
ARTICLES

The Impact of U.S. Individual and Institutional Investor Sentiment on Foreign Stock Markets

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This study examines the degree to which U.S. individual and institutional investor sentiments are propagated abroad. Previous studies construe investor sentiments as fully irrational; we find contrary evidence that individual and institutional investor sentiments are driven by both rational and irrational factors, with distinct effects on domestic and international stock market returns.

The generalized impulse response functions from VAR model estimations show that U.S. institutional investor sentiments have varying degrees of impact on the equity markets of the U.K., Mexico, and Brazil, and no effect on Chile. Specifically, the individual investor sentiment effect is statistically significant only for the U.K market. Not surprisingly, the two classes of investor sentiments have a strong significant effect on the U.S. stock market returns.

The response of the U.S. to individual investor sentiments is relatively more erratic, while the response to institutional investor sentiments is smoother. This difference in pattern becomes more visible when we consider the response of the foreign stock markets. We find significant effects of rational sentiments of institutional investors on the U.S., the U.K., Mexico, and Brazil. However, there is an insignificant effect of the irrational sentiments on the same set of countries. A direct implication of our empirical evidence is that it is important for international asset pricing models to consider the role of rational sentiments of institutional and individual investors on developed and emerging markets.

Introduction

In recent years, there has been a growing debate about the possible links between investor behavior and stock prices. The theoretical framework describing the role of investor sentiment in determining stock prices is provided by researchers such as Black [1986], Trueman [1988], DeLong et al. [1990, 1991], Shleifer and Summers [1990], Lakonishok, Shleifer, and Vishney [1991], Campbell and Kyle [1993], Shefrin and Statman [1994], Palomino [1996], Barberis, Shleifer, and Vishney [1998], Daniel, Hirshleifer, and Subrahmanyam [1998], and Hong and Stein [1999]. These studies imply that a certain

group of investors may not be making investment decisions based on a company's fundamentals. Such "noise traders," as they are referred to, are capable of affecting stock prices by way of unpredictable changes in their sentiments.

Following the "noise trader" model of DeLong et al. [1990], several empirical studies examine the influence of investor sentiment on stock prices. Studies using indirect measures of investor sentiment include the following proxies: the closed-end fund discount (Gemmell and Thomas [2002], Baker and Wurgler [2003], Sias, Starks, and Tinic [2001], Neal and Wheatley [1998], Swaminathan [1996], Elton, Gruber, and Busse [1998], Chen, Kan, and Miller [1993], and Lee, Shleifer, and Thaler [1991]); market performance-based measures (Brown and Cliff [2004]); trading activity-based measures (Brown and Cliff [2004], Neal and Wheatley [1998]); derivative variables (Brown and Cliff [2004]); the dividend premium (Baker and Wurgler [2003]); and IPO-related measures (Baker and Wurgler [2003], Brown and Cliff [2004]). Overall, these studies do not provide a

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consensus on whether the proxies chosen are appropriate. They also show mixed results as to links between sentiment and stock returns.

Studies using direct measures of investor sentiment use sentiment survey data that indicate the expectations of market participants. Research related to individual investor sentiment find strong comovements with stock market returns (Brown and Cliff [2004], De Bondt [1993]), and mixed results regarding the role of sentiment in short-term predictability of stock prices (Brown and Cliff [2004], Fisher and Statman [2000]). Similarly, studies examining institutional sentiment find strong comovements with stock market returns (Brown and Cliff [2004]), and mixed results regarding short-run implications for stock prices (Brown and Cliff [2004], Lee, Jiang, and Indro [2002], Clarke and Statman [1998], Solt and Statman [1988]). Brown and Cliff [2005] also examine the long-run implications of institutional investor sentiment, and find strong relationships with long-horizon stock returns. Overall, these studies provide evidence in favor of strong comovements between investor sentiment and stock market returns, recognizing the existence of *individual* and *institutional* investor sentiments.

Previous research focused mainly on the relationship between individual and institutional investor sentiment and the U.S. stock market. However, much less attention has been given to any correlation with international stock markets. Also, the previous literature merely conjectured that sentiments are fully irrational. No empirical tests have investigated the extent to which they are rational or irrational (for example, Brown and Cliff [2004, 2005], Lee, Jiang, and Indro [2002]).

We do not clearly understand whether the international propagation of sentiments, if any, are driven by rational factors, noise, or some combination of both. Furthermore, previous empirical studies examine the impact of individual and institutional investor sentiment separately, and ignore any potential cross-variable dynamics between the two.

This study uses a monthly database of investor sentiments at the individual and institutional level provided by the American Association of Individual Investors and *Investors Intelligence*. We use recent multivariate techniques to shed new light on the issue of investor rationality by making the following contributions to the literature.

1. First, unlike previous studies, we investigate the effect of the U.S. investor sentiment propagation on *international* stock market returns.
2. Second, unlike previous studies, we focus on both the rational and noise (irrational) components of investor sentiment, and explore how

noise and fundamental trading in the U.S. impact international stock markets.

3. Third, instead of treating two classes of investor sentiment separately, we investigate the effects of U.S. individual and institutional investor sentiments on international stock market returns in *one* model.
4. Lastly, instead of capturing only the *anticipated* sentiment changes, we examine the *unanticipated* component of sentiments using an unrestricted VAR model.

The results of the generalized impulses generated from vector autoregression (VAR) models reveal that U.S. investor sentiment significantly affects international stock market returns. However, the extent is different across countries, perhaps due to trade ties with the U.S., as well as differences in institutional and market structures. Specifically, we find that changes in institutional investor sentiment are propagated internationally more than individual investor sentiment. Additionally, we find that both individual and institutional investor sentiments are driven by a combination of rational and irrational factors.

We also find that the international effects of the U.S. stock market can be attributed to fundamental trading and not to noise trading. Furthermore, the two classes of investor sentiments have strong but different effects on U.S. stock market returns. These results are consistent with the view that U.S. investor sentiment is an important player in propagating U.S. stock market movements abroad. It is therefore important for policymakers to consider such spillover effects in forming international policy, and for investors in portfolio allocation decisions involving stock market movements.

The remainder of the paper is organized as follows. The second section presents the model and econometric methodology. The third section presents the data and the fourth section discusses our empirical findings.

Model and Econometric Methodology

We first examine the relevance of the U.S. individual and institutional investor sentiments on international stock market returns. This issue stems from an earlier study by Tandon and Urich [1987], which demonstrates the significant response of international stock markets to U.S. macroeconomic announcements. Recent evidence also shows that the U.S. stock market affects emerging stock markets to varying degrees (Ratanapakorn and Sharma [2002], Soydemir [2002], Meric et al. [2001a, 2001b], and Soydemir [2000]). We express the international propagation of U.S. investor sentiments in Equation (1) as:

$$R_{jt} = \varphi_0 + \varphi_{ik} \sum_{i=1}^2 \sum_{k=1}^K Sntt_{it-k} \quad (1)$$

$$+ \varphi_{jk} \sum_{j=1}^J \sum_{k=1}^K R_{jt-k} + v_t$$

where R_{jt} is the return on the j^{th} stock market, k is the appropriate lag length, φ_0 is a constant, φ_{ik} and φ_{jk} are the parameters to be estimated, and v_t is the random error term. $Sntt_{it}$ represents the sentiments of individual ($i = 1$) and institutional ($i = 2$) investors. The parameters φ_{1k} and φ_{2k} indicate the effects of the U.S. individual and institutional investor sentiments, respectively, on the j^{th} stock market returns (i.e., the presence of international propagation of investor sentiments).

We next decompose investor sentiments into noise (irrational) and fundamental (rational) components, as sentiments may reflect biases such as excessive optimism or pessimism that can drive prices above (below) their intrinsic values. Here we postulate that the international propagation of sentiments can be driven to any degree by rational factors, noise, or both.

Since sentiments partially contain rational expectations-based risk factors (Brown and Cliff [2005], Shleifer and Summers [1990]), it is quite possible that stock returns are affected by both *fundamental* and *noise* sentiments. Hirshleifer [2001] also relates expected returns to both risks and investor misvaluation. Whether investors are bullish or bearish could be a rational reflection of future period expectations, irrational enthusiasm, or a combination of both. It is therefore important to control for any information sentiments may contain about rational factors.

Accordingly, we formulate Equations (2) and (3) and model rational and irrational effects of fundamentals and noise, respectively, on sentiments of individual and institutional investors:

$$Sntt_{1t} = \gamma_0 + \gamma_j \sum_{j=1}^{12} Fund_{jt} + \xi_t \quad (2)$$

$$Sntt_{2t} = \theta_0 + \theta_j \sum_{j=1}^{12} Fund_{jt} + \vartheta_t \quad (3)$$

where γ_0 and θ_0 are constants, γ_j and θ_j are the parameters to be estimated, and ξ_t and ϑ_t are the random error terms. $Sntt_{1t}$ and $Sntt_{2t}$ represent individual and institutional investor shifts in sentiments at time t . $Fund_{jt}$ is the set of fundamentals representing rational expectations based on risk factors that have been shown to carry non-redundant information in the conditional asset pricing literature.

The fitted values of Equations (2) and (3) capture the rational component of sentiments (i.e., $Sent\hat{t}_{1t}$ and $Sent\hat{t}_{2t}$). The residuals of Equations (2) and (3) capture the irrational components (i.e., ξ_t and ϑ_t).

We next analyze the extent to which any international propagation of investor sentiments is due to induced noise or fundamental trading. Accordingly, the sentiment variables are decomposed into rational and noise components based on Equations (2) and (3), and included in the return-generating process as:

$$R_{jt} = \alpha_0 + \alpha_{1k} \sum_{k=1}^K Sent\hat{t}_{1t-k} \quad (4)$$

$$+ \alpha_{2k} \sum_{k=1}^K Sent\hat{t}_{2t-k}$$

$$+ \alpha_{3k} \sum_{k=1}^K \xi_{t-k}$$

$$+ \alpha_{4k} \sum_{k=1}^K \vartheta_{t-k}$$

$$+ \alpha_{jk} \sum_{j=1}^J \sum_{k=1}^K R_{jt-k} + \rho_t$$

where α_0 is a constant, α_{1k} , α_{2k} , α_{3k} , and α_{4k} are the parameters to be estimated, and ρ_t is the random error term. Parameters α_{1k} and ρ_{2k} specifically capture the international propagation of U.S. sentiment-induced fundamental trading by individual and institutional investor sentiments, respectively; α_{3k} and α_{4k} capture the international propagation of U.S. sentiment-induced noise trading by individual and institutional investor sentiments.

Studies such as Brown and Cliff [2004, 2005] and Lee, Jiang, and Indro [2002] suggest stock market returns and investor sentiments may act as a system. For this reason, we choose the VAR modeling technique (Sims [1980]) as an appropriate econometric methodology to investigate the hypothesized relationships. In addition, we consider the following issues before the estimation stage.

In an efficient financial market, we expect the stock market to react only to the *unanticipated* component of explanatory variables. Elton and Gruber [1991] argue that all the variables in a multi-index model need to be *surprises* or *innovations*, and therefore should not be predictable from their past values. Thus, asset pricing models such as arbitrage pricing theory (APT) use the unanticipated component (innovations) of explanatory variables.

Since the formulated models are multi-index models, direct estimation only gives the relationships between the anticipated components. This means ignoring the effect of changes in the unanticipated components and stock market returns, and could be misleading. To overcome such a potential

misspecification problem, we use impulse response functions (predicted pattern of surprise changes or innovations) generated from the VAR model.

Note also that the transmission of information from the stock return variables may not always be contemporaneous due to time delays in the generation and dissemination of information concerning both noise and rational factors, especially macroeconomic variables. Reporting delays may create lags between the observation of data concerning such variables and the incorporation of it into stock prices. Hence, a model in which all variables are measured at time t would imply an unrealistic assumption of *only* contemporaneous association. For this purpose, we use the Akaike information criterion (AIC) and the Schwarz information criterion (SIC) to identify the appropriate lag lengths. The VAR model thus captures the dynamic feedback effects in a relatively unconstrained fashion. It is therefore a good approximation for the true data-generating process.

We express the VAR model as:

$$Z(t) = C + \sum_{s=1}^m A(s)Z(t-s) + \varepsilon(t) \quad (5)$$

where $Z(t)$ is a column vector of variables under consideration, C is the deterministic component comprised of a constant, $A(s)$ is a matrix of coefficients, m is the lag length, and $\varepsilon(t)$ is a vector of random error terms.

The VAR specification allows researchers to do policy simulations and integrate Monte Carlo methods to obtain confidence bands around the point estimates (Doan [1988], Genberg, Salemi, and Swoboda [1987], Hamilton [1994]). The likely response of one variable at time t , $t+1$, $t+2$, etc., to a one-time unitary shock in another variable at time t can be captured by impulse response functions. As such, they represent the behavior of the series in response to pure shocks while keeping the effects of other variables constant. Since impulse responses are highly non-linear functions of the estimated parameters, confidence bands are constructed around the mean response. Responses are considered statistically significant at the 95% confidence level when the upper and lower bands carry the same sign.

It is well known theoretically that traditional orthogonalized forecast error variance decomposition results based on the widely used Choleski factorization of VAR innovations may be sensitive to variable ordering (Pesaran and Shin [1996], Koop, Pesaran, and Potter [1996], Pesaran and Shin [1998]). To mitigate these potential misspecification problems, we use the recently developed *generalized impulses* technique of Pesaran and Shin [1998], in which an orthogonal set of

innovations does not depend on the VAR ordering. The generalized impulse responses from an innovation to the j^{th} variable are derived by applying a variable-specific Cholesky factor computed with the j^{th} variable at the top of the Cholesky ordering. These generalized impulses can capture the effect of unanticipated components, and therefore are especially appropriate for this study.

Data

We obtain all data in monthly intervals from October 1988 through April 2001. To measure sentiments of market participants, we use survey data similar to that used in the literature. The institutional investors participate in the market for a living, while the individual investors' primary line of business is outside the stock market (Brown and Cliff [2004]). We use survey data from the individual investor sentiment index of the American Association of Individual Investors (AAII), following Brown and Cliff [2004], Fisher and Statman [2000], and De Bondt [1993].

Since July 1987, *AAII* has conducted a weekly survey asking for the likely direction of the stock market during the next six months (up, down, or the same). The participants are randomly chosen from approximately 100,000 *AAII* members. Each week, *AAII* compiles the results, and labels them bullish, bearish, or neutral. These results are published as "investor sentiment" in monthly editions of the *AAII Journal*. The sentiment index for individual investors is computed as the spread between the percentage of bullish investors and the percentage of bearish investors (bull-bear). Since this survey is targeted toward individual investors, it is primarily a measure of individual investor sentiments.

For the institutional investor sentiment index, we use survey data from Investors Intelligence (II), following Brown and Cliff [2004, 2005], Lee, Jiang, and Indro [2002], Clarke and Statman [1998], and Solt and Statman [1988]. *II*, an investment service based in Larchmont, New York, compiles and publishes data based on a survey of investment advisory newsletters. To overcome any potential bias problem toward buy recommendations, newsletters from brokerage houses are excluded.

Based on future market movements, the letters are labeled bullish, bearish, or correction (hold). The sentiment index for institutional investors is found by calculating the spread between the percentage of bullish and bearish investors. Because authors of these newsletters are market professionals, the *II* series is interpreted as a proxy for institutional investor sentiments.

In addition to the U.S. stock market, we include here the stock markets of three Latin American countries (Mexico, Brazil, and Chile), and one developed

country (the U.K.) as our benchmark. Previous studies have found that these stock markets are significantly affected by the U.S. market (Ratanapakorn and Sharma [2002], Soydemir [2002], Meric et al. [2001a, 2001b], and Soydemir [2000]).

We include Brazil, Mexico, and Chile because they have exhibited phenomenal growth over the past two decades. They also place among the top thirty developed and emerging markets in the world, and are ranked eighteenth, twenty-fifth, and thirtieth, respectively (*Emerging Stock Market Fact Book* [1999]). As measured by the turnover ratio, Brazil (45), Mexico (33), and Chile (10) are the three most liquid stock markets in the region. Eun and Resnick [2004] suggest the liquidity in these markets has been improving significantly.

The U.K. stock market is included to examine if the international effects of U.S. investor sentiments are similar across emerging and developed countries.

The market variable for these countries are the major indexes in their respective stock markets. Specifically, we include the following indexes in our study: DJIA (the U.S.), IPC BOLSA (Mexico), BOVESPA (Brazil), General IGPA (Chile), and the FTSE ALL SHARE (U.K.). The continuously compounded returns are computed from the U.S. dollar-adjusted stock market indexes obtained from Datastream.

We include the following variables as fundamentals. They have been shown in the asset pricing literature to carry non-redundant information:

- Economic growth (Fama [1970], Schwert [1990]), measured as the monthly change in the industrial production index.
- Short-term interest rates (Campbell [1991]), measured as the yield on the one-month U.S. Treasury bill.
- Economic risk premia (Ferson and Harvey [1991], Campbell [1987]), measured as the term structure of interest rates (the difference in monthly yields on one- and three-month Treasury bills).
- Future economic expectations variables (Fama [1990]), measured as the term spread (the yield spread on the ten-year U.S. Treasury bond and the three-month Treasury bill).
- Business conditions (Fama and French [1989], Keim and Stambaugh [1986]), measured as the default spread (the difference in yields on Baa and Aaa corporate bonds).
- The dividend yield (Hodrick [1992], Fama and French [1988], Campbell and Shiller [1988a, 1988b]), measured as the dividend yield for the value-weighted Center for Research in Security Prices (CRSP) index over the past twelve months.

- Inflation (Sharpe [2002], Fama and Schwert [1977]), measured as the monthly change in the consumer price index.
- Excess returns on the market portfolio (Lintner [1965], Sharpe [1964]), measured as the value-weighted returns on all NYSE, Amex, and Nasdaq stocks minus the one-month Treasury bill rate.
- The premium on a portfolio of small stocks relative to large stocks (SMB) (Fama and French [1993]). SMB (small minus big) is the average return on three small portfolios minus the average return on three big portfolios.
- The premium on a portfolio of high book-to-market stocks relative to low book-to-market stocks (HML) (Fama and French [1993]). This Fama/French benchmark factor is constructed from six size/book-to-market benchmark portfolios that do not include hold ranges and do not incur transaction costs. HML (high minus low) is the average return on two value portfolios minus the average return on two growth portfolios.
- The momentum factor (UMD) (Jegadeesh and Titman [1993]). UMD (up minus down) is the average return on two high prior return portfolios minus the average return on two low prior return portfolios
- Currency fluctuation (Elton and Gruber [1991]), measured as the changes in a fifteen-country trade-weighted basket of currencies.

The data on economic growth, business conditions, and inflation are obtained from Datastream; short-term interest rates, the economic risk premium, future economic variables, and currency fluctuations are obtained from the Federal Reserve Bank of St. Louis; the dividend yield and the excess return on market portfolio come from CRSP; and SMB, HML, and UMD come from the Kenneth French Data Library at the Tuck School of Business, Dartmouth College.

Table 1 provides the descriptive statistics for the variables mentioned above. The means of $Sntt_1$ and $Sntt_2$ are 11.43% and 8.96%, respectively. This suggests that both individual and institutional investors have been bullish during most of the sample period. Interestingly, individual investors appear more bullish than institutional investors. The two sentiments have higher standard deviations than those for stock market indexes, suggesting investor sentiments have been highly volatile.

The mean returns for the DJIA and the S&P 500 are 1.02% and 0.95%, suggesting that the overall market has provided slightly more returns than large-capitalization stocks. The Latin American stock markets exhibit higher volatility and mean returns than the developed markets (DJIA, S&P 500, and the U.K.); this suggests investors are generally compensated for bear-

Table 1. *Descriptive Statistics*

Variables are individual investor sentiments (Sentt₁), institutional investor sentiments (Sentt₂), returns on the Dow Jones Industrial Average (DJIA), returns on the S&P 500 (S&P 500), economic growth (IIP), short-term interest rates (T30), economic risk premiums (T90 - T30), future economic variables (B10 - T30), business conditions (Baa-Aaa), the dividend yield (Div), inflation (INF), excess returns on the market portfolio (R_m), the premium on a portfolio of small stocks relative to large stocks (SMB), the premium on a portfolio of high book/market stocks relative to low book/market stocks (HML), momentum factors (UMD), currency fluctuations (USD), and stock market returns on Brazil, Chile, Mexico, and the U.K.

	Mean	Median	Maximum	Minimum	Std. Dev.	Skewness	Kurtosis
Sentt ₁	0.1143	0.1200	0.5100	-0.3500	0.1760	-0.0863	2.6626
Sentt ₂	0.0896	0.1100	0.3640	-0.3420	0.1413	-0.5373	2.9513
DJIA	0.0102	0.0137	0.0913	-0.1177	0.0394	-0.5175	3.5256
S&P 500	0.0095	0.0154	0.1011	-0.1094	0.0392	-0.5184	3.5280
IIP	0.0096	0.0147	0.1011	-0.1094	0.0389	-0.5279	3.5607
T30	0.0026	0.0032	0.0199	-0.0121	0.0052	-0.1152	3.2783
T90 - T30	0.0043	0.0041	0.0080	0.0021	0.0013	0.4793	2.9139
B10 - T30	0.0004	0.0004	0.0017	-0.0003	0.0004	0.8185	3.7719
Baa-Aaa	0.0071	0.0078	0.0549	-0.0440	0.0181	-0.0562	3.1558
Div	0.0078	0.0073	0.0144	0.0053	0.0018	1.1020	4.3580
INF	0.0127	0.0153	0.1141	-0.1437	0.0408	-0.4639	3.9027
R _m	0.0026	0.0023	0.0103	-0.0012	0.0021	0.9335	4.3616
SMB	0.0031	0.0077	0.0994	-0.1655	0.0414	-0.7543	4.3240
HML	-0.0012	-0.0028	0.2138	-0.1626	0.0382	1.0244	11.0803
UMD	0.0024	0.0009	0.1367	-0.1205	0.0363	0.4417	5.3273
USD	1.1658	1.3200	18.2100	-25.1300	4.5224	-0.7366	11.7315
Brazil	0.0146	0.0352	0.7381	-1.1200	0.2212	-1.0106	8.4173
Chile	0.0105	0.0033	0.1619	-0.2186	0.0662	0.0133	3.1216
Mexico	0.0132	0.0240	0.2076	-0.4466	0.1109	-1.3087	6.5223
U.K.	0.0070	0.0036	0.1408	-0.1078	0.0464	-0.0428	3.2425

ing additional risk. Among these markets, Brazil seems to have provided the highest return to investors, followed by Mexico. Most of the variables relating to fundamentals have shown less variability compared to the investor sentiments and stock returns.

Estimation Results

Before proceeding with the main results, we first check the time series properties of each variable by performing an augmented Dickey-Fuller (ADF) test (Dickey and Fuller [1979, 1981]).¹ Given that the series are stationary in nature, we estimate a seven-variable VAR model (five stock market return variables and two investor sentiment variables) with two lags to investigate the relationships shown in Equation (1).² This estimation facilitates investigation of the international propagation of the U.S. individual and institutional investor sentiments.³

Figure 1 plots the impulse responses of the U.S. and international stock market returns to a one-time standard deviation increase in the individual investor sentiments. Consistent with the findings of Brown and Cliff [2004], Fisher and Statman [2000], and De Bondt [1993], there is a significant positive effect of individual investor sentiments on the U.S. stock market returns (Figure 1a). The responses are significant in the

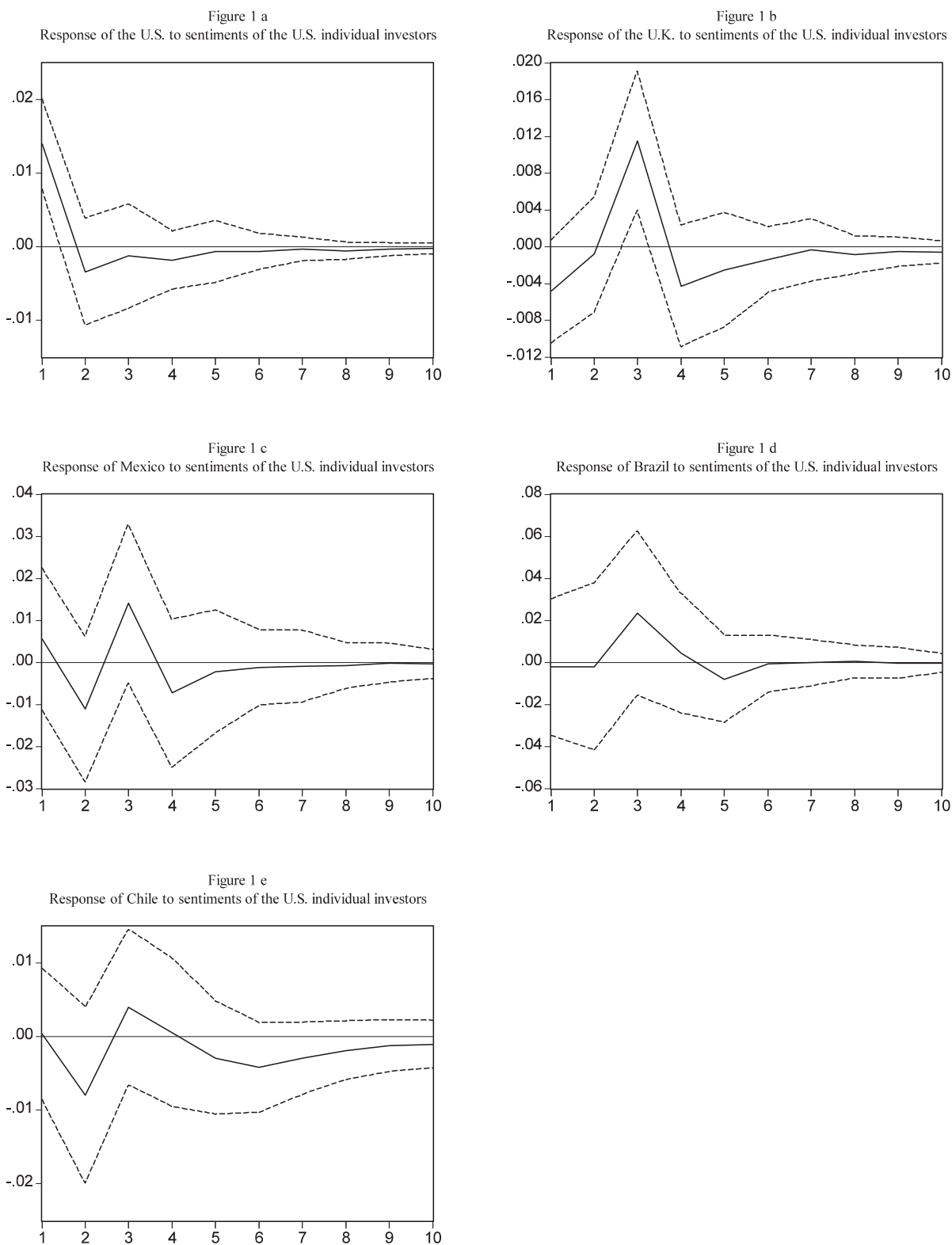
first month and become insignificant during the remaining months.

For the U.K., the responses to individual investor sentiments are not significant during the first two months, but become positive and significant during the third month and insignificant thereafter (Figure 1b). Unlike the U.S. and the U.K., the responses of Mexico, Brazil, and Chile are insignificant (Figures 1c, 1d, and 1e, respectively).

Figure 2 plots the impulse responses of the U.S. and international stock market returns to a one-time standard deviation increase in the institutional investor sentiments. Similar to the individual investor sentiments results and consistent with Brown and Cliff [2004], Fisher and Statman [2000], and De Bondt [1993], there is a significant positive effect of institutional investor sentiments on U.S. stock market returns (Figure 2a).

In the first month, the magnitude and pattern of responses to both the individual and institutional investor sentiments are quite similar. However, in the following months, there is a slight difference: The mean response for individual investor sentiments displays a peak during the third month and converges only gradually, while that for the institutional investor sentiments is relatively smoother. Thus, the response to the individual investor sentiments appears more erratic. This finding is consistent with Nofsinger and Sias [1999], who suggest that institutional investors are better informed

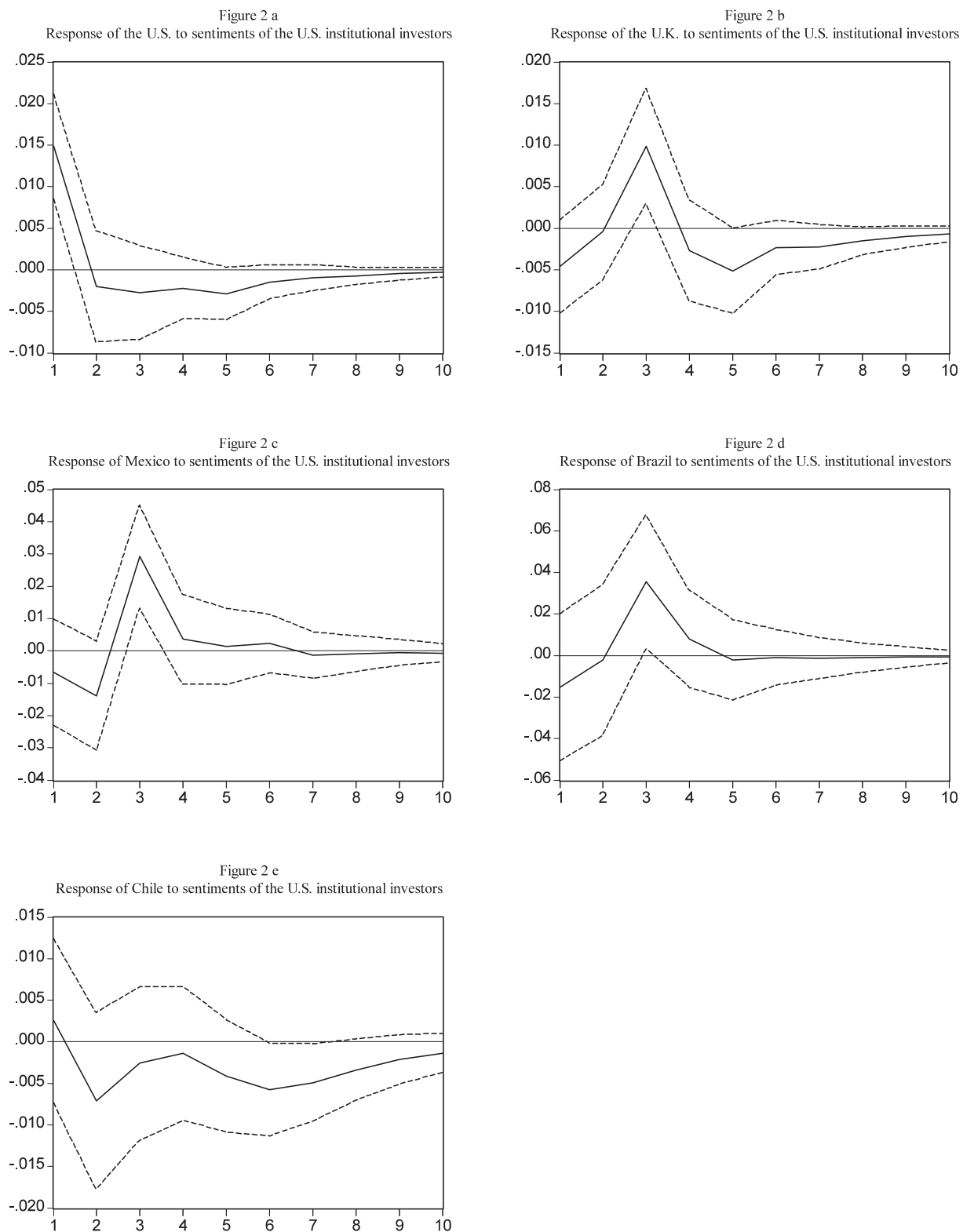
FIGURE 1
Response of the U.S., the U.K., Mexico, Brazil, and Chile to U.S. Individual Investor Sentiment



Note: The dashed lines on each graph represent the upper and lower 95% confidence bands. When the upper and lower bounds carry the same sign, the response becomes statistically significant. On each graph, “percentage returns” are on the vertical, and “horizon” is on the horizontal axis.

FIGURE 2

Response of the U.S., the U.K., Mexico, Brazil, and Chile to U.S. Institutional Investor Sentiment



Note: The dashed lines on each graph represent the upper and lower 95% confidence bands. When the upper and lower bounds carry the same sign, the response becomes statistically significant. On each graph, “percentage returns” are on the vertical, and “horizon” is on the horizontal axis.

than individual investors and are less likely to follow irrational fads.

For the U.K., the responses are not significant during the first two months, they become positive and significant during the third month, and insignificant during the remaining months (Figure 2b). The responses for Mexico and Brazil become positive and significant only during the third month, and insignificant thereafter (Figures 2c and 2d). The response of Mexico is also higher in magnitude than the responses of the U.K. and Brazil. Unlike the smoother pattern seen in the U.S. market results, Mexico's results display highly erratic behavior.

Overall, these results are consistent with the view that both individual and institutional investor sentiments play a significant role in determining stock prices in the U.S. market. Also, U.S. institutional investor sentiments have a statistically significant impact with varying degrees of strength on both the U.K. and the Latin American stock market returns. However, individual investor sentiments have significant effects only in the U.K.

A significant development in emerging markets is that individual investors have increasingly delegated their asset management to professional fund managers (Griffith-Jones and Cailloux [1998]). Such institutionalization has increased the sensitivities of emerging markets to the behavior of international institutional investors. Moreover, it is much easier for domestic institutional investors to engage in herding behavior than for individual investors, because similar information circulates among funds, allowing them to follow other institutions' decisions more easily (Nofsinger and Sias [1999]).

This may explain the significant responses of Latin American stock markets to U.S. institutional investor sentiments, as well as their insignificant responses to U.S. individual investor sentiments. Note also that transaction costs for U.S. investors investing in the U.K. are much lower than those for the Latin America countries (Eun and Resnick [2004]). Moreover, similar to the U.S. market, the U.K. market is the least regulated (Griffith-Jones and Cailloux [1998]).

Due to the high transaction costs of investing in emerging markets, closed-end country funds have emerged as one of the most popular means of investing internationally in the U.S. This may also explain the significant (non-significant) results of individual investor sentiments for the U.K. (Latin America).

The responses of the U.K. and Latin American markets to the U.S. institutional investor sentiments also appear to be of dissimilar magnitude. Specifically, the response of Mexico is higher than those of the U.K. and Brazil, while Chile's response is insignificant. This varying degree of impact on foreign stock markets may be linked to each country's respective trade ties with the U.S.

For example, U.S. imports from Mexico during the last five years have been approximately \$135 million to \$155 million; exports have been around \$110 million.⁴ The high international transmission of institutional investor sentiment to Mexico may be due to relatively closer trade ties between the U.S. and Mexico. Institutions in Mexico are also geared relatively more toward the U.S. economy.

U.S. imports and exports from the U.K. for the last five years, on the other hand, have been approximately \$35 million and \$46 million, respectively. The corresponding figures for Brazil are approximately \$13 million and \$21 million. As we saw, the international transmission of U.S. institutional investor sentiments is of lesser magnitude in the U.K. and Brazil.

These results are consistent with Dornbusch, Park, and Claessens [2000], who identify trade as one of the major determinants of stock market comovements. Our results are also consistent with earlier findings that Mexico exhibits a more rapid reaction to U.S. stock market movements than other countries in the region (Pagan and Soydemir [2000], Soydemir [2000]).

Chile's more insignificant response may be a reflection of its relatively greater ability to insulate itself from external shocks. Mexico and Brazil also have greater trade links with the U.S. and with the world than Chile. The figures for imports and exports for Chile are only approximately \$5 million and \$4 million, respectively. Moreover, Chile has higher foreign reserves to GDP ratio, giving it greater ability to insulate itself against external shocks. Chile also has the lowest liquidity and market capitalization among these countries (Eun and Resnick [2004]), and has exhibited restrictions on capital flows in the recent past more than Mexico and Brazil. Chile's results are consistent with previous studies such as Soydemir [2000, 2002], which have found insignificant effects on Chilean stock market returns of the U.S. stock market and interest rates.

Note that the significant impact of U.S. investor sentiments on the U.S. market and the foreign stock markets takes place at different times. Specifically, the response of the U.S. market is immediate, while the responses for the U.K., Mexico, and Brazil occur during the third month. These differences in timing may represent a less efficient ability of foreign stock markets to diffuse information generated from the U.S. These results are consistent with the findings of Soydemir [2002], who found an immediate effect on the U.S. market of U.S. economic indicators, but lagged effects for international markets.

Given these significant results for U.S. institutional investor sentiments, our next step is to analyze whether these effects are due to fundamental trading, or to noise trading in the U.S. market. We therefore decompose the sentiment variables into rational and irrational components. To check for the presence of

multicollinearity, we examine the cross-correlations between the variables related to fundamentals. Table 2 reports the results. There appears to be a high degree of correlation between the excess return on market returns and the dividend yield (0.97), and low correlations among the other variables.

We first estimate two separate ordinary least squares (OLS) regressions based on Equations (2) and (3) for individual and institutional investor sentiments, respectively. The first column in Tables 4 and 5 (Regression 1) report that the individual investor sentiments are significantly related to business conditions, inflation, dividend yield, excess market returns, SMB, and HML. The institutional investor sentiments are significantly related to dividend yield, SMB, and HML.

The low values of Durbin-Watson statistics in both regressions suggest a high degree of positive first-order serial correlations. To remove the serial correlation in error terms, we include an AR(1) process in both regressions (Diebold [2004]). The results are reported in the second column (Regression 2) of Tables 3 and 4.

There is a marked improvement in the Durbin-Watson statistics (1.99 and 2.12), which suggests the absence of first-order serial correlation in both cases. We also consider the possibility of multicollinearity due to existing correlations between the excess market returns and the dividend yield. Therefore, we estimate two additional sets of regressions (Regressions 3 and 4) by excluding the dividend yield and excess returns variables, respectively. For both cases, the significance of excess returns and dividend yield remains unchanged.

Overall, consistent with the results of Brown and Cliff [2005] and Shleifer and Summers [1990], we find that sentiments are a combination of both rational and irrational components and not necessarily only noise. We use the complete model (Regression 2) for the purpose of decomposition of sentiment variables into rational and irrational components.

To analyze the international effects of fundamental and/or noise trading, as depicted in Equation (4), we estimate a ten-variable VAR model. In addition to the five stock market return variables, we include the four new variables derived from Equations (2) and (3) that are related to the rational and irrational sentiments of individual and institutional investors.

Figure 3 plots the impulse responses of the U.S. and U.K. markets to rational and irrational sentiments of U.S. individual investors. The responses of the U.S. to rational sentiments are positive and significant in the first month, becoming insignificant over the remaining months (Figure 3a). However, responses to the irrational sentiments are insignificant throughout (Figure 3b).

For the U.K., the responses to rational sentiments are not significant during the first two months, but become positive and significant during the third month, and insignificant thereafter (Figure 3c). However, the effect of the irrational component of sentiments is not significant (Figure 3d). Also, the magnitude of responses to the rational sentiments of the U.S. market is higher than for the U.K. market. These results are consistent with the view that the propagation of U.S. individual investor sentiments to the U.K. market is attributable to fundamental trading and not to noise trading.

Figure 4 plots the impulse responses of the U.S. and the U.K. markets to rational and irrational sentiments of U.S. institutional investors. The results are very similar to those obtained for the individual investor sentiments. The response of the U.S. to rational sentiments is positive and significant in the first month, and becomes insignificant during the remaining months (Figure 3a); the responses to the irrational sentiments are insignificant throughout (Figure 3b). For the U.K., the response to rational sentiments becomes positive and significant during the third month (Figure 3c), while the effect of the irrational component is insignificant (Figure 3d). Also, the magnitude of response to the ra-

Table 2. *Cross-Correlations of Variables Relating to Fundamentals*

Variables are economic growth (IIP), short-term interest rates (T30), economic risk premiums (T90), future economic variables (B10), business conditions (Baa), the dividend yield (Div), inflation (INF), excess returns on the market portfolio (R_m), the premium on a portfolio of small stocks relative to large stocks (SMB), the premium on a portfolio of high book/market stocks relative to low book/market stocks (HML), momentum factors (UMD), and currency fluctuations (USD).

	B10	Baa	IIP	HML	INF	R_m	DIV	SMB	T30	T90	UMD	USD
B10	1.00											
Baa	0.00	1.00										
IIP	-0.15	-0.39	1.00									
HML	0.06	-0.06	0.05	1.00								
INF	-0.02	0.16	-0.15	0.00	1.00							
R_m	0.26	-0.01	-0.10	-0.56	-0.17	1.00						
DIV	0.32	0.02	-0.11	-0.47	-0.16	0.97	1.00					
SMB	-0.20	-0.04	-0.05	-0.50	0.00	0.17	-0.04	1.00				
T30	0.14	0.40	-0.28	-0.06	0.26	-0.07	0.02	-0.13	1.00			
T90	0.32	0.25	-0.19	-0.15	0.09	0.14	0.15	-0.01	0.19	1.00		
UMD	0.20	-0.06	0.00	-0.20	-0.10	0.03	-0.03	0.20	0.01	-0.14	1.00	
USD	-0.03	-0.09	0.17	0.19	-0.14	-0.16	-0.15	0.00	0.00	-0.04	0.00	1.00

Table 3. *Effects of Fundamentals on Individual Investor Sentiments*

Variables are individual investor sentiments (Sentiment₁), economic growth (IIP), short-term interest rates (T30), economic risk premiums (T90), future economic variables (B10), business conditions (Baa), the dividend yield (Div), inflation (INF), excess returns on the market portfolio (R_m), the premium on a portfolio of small stocks relative to large stocks (SMB), the premium on a portfolio of high book/market stocks relative to low book/market stocks (HML), momentum factors (UMD), and currency fluctuations (USD). *, **, and *** denote significance levels at the 10%, 5%, and 1% levels, respectively. Standard errors are in parentheses.

Dependent Variable: Sentiment ₁				
Variables	Regression 1	Regression 2	Regression 3	Regression 4
B10	-0.9628 (0.8765)	-0.9626 (0.8317)	-0.4449 (0.8440)	-0.6338 (0.8449)
Baa	-29.9261*** (8.3545)	-30.2967*** (10.8753)	-31.6290*** (10.7727)	-31.4972*** (10.6903)
IIP	1.3031 (2.7677)	0.5386 (2.3751)	-0.2119 (2.4771)	-0.0321 (2.4581)
HML	1.4420*** (0.5309)	1.1092** (0.5188)	0.9357* (0.5357)	1.0824** (0.5333)
INF	-18.2832*** (6.6012)	-19.2576*** (6.1852)	-19.3319*** (6.4428)	-18.8311*** (6.3859)
R _m	-6.7489** (3.2919)	-8.6253*** (3.0006)	-1.1290*** (0.4015)	
DIV	8.3230** (3.3117)	9.9073*** (3.0370)	1.2928*** (0.4028)	
SMB	2.7824*** (0.8036)	3.1352*** (0.75760)	0.9947** (0.3924)	1.3073*** (0.4181)
T30	7.4655 (13.5734)	5.4624 (16.6282)	23.2558 (15.5971)	21.8779 (15.3658)
T90	-13.1090 (36.7068)	-9.1103 (32.6258)	-18.4977 (33.9719)	-16.5123 (33.7022)
UMD	-0.0013 (0.0032)	-0.0024 (0.0027)	-0.0049* (0.0028)	-0.0044 (0.0028)
USD	-0.0039 (0.0121)	-0.0174 (0.0118)	-0.0120 (0.0122)	-0.0121 (0.0121)
AR(1)	0.3031*** (0.0955)	0.3340*** (0.0835)	0.3237*** (0.0932)	
C	0.2914*** (0.0735)	0.3743*** (0.0819)	0.3336*** (0.0936)	0.3351*** (0.0833)
R-Squared	0.3041	0.3947	0.3471	0.3580
S.E. of Regression	0.1526	0.1416	0.1465	0.1453
Sum Squared Resid	3.1906	2.7071	2.9199	2.8711
Log-Likelihood	75.9404	87.1789	81.5420	82.7987
Durbin-Watson Stat	1.3136	1.9987	2.0222	2.0213
F-Statistic	4.9891	6.7712	6.0255	6.3207

tional sentiments for the U.S. market is higher than for the U.K. market. These results suggest that the international propagation of U.S. institutional investor sentiments to the U.K. market is attributable to fundamental trading and not to noise trading.

Figure 5 plots the impulse responses of Mexico and Brazil to rational and irrational sentiments of U.S. institutional investors. As with the U.K., the responses of Mexico and Brazil to the rational component are significant, while the responses to the irrational component are not. The effect of the rational component is significant in the third month and becomes insignificant thereafter (Figures 5a and 5c), while the responses to the irrational sentiments are insignificant throughout (Figures 5b and 5d).

In all, the evidence suggests that only the rational component of U.S. investor sentiments is transmitted internationally through the U.S. stock market. Specifically, the rational components are transmitted to the U.K., Mexico, and Brazil with varying degrees of intensity.

Conclusion

This study investigates whether U.S. individual and institutional investor sentiments are propagated internationally from the U.S. stock market. We find evidence that the U.S. investor sentiments significantly influence international stock market returns. However,

Table 4. *Effects of Fundamentals on Institutional Investor Sentiment*

Variables are institutional investor sentiment (Sentiment₂), economic growth (IIP), short-term interest rates (T30), economic risk premiums (T90), future economic variables (B10), business conditions (Baa), the dividend yield (Div), inflation (INF), excess returns on the market portfolio (R_m), the premium on a portfolio of small stocks relative to large stocks (SMB), the premium on a portfolio of high book/market stocks relative to low book/market stocks (HML), momentum factors (UMD), and currency fluctuations (USD). *, **, and *** denote significance at the 10%, 5%, and 1% levels, respectively. Standard errors are in parentheses.

Dependent Variable: Sentiment ₂				
Variables	Regression 1	Regression 2	Regression 3	Regression 4
B10	0.4875 (0.7077)	0.0740 (0.5344)	0.3316 (0.5202)	0.2333 (0.5187)
Baa	-4.8248 (8.2693)	-13.2380 (10.4876)	-13.6628 (10.5618)	-13.6327 (10.5371)
IIP	-2.2212 (2.2011)	-1.5982 (1.4896)	-1.9752 (1.4685)	-1.8766 (1.4562)
HML	1.1390** (0.4587)	0.9697** (0.3980)	0.8462 (0.3995)	0.9198 (0.4017)
INF	-8.3474 (6.0550)	-7.9407 (4.8373)	-7.8985 (5.0048)	-7.7105 (4.9542)
R _m	-3.6013 (2.6627)	-2.9802* (1.5896)	-2.6978* (1.4724)	
DIV	4.4985* (2.7104)	3.7656** (1.6749)		2.7680** (1.2782)
SMB	1.9855*** (0.6633)	1.6517*** (0.4921)	0.8179 (0.2903)	1.0051 (0.3229)
T30	-6.8322 (11.5109)	8.2481 (13.6116)	12.8974 (13.0683)	12.5722 (13.0258)
T90	-31.7042*** (31.6380)	-2.2849 (22.4156)	-6.7151 (22.3456)	-5.5293 (22.2106)
UMD	-0.0001 (0.0030)	-0.0014 (0.0015)	-0.0024 (0.0018)	-0.0022 (0.0017)
USD	0.0005 (0.0093)	-0.0116* (0.0064)	-0.0099 (0.0065)	-0.0100 (0.0065)
AR(1)		0.1585* (0.0889)	0.1786 (0.0903)	0.1714 (0.0899)
C	0.1470** (0.0714)	0.6571*** (0.0613)	0.6520 (0.0594)	0.6536 (0.0598)
R-Squared	0.1607	0.5298	0.5164	0.5211
S.E. of Regression	0.1346	0.0982	0.0992	0.0988
Sum Squared Resid	2.4819	1.3025	1.3396	1.3265
Log-Likelihood	94.7793	141.6842	139.5882	140.3246
Durbin-Watson Stat	0.7079	2.1209	2.1687	2.1778
F-Statistic	2.1867	11.7003	12.1006	12.3333

the effects are different across countries, depending on their trade ties with the U.S. and their institutional structures. We find evidence that U.S. institutional investor sentiments have significant effects on the U.K., Mexico, and Brazil, but only an insignificant effect on Chile. However, the effect of individual investor sentiments is significant only for the U.K.

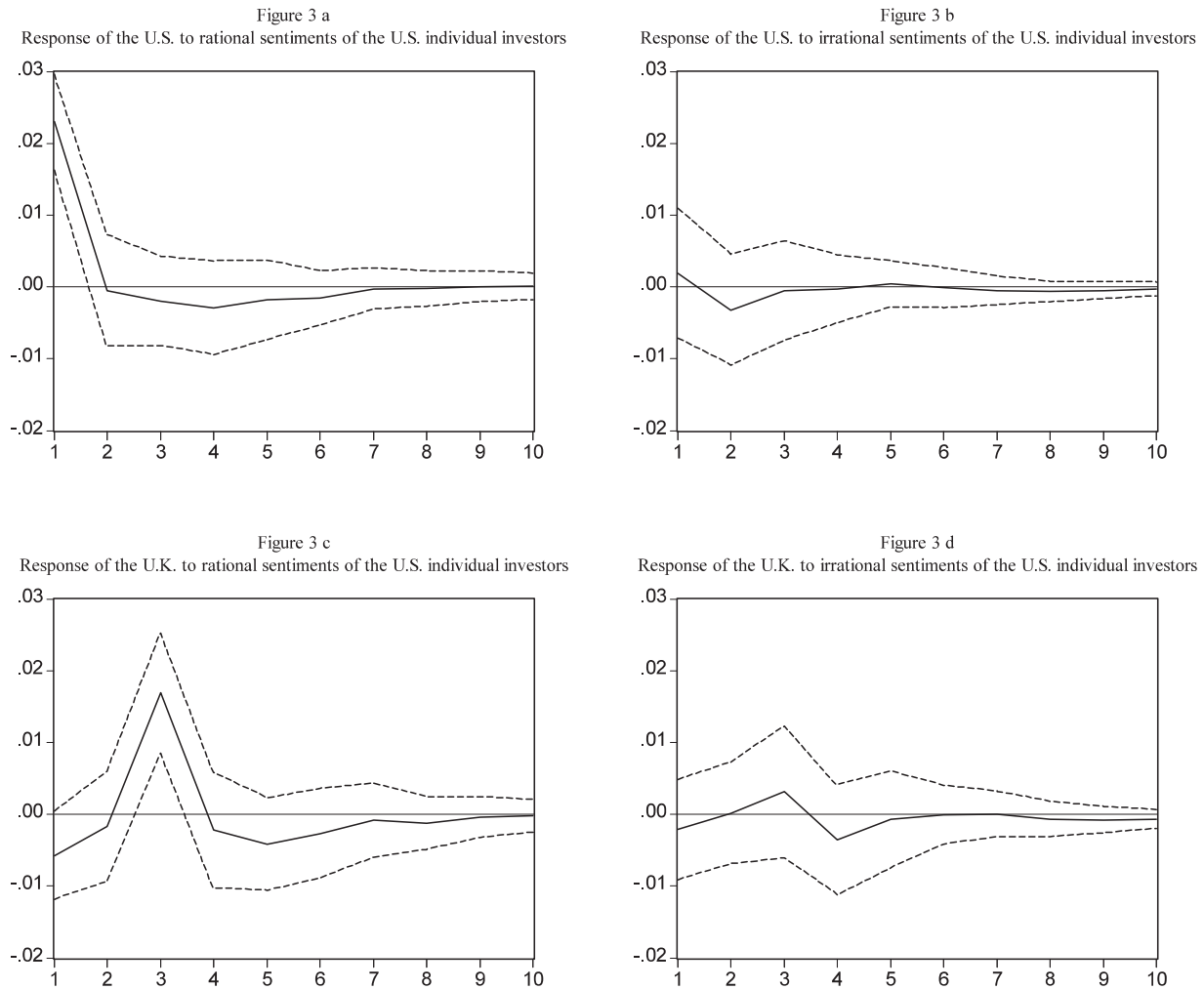
We also find that the two classes of investor sentiments have strong effects on U.S. stock market returns. There is a noticeable difference in response patterns between the U.S. and foreign stock markets. The U.S. stock market response to individual investor sentiments is relatively more erratic; the response to institutional investor sentiments is smoother. This difference

in pattern becomes more visible when we consider the response of the foreign stock markets.

Unlike previous studies that posit investor sentiments are fully irrational, we find that individual and institutional investor sentiments are driven by both rational and irrational factors. There are distinct effects of the rational and irrational institutional investor sentiments on international stock market returns. We find significant effects of rational institutional investor sentiments on the U.K., Mexico, and Brazil. There is an insignificant effect of irrational sentiments, however, on the same set of countries.

The overall evidence suggests that institutional investor sentiments are transmitted internationally from

FIGURE 3
Response of the U.S. and the U.K. to U.S. Individual Investor Rational and Irrational Sentiment



Note: The dashed lines on each graph represent the upper and lower 95% confidence bands. When the upper and lower bounds carry the same sign, the response becomes statistically significant. On each graph, “percentage returns” are on the vertical, and “horizon” is on the horizontal axis.

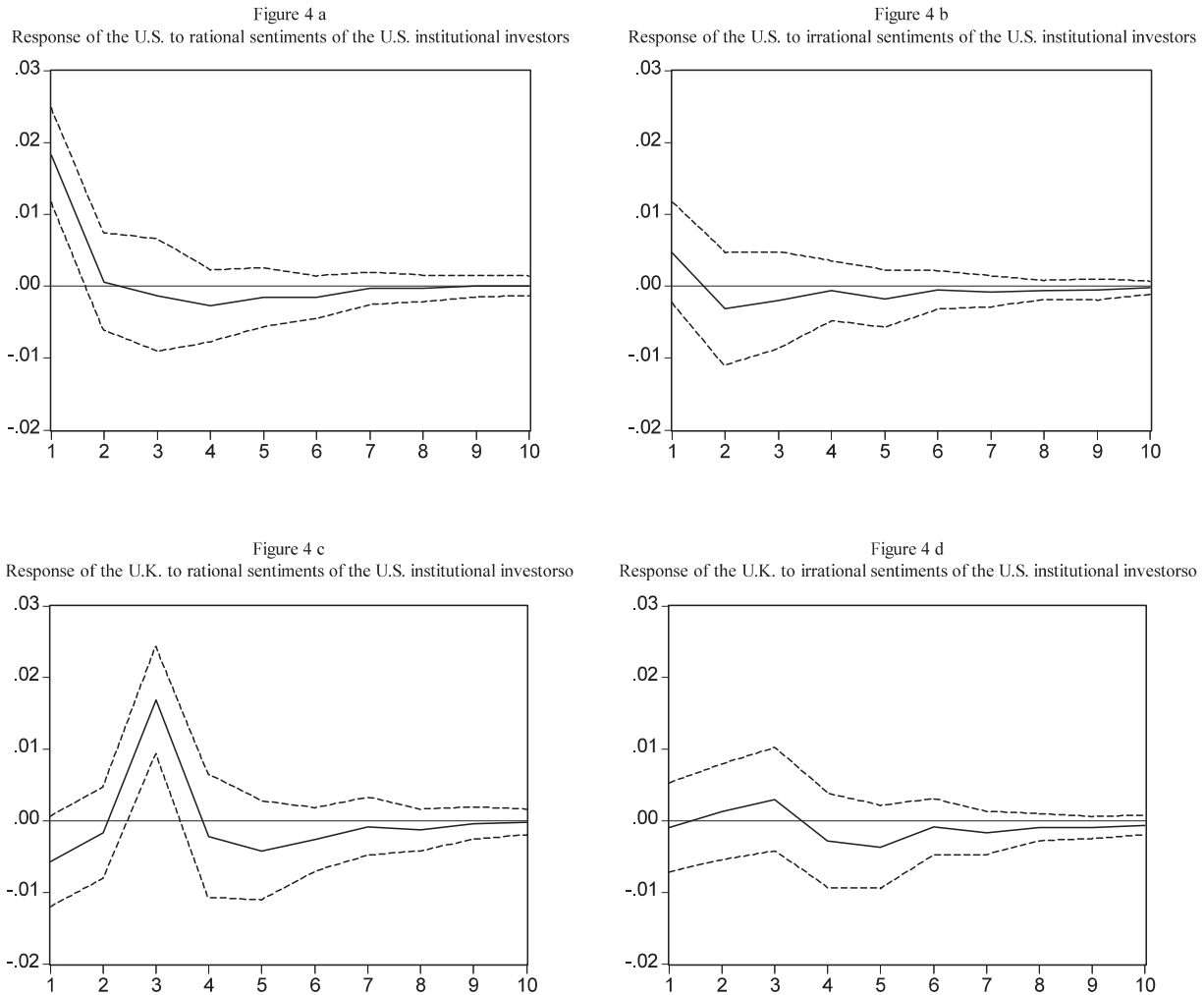
the U.S. stock market to a greater extent than individual investor sentiments. The international effects of the U.S. stock market can be attributed to the sentiments induced by fundamental trading and not to noise trading. These results are consistent with the view that, in addition to economic fundamentals, international effects of the U.S. stock market can also be attributed to investor sentiments. In particular, the institutional investor sentiment is transmitted internationally from the U.S. stock market.

These results have important practical implications for both investors and policymakers. Unlike previous studies that attribute investor sentiments fully to irrational investor behavior, our results support risk-based explanations of stock returns. Analytically, these results indicate sentiments are mainly a mani-

festation of the rational risk factors driving expected stock returns.

The effects of sentiments seem to result from the rational market outlook of investors. Investors could therefore improve their portfolio performance by considering both the stability and volatility in those rational factors as determinants of stock prices. At the same time, investors should be particularly wary of irrational investor sentiments while devising investment strategies. Policymakers should strive to achieve stability in sentiments to reduce market volatility and minimize investor uncertainty. A direct implication of our results is that international asset pricing models should consider the role of rational sentiments of institutional and individual investors depending on whether the market under study is developed or emerging.

FIGURE 4
Response of the U.S. and the U.K. to U.S. Institutional Investor Rational and Irrational Sentiment



Note: The dashed lines on each graph represent the upper and lower 95% confidence bands. When the upper and lower bounds carry the same sign, the response becomes statistically significant. On each graph, “percentage returns” are on the vertical, and “horizon” is on the horizontal axis.

Notes

1. Based on the consistent and asymptotically efficient AIC and SIC criteria (Diebold [2004]), and considering the loss in degrees of freedom, the appropriate number of lags is determined to be two. The ADF test rejects the null hypothesis of non-stationarity. The inclusion of drift/trend terms in the ADF test equations does not change these results (Dolado, Jenkinson, and Sosvilla-Rivero [1990]). The results of unit root tests are available from the authors upon request.
2. The results of the VAR estimates are available from the authors upon request.
3. Sims [1980] suggests that autoregressive systems like these are difficult to describe succinctly. It is especially difficult to make sense of them by examining the coefficients in the regression equations themselves. Likewise, Sims [1980] and Enders [2003] show that the t-tests on individual coefficients are not reliable guides, and therefore do not uncover the important in-

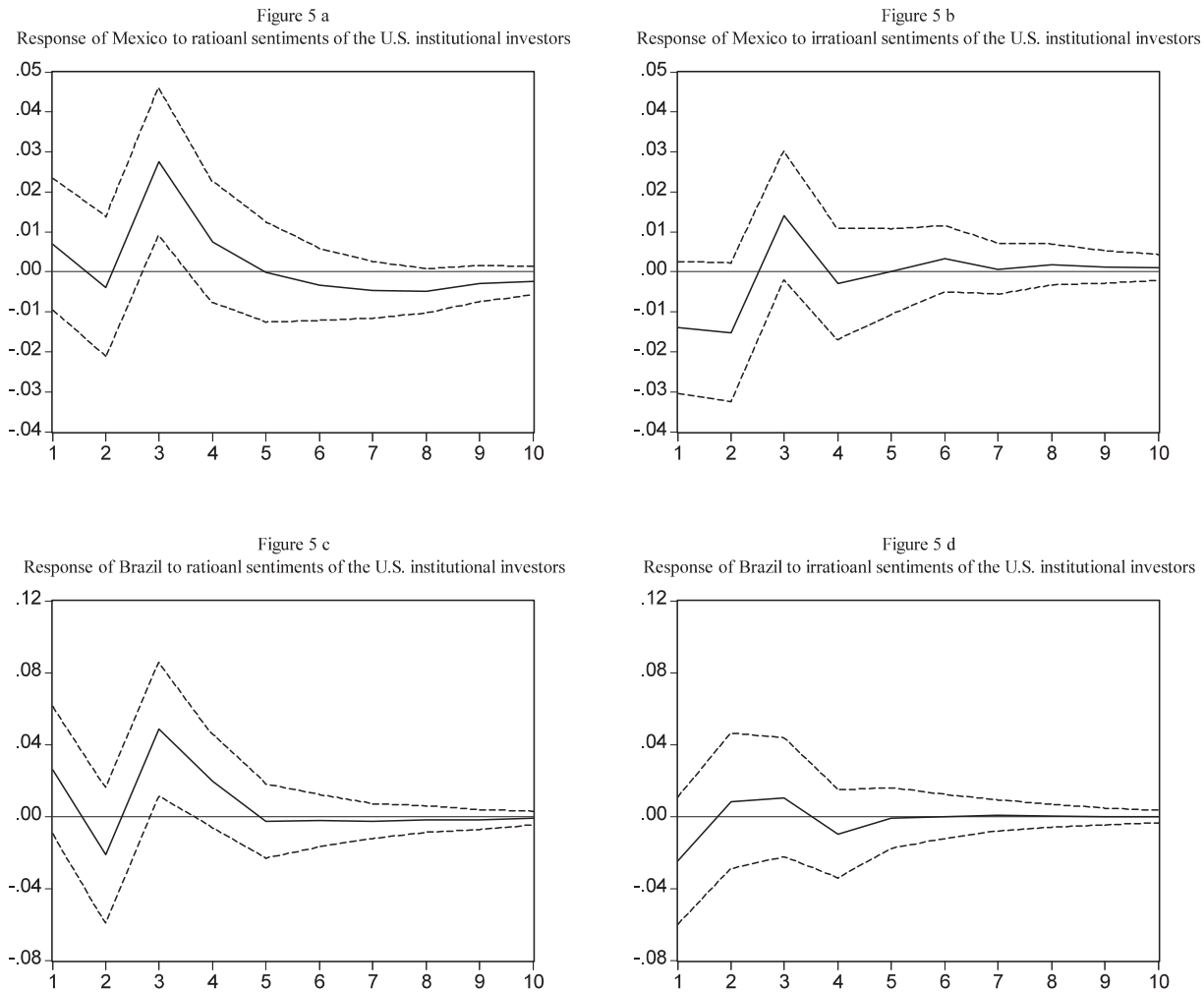
terrelationships among the variables. Sims [1980] recommends the analysis of the system’s response to typical random shocks, i.e., IRFs. Thus, we analyze the relevant IRFs and do not place much emphasis on the estimated coefficients of the VAR models.

4. Appendix A gives the U.S. imports and exports from the U.K., Mexico, Brazil, and Chile.

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FIGURE 5
Response of Mexico and Brazil to U.S. Institutional Investor Rational and Irrational Sentiment



Note: The dashed lines on each graph represent the upper and lower 95% confidence bands. When the upper and lower bounds carry the same sign, the response becomes statistically significant. On each graph, "percentage returns" are on the vertical, and "horizon" is on the horizontal axis.

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Appendix A. *U.S. Imports and Exports (in \$ millions)*

	U.K.		Mexico		Brazil		Chile	
	Imports	Exports	Imports	Exports	Imports	Exports	Imports	Exports
2000	43.35	41.57	135.93	111.35	13.85	15.32	3.27	3.46
2001	41.37	40.71	131.34	101.30	14.47	15.88	3.50	3.12
2002	40.74	33.20	134.62	97.47	15.78	12.38	3.78	2.61
2003	42.79	33.83	138.06	97.41	17.91	11.21	3.71	2.72
2004	46.40	35.96	155.84	110.78	21.16	13.86	4.73	3.62

Note: Data from Foreign Trade Division, U.S. Census Bureau, Washington.

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