models. The results provide evidence of asymmetrical influence of fundamental economic factors on confidence indexes during up and down-markets. Parameter estimations of fixed effect panel regression model presented in Table 5 show that industrial production ($Rind^{up}$) is significant only during up-markets but inflation (*Rcpi*) and unemployment (*UEmp*) are significant in both up and down markets.

However, the structure is different in the model of business confidence index (Table 6). Industrial production ($Rind^{up}$) and economic risk premium ($EcnRP^{up}$) are statistically significant only during up-market but short-term interest rate ($STint^{dw}$) is significant during down-markets. Unlike the findings of the consumer confidence index, the inflation rate ($Rcpi^{dw}$) is insignificant in down-markets.

Table 6: Conditional Institutional Investor Sentiment Estimations

$$S^{c}_{ins,it} = \theta_0 + \theta_1\delta_t + \theta_2 Rind^{up}_{it} + \theta_3 STint^{up}_{it} + \theta_4 EconRP^{up}_{it} + \theta_5 Rcpi^{up}_{it} + \theta_6 UEmp^{up}_{it} + \theta_7 Rind^{dw}_{it} + \theta_8 STint^{dw}_{it} + \theta_9 EconRP^{dw}_{it} + \theta_{10} Rcpi^{dw}_{it} + \theta_{11} UEmp^{dw}_{it} + \zeta_{it}$$

	Panel A		Panel B		
	Coefficient	p-value	Coefficient	p-value	Robust model* p-value
δ	0.00123	0.000	0.00115	0.000	0.000
$Rind^{up}$	0.00484	0.000	0.00485	0.000	0.047
$STint^{up}$	-0.03856	0.453			
$EconRP^{up}$	0.01013	0.086	0.01320	0.007	0.035
$Rcpi^{up}$	-0.22146	0.097	-0.02330	0.059	0.079
$UEmp^{up}$	0.01073	0.002	0.00991	0.002	0.082
$Rind^{dw}$	0.00063	0.522			
$STint^{dw}$	-0.29670	0.000	-0.22593	0.000	0.002
$EconRP^{dw}$	-0.01132	0.052			
$Rcpi^{dw}$	0.01263	0.483			
$UEmp^{dw}$	0.01893	0.000	0.01544	0.000	0.003
c	-0.00161	0.000	-0.00157	0.000	0.003
R-squared Within	0.0610		0.0595		
R-squared Between	0.2747		0.3503		
R-squared Overall	0.0456		0.0461		
Mod.Bhargava et al. DW	0.5153		0.5127		
Modified Wald test	308.86	0.000	310.02	0.000	
			Hausman test chi2(7)=32.14		Prob > chi2=0.0000

Notes: S^{c}_{ins} is the conditional monthly log return of business confidence index as the proxy of institutional investor sentiment, *Rind* is the monthly log change in industrial production, *Stint* is the monthly log change in short-term interest rates, *EcnRP* is the economic risk premium measured by the difference between long and short-term interest rates, *Rcpi* is the monthly log change in consumer price index and *UEmp* is the unemployment rate, *c* is the constant term. The superscripts ^{up} and ^{dw} indicate that the corresponding variables are conditioned on the up and down markets, respectively. Fixed effect panel regression model is estimated.

* $EconRP^{dw}$ Is excluded from the model due to its insignificant parameter at 10% level (p-value is 0.166) in robust estimation.

Following the estimation of conditional and unconditional models for consumer and institutional confidence indexes, fitted values of each model are generated as rational investor sentiments and error terms are generated as irrational investor sentiments of both types of investors.

4.2. Effects of Investment Sentiments on Asset Returns

We employ rational and irrational investment sentiments proxies as explanatory variables in panel regression model to analyze their explanatory power on market returns as stated in Equation (8) and Equation (9). In order to analyze the stationarity of sentiment proxies, cross-sectional dependencies of variables are investigated to determine the convenient unit root test to implement. The test outcomes presented in Table 7 induce us to implement the second-

generation stationarity tests. The evidence from Pesaran's CADF tests indicates that the panel data of market index returns and investor sentiments are stationary.

Table 7: Cross sectional dependence and unit root tests of market returns and sentiment proxies

	Pesaran CD test		Average correlation	Pesaran's CADF test	
	CD-test	P value		Z[t-bar]	P value
R^M	92.44	0.000	0.678	-17.627	0.000
$\hat{S}^u_{ind}$	42.93	0.000	0.328	-15.040	0.000
$\hat{S}^u_{ins}$	82.29	0.000	0.604	-9.172	0.000
ζ	61.95	0.000	0.455	-17.627	0.000
ξ	93.12	0.000	0.683	-17.627	0.000
$\hat{S}^c_{ind}$	57.62	0.000	0.423	-17.013	0.000
$\hat{S}^c_{ins}$	66.93	0.000	0.491	-16.347	0.000
ε	58.77	0.000	0.432	-17.627	0.000
ϑ	89.43	0.000	0.656	-17.627	0.000

Notes: R^M is the monthly return of stock market index, $\hat{S}^u_{ind}$ is the rational individual investor sentiment, $\hat{S}^u_{ins}$ is the rational institutional investor sentiment, ζ is the irrational individual investor sentiment, and ξ is the irrational institutional investor sentiment derived by unconditional panel regression analysis. $\hat{S}^c_{ind}$ is the rational individual investor sentiment, $\hat{S}^c_{ins}$ is the rational institutional investor sentiment, ε is the irrational individual investor sentiment, and ϑ is the irrational institutional investor sentiment derived by conditional panel regression analysis.

Following the rejection of unit root in all sentiment proxies, we analyze the effects of rational and irrational investor sentiments on market returns. The fitted values of Equations (1) and (2) capture the rational individual and institutional investor sentiments respectively and the residuals of these models capture irrational sentiments. We also employ rational and irrational sentiment proxies which are generated from conditional models of Equations (5) and (6) that reflect the asymmetric characteristics based on market movements.

Table 8 summarizes the fixed effect panel regression estimations. Panel A reveals that individual rational sentiment is statistically insignificant in European stock markets when we consider the robust model outcomes. The findings indicate the importance of noise trading impact on stock returns. However, it is inconsistent with the results of Verma et al. (2008). Although they find significant effects of rational sentiments of institutional investors on the U.S., the U.K., Mexico, and Brazil, the effects of irrational sentiments are insignificant in these countries. Bayram (2017) also finds significant and positive effect of rational sentiments on Turkish stock market returns and Marschner et al. (2024) state greater impact of rational trading than irrational trading. On the other hand, our results summarized in Panel B show that all rational and irrational sentiments derived from the conditional models are significant at least at 10% level. These results reveal that both individual and institutional fundamental and noise trading affect market returns. The significant and positive signs of all parameters are also consistent with theoretical expectations, depicting that the increases in rational and irrational sentiments increase stock market returns. We can argue that this evidence highlights the importance of conditional models, especially when unconditional models fail to account for the asymmetric structure, which may obscure the impact of sentiment on asset returns. The comparison of R-squared values between unconditional and conditional models reveals

significantly lower statistics for the former, suggesting that accounting for the asymmetric response of investment sentiment to macroeconomic fundamentals, conditional on market movements, provides a stronger explanatory power.

Table 8: Effects of Investor Sentiments on Market Returns

Panel A: Unconditional sentiments $R_{it}^{M} = \lambda_0 + \lambda_1 \hat{S}_{ind,it}^{u} + \lambda_2 \hat{S}_{ins,it}^{u} + \lambda_3 \zeta_{it} + \lambda_4 \xi_{it} + \epsilon_{it}$				Panel B: Conditional sentiments $R_{it}^{M} = \lambda_0 + \lambda_1 \hat{S}_{ind,it}^{c} + \lambda_2 \hat{S}_{ins,it}^{c} + \lambda_3 \varepsilon_{it} + \lambda_4 \vartheta_{it} + \varsigma_{it}$			
	Coefficient	p-value	Robust estimation p-value		Coefficient	p-value	Robust estimation p-value
$\hat{S}_{ind}^{u}$	-3.06883	0.117	0.241	$\hat{S}_{ind}^{c}$	18.0879	0.000	0.069
$\hat{S}_{ins}^{u}$	3.03593	0.051	0.009	$\hat{S}_{ins}^{c}$	15.1414	0.000	0.009
ζ	2.61416	0.000	0.000	ε	1.2112	0.000	0.001
ξ	2.67156	0.000	0.000	ϑ	1.6174	0.000	0.010
c	0.00298	0.004	0.000	c	0.0049	0.000	0.000
		Statistic	p-value			Statistic	p-value
R-sqr Within		0.0807		R-sqr Within		0.2543	
R-sqr Between		0.0835		R-sqr Between		0.3404	
R-sqr Overall		0.0802		R-sqr Overall		0.1943	
Mod.Bhargava et al. DW		2.0062		Mod.Bhargava et al. DW		1.7608	
Modified Wald test		256.21	0.000	Modified Wald test		435.28	0.000
Hausman test: chi(4)		10.14	0.038	Hausman test: chi(4)		375.27	0.000

Notes: R^{M} is the monthly return of stock market index, $\hat{S}_{ind}^{u}$ is the rational individual investor sentiment, $\hat{S}_{ins}^{u}$ is the rational institutional investor sentiment, ζ is the irrational individual investor sentiment, and ξ is the irrational institutional investor sentiment derived by unconditional panel regression analysis. $\hat{S}_{ind}^{c}$ is the rational individual investor sentiment, $\hat{S}_{ins}^{c}$ is the rational institutional investor sentiment, ε is the irrational individual investor sentiment, and ϑ is the irrational institutional investor sentiment derived by conditional panel regression analysis, *c* is the constant term. Fixed effect panel regression analysis method is implemented.

At the next step, we analyze the lagged effects of investor sentiments on stock market returns. The summarized findings of robust estimation presented in Panel A of Table 9 show that parameters of rational investor sentiments ($\hat{S}_{ind,it}^{u}$ and $\hat{S}_{ins,it}^{u}$) and one month lagged rational individual investment sentiment ($\hat{S}_{ind,it-1}^{u}$) generated by unconditional models are statistically insignificant. However, all parameters of lagged and non-lagged irrational sentiments are statistically significant.

Table 9: Effects of Lagged Investor Sentiments on Market Returns

Panel A: Unconditional sentiments $R_{it}^{M} = \lambda_0 + \lambda_1 \hat{S}_{ind,it}^{u} + \lambda_2 \hat{S}_{ind,it-1}^{u} + \lambda_3 \hat{S}_{ins,it}^{u} + \lambda_4 \hat{S}_{ins,it-1}^{u} + \lambda_5 \zeta_{it} + \lambda_6 \zeta_{it-1} + \lambda_7 \xi_{it} + \lambda_8 \xi_{it-1} + \epsilon_{it}$				Panel B: Conditional sentiments $R_{it}^{M} = \lambda_0 + \lambda_1 \hat{S}_{ind,it}^{c} + \lambda_2 \hat{S}_{ind,it-1}^{c} + \lambda_3 \hat{S}_{ins,it}^{c} + \lambda_4 \hat{S}_{ins,it-1}^{c} + \lambda_5 \varepsilon_{it} + \lambda_6 \varepsilon_{it-1} + \lambda_7 \vartheta_{it} + \lambda_8 \vartheta_{it-1} + \varsigma_{it}$			
	Coeff.	p-value	Robust estimation p-value		Coeff.	p-value	Robust estimation p-value
$\hat{S}_{ind,it}^{u}$	-1.4559	0.524	0.576	$\hat{S}_{ind,it}^{c}$	21.9496	0.000	0.041
$\hat{S}_{ind,it-1}^{u}$	-2.3694	0.298	0.293	$\hat{S}_{ind,it-1}^{c}$	-13.2890	0.000	0.005
$\hat{S}_{ins,it}^{u}$	-2.1760	0.304	0.556	$\hat{S}_{ins,it}^{c}$	17.6583	0.000	0.014
$\hat{S}_{ins,it-1}^{u}$	7.8168	0.000	0.049	$\hat{S}_{ins,it-1}^{c}$	-3.2742	0.032	0.487
ζ_{it}	4.2577	0.000	0.000	ε_{it}	2.7601	0.000	0.000
ζ_{it-1}	-2.1600	0.000	0.012	ε_{it-1}	-1.5625	0.001	0.017
ξ_{it}	3.7663	0.000	0.001	ϑ_{it}	2.7290	0.000	0.014
ξ_{it-1}	-1.3636	0.001	0.006	ϑ_{it-1}	-0.8681	0.013	0.093
c	0.0028	0.006	0.000	c	0.0042	0.000	0.000
	Statistic	p-value			Statistic	p-value	
R-sqr Within	0.0993				0.3035		
R-sqr Between	0.1967				0.3775		
R-sqr Overall	0.0965				0.2554		
M.Bhargava et al. DW	2.0320				1.8065		
Modified Wald test	262.47	0.000			367.21	0.000	
Hausman test: chi(8)	14.11	0.079			184.33	0.000	

Notes: R^{M} is the monthly return of stock market index, $\hat{S}_{ind}^{u}$ is the rational individual investor sentiment, $\hat{S}_{ins}^{u}$ is the rational institutional investor sentiment, ζ is the irrational individual investor sentiment, and ξ is the irrational institutional investor sentiment derived by unconditional panel regression analysis. $\hat{S}_{ind}^{c}$ is the rational individual investor sentiment, $\hat{S}_{ins}^{c}$ is the rational institutional investor sentiment, ε is the irrational individual investor sentiment, and ϑ is the irrational institutional investor sentiment derived by conditional panel regression analysis, *c* is the constant term. Fixed effect panel regression analysis method is implemented.

The findings demonstrated in Panel B of Table 9 present the parameter estimations of conditional sentiments on market returns. The evidence reveals that all sentiment proxies are statistically significant. However, modified Bhargava Durbin Watson and modified Wald tests indicate that there are autocorrelation and heteroscedasticity in the residuals of the model. Therefore, we also reported the p-values of the robust estimation. The evidence shows that one month lagged rational institutional investor sentiment ($\hat{S}_{ins,it-1}^{c}$) is statistically insignificant but the other sentiment proxies are statistically significant at least at 10% level. On the other hand, all parameters of lagged variables are negative. Positive contemporaneous parameters, alongside negative lagged parameters, indicate that high investor sentiment leads to an increase in current market returns and a decrease in returns in the subsequent periods. This result is consistent with the theoretical arguments which propose that periods of high sentiments are followed by low returns because of price reversion to their fundamental values (Verma et al., 2008, p. 1312).

The comparison of the explanatory powers of models indicates that the conditional model yields significantly higher R-squared statistics than the unconditional model. This result can be evaluated as another evidence for the importance of considering market conditions for investor sentiments.

4.3. Panel Granger Causality tests

These results open the way for several directions in the exploration of the relations among market returns and investor sentiments proxies. As previously stated, a group of research analyze the effect of stock market returns on confidence indexes (among the others see Otoo, 1999; Jansen & Nahuis, 2003; and Brown & Cliff, 2004; Fisher & Statman, 2000; Clarke & Statman, 1998; Solt & Statman, 1988; and De Bondt, 1993) while another group analyze the effect of investor sentiment on market returns (among the other see, Schmeling, 2009; Akhtar et al., 2011; Zouaoui et al., 2011; and Köse & Akkaya, 2016). Therefore, in the next step of our research, we analyze the causal relation between sentiment proxies and market returns. Previous research proposes contradictory evidence for the causal relation between investor sentiment and stock returns. For example, the research of Brown and Cliff (2004) present some evidence of Granger causality from investor sentiment to stock returns in US, Schmeling (2009) reveals bidirectional Granger causality in 18 industrialized countries, Hsu and Lin (2011) documented two-way causality between the consumer confidence index and stock market index returns in a panel data of 21 countries, Dergiades (2012) demonstrates unidirectional causality from investor sentiment to stock returns in US, and Cagli et al.(2020) find contradictory results based on causality methods, sentiment proxies and time in Turkiye.

Table 10: Panel Granger Causality Tests

Causality direction ↓		Causality direction ← R^M	$\hat{S}^c_{ind}$	$\hat{S}^c_{ins}$	ε	ϑ
R^M	chi2	.	5.020	3.421	32.398	36.569
	Prob>chi2		(0.170)	(0.331)	(0.000)	(0.000)
$\hat{S}^c_{ind}$	chi2	42.630	.	15.161	48.144	27.928
	Prob>chi2	(0.000)		(0.002)	(0.000)	(0.000)
$\hat{S}^c_{ins}$	chi2	14.676	3.035	.	22.238	53.467
	Prob>chi2	(0.002)	(0.386)		(0.000)	(0.000)
ε	chi2	24.247	232.576	4.724	.	10.337
	Prob>chi2	(0.000)	(0.000)	(0.193)		(0.016)
ϑ	chi2	11.912	4.235	87.351	7.196	.
	Prob>chi2	(0.008)	(0.237)	(0.000)	(0.066)	

Notes: R^M is the monthly return of stock market index, $\hat{S}^c_{ind}$ is the rational individual investor sentiment, $\hat{S}^c_{ins}$ is the rational institutional investor sentiment, ε is the irrational individual investor sentiment, and ϑ is the irrational institutional investor sentiment derived by conditional panel regression analysis. P-values are stated in parentheses; lags are determined by Akaike information criteria.

The Panel Granger causality test is an approach used in panel data studies to evaluate the dynamic relationships between variables and the information contribution provided by past values. The basic rationale of the test is to determine whether the past values of one variable statistically significantly explain the present values of another variable. This approach is first developed by Granger (1969) within the scope of time series analysis and later adapted to panel data, used in the analysis of causal relationships in samples with a large number of units.

We also implement panel Granger causality test to investigate the possible causal relations among these variables and summarize in Table 10. We impose lag specifications depending on the lowest Akaike information criteria. The following evidence can be observed: First, there is a unidirectional causal relation from market returns (R^M) towards rational investor sentiments ($\hat{S}^c_{ind}$ and $\hat{S}^c_{ins}$). Second, there are two-way causalities between market returns and irrational investor sentiments (ε and ϑ). Third, there is a unidirectional causality from rational institutional

investor sentiment ($\hat{S}_{ind}^{c}$) to rational individual investor sentiment ($\hat{S}_{ins}^{c}$). Fourth, irrational investor sentiments (ε and ϑ) have unidirectional causalities towards rational investor sentiment proxies ($\hat{S}_{ind}^{c}$ and $\hat{S}_{ins}^{c}$). Fifth, there are a two-way causalities between institutional sentiments ($\hat{S}_{ins}^{c}$ and ϑ) and individual sentiments ($\hat{S}_{ind}^{c}$ and ε). Sixth, there is a bidirectional causality between irrational institutional investor sentiment (ϑ) and irrational individual investor sentiment (ε).

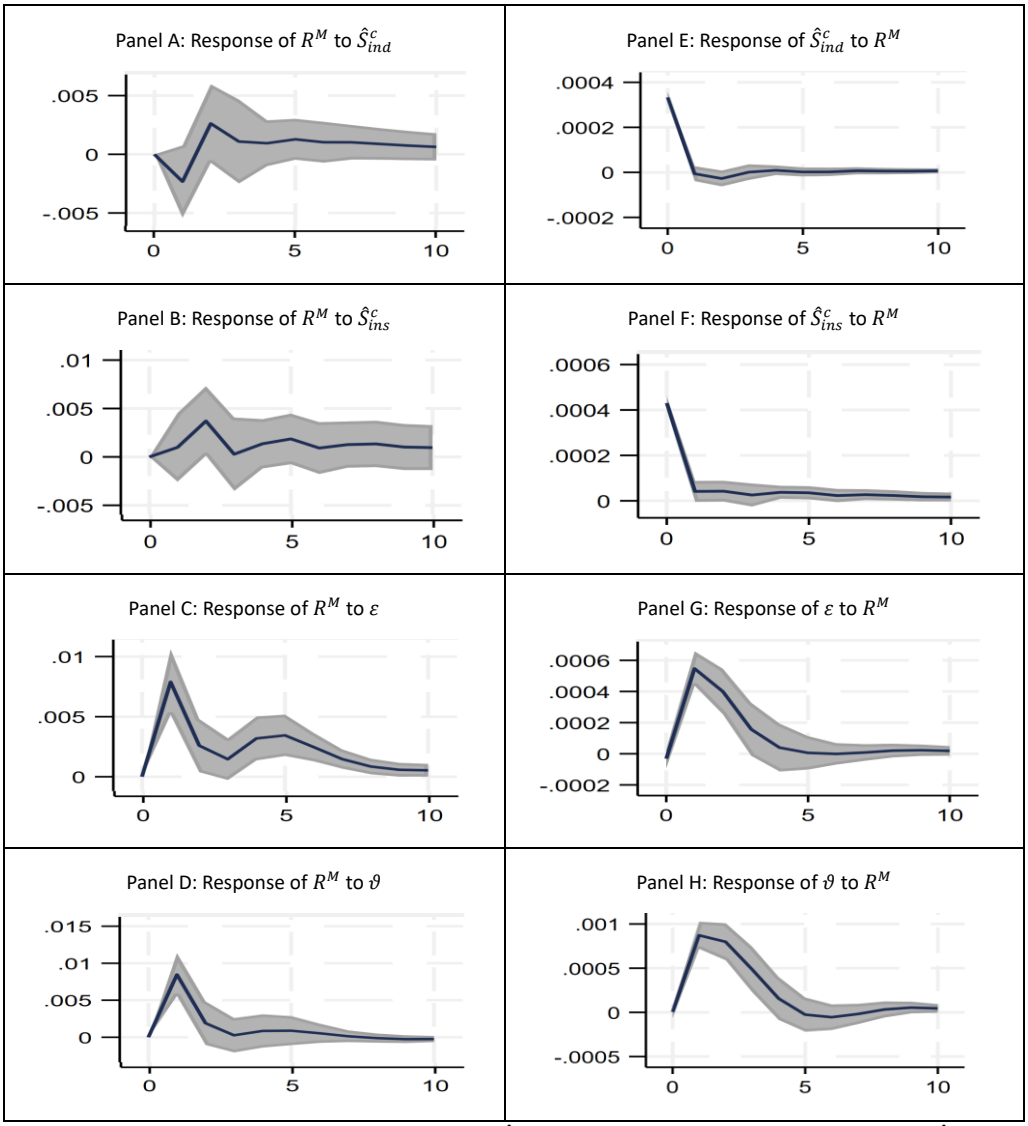
The evidence of Granger causality between market returns and investor sentiment is stunning. Although, outcomes of the analyses reveal that only rational individual sentiment has unilateral causality, irrational sentiment proxies have bilateral causality relations with market returns. These findings can be considered as the presence of systematic interrelations of sentiment factors and market returns.

4.4. Panel VAR analysis

Following the evidence of Granger causalities among the variables we also implement panel VAR impulse response analysis to investigate the dynamic relationships between sentiment proxies and market returns. Our aim is to understand the dynamic structure of the relation between market returns and sentiment proxies by observing how changes in one can influence the other over time.

The panel vector autoregression (PVAR) model is a panel data methodology in which multiple variables are treated as jointly endogenous, allowing for the analysis of their dynamic interdependencies over time. By extending the conventional vector autoregression (VAR) framework to a panel setting, the PVAR approach simultaneously accounts for cross-sectional heterogeneity and dynamic lagged relationships. Following the evidence of stationary of all variables which are presented in Table 7, we estimate a PVAR model with 3 lags which is determined by modified Akaike criteria. The impulse responses between market returns and sentiment proxies are plotted in Figure 3.

Figure 3: Orthogonalized Impulse Response Functions between Market Returns and Sentiment Proxies



Notes: R^M is the monthly return of stock market index, $\hat{S}^c_{ind}$ is the rational individual investor sentiment, $\hat{S}^c_{ins}$ is the rational institutional investor sentiment, ε is the irrational individual investor sentiment, and ϑ is the irrational institutional investor sentiment derived by conditional panel regression analysis. Shaded areas indicate 95% confidence level. Impulse response functions (IRFs) are derived from system $\mathrm{Y_{it}} = \mathrm{A_1 Y_{it-1}} + \cdots + \mathrm{A_p Y_{it-p}} + \mu_\mathrm{i} + \mathrm{u_{it}}$, in which the variables are jointly estimated within a framework that explicitly allows for mutual feedback mechanisms. The vector of endogenous variables is denoted by $\mathrm{Y_{it}} = \left(R^M_{it}, \hat{S}^c_{ind,it}, \hat{S}^c_{ins,it}, \varepsilon_{it}, \vartheta_{it}\right)'$, while the system's dynamics are characterized by the coefficient matrix (Ψ_h) and the vector of shocks ($\eta_{\mathrm{it-h}}$). The moving-average representation of the autoregressive VAR form, denoted by $\mathrm{Y_{it}} = \sum_{\mathrm{h=0}}^{\infty} \Psi_\mathrm{h} \eta_{\mathrm{it-h}}$, provides a cumulative assessment of the dynamic effects of shocks over time.

Panel A of Figure 3 plots the response of market return to a one-time standard deviation increase in the rational individual investor sentiment ($\hat{S}^{c}_{ind}$). The evidence reveals significant effect of rational individual investor sentiment on market returns which is consistent with the results of De Bondt (1993), Fisher and Statman (2000), Brown and Cliff (2004), Verma and Soydemir (2006), Calafiore et al. (2010), and Bayram (2017). The intensity of wavy responses of the market returns to increase in standard deviation of individual rational sentiments sharply decreases after the third month. On the other hand, there are also up and down effects of rational institutional investor sentiment ($\hat{S}^{c}_{ins}$) on market returns especially for the six months (Panel B). These results present a different structure than the previous evidence of Verma et al. (2008) which shows only one positive response in the second month and the evidence of Bayram (2017) which finds significant responses in the first two months.

Panel C and Panel D of Figure 3 show that there are positive responses to one-time standard deviation increase in irrational investor sentiments (ε and ϑ) on stock market returns for more than 5 months. This result can also be compared with the outcomes of the analysis of Verma et al. (2008) and Bayram (2017). The results of Verma et al. (2008) and Calafiore et al. (2010) present immediate positive responses in the short term whereas the evidence of Bayram (2017) reveals insignificant responses.

When we analyze the effects of one-time standard deviation increase in market returns on investor sentiments, the evidence depicts that responses of irrational investor sentiments (ε, ϑ) are positive in the first and 4 months and converge to the equilibrium level after the fifth month. The graphics in Panel E and F reveal that the immediate positive responses of the rational sentiments to market returns sharply decrease to very low levels after the first month. On the other hand, one-time standard deviation increases in market returns have higher and positive effects on irrational sentiments.

5. Conclusion

The aim of this study is to analyze the effects of rational and irrational investor sentiments on 13 European stock market returns. We implement a methodology which considers the asymmetric reactions of the investor sentiments to macroeconomics factors during up and down markets. This paper complements the literature by implementing the Pettengill et al. (1995) type conditional model for discriminating against the investor sentiments conditional upon market movements.

Among the European markets in the sample, Turkiye stands out due to its distinct macroeconomic environment. Descriptive statistics indicate that Turkiye exhibits the highest average inflation and short-term interest rates, along with elevated market returns and volatility, reflecting a higher degree of uncertainty relative to other European markets. In such emerging market conditions, sentiment-driven price deviations are expected to be more pronounced, as high inflation and interest rates necessitate frequent revisions of investors' expectations and strengthen the role of sentiment in asset pricing. During periods of price instability, fluctuations in consumer and business confidence indices therefore capture not only changes in expectations but also intensified noise-driven behavior. Consistent with behavioral finance theory, our conditional decomposition approach reveals statistically significant sentiment effects for Turkiye and other European markets, suggesting that conditional models more effectively capture market-state-dependent psychological components than unconditional specifications.

There are some important findings obtained from the analysis. First, the panel regression analyses show that although rational individual investor sentiments are insignificant in classical unconditional analysis, all investor sentiments derived from conditional models are statistically significant in explaining market returns. Second, implementing conditional sentiment proxies increases the explanation power of the models. Third, significant and negative lagged parameters of sentiment proxies suggest that there is a reversion to fundamentals process following the positive concurrent effect of investor sentiment on market returns. Thus, price distortions resulted from investor sentiments bring back to their fundamental values in European markets. Fourth, there are bilateral causal relations among market returns and irrational investor sentiments however, there are only one-way causalities from market returns towards rational investor sentiments. Fifth, panel VAR analysis presents the evidence that market returns respond positively to one-time standard deviation shocks in irrational investor sentiments and the effects of the shocks are higher in the first month. The responses of market returns to one-time standard deviation increase in both rational investor sentiments follow wavy patterns with slowly converging to their equilibrium levels. On the other hand, the shocks from market returns are more significant on irrational sentiments rather than rational sentiments.

The results have important practical implications for investors and policymakers. The outcomes of our research particularly reveal fundamental driven trading and irrational sentiments are significant on market returns especially in conditional models. This result provides additional evidence on the importance of considering investor irrationalities in European stock markets. Therefore, conditional modeling upon market movements improve the significance and explaining power of the financial models. There are also significant negative reactions of market returns to one month lagged sentiments revealing that prices return to their fundamental returns following the distortions resulted from the investor sentiments. Another point is the importance of considering the two-way causalities between returns and irrational sentiments. Thus, investors and policy makers should consider the interrelations among different aspects of investor sentiments and market returns in a system framework.

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Extended Summary
The Effects of Confidence Index-Based Investor Sentiments Conditional upon Market Movements on European Stock Market Returns

Investor sentiment is generally considered as a reflection of solely the irrationality of the investors in classical view. However, Verma et al. (2008) point out another perspective of investor sentiment by proposing a method for distinguishing the rational and irrational investor sentiments. Their method enables to analyze the source of the sentiment effect on asset returns whether it is arising from rational or irrational behavior. Another important aspect of investor behavior can be considered as its asymmetric structure under different conditions. Prospect theory of Kahneman and Tversky (1979) is an important cornerstone of finance theory that presents the significance of different states on investor behavior. According to the theory, investors are risk averse in the profit area and risk seeker in the loss area. Therefore, their reactions and investment decisions may differ according to different conditions. Conditional pricing models also consider different phases of markets and related research show that it is relevant to analyze the relations in the market under different conditions like up and down-markets.

In this research we contribute to the literature by analyzing the effects of conditional rational and irrational investor sentiments on market returns to reveal a deeper understanding of the fundamental and noise trading in stock markets. We generate rational and irrational investor sentiments by implementing a conditional version of the approach of Verma et al. (2008) which employs consumer and business confidence indexes. We use monthly data of 13 European countries over the sample period of February 2005 to December 2024. Sample countries comprise of heterogeneous characteristics with different development levels. These countries are: Austria, Belgium, Czechia, France, Germany, Greece, Italy, Netherlands, Poland, Spain, Sweden, Turkiye and United Kingdom.

We decompose individual and institutional investor sentiments into rational and irrational parts indicating the sentiments related to fundamentals and noise respectively following the procedure of Verma et al. (2008). Their method depends on estimating regression models which employ confidence indexes as dependent variables and macroeconomic factors as independent variables. The method defines fitted values of regression models as fundamental driven rational investor sentiment and error terms as noise driven irrational investment sentiment proxies.

We implement the method of Pettengill et al. (1995) to capture the possible differences in different market conditions. We define up-markets as the months when stock market returns exceed risk-free rates. Following the previous research. In our analysis we employ logarithmic change in consumer price index, logarithmic change in industrial production index, short-term interest rates, economic risk premium (difference between long and short-term interest rates) and unemployment rate to generate fundamental variables in the models. We analyze the effects of rational and irrational investor sentiment on stock returns by estimating the significance of the fitted values and residuals of models by implementing fixed effect panel regression models. We analyzed and compared investor sentiments produced by unconditional and conditional models and compared the results. At the next stage of our study we also analyzed panel Granger causalities among the investor sentiments and market returns. We also present impulse response function results as a result of panel VAR analysis.

Our results reveal that although rational individual investor sentiments are insignificant in classical unconditional analysis, all investor sentiments derived from conditional models are statistically significant in explaining market returns. The outcomes also reveal that implementing conditional sentiment proxies increases the explanation power of the models. Another result of significant and negative lagged parameters of sentiment proxies suggest that there is a reversion to fundamentals process following the positive concurrent effect of investor sentiment on market returns. Thus, price distortions resulted from investor sentiments bring back to their fundamental values in European markets. The evidence produced by Panel Granger causality analysis reveal that there are bilateral causal relations among market returns and irrational investor sentiments but there are only one-way causalities from market returns towards rational investor sentiments. On the other hand, panel VAR analysis presents the evidence that market returns respond positively to one-time standard deviation shocks in irrational investor sentiments and the effects of the shocks are higher in the first month. The responses of market returns to one-time standard deviation increases in rational investor sentiments follow wavy patterns with slowly converging to their equilibrium levels and the shocks from market returns are more significant on irrational sentiments rather than rational sentiments. The results of this research have important practical implications for investors and policymakers. The outcomes of our study particularly reveal fundamental driven trading and irrational sentiments are significant on market returns especially in conditional models. Therefore, conditional modeling upon market movements improve the significance and explaining power of the financial models.