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Where the Wild Things Are: Measuring Systemic Risk through Investor Sentiment

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In this paper, I develop a systemic risk measure derived from investor sentiment that has predictive power over future economic activity and market returns. Unlike existing measures, it is not focused on flagging investors' heightened awareness of risk at the end of a boom episode but rather on capturing shifts in their trading behavior at the beginning of the episode. The method allows investors and regulators to observe industries in which risks could be building and provides regulators some lead time in deploying their macroprudential tools.

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I. Introduction

Excessive credit growth has historically been a strong predictor of financial crises (Elekdağ and Wu, 2011; Schularick and Taylor, 2012). In response to growing evidence, Basel III seeks to discourage destabilizing credit booms through the establishment of a countercyclical capital buffer (CCB) requirement (Basel Committee on Banking Supervision, 2010, paragraphs 29-31). US regulators have already incorporated this requirement into Regulation Q (§217.11(b)). The buffer is set at zero in normal times and only increases during periods of excessive credit availability.

The obvious difficulty is the timing of the increase. Regulation Q states that the decision will be based "on a range of macroeconomic, financial, and supervisory information indicating an increase in systemic risk including, but not limited to, the ratio of credit to gross domestic product, a variety of asset prices, other factors indicative of relative credit and liquidity expansion or contraction, funding spreads, credit condition surveys, indices based on credit default swap spreads, options implied volatility, and measures of systemic risk" (§217.11(b)(2)(iv)). In essence, regulators must use statistical tools to determine when credit is becoming excessive while being careful enough not to choke the deployment of productive and desirable credit. This is a formidable task as credit booms attract accolades from the public as well as controversy. For example, the main complaint of consumer groups in 2005 was not the abundance of subprime mortgages but that their rates were too high for minority groups and women, and that some subprime borrowers should have qualified for a lower-cost fixed-rate prime mortgage.[1] The public was not demanding the choking of subprime credit or credit in general through regulatory means but an end to the perceived discrimination and high mortgage rates in the market. While in hindsight it would have been beneficial to slow down credit growth during that period, it is not clear how one would have gauged *in real time* the welfare impact of constrained credit growth in general.

When there are so many conflicting interests, leaning against a credit boom requires a publicly defensible degree of certainty over the presence of excessive risk taking in the

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[1] "Disparities Found in Sub-Prime Lending: Data Show African Americans, Hispanics Pay More to Borrow for Home, Refinance". Washington Post April 11, 2005. Available at http://www.washingtonpost.com/wp-dyn/articles/A42432-2005Apr10.html on December 31, 2015.
"Subprime loan market grows despite troubles". USA Today December 7, 2004. Available at http://usatoday30.usatoday.com/money/perfi/housing/2004-12-07-subprime-day-2-usat_x.htm on December 31, 2015.

financial system. Researchers developed a wide variety of measures for this purpose since the financial crisis. As will be discussed in a later section, many of those measures do not indicate excessive risk taking until the end stage of the credit boom, at which point a regulatory intervention can only precipitate the credit bust without much preventative influence on the building up of excesses in the economy. This is to be expected as investors do not knowingly take excessive or underpriced risks with the explicit intention to damage their portfolios. Therefore, any measure of excessive risk-taking that relies on investors' risk perceptions can raise a warning flag only after investors realize that they have been measuring the risks incorrectly.

This paper's approach is different. I develop a systemic risk measure that does *not* rely on detecting what investors knew and when they knew it. Instead, I develop an industry-specific Sentiment Index (SI) for every industry traded in the stock market and identify those industries that exhibit signs of 'exuberance'. Exuberance is defined by two criteria: i) the industry experiences an upturn (improvement) in investor sentiment (SI) without a parallel improvement in earnings; and ii) the improvement in sentiment results in positive excess stock returns for the industry in the next period. The first criterion is an indication that the improvement in sentiment may not be driven by the fundamentals of the industry. The second criterion, combined with the first one, may be interpreted as a flag for trading behavior driven by investor sentiment rather than industry fundamentals. The systemic risk measure in this paper, which I refer to as the Exuberance Index (EI), is the number of firms in industries flagged according to these two criteria, expressed as a fraction of all firms traded in the stock market during the period.

Because sentiment may rationally be driven by the strength of economic activity, EI and various economic variables are orthogonalized by regressing EI on the economic variables. The systemic risk index, EI_t, is the orthogonalized component of EI. It captures the investors' enthusiasm for various industries that cannot be explained by economic activity or fundamentals. A sustained period of positive EI_t may be interpreted as a degree of exuberance that deserves a reassessment of risks by market participants.

As one might expect, EI reaches abnormally high levels years before the global financial crises and also before the stock market crash of 2001. However, not every high value of EI corresponds to a period of distress in the US. When investors feel exuberant, the worst mispricings of risk do not always occur in US dollar assets alone. Using a list of the countries suffering financial crises since 1990, I show that high levels of EI_t in a particular year Granger-cause higher numbers of financial crises (in terms of the number of countries affected) one-to-two years later.

Because it is based on a sentiment measure, this paper's approach is most closely related to previous studies on investor sentiment and its predictive power over stock prices (Baker and Wurgler (BW), 2006, 2007; Huang et al. (HJTZ), 2015). The key difference is that unlike the BW-HJTZ measures that capture sentiment through its manifestation in the IPO market or equity share in security issuance (among other things), EI captures the shift in investor sentiment in its initial phase, before it triggers any detectable change in investor/firm behavior in the primary markets. It has predictive power over long-run industry stock returns above and beyond what can already be predicted by HJTZ. Another related paper by Lopez-Salido et al. (2015) investigates the role the credit-market sentiment plays in corporate decisions and macroeconomic activity. They find that 'loose' credit environments that are likely to lead to tighter credit market conditions can predict deteriorating economic activity with a two-year lag. I find that industries with high SI values not only suffer stock price declines within a year but that their cumulative returns show the negative impact of high sentiment for up to seven years.

While more detail on the construction of SI will be provided later, the index is derived from a three-factor model, consisting of a market-factor, a momentum factor, and a liquidity factor[2]. The basic concept is to track the sensitivity of industries to market momentum and liquidity over time (momentum and liquidity betas re-calculated monthly with weekly data). If the stocks underlying the industry benefit from momentum trading (positive momentum beta) *and* are highly liquid (a modified liquidity beta described later), the sentiment towards the industry is deemed to be positive. However, positive sentiment (high SI) is not sufficient to be included in EI. As stated in criterion i) above, the sentiment must also experience a statistically significant and positive break in its trend to qualify.

In the rest of the paper, I will discuss the existing measures of financial distress and systemic risk and the limitations to their practical use (Section II). I will then describe the

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[2] Carhart (1997) and Liu (2006)

mechanics of calculating the *EI* (Section III) and verify its predictive power (Section IV). Finally, I will highlight some caveats and conclude in Section V.

II. Existing Measures of Financial Stress and Systemic Risk

Measures of financial distress (or conditions) can be divided into two broad categories. The first group, Threshold Measures, consists of a wide variety of financial market and macro statistics (such as asset prices/returns, spreads, volatility, volumes, credit growth, home price growth, etc.) all combined into an indicator through a developer-specific weighting scheme. The indicator issues a warning signal when it exceeds a threshold. The second group, dubbed the Systematic Measures, has its foundations more solidly grounded in established asset pricing theory. Rather than including every financial or economic variable that moved before or during the crisis into an index, the systematic measures approach the problem through the lens of an economic model. I put the return-covariance measures and measures derived from option prices in this group.

A. Threshold Measures

Financial condition (or stress) indicators that fall into the threshold measure category are numerous.[3] The Federal Reserve Bank (FRB) of Kansas City's Financial Stress Index, for example, is a principal-components measure of 11 standardized financial indicators, including yield spreads and measures of uncertainty, such as VIX, and the cross-section dispersion of bank stock returns. Higher return dispersion is interpreted as higher asymmetry of information between investors and banks (Hakkio and Keeton, 2009). FRB-Chicago casts a wider net and aggregates 105 measures of financial activity in its national financial conditions index (Brave and Butters, 2010)

Being built with highly correlated financial variables, these indices themselves are highly correlated. A simple correlation analysis of financial condition indices developed by Federal Reserve Banks, Bloomberg and Goldman Sachs shows that the bilateral correlations vary between 30 percent and 95 percent, with the great majority above 70 percent. In a recent study, Aramonte et al. (2013) assessed the predictive power of a large sample of such indices and found that the evidence was weak if the financial crisis was not included in the

[3] See Kliesen et al (2012) and Aramonte et al. (2013) for a detailed review of a large number of these Threshold Measures. Making a complete list of all indices is nearly impossible.

evaluation period, raising the possibility that the indices might have been specifically designed to predict the characteristics of the most recent crisis. They also note that the indices “are built by combining public data for typically highly liquid financial instruments - hence they can hardly be characterized as containing privileged information.”

Three recent indices, which are less correlated with the early aggregated measures and have more predictive power, deserve a closer look. The first one is the Board of Governors’ Aggregate Vulnerability Index, which focuses on 44 variables including FICO scores of mortgages sold to Fannie Mae and Freddie Mac, home mortgage debt owed by high risk borrowers, the incidence of rapid borrowing among such households, the incidence of “piggy back” mortgages in new originations, and non-agency securitization volume (Aikman et al., 2015). Once again, the index seems designed to predict the characteristics of the last financial crisis; furthermore, its reliance on the institutional characteristics of US markets limits its global use.

The second measure is the deviation of the credit-to-GDP ratio from its long-run trend. A wide positive gap indicates growing vulnerabilities in the financial system (Drehmann et al., 2011; Drehmann and Tsatsaronis, 2014). As Edge and Meisenzahl (2011) show, there are problems with the real-time estimation of this measure due to the revisions to macro statistics and the wide error band of the one-sided HP filter at the end point. Another problem is more conceptual and illustrated in Figure 1. The blue trend line is calculated following the recommendations of Drehmann et al. (2011) and it suggests that the current level of the credit gap is wide and negative (too little credit). However, if one assumes that the growth in the credit-to-GDP ratio in late 1990s was a manifestation of the internet bubble and the observations beyond December 1996 (an arbitrary cutoff for illustration) do not represent safe levels of credit growth, then one may wish to truncate the estimation of the trend in December 1996. In that case, the green line suggests that the credit-to-GDP ratio has barely reached its trend despite the significant decline in credit outstanding after the financial crisis. One might also question whether the credit-to-GDP ratio can rise forever, dragging its trend with it to new heights. This is not an issue that can be addressed with a statistical measure.

The third analysis of interest is by Alessi and Detken (2014), who use a binary classification tree algorithm to determine the relative importance and critical thresholds of key economic and financial variables that best describe the incidence of crisis and no-crisis periods in a comprehensive dataset of European banking crises. Key variables include many familiar measures such as the credit-to-GDP ratio, house price growth, equity price growth, and household debt as well as measures stemming from the unique crisis experiences of European countries such as exchange rates (Scandinavian countries and UK), and government debt (PIIGS countries).

While the variables included in the threshold measures cover every single factor that was associated with a crisis over the last 35 years, there is always a bias demonstrated by the economists developing the measure towards the most recent experience of their country. However, the experience of one country's economy does not always apply to other countries. Consider the brown trend line in Figure 1, which is the trend of the credit-to-GDP ratio estimated in 2004.[4] At that time, a hypothetical regulator would have noticed that the credit-to-GDP ratio has been above its trend since late 2000. Setting aside the question of whether such a small positive gap would have been enough to trigger a regulatory response such as the countercyclical capital buffer, we can at least conclude that there was some indication of above-trend credit growth before the conditions deteriorated.

In contrast, let's examine briefly the Latin American debt crisis (also see the relevant section of Appendix A). Following the global recession of 1974-1975 and the rise in oil and commodity prices, Latin American countries accelerated their borrowing and investment in their infrastructure. They were seemingly able to afford their debt payments as they were commodity exporters themselves and their economies were booming. When the Federal Reserve raised the short-term interest rates under Chairman Volcker to battle US inflation, commodity prices and global trade collapsed and Latin American debt became unmanageable.[5] Mexico and Argentina were the first major Latin American countries to default in 1982, followed by Brazil in 1983. Debt growth is clearly a factor to consider and all the threshold measures already do so. But the relevant question for regulatory purposes is whether or not one could have detected the excessive borrowing during the 1970s when the problem was growing and an intervention (such as a countercyclical capital buffer on lenders) might have been both feasible and effective. The challenge is that the debt was clearly on the rise but so was the GDP. Figure 2 shows the government debt to GDP ratio in

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[4] I use the final figures for debt and GDP not the real-time measures available at the time.

[5] By the middle of the decade, metal prices had fallen nearly 45 percent and agricultural prices nearly 30 percent from their 1980 peak.

Brazil, Argentina and Mexico. It is very difficult to detect a rise in indebtedness of Argentina and Brazil in proportion to output. Mexico's debt rises but only from very low levels. Figure 3 examines the total credit-to-GDP ratio in Mexico and its trend, admittedly with a very short history.[6] In 1980, the ratio was slightly below its trend, having declined seven percentage points from its peak in 1977. Unlike the trend in the US in 2004, neither Figure 2 nor 3 indicate a worrisome trend in Latin America until the last quarter of the 1970s. A hypothetical regulator could always have voiced concerns over the sustainability of prices and trends but a "concern" not backed by data is not a feasible regulatory trigger.

B. Systematic Measures

The systematic measurement category is not any less crowded. Among many excellent proposals, the leading examples are the tail dependency measures such as SES (Acharya et al., 2010), SRISK (Brownlees and Engle, 2010), and CoVaR (Adrian and Brunnermeier, 2011), and measures obtained from structural asset-pricing models such as option-based OBSESS (Malz, 2013) and CDS-based DIP (Huang et al., 2011).

Both SES and SRISK capture the total capital shortfall in the financial system in a crisis but the estimation methodologies are different. SES directly measures the covariance of a financial institution with the market during an extreme event while SRISK monitors the evolution of the volatility and correlation dynamics of individual financial firms and the market. It is more forward looking than SES as the estimated dynamics can be used in making predictions. CoVaR detects which institution would contribute most to financial sector losses in a crisis and predicts that loss. $\Delta CoVaR_i$ is the change in the value at risk (VaR) of the entire financial sector conditional on institution i being in distress or not. Distress insurance premium or DIP is a measure of the marginal contribution of institution i to the hypothetical distress insurance premium of the entire banking sector. Just like CoVaR, it is a measure of expected losses when losses exceed a threshold. Unlike CoVaR, it is not the threshold itself (VaR) but the expectation of the losses conditional on the threshold. As a conditional expectation of losses, it is similar to the SES and SRISK measures. The main difference is in the methodologies. OBSESS drops the reliance on historical data all together and gleans the risk-neutral probability of default from the implied return distributions and correlations in the options market.

[6] I use all the data made available on Carmen Reinhart's website: http://www.carmenreinhart.com/this-time-is-different/

The systematic measures are excellent tools for systemic risk monitoring as they are model-based and do not suffer from data-mining. Their downside, as mentioned above in the introduction, is that any risk indicator that relies on extracting what investors know from asset prices is bound to raise a flag too late in the credit boom. Before the global financial crisis, none of the systematic measures triggered a warning before July 2007. This is very curious given the dire reviews of the financial conditions in reputable financial newspapers in the months leading up to the August 2007 liquidity freeze.[7] Of course, the mainstream view was that the subprime losses would remain contained in that market and this may very well have been investors' expected outcome. But the systematic measures are not simply about return expectations, they are also about the expected distributions and correlations of those returns. What is surprising is that the systematic measures do not show *any* indication of concern before July. After all, the risks were not completely unknown among the senior players. Chuck Prince delivered his famous remarks on liquidity conditions to the Financial Times on July 9th, 2007. Speaking of leveraged loan deals, he said, "the depth of the pools of liquidity is so much larger than it used to be that a disruptive event now needs to be much more disruptive than it used to be. At some point, the disruptive event will be so significant that instead of liquidity filling in, the liquidity will go the other way. I don't think we're at that point." It is remarkable that the systematic measures started to detect a rise in systemic risk after that article was published. Still, why the positive probability of a significant disruptive event had no effect on the systemic risk measures until July remains a conundrum.

The lesson from this episode, however, is clear. Investors will not drive the prices of liquid financial assets to new heights while inserting clues about an upcoming disaster in return correlations and implied distributions. They may be wrong but they are rational. Evidence shows that the systematic measures can identify who may be in most trouble if a crisis hits, which makes them invaluable regulatory tools. But they cannot predict the arrival of a crisis in time for regulators to react with preventative measures. Ideally, a warning issued by an indicator should provide regulators with enough time to measure the magnitude of the problem with stress-testing and on-site examinations before the liquidity disappears from the

[7] Below is a short list of articles from early 2007:
January 15- Financial Times; "Should Atlas still shrug? The threat that lurks behind the growth of complex debt deals"
February 17- Economist; "Bleak houses - American mortgages"
February 27- Financial Times; "Freddie Mac refuses some subprime loans"
March 3- Wall Street Journal; "Subprime Woes Pressure Wall Street Banks' Bonds"

financial markets. Of course, the trouble with public indicators is that if they are credible, they will only bring forward the starting point of the crisis.

In the remainder of the paper, I introduce an index that tracks not what investors know but how susceptible they are to herd behavior.

III. Investor Sentiment and Exuberance

A. The Concept

Multiple theoretical models have been proposed to explain the apparent pricing anomalies in experimental financial markets (Smith et al., 1988; King et al., 1992; Porter and Smith, 1994, 1995; Caginalp et al. 2000a, 2000b) as well as the real ones (De Bondt and Thaler, 1987; Jegadeesh and Titman, 1993; Lakonishok et al. 1994; Chan et al., 1996). These models impose some limits on investor rationality through various behavioral biases: conservatism and representativeness heuristic in Barberis et al. (1998), overconfidence and self-attribution bias in Daniel et al. (1998), or heuristic information processing in Hong and Stein (1999). One common characteristic of these models is that there must be some limits to arbitrage that prevent these anomalies from disappearing (De Long et al., 1990; Shleifer and Vishny, 1997). It follows that as these limits are less binding in liquid markets, anomalies should be less likely to appear in asset returns (Lee et al., 1993; Green and Smart, 1999; Chordia et al., 2014). Yet, this is not always the case. Momentum profits are significantly larger when market liquidity is higher (Avramov et al., 2015).

While it may seem counter-intuitive at first, this is in fact one of the most important findings of the experimental studies of the mass psychology of investors in financial markets (King et al., 1992; Caginalp et al., 2000a&b). Put simply, just as liquidity gives arbitrageurs more opportunity to borrow cash or securities to lean against under- or over-pricing, the same liquidity also gives momentum traders more rope to hang themselves with. King et al. (1992) observe that short-selling by the rational traders does not necessarily diminish the amplitude and duration of bubbles especially if momentum traders have access to margin loans. Also, only advanced graduate students in economics, who read Smith et al. (1988) in advance behave like rational value traders in an experimental setting. The observed trading patterns are not dependent on the experiment subjects being college undergraduates. Price booms and busts have been replicated in experiments among small businesspeople, mid-level corporate executives, and over-the-counter market dealers (Smith et al., 1988; Caginalp et al., 2000a).

The conceptual framework in these experimental studies is straightforward and summarized here very briefly (for additional details, see Caginalp and Ermentrout, 1990; Caginalp and Balenovich, 1994). Imagine a market that consists of traders whose wealth is split between a stock and cash. The total amount of cash and number of shares are constant. For reasons to be described momentarily, a fraction, k, of the traders decide to become buyers of the stock and a fraction $(1-k)$ decide to become sellers. The stronger the k shock is, the larger is the price response given that the price adjustment must rebalance supply and demand. k is a function of the investor sentiment, ζ. Investor sentiment has two components. One is the emotional "trend" component, which reacts positively to recent upward price movements. The second is the rational "value" component that rises if the stock is underpriced; i.e., $P < P_a$, its fundamental value. More specifically, ζ is defined as

$$\zeta(t) = q_1 c_1 \int_{-\infty}^{t} e^{-c_1(t-\tau)} \frac{1}{P(\tau)} \frac{dP(\tau)}{d\tau} d\tau + q_2 c_2 \int_{-\infty}^{t} e^{-c_2(t-\tau)} \frac{P_a(\tau) - P(\tau)}{P_a(\tau)} d\tau \tag{1}$$

q_1 is a weight that determines how much emotions can cloud the trader's reasoning, q_2 represents the weight of rational judgment. Caginalp and Ermentrout (1990) refer to c_1^{-1} as the "memory length" and c_2^{-1} as the "intellectual inertia". If c_1^{-1} is small (c_1 large), the trader pays attention to the most recent price movements only. If c_2^{-1} is large (c_2 small), the trader is slow to respond to deviations from the intrinsic value and only a persistent deviation will affect the trader's sentiment significantly. Intellectual inertia is similar to Hong and Stein's (1999) bounded rationality constraint arising from the newswatchers' limited capacity to process publicly available information. If a stock is underpriced, value traders move in and drive the stock price up, which creates the trend that attracts the momentum investors whose participation further intensifies the rate of price increase and attracts additional momentum traders. The trend reverses when the conviction of value traders grows strong enough to lean against the trend (second component of (1)). Once the trend is reversed, momentum traders will now push towards deep underpricing of the asset. q_1, c_1, q_2, and c_2 can be estimated experimentally in a laboratory setting for a particular investor group and factors that amplify or lessen asset price booms can be analyzed.

Under this framework, Caginalp and Balenovich (1999) relax the constant-cash constraint and allow liquidity injections into the markets. They show analytically and numerically that under plausible conditions, the asset price may converge to the "liquidity" value, which is a value disconnected from fundamentals and determined solely by the amount of funds chasing the asset.

Therefore, in building the Exuberance Index, I will examine how stock market returns of industries respond to both momentum *and* liquidity.

B. The Basics

At time t, I measure the sensitivity of every traded firm i to momentum and liquidity by estimating a three-factor model of stock returns

$$R_{it} - R_{f_t} = \beta_{o_{it}} + \beta_{M_{it}} MKT_t + \beta_{U_{it}} UMD_t + \beta_{L_{it}} LIQ_t + \varepsilon_{it} \qquad (2)$$

MKT_t is the market factor, UMD_t is the Carhart (1997) momentum factor and LIQ_t is Liu (2006) liquidity factor. Note that there is no size or book-to-market factor since Liu shows that liquidity can explain those factors but cannot explain momentum. The model is estimated with 72 weeks (18 months) of data. The choice of time horizon, while arbitrary, balances two opposing forces. The first is to have a short-enough horizon so that changes in sentiment can be captured quickly for systemic risk monitoring. The second is to have an acceptable number of observations in the estimation. A firm is included in the analysis if it has return information in the CRSP database for at least 19 months (I drop the first month after IPOs). I follow the steps below.

1) *Beta estimation:* At the end of every month between June 1976 and December 2014, I estimate (2) with the previous 72 weeks' data. Weekly market factor is available on Kenneth French's website. Momentum and liquidity factors are estimated at weekly frequency using Carhart and Liu's descriptions.

2) *Industry aggregation:* I am looking for industries that do well when market momentum is positive but wish to avoid those that become sensitive to momentum only because liquidity is abundant (as suggested by Avramov et al., 2015). In other words, I am searching for firms about which the investors are so confident that when liquidity drops (negative LIQ_t), these firms do well as a safe harbor. Thus, I am interested not in firms

with rising $\beta_{L_{it}}$ but firms with rising $(-\beta_{L_{it}})$. Given LIQ_t's design, this is tantamount to searching for increasingly more liquid firms that have done well in the past. Once I have each firm's $\beta_{U_{it}}$ and $-\beta_{L_{it}}$, I aggregate them to industry level, β_{U_t} and β_{L_t}, using each firm's market capitalization as its weight (equally-weighted aggregation is discussed in the robustness check section). An industry is defined by the first four digits of its NAICS code. Note that β_{L_t} is an aggregation of $-\beta_{L_{it}}$s but I will not carry a negative sign in front of it for expositional reason.

3) *The time-series and re-scaling of betas:* I repeat steps 1) and 2) every month for at least 10 years using the data from the 72 weeks preceding each month. Once the 10-year minimum is reached, I re-scale β_{U_t} and β_{L_t} to lie between 0 and 1 using the history of the series up to that point.

   Here is an illustration of the process. Since the first betas were estimated in June 1976, I collect the monthly betas until June 1986 before I continue with the rest of the analysis. Starting in June 1986, I re-scale each beta series to the [0,1] range using the history up to June 1986. In *July* 1986, I calculate the new betas for that month. I re-scale all the betas again using the history until *July*. If the July betas do not constitute a new low or a new high, the re-scaling makes no difference to the history. If July is a new extreme observation, the entire beta history will be re-scaled using the new extreme. The analysis in each period will utilize the most up-to-date re-scaled beta time-series.

4) *The common trend:* I determine the common trend in the re-scaled β_{U_t} and β_{L_t} by calculating their principal components. The calculation in each month (from June 1986 to December 2014) will use the entire history of betas starting in June 1976. I am looking for the component that is positively correlated with both betas. I prefer this technique to simple averaging because the principal component is equally correlated with both series without emphasizing one series at the expense of the other. The positively correlated component may not be the first principal if β_{U_t} and β_{L_t} have been negatively correlated in the past. Therefore, I use the first principal if the past correlation has been positive and the second principal if the correlation has been negative. I will refer to the preferred component as the *Sentiment Index* (*SI*) of the industry. A sample of *SI* is presented in Figure 4.

5) *Trend breaks:* At the end of each month, I have the SI calculated with the betas up to that point. The next step is to identify the industries that have experienced a sharp rise in their SI after a trend break within the past 6 years. The six year limit is based on a review of historical asset price boom and busts (Appendix A). There is no instance in the historical record when an unsound boom lasted for more than five years. I allow one more year to be conservative.

   The search for the trend break is undertaken with Christiano's (1988) bootstrapping technique and allows for a shift in the mean and in the trend. For each industry i at time *T,* an error distribution is calculated from the trend-stationary model using the data up to *T*:

$$SI_{i,t} = \gamma_0 + \gamma_1 t + \gamma_2 SI_{i,t-1} + \gamma_3 SI_{i,t-2} + \varepsilon_t \tag{3}$$

   5,000 F-statistics are computed with draws from the error distribution and using the following unrestricted model with a trend break at time θ, represented by the dummy δ_θ (zero if $t < \theta$ and one if $t \geq \theta$).

$$SI_{i,t} = \gamma_0 + \mu_0 \delta_\theta + \gamma_1 t + \mu_1 \delta_\theta t + \gamma_2 SI_{i,t-1} + \gamma_3 SI_{i,t-2} + \varepsilon_t \tag{4}$$

   The 90^{th} percentile of the simulated F values is used as the significance threshold with the intent to minimize the Type-II error.

   Searching across all industries for those that may have a trend break and repeating the search quarterly (SI is monthly but EI is quarterly) is a computational challenge. In the interest of efficiency, I use only 10 years of the SI data (120 monthly observations up to *T*). As stated earlier, I will only consider the significant trend breaks that take place within the 6 years preceding *T*. Those that take place earlier are assumed to represent benign exuberance episodes. But it is also possible that less than 4 years of pre-break data may not be sufficient to establish a meaningful initial mean and trend.

   If the F-test detects a break over multiple consecutive periods, θ is set at the *earliest t* when a break can be detected. If multiple distinct breaks are detected, θ is the one closest to T since I am only interested in the most recent change in sentiment about the industry.

6) *The nature and significance of the trend breaks:* The method above determines all breaks not just positive breaks in sentiment. What constitutes a positive break must be defined. For example, $\mu_0 > 0$ and $\mu_1 = 0$ is one possibility. $\mu_0 = 0$ and $\mu_1 > 0$ is another as well as both μs being positive. The following constraints are set to identify and eliminate the trend breaks that are *immaterial* (too-weak-to-qualify as 'exuberant') or in the *wrong direction*. Those industries will not be considered any further for inclusion in the EI index at time T (but they may qualify in future periods).

The immateriality constraint is a way to balance the Type-I and Type-II errors. I set the significance threshold for the F-test in the previous step at 10 percent because missing a warning sign, a Type II error, is costlier to a regulator than examining too many industries. However, the Type-I error must be considered if the risk measure may be used to trigger a macroprudential policy action that could harm misidentified or unrelated industries. Therefore, in building the EI, I drop industries in which the trend break is too ambiguous. Ambiguity is defined as a t-statistic for μ_0 or μ_1 that is less than 2. I will examine the sensitivity of EI to the selection of this ambiguity threshold later in this section. Note that t-statistics below are represented by '$\mathbb{t}$' since 't' already denotes time.

An industry is *excluded* from the EI in period T if:

i. After the trend break, the new slope is negative even if it is a weakly negative slope: $\mathbb{t}_{\gamma_1+\mu_1} < -1.7$

   A declining trend in sensitivity to momentum and liquidity is not indicative of exuberant behavior. The industry may be recovering from a positive shock but there is no concern if investors came back to their senses after the shock.

ii. The breaks are not statistically strong (or they are too ambiguous) or in the wrong direction: $\mathbb{t}_{\mu_0} < 2$ *and* $\mathbb{t}_{\mu_1} < 2$.

iii. There is no 'exuberant' behavior after the break: $\mathbb{t}_{\mu_0} < 2$ *and* $\mathbb{t}_{\gamma_1+\mu_1} < 2$

   If the change in the mean is not unambiguously positive, at least the post-break trend should be positive. Alternatively, if μ_0 is unambiguously positive, a flat trend after the break is acceptable (as long as it does not violate threshold i.)

After shortening the list of industries that experience a trend break by applying thresholds i to iii, one notices two unforeseen properties of the data that must be accounted for. First, there are many industries that survive the elimination process (show a positive break) around the time a recession ends and market recovery begins. Most of these industries drop out in less than a year but they leave behind a short-lived spike in the number of qualified industries at the end of recessions. As an *ex-post* adjustment after observing this behavior, I impose the restriction that the trend break should be detectable for at least four quarters after it takes place. Second, in some industries, the SI is on a declining trend before the break ($\gamma_1 < 0$) and then suffers a negative level-shock ($\mu_0 < 0$). The trend often turns positive after the shock but to distinguish true reversals in sentiment from mean reversion, I disregard these industries until the positive trend lasts long enough to overcome the negative impact of the level shock. The following two constraints make the data-driven exclusion rules explicit.

iv. The change in trend is too 'immature' to consider: $T - \theta < 4$ quarters

v. Exclude potential mean-reversions: $\mathbb{t}_{\gamma_1} < -1$ *and* $\mathbb{t}_{\mu_0} < -1$

Trend breaks of this type are associated with strong reversals ($\mathbb{t}_{\mu_1} > 2$). If there is a positive trend after the shock ($\gamma_1 + \mu_1 > 0$) that is sufficiently strong, it will eventually eliminate the impact of the initial level shock and constraint v. will no longer be binding for the industry in a future period. Until that time, the industry is eliminated. Therefore, v. may delay the detection of exuberant industries.

After all five constraints are applied, the number of firms in industries surviving the elimination is shown in Figure 5.

A quarterly SI_ttrend-break index (SIT_t) is built by assigning the index a value of '1' in period T if there is an identifiable positive break in SI in the 6 years preceding T and zero otherwise.

Not every positive break in sentiment is exuberance. For example, if the fundamentals of the industry are showing a trend-breaking improvement around the same time as the SI, the optimism may be rational. Still, drawing a clear line that separates optimism from exuberance is obviously difficult. If the fundamental characteristic has been improving smoothly over the sample period (without an breaks), one could justify the change in investor sentiment with investors' surprise at the uninterrupted long-run improvement. For example, at time θ, investors may realize that the upward trend in historical earnings is not temporary as they initially thought and from that point forward, the industry may become a magnet for informed investors as well as momentum traders. At the other extreme, even if there is a positive break in earnings, this is no proof that investor reaction has been proportional to the improvement in earnings. Therefore, monitoring fundamentals is necessary but not sufficient. Step 7) of the analysis is on the development of a statistic that represents fundamentals.

7) *Fundamentals:* As the industry fundamental, I use the industry's seasonally-adjusted quarterly return-on-assets, *ROA*, calculated as the sum of EBITs of all firms in the industry divided by industry total assets (source: Compustat). EBIT rather than net income is utilized because debt will be considered in a later step. As explained in the next section, the level of $ROA_{i,t}$ and the breaks in its trend will be monitored. In the latter case, a trend break is identified using the same methodology and constraints explained in steps 5) and 6). A quarterly $ROA_{i,t}$ trend-break index ($ROAT_{i,t}$) is built by assigning the index a value of '1' in period *T* if there is an identifiable positive break in *ROA* in the 6 years preceding *T* and zero otherwise.

One way to separate optimism from exuberance is to look for indications of a vicious cycle in which sentiment and stock returns are driving one another in a manner detached from fundamentals. Step 8) builds that indicator.

8) *Vicious Cycle Indicator:* At the end of every quarter *T*, I examine how returns and sentiment influence one another using a VAR model and monthly data. Denoting by $R_{i,t}$ the monthly value-weighted stock return of an industry i at time $t \leq T$, let's define the expected return for the month by $\hat{R}_{i,t}$, which is calculated as

$$\hat{R}_{i,t} = R_{f_t} + \hat{\beta}_{O\,i,t-1} + \hat{\beta}_{M\,i,t-1}MKT_t + \hat{\beta}_{U\,i,t-1}UMD_t + \hat{\beta}_{L\,i,t-1}LIQ_t \qquad (5)$$

by using the monthly factors and the re-estimated monthly lagged betas of the industry. The estimated VAR is of the form:

$$R_{i,t} = \mu_0\hat{R}_{i,t} + \sum_{k=1}^{p}\mu_k R_{i,t-k} + \sum_{j=1}^{p}\gamma_j SI_{i,t-j} + u_{i,t} \qquad (6a)$$

$$SI_{i,t} = \sum_{j=1}^{p}\varphi_j SI_{i,t-j} + \sum_{k=1}^{p}\omega_k R_{i,t-k} + v_{i,t} \qquad (6b)$$

where p is the number of autoregressive terms. $\hat{R}_{i,t}$ is included to determine the impact of sentiment on $R_{i,t}$ beyond what can already be predicted by a factor model. As a principal component, $SI_{i,t}$ has a zero mean.[8]

Recall that in step 1), betas were estimated with 18 months (72 weeks) of data to balance the need for degrees of freedom with the focus on short-term sentiment effects. In the current step, 18 months is no longer feasible since the SI is monthly and (6) cannot be estimated with 18 observations. Expanding the sample to 36 or 48 months does not have any material impact on the conclusions; therefore, 48-months is chosen. p is selected to minimize Schwarz Bayesian information criterion.

Granger causality between $R_{i,t}$ and $SI_{i,t}$ is evaluated in both directions. A quarterly causation index (CI_t) is built by assigning the index a value of '1' at time T if the causality tests reject non-causality in at least one direction and zero otherwise.

One additional factor to consider is industry leverage. If positive investor sentiment motivates the firms in the industry to borrow excessively, leverage could be a risk factor tied to exuberance. The financial stability literature emphasizes the overall leverage in the financial system rather than industry leverage but there is some evidence that firm level leverage also matters (Mendoza and Terrones, 2008). In any case, how SI interacts with leverage is an interesting an empirical question. Step 9) builds the leverage measure.

9) *Leverage:* I track corporate leverage with two measures (source: Compustat). The coverage ratio is the total interest expense of the industry divided by the total revenues. The leverage ratio is the ratio of the total industry debt to total assets. The first statistic ($LEV_{i,t}$) is the first principal component of the seasonally-adjusted leverage and coverage ratio series.[9]

C. Establishing the Relevance of Risk Factors

Whether $SI_{i,t}$, $CI_{i,t}$, $ROA_{i,t}$, or $LEV_{i,t}$ are relevant risk factors as hypothesized must be examined empirically. To gauge their relevance, I examine their impact on long-run industry stock returns.

[8] In the rare case in which the existence of a unit root in the SI series of an industry cannot be rejected at time T, ΔSI_t is used instead of SI_t in (6).
[9] Leverage does not have a seasonal component in most industries.

For industry i, Q-quarter holding-period log return from quarter t to t+Q, $y_{i,t+Q}$, can be expressed as a function of the quarter t risk factors as

$$y_{i,t+Q} = \phi_{SI}SI_{i,t} + \phi_{CI}CI_{i,t} + \phi_{ROA}ROA_{i,t} + \phi_{LEV}LEV_{i,t} + \phi_{SIZE}SIZE_{i,t} + \phi_{LAG}y_{i,t-4} + FixedEffects_{i,t}\phi_D + \mathrm{u}_{it} \tag{7a}$$

or

$$y_{i,t+Q} = x_{i,t}\Phi + \mathrm{u}_{it} \tag{7b}$$

$SIZE_{i,t}$ is the market capitalization of the industry five years prior to t, which represents the pre-exuberance size of the industry. $y_{i,t-4}$ is the 4-quarter holding period log return of the industry up to time t. $FixedEffects_{i,t}$ is a row-vector of year-quarter and industry fixed effects. Observations from an entire industry can be represented in matrix form as

$$\boldsymbol{Y_{i,Q}} = \boldsymbol{X_i\Phi} + \mathbf{u}_{\boldsymbol{i,Q}} \tag{7c}$$

where $y_{i,t+Q}$ and $x_{i,t}$ are rows of $\boldsymbol{Y_{i,Q}}$ and $\boldsymbol{X_i}$. Note that $\boldsymbol{X_i}$ has T – Q rows (where T is the number of observations) since the last Q quarters will be used to calculate the last long-run return at $t = T - Q$. Similarly, industry-level data can be stacked to obtain the full panel represented by

$$\boldsymbol{Y_Q} = \boldsymbol{X\Phi} + \mathbf{u}_{\boldsymbol{Q}} \tag{7d}$$

An analysis of long-run returns based on (7d) will suffer from strong autocorrelation due to overlapping observations. To overcome this problem, I utilize the procedure developed by Britten-Jones et al. (2011). To summarize here briefly, the procedure creates a new $\boldsymbol{Z_i}$ matrix from $\boldsymbol{X_i}$ and its lags, which transforms the problem from one that contains overlapping returns to one that contains one-period returns using the additivity of log returns. That is, denoting the one-quarter log return k quarters from now by $r_{i,t+k}$,

$$y_{i,t+Q} = r_{i,t+1} + r_{i,t+2} + \cdots + r_{i,t+Q} \tag{8}$$

For all $0 < t \leq T - 1$, let $\hat{x}_{i,t} = \sum_{k=0}^{Q-1} x_{i,t-k}$, where $x_{i,t} = 0$ for $t \leq 0$ and $t > T - Q$. Note that this restriction assures that $\hat{x}_{i,t}$ is not forward looking; $\hat{x}_{i,t}$ for $t > T - Q$ contains observations up to $T - Q$. Let $\boldsymbol{\hat{X}_i}$ be the matrix with $T - 1$ rows formed by stacking the $\hat{x}_{i,t}$s and $\boldsymbol{r_i}$ be the

$(T-1) \times 1$ vector of one quarter log returns starting with $r_{i,2}$. After obtaining $\boldsymbol{r_i}$, $\widehat{\boldsymbol{X}}_{\boldsymbol{i}}$ and $\boldsymbol{X_i}$ for each industry i, I stack them to obtain the matrices $\boldsymbol{r}$, $\widehat{\boldsymbol{X}}$, and $\boldsymbol{X}$. Britten-Jones et al. show that (7c) in panel form can be written as

$$\boldsymbol{r} = \boldsymbol{Z\Phi} + \mathbf{u} \tag{9}$$

where $\boldsymbol{Z_i}$ is

$$\boldsymbol{Z} = \widehat{\boldsymbol{X}}\left(\widehat{\boldsymbol{X}}'\,\widehat{\boldsymbol{X}}\,\right)^{-1}\boldsymbol{X}'\boldsymbol{X} \tag{10}$$

and $\boldsymbol{\Phi}$ in (9) is the same $\boldsymbol{\Phi}$ in (7d). In estimating (9), I compute an asymptotically-consistent empirical covariance matrix. Errors are clustered by industry. Table 1 presents the results for the full sample. Table 2 repeats the analysis after dropping all observations post December 2005. This is done to verify that the findings of Table 1 are not driven by the last credit boom episode and its aftermath. Note that in some specifications, I expanded (7a) by adding three interaction terms $\phi_{SI\times CI}SI_{i,t} \times CI_{i,t}$, $\phi_{CI\times ROA}CI_{i,t} \times ROA_{i,t}$ and $\phi_{SI\times ROA}SI_{i,t} \times ROA_{i,t}$. $LEV_{i,t}$ and its interaction with $SI_{i,t}$ are always insignificant. Therefore, I exclude that interaction from the Table.

Both Tables 1 and 2 show that high levels of $SI_{i,t}$ are associated with negative stock market returns starting in year one and cumulative returns not recovering in a statistical sense for at least six (Table 2) or seven (Table 1) years. That is when the statistical significance of $SI_{i,t}$ disappears even though the coefficient remains negative. Economic and statistical significance of $CI_{i,t}$ becomes more pronounced at long horizons but a negative effect is detectable at short-horizons as well. The most crucial interaction term is $\phi_{CI\times ROA}$, which indicates that high $ROA_{i,t}$ can undo the negative impact of high $CI_{i,t}$.

Based on the results from these two Tables, the industries at highest risk should be those that have high levels of $CI_{i,t}$ and $SI_{i,t}$ but low levels of $ROA_{i,t}$. Then, an industry is included in EI in quarter T if $CI_{i,T} \times SIT_{i,T} \times \left(1 - ROAT_{i,T}\right) > 0$. In other words, in each quarter T and using only the data up to the end of that quarter, i) a trend break has been observed in $SI_{i,t}$, ii) $SI_{i,t}$ and $CI_{i,t}$ have been found to cause one another in at least one direction and iii) *no* positive break has been observed in ROA. EI is the number of firms in the selected industries divided by the total number of firms traded in the market at that time. Figure 6 shows the 4-quarter moving average of EI as well as the market capitalization share of the firms in EI. The market capitalization share is very sensitive to the inclusion of extremely large industries. Even though there were 220 companies in Semiconductor and Other Electronic Component Manufacturing industry in June 1997 compared to 206 in Electric Power Generation, Distribution and Transmission, the market capitalization of the power generation industry is ten times larger than the semiconductor industry. Because the intent of EI is to capture pervasive exuberance in the market, I prefer to track the number of firms rather than market capitalization.

Appendix B lists industries with $SIT_{i,T} = 1$ and their $CI_{i,T}$ and $ROAT_{i,T}$ values in various periods. Those that are indicated by a '*' are included in EI. The table in Appendix C shows whether select industries appear with $SIT_{i,T} = 1$ in a particular quarter (indicated by '*') and also in EI (indicated by '†').

In Figure 7, I recalculate EI using a stricter ambiguity threshold ($\mathfrak{t}$) of 2.3 and a weaker threshold of 1.7 rather than 2 (in conditions ii. and iii. in step 6). Unlike the earlier EI in Figure 6, which has a hump-shape in the 1994-2002 period, the less-ambiguous (2.3) EI in Figure 7 has three distinct peaks over the same period; namely, September 1996, June 1998, and December 2000. While the first two peaks *precede* the Asian crisis and the Russian default by 2 to 10 months, the last peak *lags* the April 2000 peak of NASDAQ by 8 months. The behavior of the sentiment component (SI) is confounded by the Russian default, which depressed the sentiment measures throughout 1999. By the time another positive trend break in SI could be detected statistically in many industries, the overall market had already moved beyond its peak. Thus, as one would expect, the cost of reducing the Type-I error is higher Type-II error, which is further aggravated when the stress episodes are too close to one another. EI under the weaker threshold behaves similarly to the original threshold. How the choice of thresholds affects the predictive power of EIwill be examined in the next section.

IV. Predictive Power of the Exuberance Index

In this section, I evaluate the impact of EI on long-run economic growth, business investment and future stock market returns as measured by the S&P500 total return index. I also investigate its predictive ability of financial crises. I will run the analysis using the '2' threshold and compare it to the alternatives at the end.

The first order of business is to extract the component of EI that cannot be explained by current or anticipated economic activity. It is appropriate for investors to be excited about a growing economy. Exuberance is enthusiasm that cannot be explained purely by the state of the economy. In order to obtain the orthogonal component of EI, I regress it on the contemporaneous quarterly growth in durables and nondurables consumption, business investment, exports, and imports, quarterly change in the consumer price index and the US Treasury 10-year to 1-year term spread. The spread is included as a predictor of future economic activity.[10] In the analysis that follows, EI_t is the orthogonalized exuberance index.

A. The Growth of Investment, Consumption, and GDP, and the Stock Market Returns

The main specification is of the form

$$y_{t+Q} = \phi_o + \phi_{EI}EI_t + \phi_{MR}MARGIN_t + \phi_{SP}\Delta SNP_t + \phi_{LV}CLEV_t + \phi_{PE}PE_t + \phi_{CPI}CPI_t + \phi_{\Delta y}\Delta y_t + \phi_H HJTZ_t + \phi_{CS}CSPR_t + \phi_{TS}TSPR_t + \phi_{EX}EI_t \times Interaction + \mathrm{u}_t \quad (11)$$

y_{t+Q} is the Q-quarter log-change of the dependent variable of interest. $MARGIN_t$ is the margin debt to NYSE market capitalization ratio, which I use as a measure of fragility in the stock market. ΔSNP_t is the log-change in the S&P 500 total return index over the 4 quarters preceding t, $CLEV_t$ is the corporate leverage calculated as total debt to assets ratio of nonfinancial corporate businesses as reported in the Flow of Funds, PE_t is the price-to-earnings ratio of the S&P 500 index, CPI_t is the change in the consumer price index over the previous quarter, Δy_t is the log-change in the dependent variable over the 4 quarters preceding t[11], $HJTZ_t$ is the Huang et al. (2015) investor sentiment index, $CSPR_t$ is the Baa-Aaa corporate credit spread, $TSPR_t$ is the US Treasury term spread. In some specifications, EI_t will be interacted with $HJTZ_t$, $CSPR_t$, PE_t, and $TSPR_t$. That is the $Interaction$ term. The estimation technique is once again from Britten-Jones et al. (2011).

Table 3 presents the results with the cumulative long-run stock market return as the dependent variable and using the full sample. Table 4 repeats the analysis after excluding the crisis (post-2006) period. Although high $SI_{i,t}$ and $CI_{i,t}$ were indicative of persistent and immediate poor performance at affected-industry level (Tables 1 and 2), the existence of some

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[10] Results are available upon request.
[11] if y_{t+Q} is the future performance of the stock market, Δy_t is replaced with the 4-quarter GDP growth as ΔSNP_t is already among the explanatory variables.

exuberant industries is not indicative of persistent poor performance at the broad-market level. At 1-to-2 year horizons, the overall impact of EI_t is negative but significant only at the 10 percent level. Most interestingly, $EI_t \times CSPR_t$ interaction shows that as long as the credit markets remain calm (narrow $CSPR_t$), exuberance is actually associated with positive stock market outcomes in the short-run. Put differently, widening credit spreads mark the end of the exuberance episode. Even though the significance of EI_t dies off at longer horizons, interaction terms indicate the conditions under which exuberance can be damaging to very-long-run market returns. At 5 or 6-year horizons, high levels of EI_t hurt market performance if the contemporaneous P/E ratios or the $HJTZ$-sentiment were high. While the widening of credit market spreads mark the end of the exuberance episode, the subsequent market correction is over in five years, with higher spreads at time T now suggesting higher returns at time (T + 5) as indicate by the ($EI_t \times CSPR_t$) interaction term.

When the crisis period is excluded, the effect of exuberance on short-term (2-year) market returns turns positive. In other words, a high level of exuberance does not necessarily precede an immediate market correction. However, the term spread is a key factor in determining the short-term impact of exuberance. If the spread is relatively flat, EI_t has the strongest positive impact on short-term market returns. One could speculate that search for yield is exacerbating the effect of exuberance although the current analysis is not designed to test this argument.

In the long-run (4-5 years), the earlier results in Table 3 still stand. The interaction of exuberance with the P/E ratio and $HJTZ_t$ is both negative and significant. If the credit spread were low at the time of the high exuberance reading, the cumulative market return after 5 years is still significantly negative. However, if the credit spread were high (which may signal the end of the exuberance period), the negative impact of exuberance dissipates after 5 years.

Table 5 examines the impact of high EI_t on overall economic activity. The negative impact appears in the 2-year GDP growth numbers but some negative effect is apparent even in the first year if $HJTZ$-sentiment, credit spreads or valuations are high. The economic output reaches the pre-bust levels in year five with the coefficient of EI_t turning positive and statistically significant (the coefficient itself turns positive in year four but it is insignificant). Once again, $HJTZ$, high valuations and low credit spreads exacerbate the impact of exuberance on the economy.

Table 6 repeats the analysis with the pre-crisis sample. The findings from this limited sample deviate from the full sample results in a way similar to the stock market results. The short-term impact of exuberance on GDP can be positive and significant if the yield curve is flat. In the long-run, high $HJTZ$-sentiment, high valuations and low credit spreads are associated with lower growth when they occur concurrently with high EI_t.

Tables 7 and 8 examine the impact of EI_t on cumulative long-term business investment and consumption growth. Both components of GDP are similarly affected from exuberance. Despite the immediate negative impact of $HJTZ_t$ on investment and consumption, EI_t's negative impact materializes in year 2, which suggests that EI_t can be used as a 2-year advance warning system. Note that when $HJTZ_t$ and EI_t are jointly high, they augment each other's negative impact even in year 1. As with the stock market returns, as long as the credit spreads remain narrow, exuberance may encourage business investment and increase consumption. In the very-long-run, the combination of exuberance with high valuations and $HJTZ_t$ can hurt both consumption and investment; the negative impact is still detectable in year 6. Credit spread interaction marks year 5 as the year in which the cumulative business investment and consumption growth turns positive following a credit market anxiety (high *CSPR*) episode.

B. Alternative Construction Techniques

The principal building block of EI_t is the industry-level sentiment index $SI_{i,t}$. In this section, I examine the sensitivity of the $SI_{i,t}$ to alternative construction techniques and how those techniques affect the predictive power of EI_t. I will consider two alternatives. The first is to measure sentiment through the sensitivity of the industry returns to momentum factor alone without considering the effect of liquidity. The second is to build the industry-level momentum and liquidity betas as an equally-weighted average of firm-level betas instead of a market capitalization-weighted average.

First, I repeat the entire analysis by using the history of momentum betas alone as the sentiment index, which I denote by $MomSI_{i,t}$. The causation analysis will now generate a $MomCI_{i,t}$ index calculated with the exact same methodology but with $MomSI_{i,t}$ as the sentiment component. I present the results in Table 9. Panel A shows the sensitivity of industry returns to $MomSI_{i,t}$ and $MomCI_{i,t}$. The coefficients of $MomSI_{i,t}$ are economically weaker than $SI_{i,t}$ and lose their statistical significance two years earlier. $MomCI_{i,t}$'s performance is comparable to $CI_{i,t}$ although its statistical significance is weaker in the short-run. After searching for trend breaks in $MomSI_{i,t}$, I build a new momentum-based exuberance index $MomEI_t$ and present its predictive powers in Panels B and C. I report the coefficients of a select group of variables for brevity even though the specification is identical to the ones in Tables 3 and 7. The crucial observation is that the momentum-based $MomEI_t$ finds essentially no downside to exuberance. $MomEI_t$ effect becomes more positive with higher $HJTZ_t$.

The second alternative construction technique repeats the entire analysis by building the industry momentum and liquidity betas as an equally-weighted average of firm betas. Those betas are then used in the construction of the sentiment index $EwSI_{i,t}$ and the causation index $EwCI_{i,t}$. The results are in Table 10. Panel A shows that the industry-level returns are strongly affected by both the alternative sentiment and causality indices in all time horizons. The statistical significance of $EwCI_{i,t}$ is more uniform over time than $CI_{i,t}$. However, the $EwCI_{i,t} \times ROA_{i,t}$ interaction is statistically weaker than the $CI_{i,t} \times ROA_{i,t}$ interaction even though the coefficients are comparable in magnitude for the most part (not shown). The interaction is the crucial justification for the inclusion of $ROAT_{i,t}$ in the definition of the exuberance index. When I analyze the predictive power of $EwEI_t$ in Panels B and C, I find that either it is insignificant or its sign is in the wrong direction. All interactions with $HJTZ$-sentiment, and P/E are also insignificant.

C. Financial Crises

EI_t is associated with declining future economic activity and business investment but that does not imply that it measures *systemic risk*. In this section, I examine whether EI_t is associated with the occurrence of financial crises. Even though the calculation of the index is based entirely on US stock market trading data, investment in the US financial assets is not solely driven by domestic investors nor do the domestic investors invest only in US financial assets. Therefore, investor exuberance does not necessarily create the worst mispricings of risk in US financial markets. In fact, as foreign economies re-adjust in the aftermath of an exuberance episode, US financial markets may benefit from the global run for safety, which may soften or delay the adjustment process in the US. Under this hypothesis, there should be a causal relationship between the EI_t and the incidence of global crises. To test this hypothesis, I use the list of global financial crises reported in Elekdağ and Wu (2011) and create a crisis index, CR_t, by counting the number of banking or currency crises in each year. Because the crisis index is annual, I annualize EI_t by summing the quarterly values in each year and denote it by $EI+_t$. The end result is an admittedly small sample of 27 annual observations. The estimated VAR is of the form

$$CR_t = \mu_0 + \sum_{k=1}^{3} \mu_k CR_{t-k} + \sum_{j=1}^{3} \gamma_j EI+_{t-j} + u_t \tag{12a}$$

$$EI+_t = \sum_{k=1}^{3} \varphi_j CR_{t-k} + \sum_{j=1}^{3} \omega_j EI+_{t-j} + v_t \tag{12b}$$

The estimated coefficients are presented in Table 11. The Granger causality test rejects the null hypothesis of the independence of the crisis index at one percent level while the independence of the exuberance index cannot be rejected.

D. Alternative Thresholds

In this section, I examine how the predictive power of EI_t is impacted by the choice of the ambiguity threshold in conditions ii. and iii. of step 6 in section III-B. Table 12 presents the cumulative stock market returns one-to-six years into the future. Based on the R-Square values at the bottom of each panel, there is no single threshold that dominates the other two at any return horizon. Table 13 presents the forward-looking GDP growth outcomes. Once again, neither the findings nor the model fit are materially affected by the choice of thresholds.

Therefore, I retain '2' as my preferred ambiguity threshold.

V. Caveats and Conclusions

In this paper, I develop a systemic risk measure based on investor sentiment. Unlike existing measures, it is not focused on flagging investors' heightened awareness of risk at the end of a boom episode but rather on capturing shifts in their trading behavior at the beginning of the episode. The method allows investors and regulators to observe industries in which risks could be building although making such a list is subject to both Type-I and Type-II errors. The sentiment index is a good predictor of future industry returns even after controlling for other well-known sentiment measures. It has predictive power over broad market returns and measures of economic activity especially if it is considered jointly with other sentiment measures such as valuations and credit spreads. I present evidence that it may have predictive power over global financial instability episodes with the caveat that those results should be interpreted cautiously due to the small sample size.

Since the Exuberance Index is a numerical exercise, one should also be cautious drawing conclusions on the timing of a macroprudential intervention when the index exceeds a pre-determined threshold. For example, if the index is rising but risks are building in foreign economies, it may not be efficient to intervene in the US financial markets. The paper is not designed as a theoretical model that can comment on the efficiency and welfare issues that arise from the application of the index. However, if the index is rising in an environment where credit spreads in the US are narrow and valuations are high, it may be worthwhile for the investors to take a step back and review their assumptions of future returns.

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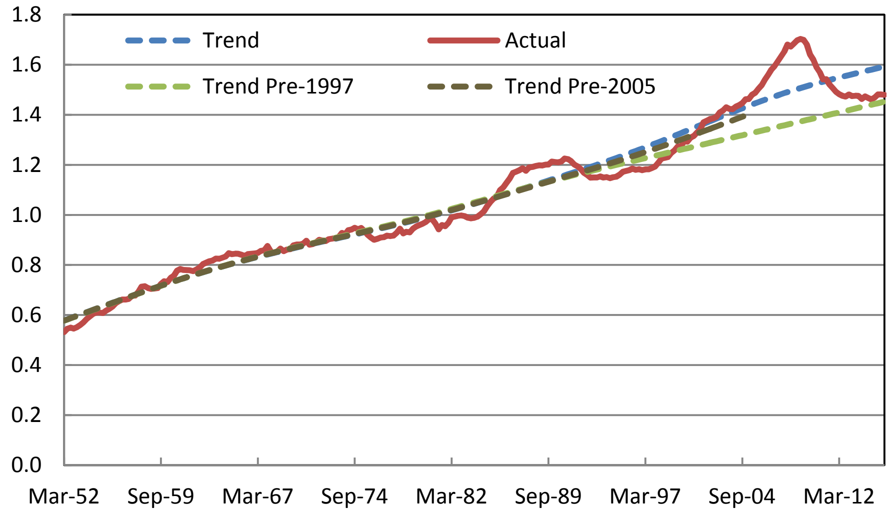
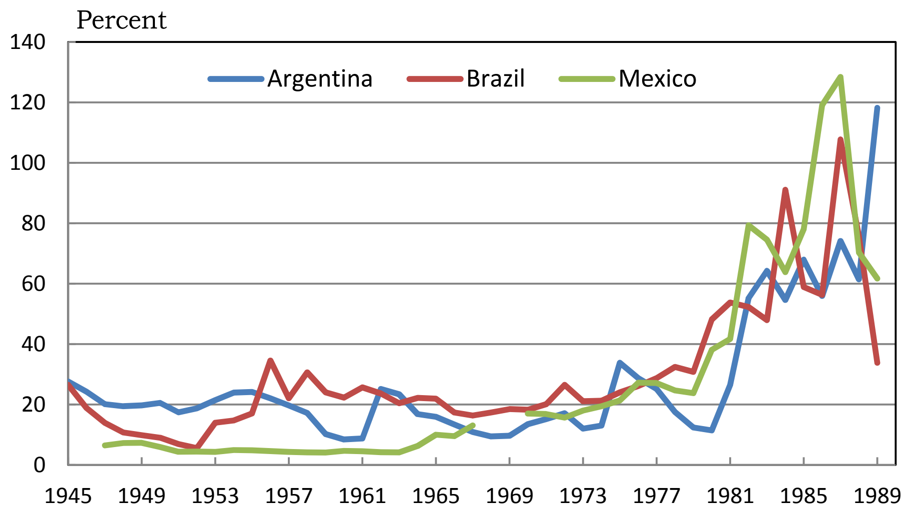
Figure 1: Private non-financial credit to GDP ratio and its trend.
The blue trend is calculated using the entire data history and a one-sided HP filter. The green trend is estimated with the data up to December 1996. The brown trend is estimated with the data up to December 2004.



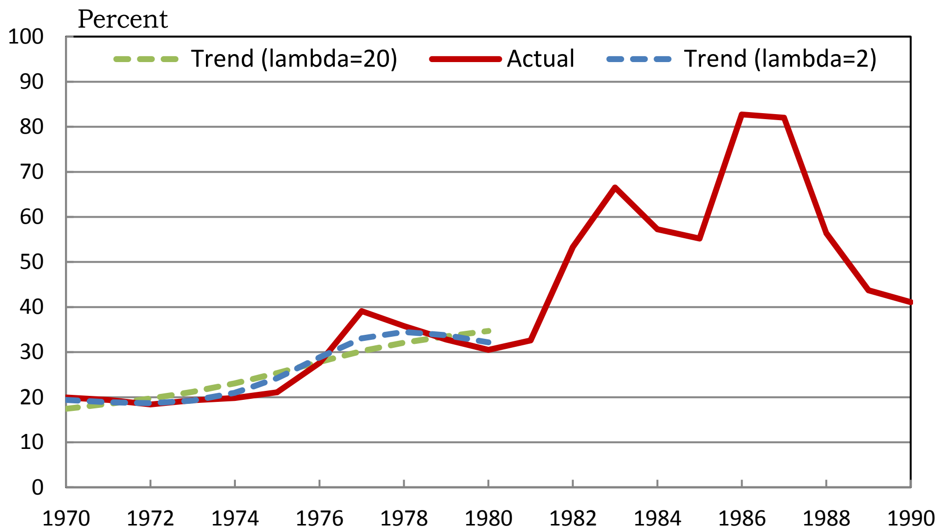
Source: Financial Accounts of the United States and Author's calculations

Figure 2: Central Government debt to GDP ratio in Latin America
It is difficult to detect a significant deviation from trend in Brazil before 1980, in Argentina before 1982 and in Mexico before 1979.



Source: World Bank WDI

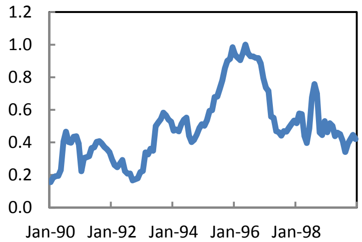
Figure 3: Total public and private external debt to GDP ratio in Mexico and its trend
Trends are estimated using annual data and an HP filter. The blue trend has a lambda value of 2 and the green trend has a lambda value of 20.



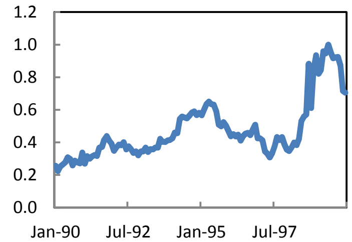
Source: World Bank WDI and Author’s calculations

Figure 4: Sentiment Indices

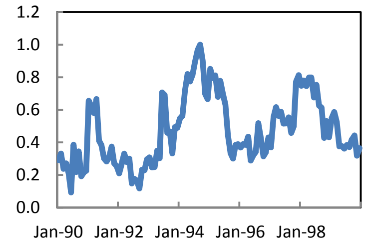
SI is the principal component of the re-scaled $\boldsymbol{\beta}_{U_t}$ and $\boldsymbol{\beta}_{L_t}$ series that is positively correlated with both betas. 4-digit NAICS codes in parentheses. SI rescaled to [0,1] range for visual comparability.



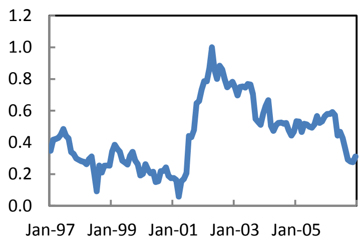
A. Computer and Peripheral Equipment Manufacturing (3341) - December 1999



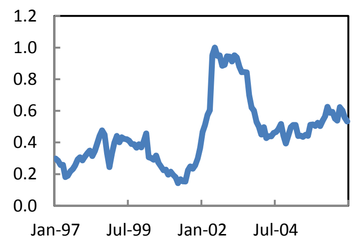
B. Electronic Shopping and Mail-Order Houses (4541) - December 1999



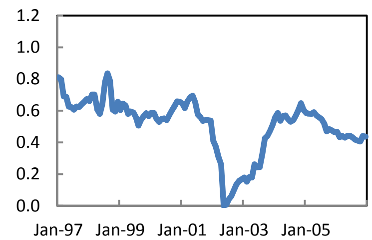
C. Land Subdivision (2372) - December 1999



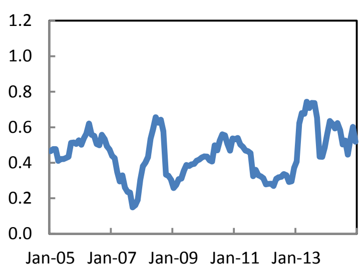
D. Natural Gas Distribution (2212) - December 2006



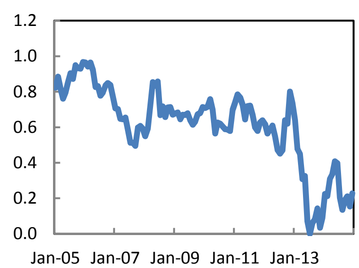
E. Residential Building Construction (2361) - December 2006



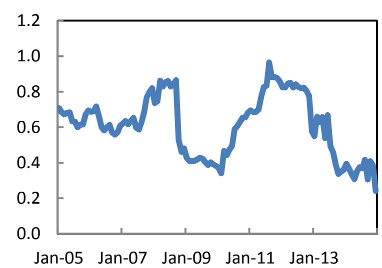
F. Computer and Peripheral Equipment Manufacturing (3341) - December 2006



G. Residential Building Construction (2361) - December 2014



H. Land Subdivision (2372) - December 2014



I. Pipeline Transportation of Crude Oil (4861) - December 2014

Figure 5: Industries with a positive trend-break in the SI as of time T
The blue line shows the *number of industries* that exhibit a trend-break in the 6 years preceding time T. These industries also survived the elimination process guided by the five constraints. The red line is the *number of firms* in these industries.

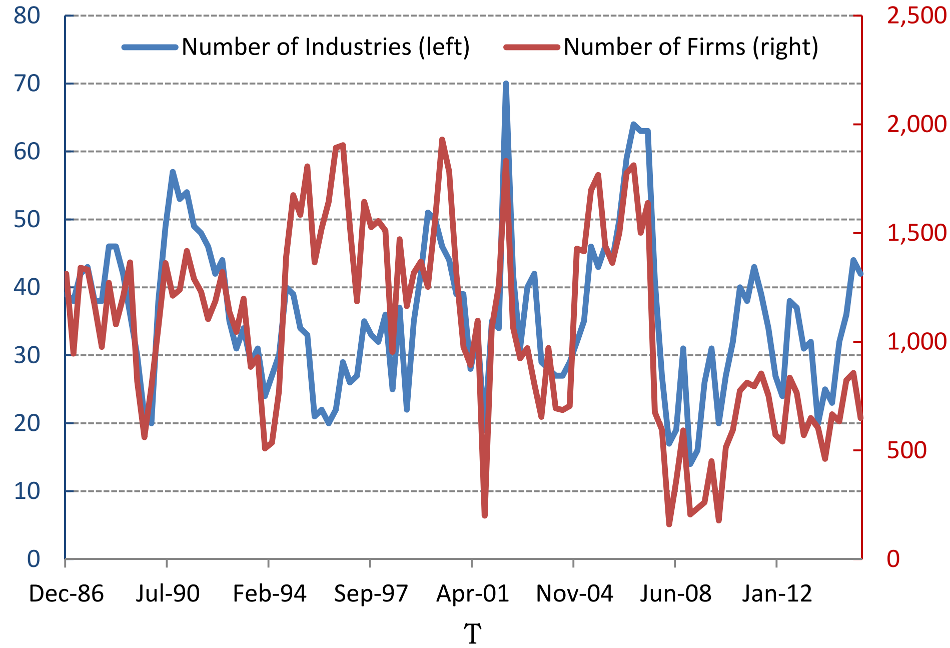


Figure 6: EI and the market capitalization of industries included in EI
The blue line shows the EI, the ratio of the number of firms in 'exuberant' industries to total number of firms traded. The red line is the market capitalization share of the same firms.

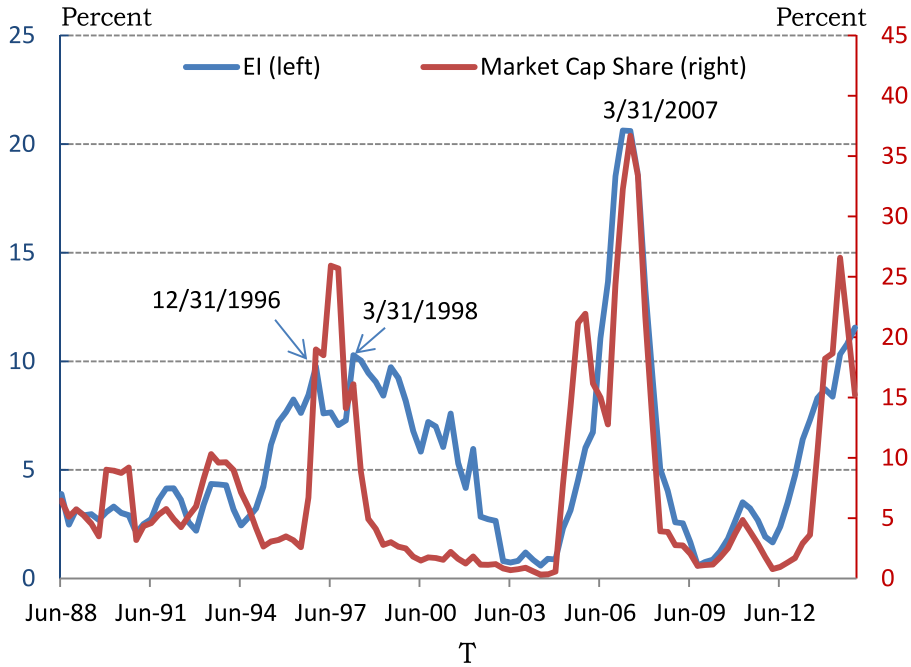


Figure 7: EI calculated with various ambiguity thresholds
The chart shows the EI, the ratio of the number of firms in 'exuberant' industries to total number of firms traded. The trend-breaks in investor sentiment and ROA have been calculated using a significance (ambiguity) threshold of '2.3' in the blue line and '1.7' in the red line.

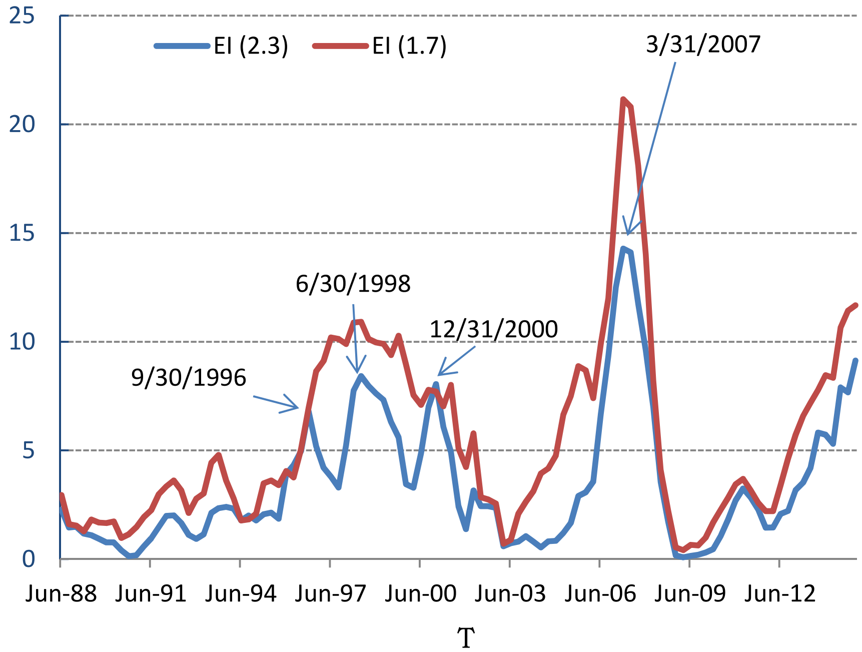


Table 1: Long-run Predictive Power of Sentiment (SI_t) and Causality (CI_t): Full Sample 1987 – 2014

The Table shows the 1-year to 8-year predictive power of the sentiment ($\boldsymbol{SI_t}$) and causality ($\boldsymbol{CI_t}$) indices. $\boldsymbol{LEV_t}$ is the first principal of leverage and coverage ratios as described in Step 9). $\boldsymbol{ROA_t}$ is the industry return on assets as described in Step 7). $\boldsymbol{SIZE_t}$ is the market capitalization of the industry from 5 years earlier. $\boldsymbol{y_{i,t-4}}$ is the industry stock market return over the preceding four quarters. The dependent variable is the cumulative stock market log-return of the industry over various horizons. December 2014 is the last observation. Each specification includes industry and year-quarter fixed effects. Heteroscedasticity-consistent errors are in parentheses. Errors are clustered at industry level. ***, **, * denote significance at 1, 5 and 10 percent levels.

HORIZON				1 Year								2 Years		
CI		-0.025 ***		-0.023 ***	-0.023 ***	-0.030	-0.046 ***		-0.023		-0.023	-0.023	-0.055	-0.046 **
		(0.009)		(0.009)	(0.009)	(0.021)	(0.012)		(0.017)		(0.017)	(0.017)	(0.036)	(0.021)
SI			-0.103 ***	-0.102 ***	-0.116 ***	-0.106 ***	-0.102 ***			-0.148 ***	-0.147 ***	-0.156 ***	-0.168 ***	-0.147 ***
			(0.027)	(0.027)	(0.032)	(0.030)	(0.028)			(0.048)	(0.048)	(0.057)	(0.053)	(0.048)
ROA	-0.183	-0.183	-0.165	-0.165	-0.490	-0.163	-0.485 **	-0.563	-0.562	-0.541	-0.541	-0.731	-0.535	-0.878 **
	(0.251)	(0.249)	(0.247)	(0.245)	(0.498)	(0.246)	(0.230)	(0.388)	(0.387)	(0.381)	(0.381)	(0.786)	(0.381)	(0.366)
LEV	0.001	0.000	0.000	0.000	0.000	0.000	0.000	0.001	0.001	0.000	0.000	0.000	0.000	-0.001
	(0.003)	(0.003)	(0.004)	(0.003)	(0.003)	(0.003)	(0.004)	(0.007)	(0.007)	(0.007)	(0.007)	(0.007)	(0.007)	(0.007)
y_{t-4}	-0.030	-0.025	-0.022	-0.017	-0.017	-0.017	-0.016	-0.129 ***	-0.124 ***	-0.116 ***	-0.112 ***	-0.112 ***	-0.113 ***	-0.111 ***
	(0.018)	(0.018)	(0.018)	(0.018)	(0.018)	(0.018)	(0.018)	(0.029)	(0.029)	(0.029)	(0.029)	(0.029)	(0.029)	(0.029)
SIZE	-0.046 ***	-0.047 ***	-0.052 ***	-0.052 ***	-0.052 ***	-0.052 ***	-0.052 ***	-0.091 ***	-0.091 ***	-0.098 ***	-0.098 ***	-0.098 ***	-0.098 ***	-0.098 ***
	(0.011)	(0.011)	(0.011)	(0.011)	(0.011)	(0.011)	(0.011)	(0.022)	(0.022)	(0.023)	(0.023)	(0.023)	(0.023)	(0.022)
SI x ROA					0.690							0.404		
					(0.842)							(1.376)		
SI x CI						0.013							0.062	
						(0.035)							(0.062)	
CI x ROA							1.065 ***							1.134 *
							(0.371)							(0.607)
R-Square (%)	35	35	35	35	35	35	35	31	31	31	31	31	31	31

HORIZON				3 Year								4 Years		
CI		-0.028		-0.027	-0.027	-0.057	-0.057 *		-0.043		-0.042	-0.042	-0.045	-0.075 **
		(0.025)		(0.025)	(0.025)	(0.047)	(0.030)		(0.031)		(0.031)	(0.031)	(0.056)	(0.036)
SI			-0.199 ***	-0.198 ***	-0.195 ***	-0.218 ***	-0.197 ***			-0.176 **	-0.175 **	-0.138	-0.177 **	-0.174 **
			(0.064)	(0.064)	(0.075)	(0.066)	(0.065)			(0.075)	(0.076)	(0.087)	(0.076)	(0.076)
ROA	-0.568	-0.566	-0.541	-0.539	-0.464	-0.533	-0.963 **	-0.783	-0.781	-0.765	-0.763	0.084	-0.762	-1.231 **
	(0.492)	(0.491)	(0.483)	(0.483)	(1.019)	(0.482)	(0.481)	(0.544)	(0.543)	(0.544)	(0.542)	(1.057)	(0.543)	(0.556)
LEV	0.002	0.001	0.000	0.000	0.000	0.000	0.000	0.012	0.011	0.010	0.010	0.009	0.010	0.010
	(0.010)	(0.010)	(0.010)	(0.010)	(0.010)	(0.010)	(0.010)	(0.013)	(0.013)	(0.013)	(0.013)	(0.013)	(0.013)	(0.013)
y_{t-4}	-0.181 ***	-0.176 ***	-0.164 ***	-0.160 ***	-0.159 ***	-0.160 ***	-0.158 ***	-0.232 ***	-0.226 ***	-0.220 ***	-0.213 ***	-0.212 ***	-0.214 ***	-0.212 ***
	(0.033)	(0.033)	(0.033)	(0.033)	(0.033)	(0.033)	(0.033)	(0.034)	(0.034)	(0.033)	(0.034)	(0.034)	(0.034)	(0.034)
SIZE	-0.132 ***	-0.132 ***	-0.142 ***	-0.142 ***	-0.142 ***	-0.142 ***	-0.142 ***	-0.171 ***	-0.172 ***	-0.180 ***	-0.182 ***	-0.182 ***	-0.182 ***	-0.182 ***
	(0.036)	(0.036)	(0.037)	(0.037)	(0.037)	(0.037)	(0.036)	(0.047)	(0.047)	(0.048)	(0.048)	(0.048)	(0.048)	(0.047)
SI x ROA					-0.157							-1.778		
					(1.745)							(1.878)		
SI x CI						0.059							0.005	
						(0.078)							(0.091)	
CI x ROA							1.425 **							1.564 **
							(0.701)							(0.788)
R-Square (%)	28	28	28	28	28	28	28	25	25	25	25	25	25	25

HORIZON				5 Year							6 Years			
CI		-0.056		-0.055	-0.055	-0.077	-0.086 **		-0.084 **		-0.083 **	-0.083 **	-0.081	-0.124 ***
		(0.038)		(0.037)	(0.037)	(0.063)	(0.042)		(0.040)		(0.040)	(0.040)	(0.076)	(0.045)
SI			-0.187 **	-0.187 **	-0.151	-0.201 **	-0.185 **			-0.226 **	-0.225 **	-0.224 **	-0.223 **	-0.223 **
			(0.081)	(0.081)	(0.096)	(0.082)	(0.081)			(0.090)	(0.091)	(0.107)	(0.094)	(0.091)
ROA	-0.854	-0.845	-0.830	-0.821	-0.009	-0.817	-1.273 *	-1.360 **	-1.329 **	-1.330 *	-1.300 *	-1.275	-1.300 *	-1.906 ***
	(0.656)	(0.655)	(0.657)	(0.655)	(1.289)	(0.655)	(0.661)	(0.680)	(0.674)	(0.689)	(0.682)	(1.298)	(0.683)	(0.725)
LEV	0.018	0.017	0.016	0.016	0.015	0.016	0.016	0.012	0.011	0.010	0.009	0.009	0.009	0.009
	(0.015)	(0.015)	(0.015)	(0.015)	(0.015)	(0.015)	(0.016)	(0.018)	(0.018)	(0.019)	(0.019)	(0.019)	(0.019)	(0.019)
y_{t-4}	-0.325 ***	-0.315 ***	-0.310 ***	-0.300 ***	-0.299 ***	-0.301 ***	-0.298 ***	-0.369 ***	-0.348 ***	-0.349 ***	-0.328 ***	-0.328 ***	-0.328 ***	-0.326 ***
	(0.040)	(0.041)	(0.040)	(0.041)	(0.041)	(0.041)	(0.041)	(0.049)	(0.050)	(0.049)	(0.051)	(0.050)	(0.051)	(0.051)
SIZE	-0.151 **	-0.153 **	-0.162 ***	-0.164 ***	-0.164 ***	-0.164 ***	-0.164 ***	-0.200 ***	-0.202 ***	-0.213 ***	-0.216 ***	-0.216 ***	-0.216 ***	-0.216 ***
	(0.059)	(0.059)	(0.060)	(0.060)	(0.061)	(0.060)	(0.060)	(0.075)	(0.075)	(0.077)	(0.076)	(0.077)	(0.076)	(0.076)
SI x ROA					-1.704							-0.052		
					(2.177)							(2.321)		
SI x CI						0.042							-0.005	
						(0.099)							(0.123)	
CI x ROA							1.487 *							1.924 **
							(0.836)							(0.955)
R-Square (%)	28	28	28	28	28	28	28	19	19	19	19	19	19	19

HORIZON				7 Year							8 Years			
CI		-0.099 **		-0.098 **	-0.098 **	-0.151 *	-0.131 ***		-0.122 ***		-0.121 ***	-0.121 ***	-0.196 **	-0.145 ***
		(0.042)		(0.042)	(0.041)	(0.077)	(0.045)		(0.043)		(0.042)	(0.042)	(0.081)	(0.049)
SI			-0.192 *	-0.188 *	-0.152	-0.224 **	-0.186 *			-0.162	-0.158	-0.153	-0.207 *	-0.156
			(0.103)	(0.104)	(0.118)	(0.108)	(0.105)			(0.100)	(0.101)	(0.117)	(0.107)	(0.101)
ROA	-0.967	-0.938	-0.940	-0.912	-0.128	-0.901	-1.451 *	-1.168	-1.132	-1.158	-1.122	-1.011	-1.108	-1.530 *
	(0.768)	(0.761)	(0.777)	(0.770)	(1.369)	(0.770)	(0.824)	(0.816)	(0.809)	(0.821)	(0.813)	(1.366)	(0.813)	(0.852)
LEV	0.019	0.018	0.017	0.016	0.016	0.016	0.016	0.024	0.024	0.023	0.022	0.022	0.022	0.022
	(0.019)	(0.019)	(0.019)	(0.019)	(0.019)	(0.019)	(0.019)	(0.021)	(0.021)	(0.021)	(0.021)	(0.021)	(0.021)	(0.021)
y_{t-4}	-0.328 ***	-0.307 ***	-0.310 ***	-0.290 ***	-0.289 ***	-0.292 ***	-0.288 ***	-0.432 ***	-0.409 ***	-0.417 ***	-0.394 ***	-0.394 ***	-0.397 ***	-0.393 ***
	(0.057)	(0.055)	(0.057)	(0.056)	(0.056)	(0.056)	(0.056)	(0.058)	(0.058)	(0.059)	(0.058)	(0.058)	(0.058)	(0.058)
SIZE	-0.235 ***	-0.239 ***	-0.246 ***	-0.250 ***	-0.250 ***	-0.250 ***	-0.250 ***	-0.251 ***	-0.257 ***	-0.260 ***	-0.266 ***	-0.266 ***	-0.265 ***	-0.266 ***
	(0.084)	(0.083)	(0.086)	(0.085)	(0.085)	(0.085)	(0.084)	(0.097)	(0.096)	(0.097)	(0.096)	(0.096)	(0.096)	(0.096)
SI x ROA					-1.693							-0.234		
					(2.480)							(2.405)		
SI x CI						0.103							0.147	
						(0.125)							(0.131)	
CI x ROA							1.573							1.115
							(1.022)							(1.069)
R-Square (%)	17	17	17	17	17	17	17	17	17	17	17	17	17	17

Table 2: Long-run Predictive Power of Sentiment (SI_t) and Causality (CI_t): Pre-Financial Crisis 1987 – 2006

The Table shows the 1-year to 8-year predictive power of the sentiment (SI_t) and causality (CI_t) indices. LEV_t is the first principal of leverage and coverage ratios as described in Step 9). ROA_t is the industry return on assets as described in Step 7). $SIZE_t$ is the market capitalization of the industry from 5 years earlier. $y_{i,t-4}$ is the industry stock market return over the preceding four quarters. The dependent variable is the cumulative stock market log-return of the industry over various horizons. December 2006 is the last observation. Each specification includes industry and year-quarter fixed effects. Heteroscedasticity-consistent errors are in parentheses. Errors are clustered at industry level. ***, **, * denote significance at 1, 5 and 10 percent levels.

HORIZON	1 Year							2 Years						
CI		-0.024 **		-0.023 **	-0.023 **	-0.044 *	-0.053 ***		-0.036		-0.035	-0.035	-0.112 **	-0.060 **
		(0.012)		(0.012)	(0.012)	(0.026)	(0.017)		(0.023)		(0.023)	(0.023)	(0.045)	(0.029)
SI			-0.140 ***	-0.139 ***	-0.148 ***	-0.152 ***	-0.137 ***			-0.179 ***	-0.178 ***	-0.161 **	-0.229 ***	-0.176 ***
			(0.033)	(0.034)	(0.040)	(0.037)	(0.034)			(0.058)	(0.059)	(0.075)	(0.063)	(0.059)
ROA	0.066	0.074	0.066	0.074	-0.123	0.080	-0.430	-0.304	-0.296	-0.310	-0.302	0.073	-0.279	-0.767
	(0.324)	(0.323)	(0.320)	(0.319)	(0.632)	(0.319)	(0.336)	(0.550)	(0.550)	(0.543)	(0.543)	(0.962)	(0.541)	(0.564)
LEV	0.003	0.003	0.002	0.002	0.002	0.002	0.002	0.008	0.007	0.006	0.006	0.006	0.006	0.006
	(0.005)	(0.005)	(0.005)	(0.005)	(0.005)	(0.005)	(0.005)	(0.010)	(0.010)	(0.010)	(0.010)	(0.010)	(0.010)	(0.010)
y_{t-4}	-0.017	-0.013	-0.004	0.000	0.000	-0.001	0.002	-0.207 ***	-0.200 ***	-0.194 ***	-0.188 ***	-0.187 ***	-0.192 ***	-0.185 ***
	(0.023)	(0.023)	(0.023)	(0.023)	(0.023)	(0.023)	(0.023)	(0.034)	(0.034)	(0.034)	(0.034)	(0.034)	(0.034)	(0.033)
SIZE	-0.060 ***	-0.061 ***	-0.068 ***	-0.068 ***	-0.068 ***	-0.068 ***	-0.069 ***	-0.101 ***	-0.103 ***	-0.110 ***	-0.111 ***	-0.112 ***	-0.111 ***	-0.112 ***
	(0.016)	(0.016)	(0.016)	(0.016)	(0.016)	(0.016)	(0.016)	(0.038)	(0.038)	(0.038)	(0.038)	(0.038)	(0.038)	(0.038)
SI x ROA					0.419							-0.812		
					(1.074)							(1.761)		
SI x CI						0.040							0.157 **	
						(0.045)							(0.074)	
CI x ROA							1.394 ***							1.200
							(0.491)							(0.815)
R-Square (%)	25	25	25	25	25	25	26	22	22	22	22	22	22	22

HORIZON	3 Year							4 Years						
CI		-0.046		-0.044	-0.044	-0.111 **	-0.065 *		-0.091 **		-0.091 **	-0.091 **	-0.099	-0.115 **
		(0.030)		(0.030)	(0.030)	(0.053)	(0.034)		(0.041)		(0.041)	(0.041)	(0.068)	(0.046)
SI			-0.188 ***	-0.186 ***	-0.168 **	-0.230 ***	-0.184 ***			-0.110	-0.108	-0.076	-0.113	-0.106
			(0.069)	(0.069)	(0.084)	(0.071)	(0.069)			(0.078)	(0.079)	(0.095)	(0.077)	(0.079)
ROA	-0.544	-0.538	-0.515	-0.509	-0.116	-0.488	-0.916	-0.664	-0.653	-0.642	-0.632	0.045	-0.630	-1.126
	(0.652)	(0.649)	(0.641)	(0.639)	(0.998)	(0.638)	(0.696)	(0.731)	(0.722)	(0.728)	(0.720)	(0.967)	(0.718)	(0.780)
LEV	0.008	0.008	0.006	0.006	0.006	0.006	0.006	0.007	0.006	0.006	0.005	0.004	0.005	0.005
	(0.014)	(0.014)	(0.014)	(0.014)	(0.014)	(0.014)	(0.014)	(0.019)	(0.019)	(0.019)	(0.019)	(0.019)	(0.019)	(0.019)
y_{t-4}	-0.285 ***	-0.277 ***	-0.270 ***	-0.263 ***	-0.263 ***	-0.267 ***	-0.261 ***	-0.339 ***	-0.323 ***	-0.329 ***	-0.314 ***	-0.314 ***	-0.315 ***	-0.312 ***
	(0.038)	(0.039)	(0.038)	(0.039)	(0.039)	(0.039)	(0.038)	(0.046)	(0.046)	(0.047)	(0.047)	(0.047)	(0.048)	(0.047)
SIZE	-0.127 **	-0.129 **	-0.136 **	-0.137 **	-0.138 **	-0.137 **	-0.138 **	-0.119 *	-0.122 *	-0.123 *	-0.126 *	-0.127 *	-0.126 *	-0.128 *
	(0.057)	(0.056)	(0.056)	(0.055)	(0.056)	(0.055)	(0.055)	(0.068)	(0.066)	(0.068)	(0.066)	(0.067)	(0.066)	(0.066)
SI x ROA					-0.854							-1.497		
					(1.831)							(2.080)		
SI x CI						0.137							0.016	
						(0.087)							(0.106)	
CI x ROA							0.989							1.160
							(0.736)							(0.807)
R-Square (%)	21	21	21	21	21	21	21	17	17	17	17	17	17	17

HORIZON	5 Year							6 Years						
CI		-0.135 ***		-0.132 ***	-0.132 ***	-0.205 ***	-0.168 ***		-0.132 ***		-0.131 ***	-0.132 ***	-0.195 **	-0.134 **
		(0.043)		(0.043)	(0.043)	(0.079)	(0.049)		(0.049)		(0.049)	(0.049)	(0.092)	(0.059)
SI			-0.201 **	-0.188 **	-0.215 **	-0.241 ***	-0.186 **			-0.062	-0.049	-0.170	-0.095	-0.048
			(0.082)	(0.082)	(0.097)	(0.086)	(0.082)			(0.092)	(0.093)	(0.111)	(0.103)	(0.093)
ROA	-1.353	-1.370 *	-1.338	-1.354	-1.954	-1.330	-2.064 **	-1.185	-1.179	-1.178	-1.173	-3.703 **	-1.152	-1.228
	(0.846)	(0.830)	(0.846)	(0.830)	(1.412)	(0.826)	(0.905)	(0.800)	(0.794)	(0.801)	(0.794)	(1.554)	(0.792)	(0.927)
LEV	0.027	0.024	0.025	0.022	0.023	0.023	0.022	0.014	0.011	0.013	0.011	0.012	0.011	0.011
	(0.019)	(0.019)	(0.019)	(0.019)	(0.019)	(0.019)	(0.019)	(0.025)	(0.025)	(0.025)	(0.025)	(0.025)	(0.025)	(0.025)
y_{t-4}	-0.407 ***	-0.380 ***	-0.392 ***	-0.367 ***	-0.367 ***	-0.371 ***	-0.365 ***	-0.563 ***	-0.532 ***	-0.556 ***	-0.526 ***	-0.525 ***	-0.529 ***	-0.526 ***
	(0.057)	(0.058)	(0.057)	(0.058)	(0.058)	(0.058)	(0.058)	(0.070)	(0.072)	(0.070)	(0.072)	(0.072)	(0.072)	(0.072)
SIZE	-0.143 *	-0.148 *	-0.153 *	-0.158 *	-0.157 *	-0.157 *	-0.160 *	-0.086	-0.093	-0.089	-0.095	-0.093	-0.095	-0.095
	(0.085)	(0.084)	(0.085)	(0.084)	(0.083)	(0.083)	(0.084)	(0.091)	(0.093)	(0.091)	(0.093)	(0.091)	(0.093)	(0.092)
SI x ROA					1.266							5.415 *		
					(2.436)							(2.880)		
SI x CI						0.150							0.128	
						(0.130)							(0.138)	
CI x ROA							1.725 *							0.141
							(1.009)							(1.067)
R-Square (%)	19	19	19	19	19	19	19	12	12	12	12	12	12	12

HORIZON	7 Year							8 Years						
CI		-0.110 **		-0.107 **	-0.108 **	-0.173 *	-0.100 *		-0.118 ***		-0.117 ***	-0.117 ***	-0.124	-0.141 ***
		(0.045)		(0.045)	(0.045)	(0.092)	(0.055)		(0.043)		(0.043)	(0.043)	(0.093)	(0.053)
SI			-0.132	-0.118	-0.231 **	-0.166 *	-0.119			-0.071	-0.052	-0.068	-0.057	-0.050
			(0.085)	(0.086)	(0.107)	(0.091)	(0.085)			(0.093)	(0.092)	(0.109)	(0.105)	(0.092)
ROA	-0.880	-0.861	-0.860	-0.844	-3.135 **	-0.821	-0.711	-0.815	-0.775	-0.799	-0.763	-1.099	-0.761	-1.215
	(0.809)	(0.798)	(0.811)	(0.800)	(1.501)	(0.799)	(0.952)	(0.791)	(0.790)	(0.791)	(0.789)	(1.414)	(0.788)	(1.002)
LEV	0.027	0.025	0.025	0.023	0.024	0.024	0.023	0.016	0.015	0.015	0.014	0.014	0.014	0.014
	(0.025)	(0.025)	(0.025)	(0.025)	(0.025)	(0.025)	(0.025)	(0.024)	(0.024)	(0.024)	(0.024)	(0.024)	(0.024)	(0.024)
y_{t-4}	-0.606 ***	-0.585 ***	-0.587 ***	-0.568 ***	-0.565 ***	-0.570 ***	-0.568 ***	-0.566 ***	-0.543 ***	-0.556 ***	-0.536 ***	-0.536 ***	-0.537 ***	-0.535 ***
	(0.065)	(0.064)	(0.064)	(0.063)	(0.063)	(0.063)	(0.063)	(0.067)	(0.066)	(0.067)	(0.067)	(0.067)	(0.067)	(0.067)
SIZE	-0.027	-0.033	-0.034	-0.039	-0.038	-0.039	-0.039	0.023	0.020	0.019	0.016	0.016	0.016	0.015
	(0.078)	(0.078)	(0.079)	(0.078)	(0.078)	(0.078)	(0.078)	(0.086)	(0.084)	(0.087)	(0.086)	(0.086)	(0.086)	(0.086)
SI x ROA					4.980 *							0.719		
					(2.863)							(2.872)		
SI x CI						0.132							0.014	
						(0.137)							(0.150)	
CI x ROA							-0.320							1.108
							(1.160)							(1.179)
R-Square (%)	12	12	12	13	13	13	13	7	7	7	7	7	7	7

Table 3: The Influence of EI_t on Long-Run Stock Market Returns: Full Sample 1987 – 2014

The Table shows the 1-year to 6-year predictive power of the exuberance index (EI_t). $MARGIN_t$ is the margin debt at broker dealers normalized by market capitalization. ΔSNP_t is the log-change in S&P500 total return index in the preceding 4 quarters. $CLEV_t$ is nonfinancial corporate leverage. PE_t is the PE ratio of S&P500 (per $100 earnings). ΔGDP_{t-4} is the log-change of the Gross Domestic Product in the preceding 4 quarters. CPI_t is the change in the Consumer Price Index in the preceding quarter. $HJTZ_t$ is Huang-Jian-Tu-Zhou investor sentiment index. $CSPR_t$ is the Baa-Aaa bond spread. $TSPR_t$ is the US Treasury term spread. The dependent variable is the cumulative S&P500 log-total return over various horizons. December 2014 is the last observation. Heteroscedasticity-consistent errors are in parentheses. ***, **, * denote significance at 1, 5 and 10 percent levels.

HORIZON	**1 Year**						**2 Years**					
EI		-1.319 *	-2.088 **	-2.471	9.003 *	-0.944		-3.005 *	-2.488	0.531	2.013	-3.393 **
		(0.681)	(0.981)	(5.556)	(4.963)	(0.812)		(1.556)	(2.035)	(7.222)	(5.333)	(1.670)
MARGIN	0.733	0.808	0.832	0.817	0.731	0.920	2.099	2.204	2.175	2.191	2.191	2.214
	(0.813)	(0.801)	(0.797)	(0.790)	(0.794)	(0.793)	(1.418)	(1.387)	(1.365)	(1.388)	(1.378)	(1.355)
ΔSNP	0.101	0.123	0.125	0.117	0.041	0.108	-0.005	0.044	0.043	0.061	0.005	0.061
	(0.211)	(0.213)	(0.210)	(0.212)	(0.194)	(0.209)	(0.308)	(0.313)	(0.298)	(0.313)	(0.291)	(0.311)
CLEV	3.568 **	3.079 **	3.548 **	3.034 **	2.403 *	3.426 **	8.180 ***	7.055 ***	6.725 **	7.202 ***	6.742 ***	6.733 **
	(1.410)	(1.427)	(1.455)	(1.428)	(1.441)	(1.473)	(2.748)	(2.622)	(2.635)	(2.664)	(2.416)	(2.626)
PE	-1.320 *	-1.225 *	-1.183 *	-1.198 *	-1.170 *	-1.220 *	-2.153 **	-1.946 *	-1.976 **	-2.028 *	-1.918 *	-1.950 *
	(0.667)	(0.670)	(0.660)	(0.704)	(0.659)	(0.670)	(0.976)	(1.000)	(0.991)	(1.031)	(0.972)	(0.997)
ΔGDP_{t-4}	4.412 **	3.662 *	3.698 *	3.701 *	3.861 *	3.753 *	5.342 **	3.662	3.632	3.522	3.761	3.454
	(2.012)	(2.069)	(2.049)	(2.045)	(1.975)	(2.077)	(2.498)	(2.536)	(2.458)	(2.491)	(2.584)	(2.583)
CPI	-4.969 **	-5.412 **	-4.949 **	-5.461 **	-4.235 **	-5.304 **	-6.371 **	-7.338 ***	-7.651 ***	-7.209 ***	-6.785 ***	-7.604 ***
	(2.216)	(2.099)	(2.044)	(2.094)	(1.957)	(2.093)	(2.489)	(2.361)	(2.429)	(2.344)	(2.098)	(2.377)
HJTZ	-5.750	-6.443	-9.854 *	-6.220	-5.878	-6.562	-12.388 *	-13.801 **	-11.436	-14.521 **	-13.585 **	-13.968 **
	(4.855)	(4.696)	(5.335)	(4.542)	(4.703)	(4.704)	(6.689)	(6.475)	(7.096)	(6.436)	(6.262)	(6.452)
CSPR	11.361	8.385	9.804	7.948	-3.227	7.501	6.741	0.406	-0.520	1.598	-5.338	0.369
	(9.642)	(9.622)	(9.399)	(9.945)	(11.117)	(9.515)	(12.774)	(13.422)	(12.852)	(13.486)	(14.208)	(13.175)
TSPR	-2.058	-2.517	-2.168	-2.334	-2.185	-2.236	2.152	0.908	0.637	0.357	1.138	0.808
	(2.997)	(3.003)	(3.015)	(3.154)	(2.937)	(3.078)	(4.983)	(4.464)	(4.524)	(4.752)	(4.500)	(4.402)
Intercept	-0.673	-0.543	-0.699	-0.540	-0.304	-0.645	-1.694 **	-1.384 *	-1.273	-1.394 *	-1.276 *	-1.296
	(0.484)	(0.492)	(0.500)	(0.489)	(0.501)	(0.509)	(0.845)	(0.792)	(0.828)	(0.792)	(0.730)	(0.807)
EI x HJTZ			-2.086						1.426			
			(1.598)						(1.980)			
EI x PE				0.046						-0.140		
				(0.212)						(0.278)		
EI x CSPR					-11.386 **						-5.514	
					(5.576)						(6.191)	
EI x TSPR						-0.567						0.652
						(0.623)						(0.891)
R-Square (%)	19	21	22	22	24	21	19	25	26	25	26	26

HORIZON	3 Years						4 Years					
EI		-1.008	-1.605	4.187	-3.694	-0.453		0.943	-0.153	9.576	-2.545	1.670
		(2.023)	(2.247)	(7.465)	(6.604)	(2.159)		(1.467)	(1.621)	(8.569)	(6.064)	(1.309)
MARGIN	2.984	3.088	3.103	3.066	3.074	3.049	3.864	3.702	3.781	3.753	3.672	3.385
	(1.978)	(1.932)	(1.930)	(1.942)	(1.918)	(1.916)	(2.866)	(2.775)	(2.785)	(2.734)	(2.808)	(2.808)
ΔSNP	-0.153	-0.132	-0.130	-0.107	-0.114	-0.158	-0.061	-0.079	-0.076	-0.039	-0.056	-0.108
	(0.394)	(0.389)	(0.389)	(0.382)	(0.349)	(0.387)	(0.401)	(0.400)	(0.403)	(0.391)	(0.374)	(0.402)
CLEV	10.499 **	10.136 **	10.520 **	10.351 **	10.313 **	10.582 **	13.336 **	13.648 **	14.362 **	14.046 **	13.880 **	14.126 **
	(4.742)	(4.219)	(4.220)	(4.222)	(4.083)	(4.059)	(6.010)	(5.882)	(5.898)	(5.976)	(5.825)	(5.890)
PE	-3.653 **	-3.608 **	-3.570 **	-3.727 **	-3.615 **	-3.596 **	-4.745 **	-4.782 **	-4.712 **	-4.985 **	-4.792 **	-4.764 **
	(1.514)	(1.509)	(1.521)	(1.537)	(1.485)	(1.495)	(2.026)	(2.042)	(2.057)	(2.084)	(2.022)	(1.991)
ΔGDP_{t-4}	5.110 *	4.628 *	4.663 *	4.414 *	4.524 *	4.933 *	2.667	3.135	3.172	2.744	3.015	3.675
	(2.657)	(2.610)	(2.608)	(2.535)	(2.561)	(2.667)	(2.724)	(2.607)	(2.604)	(2.400)	(2.636)	(2.620)
CPI	-6.004 *	-6.401 **	-5.980 *	-6.187 **	-6.701 **	-5.987 **	-6.404	-5.995	-5.240	-5.688	-6.385	-5.397
	(3.142)	(2.969)	(3.066)	(2.936)	(2.739)	(2.995)	(4.114)	(3.854)	(3.943)	(3.712)	(3.858)	(3.879)
HJTZ	-6.316	-6.886	-9.620	-7.919	-6.964	-6.637	0.468	1.169	-3.953	-0.768	1.093	2.152
	(6.073)	(5.903)	(6.232)	(6.233)	(5.740)	(5.709)	(5.676)	(5.186)	(4.708)	(6.418)	(5.207)	(5.420)
CSPR	-14.239	-16.146	-14.948	-14.369	-13.293	-15.990	-22.013	-19.913	-18.047	-17.459	-16.112	-18.030
	(14.948)	(16.005)	(15.819)	(15.195)	(15.145)	(15.994)	(15.535)	(15.074)	(15.218)	(14.249)	(12.768)	(14.386)
TSPR	5.279	4.826	5.154	4.017	4.724	4.989	4.890	5.241	5.919	3.970	5.079	5.037
	(6.918)	(6.035)	(6.223)	(6.263)	(6.061)	(5.920)	(6.687)	(6.435)	(6.634)	(7.009)	(6.459)	(6.387)
Intercept	-1.733	-1.640	-1.769	-1.655	-1.696	-1.761	-2.032	-2.107	-2.352	-2.149	-2.179	-2.216
	(1.392)	(1.215)	(1.237)	(1.210)	(1.161)	(1.168)	(1.618)	(1.579)	(1.603)	(1.597)	(1.552)	(1.545)
EI x HJTZ			-1.676						-3.055 *			
			(1.769)						(1.737)			
EI x PE				-0.206						-0.343		
				(0.265)						(0.309)		
EI x CSPR					2.972						3.863	
					(7.956)						(7.051)	
EI x TSPR						-0.910						-1.112
						(0.782)						(1.273)
R-Square (%)	14	18	18	18	20	19	17	17	18	19	18	22

HORIZON	5 Years						6 Years					
EI		1.988	0.935	18.082 **	-6.755	0.918		2.095	1.115	15.167	-7.411	0.355
		(1.310)	(1.178)	(7.453)	(5.159)	(1.265)		(1.738)	(1.907)	(9.557)	(5.143)	(1.291)
MARGIN	3.157	2.706	2.795	2.595	2.592	3.182	1.640	0.905	1.136	0.706	0.646	1.614
	(2.979)	(2.791)	(2.822)	(2.779)	(2.801)	(2.838)	(2.915)	(2.781)	(2.854)	(2.719)	(2.790)	(2.840)
ΔSNP	-0.591 *	-0.661 **	-0.654 **	-0.652 **	-0.609 *	-0.626 *	-0.080	-0.193	-0.169	-0.214	-0.150	-0.148
	(0.335)	(0.324)	(0.322)	(0.324)	(0.318)	(0.323)	(0.385)	(0.400)	(0.402)	(0.398)	(0.392)	(0.408)
CLEV	14.966 **	15.717 **	16.384 **	16.696 **	16.342 **	15.031 **	11.437	12.114	12.868	13.117	12.744	10.943
	(7.336)	(7.501)	(7.535)	(7.566)	(7.462)	(7.499)	(9.378)	(9.639)	(9.582)	(9.790)	(9.614)	(9.406)
PE	-4.740 **	-4.746 **	-4.687 **	-4.967 **	-4.743 **	-4.752 **	-4.828 *	-4.841 *	-4.771 *	-4.994 *	-4.847 *	-4.858 *
	(2.235)	(2.233)	(2.232)	(2.269)	(2.202)	(2.194)	(2.458)	(2.466)	(2.453)	(2.543)	(2.484)	(2.474)
ΔGDP_{t-4}	0.087	0.970	1.007	0.034	0.570	0.153	-2.975	-1.220	-1.569	-1.527	-1.255	-2.280
	(3.295)	(3.128)	(3.117)	(2.930)	(3.096)	(3.139)	(2.754)	(2.839)	(2.808)	(2.757)	(2.818)	(2.708)
CPI	-5.107	-4.117	-3.423	-3.163	-5.070	-4.908	-4.078	-2.886	-2.027	-1.460	-3.839	-4.148
	(4.500)	(4.293)	(4.256)	(4.075)	(4.551)	(4.316)	(6.339)	(5.873)	(5.826)	(5.373)	(5.832)	(5.984)
HJTZ	-3.419	-2.413	-7.240	-7.040	-2.712	-4.119	3.563	4.574	0.140	0.604	4.359	1.751
	(5.491)	(5.357)	(6.042)	(6.397)	(5.517)	(5.503)	(6.657)	(6.644)	(8.705)	(7.140)	(6.619)	(6.361)
CSPR	-29.103 *	-24.792 *	-23.033	-20.368	-15.359	-27.643 *	-30.321	-23.036	-20.815	-14.837	-11.393	-26.797
	(14.863)	(14.721)	(14.440)	(13.906)	(13.015)	(14.510)	(24.047)	(22.013)	(21.480)	(19.441)	(23.006)	(21.992)
TSPR	1.251	1.701	2.379	-1.085	1.232	2.012	1.288	1.057	1.884	-1.602	0.282	1.366
	(5.244)	(5.150)	(5.232)	(5.310)	(5.149)	(5.094)	(6.213)	(6.258)	(6.585)	(6.595)	(6.239)	(6.042)
Intercept	-2.013	-2.188	-2.418	-2.320	-2.376	-2.038	-0.800	-0.955	-1.226	-1.153	-1.145	-0.698
	(1.815)	(1.853)	(1.871)	(1.859)	(1.839)	(1.843)	(2.155)	(2.210)	(2.187)	(2.222)	(2.216)	(2.176)
EI x HJTZ			-2.912 **						-2.572			
			(1.420)						(1.955)			
EI x PE				-0.635 **						-0.510		
				(0.276)						(0.333)		
EI x CSPR					9.703 *						10.630 *	
					(5.736)						(5.839)	
EI x TSPR						1.650						2.768 **
						(1.073)						(1.339)
R-Square (%)	29	29	29	29	30	30	20	20	20	20	21	21

Table 4: The Influence of EI_t on Long-Run Stock Market Returns: Pre-Financial Crisis 1987 – 2006

The Table shows the 1-year to 6-year predictive power of the exuberance index ($\boldsymbol{EI_t}$). $\boldsymbol{MARGIN_t}$ is the margin debt at broker dealers normalized by market capitalization. $\boldsymbol{\Delta SNP_t}$ is the log-change in S&P500 total return index in the preceding 4 quarters. $\boldsymbol{CLEV_t}$ is nonfinancial corporate leverage. $\boldsymbol{PE_t}$ is the PE ratio of S&P500 (per $100 earnings). $\boldsymbol{\Delta GDP_{t-4}}$ is the log-change of the Gross Domestic Product in the preceding 4 quarters. $\boldsymbol{CPI_t}$ is the change in the Consumer Price Index in the preceding quarter. $\boldsymbol{HJTZ_t}$ is Huang-Jian-Tu-Zhou investor sentiment index. $\boldsymbol{CSPR_t}$ is the Baa-Aaa bond spread. $\boldsymbol{TSPR_t}$ is the US Treasury term spread. The dependent variable is the cumulative S&P500 log-total return over various horizons. December 2006 is the last observation. Heteroscedasticity-consistent errors are in parentheses. ***, **, * denote significance at 1, 5 and 10 percent levels.

HORIZON	1 Year						2 Years					
EI	…	1.158	1.141	-2.197	7.260	9.374 ***	…	5.583 **	5.864 **	-3.903	3.833	13.330 ***
	…	(1.656)	(1.630)	(6.242)	(5.673)	(3.131)	…	(2.606)	(2.791)	(6.610)	(7.126)	(4.961)
EI x HJTZ			-0.082						1.378			
			(1.386)						(2.088)			
EI x PE				0.144						0.395		
				(0.251)						(0.291)		
EI x CSPR					-7.230						2.100	
					(6.540)						(7.538)	
EI x TSPR						-5.226 ***						-5.555 ***
						(1.426)						(2.055)
R-Square (%)	25	25	25	25	25	33	19	24	25	25	25	28

HORIZON	3 Years						4 Years					
EI	…	5.024	5.043	10.068	-4.972	10.109	…	5.461	4.982	10.439	-11.621	7.918
	…	(3.512)	(3.760)	(6.032)	(7.231)	(6.470)	…	(3.864)	(4.105)	(6.256)	(7.713)	(6.639)
EI x HJTZ			0.088						-2.158			
			(1.892)						(2.039)			
EI x PE				-0.210						-0.205		
				(0.280)						(0.248)		
EI x CSPR					12.005						22.204 **	
					(7.211)						(10.861)	
EI x TSPR						-3.805						-2.315
						(2.553)						(3.028)
R-Square (%)	30	30	31	33	30	32	19	21	21	22	21	26

HORIZON	5 Years						6 Years					
EI	…	1.192	0.677	16.944 **	-20.803 ***	-0.060	…	-3.536	-4.493	2.377	-15.256	-6.279
	…	(2.779)	(2.845)	(7.409)	(7.738)	(5.848)	…	(3.757)	(3.831)	(9.755)	(11.029)	(6.277)
EI x HJTZ			-4.292 **						-6.648 *			
			(1.915)						(3.320)			
EI x PE				-0.672 ***						-0.247		
				(0.251)						(0.305)		
EI x CSPR					31.403 **						16.919	
					(11.992)						(15.209)	
EI x TSPR						1.083						2.399
						(3.329)						(2.796)
R-Square (%)	26	26	26	26	28	26	19	19	19	19	21	21

Table 5: The Influence of EI_t on the Gross Domestic Product: Full Sample 1987 – 2014

The Table shows the 1-year to 6-year predictive power of the exuberance index ($\boldsymbol{EI_t}$). $\boldsymbol{MARGIN_t}$ is the margin debt at broker dealers normalized by market capitalization. $\boldsymbol{\Delta SNP_t}$ is the log-change in S&P500 total return index in the preceding 4 quarters. $\boldsymbol{CLEV_t}$ is nonfinancial corporate leverage. $\boldsymbol{PE_t}$ is the PE ratio of S&P500 (per $100 earnings). $\boldsymbol{\Delta GDP_{t-4}}$ is the log-change in the Gross Domestic Product in the preceding 4 quarters. $\boldsymbol{CPI_t}$ is the change in the Consumer Price Index in the preceding quarter. $\boldsymbol{HJTZ_t}$ is Huang-Jian-Tu-Zhou investor sentiment index. $\boldsymbol{CSPR_t}$ is the Baa-Aaa bond spread. $\boldsymbol{TSPR_t}$ is the US Treasury term spread. The dependent variable is the cumulative log-change in the Gross Domestic Product over various horizons. December 2014 is the last observation. Heteroscedasticity-consistent errors are in parentheses. ***, **, * denote significance at 1, 5 and 10 percent levels.

HORIZON	1 Year						2 Years					
EI		0.001	-0.100	0.701 *	0.883 **	0.040		-0.258 *	-0.287 *	0.856	0.737 *	-0.271 *
		(0.061)	(0.083)	(0.367)	(0.337)	(0.072)		(0.146)	(0.162)	(0.530)	(0.392)	(0.156)
MARGIN	-0.074	-0.074	-0.071	-0.080	-0.081	-0.062	-0.107	-0.098	-0.096	-0.102	-0.100	-0.097
	(0.061)	(0.060)	(0.059)	(0.060)	(0.062)	(0.056)	(0.110)	(0.101)	(0.101)	(0.103)	(0.100)	(0.102)
ΔSNP	0.018	0.018	0.018	0.022	0.011	0.017	0.006	0.010	0.010	0.015	0.002	0.010
	(0.013)	(0.013)	(0.013)	(0.013)	(0.012)	(0.013)	(0.017)	(0.017)	(0.017)	(0.017)	(0.015)	(0.017)
CLEV	0.254 **	0.254 **	0.315 **	0.281 **	0.196 *	0.290 **	0.802 ***	0.705 ***	0.724 ***	0.752 ***	0.643 ***	0.695 ***
	(0.115)	(0.116)	(0.120)	(0.113)	(0.117)	(0.118)	(0.247)	(0.237)	(0.243)	(0.236)	(0.237)	(0.242)
PE	0.125 ***	0.125 ***	0.131 ***	0.109 **	0.130 ***	0.126 ***	0.088	0.106	0.108	0.080	0.111	0.106
	(0.046)	(0.046)	(0.046)	(0.049)	(0.045)	(0.046)	(0.072)	(0.073)	(0.073)	(0.078)	(0.073)	(0.073)
CPI	-0.519 ***	-0.518 ***	-0.458 ***	-0.488 ***	-0.418 ***	-0.507 ***	-0.715 ***	-0.798 ***	-0.780 ***	-0.757 ***	-0.688 ***	-0.806 ***
	(0.153)	(0.154)	(0.138)	(0.151)	(0.139)	(0.154)	(0.174)	(0.169)	(0.161)	(0.161)	(0.164)	(0.171)
ΔGDP_{t-4}	-0.105	-0.105	-0.100	-0.128	-0.088	-0.095	0.278 *	0.134	0.136	0.090	0.153	0.127
	(0.116)	(0.118)	(0.113)	(0.118)	(0.119)	(0.119)	(0.146)	(0.125)	(0.125)	(0.111)	(0.118)	(0.118)
HJTZ	-0.791 ***	-0.790 ***	-1.237 ***	-0.926 ***	-0.742 ***	-0.803 ***	-0.907 **	-1.028 ***	-1.161 ***	-1.255 ***	-0.985 ***	-1.033 ***
	(0.258)	(0.259)	(0.352)	(0.246)	(0.260)	(0.259)	(0.377)	(0.359)	(0.425)	(0.337)	(0.345)	(0.360)
CSPR	-0.770	-0.768	-0.583	-0.502	-1.761 **	-0.861	-0.209	-0.754	-0.702	-0.378	-1.894 **	-0.755
	(0.605)	(0.607)	(0.563)	(0.579)	(0.750)	(0.587)	(0.851)	(0.813)	(0.786)	(0.730)	(0.852)	(0.794)
TSPR	0.603 ***	0.603 ***	0.649 ***	0.492 **	0.631 ***	0.632 ***	0.986 ***	0.879 ***	0.894 ***	0.705 **	0.924 ***	0.876 ***
	(0.191)	(0.191)	(0.190)	(0.204)	(0.189)	(0.191)	(0.341)	(0.299)	(0.308)	(0.300)	(0.299)	(0.296)
Intercept	-0.051	-0.051	-0.072 *	-0.053	-0.031	-0.062	-0.157 **	-0.130 *	-0.136 *	-0.133 *	-0.108	-0.127 *
	(0.038)	(0.038)	(0.039)	(0.037)	(0.039)	(0.038)	(0.077)	(0.073)	(0.075)	(0.074)	(0.072)	(0.075)
EI x HJTZ			-0.273 **						-0.080			
			(0.126)						(0.131)			
EI x PE				-0.028 *						-0.044 **		
				(0.014)						(0.020)		
EI x CSPR					-0.973 **						-1.094 **	
					(0.382)						(0.478)	
EI x TSPR						-0.059						0.020
						(0.057)						(0.071)
R-Square (%)	38	39	40	40	42	39	35	43	43	44	45	44

HORIZON	3 Years						4 Years					
EI		-0.131	-0.137	0.925	-0.006	-0.099		0.101	0.036	0.905	0.110	0.206 **
		(0.153)	(0.162)	(0.569)	(0.356)	(0.155)		(0.113)	(0.129)	(0.721)	(0.436)	(0.079)
MARGIN	-0.054	-0.041	-0.041	-0.045	-0.040	-0.043	-0.044	-0.061	-0.056	-0.056	-0.061	-0.107
	(0.150)	(0.140)	(0.139)	(0.138)	(0.140)	(0.139)	(0.179)	(0.161)	(0.162)	(0.163)	(0.162)	(0.178)
ΔSNP	-0.012	-0.010	-0.010	-0.004	-0.010	-0.011	-0.017	-0.019	-0.019	-0.015	-0.019	-0.023
	(0.022)	(0.021)	(0.021)	(0.020)	(0.019)	(0.021)	(0.028)	(0.027)	(0.027)	(0.026)	(0.025)	(0.027)
CLEV	1.475 ***	1.427 ***	1.431 ***	1.471 ***	1.419 ***	1.453 ***	2.137 ***	2.170 ***	2.212 ***	2.207 ***	2.170 ***	2.239 ***
	(0.410)	(0.354)	(0.363)	(0.359)	(0.349)	(0.351)	(0.505)	(0.493)	(0.503)	(0.489)	(0.485)	(0.476)
PE	0.062	0.068	0.069	0.044	0.068	0.069	-0.019	-0.023	-0.019	-0.042	-0.023	-0.021
	(0.099)	(0.096)	(0.096)	(0.103)	(0.096)	(0.097)	(0.118)	(0.115)	(0.114)	(0.120)	(0.114)	(0.114)
CPI	-0.699 ***	-0.750 ***	-0.746 ***	-0.707 ***	-0.736 ***	-0.727 ***	-0.651 **	-0.607 ***	-0.563 ***	-0.579 ***	-0.606 ***	-0.521 **
	(0.216)	(0.187)	(0.175)	(0.188)	(0.194)	(0.194)	(0.261)	(0.218)	(0.212)	(0.214)	(0.217)	(0.227)
ΔGDP_{t-4}	0.036	-0.027	-0.026	-0.070	-0.022	-0.009	0.036	0.086	0.088	0.050	0.087	0.164
	(0.158)	(0.140)	(0.139)	(0.132)	(0.141)	(0.144)	(0.179)	(0.171)	(0.171)	(0.165)	(0.176)	(0.172)
HJTZ	-0.585	-0.659 *	-0.688	-0.869 **	-0.655 *	-0.645 *	0.127	0.202	-0.099	0.022	0.202	0.344
	(0.381)	(0.373)	(0.430)	(0.379)	(0.371)	(0.374)	(0.439)	(0.404)	(0.412)	(0.482)	(0.405)	(0.422)
CSPR	-2.118 *	-2.365 **	-2.353 **	-2.004 **	-2.498 **	-2.357 **	-2.659 *	-2.434 **	-2.325 **	-2.206 **	-2.444 ***	-2.162 *
	(1.096)	(1.074)	(1.022)	(0.995)	(1.022)	(1.084)	(1.342)	(1.200)	(1.170)	(1.102)	(0.900)	(1.241)
TSPR	1.283 **	1.224 ***	1.228 **	1.060 **	1.229 ***	1.234 ***	0.979 **	1.016 **	1.056 **	0.898 *	1.016 **	0.987 **
	(0.530)	(0.452)	(0.468)	(0.448)	(0.459)	(0.450)	(0.486)	(0.461)	(0.477)	(0.500)	(0.463)	(0.439)
Intercept	-0.270 **	-0.258 **	-0.259 **	-0.261 **	-0.255 **	-0.265 **	-0.372 ***	-0.380 ***	-0.394 ***	-0.384 ***	-0.380 ***	-0.396 ***
	(0.121)	(0.105)	(0.108)	(0.105)	(0.102)	(0.104)	(0.139)	(0.136)	(0.139)	(0.135)	(0.133)	(0.131)
EI x HJTZ			-0.018						-0.179			
			(0.115)						(0.163)			
EI x PE				-0.042 **						-0.032		
				(0.020)						(0.026)		
EI x CSPR					-0.138						-0.010	
					(0.453)						(0.506)	
EI x TSPR						-0.052						-0.161
						(0.075)						(0.100)
R-Square (%)	33	40	40	41	40	40	29	33	33	33	33	35

HORIZON	5 Years						6 Years					
EI		0.282 **	0.154	2.258 ***	-0.431	0.257 ***		0.349 ***	0.280 *	2.530 ***	-0.464	0.176 *
		(0.110)	(0.103)	(0.675)	(0.394)	(0.081)		(0.131)	(0.143)	(0.635)	(0.381)	(0.099)
MARGIN	-0.054	-0.118	-0.107	-0.131	-0.127	-0.107	-0.116	-0.238	-0.222	-0.271	-0.260	-0.167
	(0.189)	(0.177)	(0.180)	(0.176)	(0.174)	(0.183)	(0.213)	(0.209)	(0.208)	(0.209)	(0.209)	(0.207)
ΔSNP	-0.041	-0.051 *	-0.050 *	-0.050 *	-0.047 *	-0.051 *	-0.024	-0.043 *	-0.041	-0.046 *	-0.039	-0.038
	(0.028)	(0.027)	(0.027)	(0.027)	(0.027)	(0.026)	(0.027)	(0.026)	(0.026)	(0.026)	(0.025)	(0.026)
CLEV	2.737 ***	2.844 ***	2.925 ***	2.964 ***	2.895 ***	2.828 ***	2.981 ***	3.094 ***	3.148 ***	3.262 ***	3.148 ***	2.978 ***
	(0.634)	(0.661)	(0.651)	(0.668)	(0.636)	(0.607)	(0.733)	(0.767)	(0.739)	(0.776)	(0.770)	(0.748)
PE	-0.036	-0.037	-0.030	-0.064	-0.037	-0.037	-0.063	-0.065	-0.060	-0.091	-0.066	-0.067
	(0.146)	(0.145)	(0.145)	(0.150)	(0.143)	(0.137)	(0.142)	(0.139)	(0.141)	(0.142)	(0.141)	(0.139)
CPI	-0.824 ***	-0.684 ***	-0.599 **	-0.566 **	-0.761 ***	-0.702 ***	-1.019 **	-0.821 **	-0.760 **	-0.583	-0.902 **	-0.946 **
	(0.286)	(0.259)	(0.258)	(0.240)	(0.261)	(0.265)	(0.407)	(0.380)	(0.381)	(0.362)	(0.400)	(0.383)
ΔGDP_{t-4}	-0.310	-0.184	-0.180	-0.299	-0.217	-0.203	-0.526 **	-0.234	-0.259	-0.285	-0.237	-0.340
	(0.233)	(0.225)	(0.224)	(0.214)	(0.216)	(0.218)	(0.213)	(0.207)	(0.206)	(0.203)	(0.206)	(0.216)
HJTZ	0.125	0.268	-0.319	-0.300	0.243	0.228	0.311	0.479	0.166	-0.183	0.461	0.198
	(0.395)	(0.396)	(0.426)	(0.453)	(0.402)	(0.378)	(0.523)	(0.518)	(0.538)	(0.496)	(0.512)	(0.477)
CSPR	-4.166 ***	-3.554 ***	-3.340 ***	-3.011 ***	-2.785 ***	-3.620 ***	-5.939 ***	-4.726 ***	-4.569 ***	-3.358 ***	-3.730 ***	-5.100 ***
	(1.097)	(1.031)	(0.997)	(0.933)	(0.838)	(1.045)	(1.380)	(1.350)	(1.290)	(1.231)	(1.394)	(1.334)
TSPR	0.344	0.407	0.490	0.065	0.369	0.415	0.140	0.101	0.160	-0.342	0.035	0.132
	(0.397)	(0.379)	(0.388)	(0.379)	(0.381)	(0.352)	(0.481)	(0.472)	(0.497)	(0.490)	(0.476)	(0.467)
Intercept	-0.449 ***	-0.474 ***	-0.502 ***	-0.490 ***	-0.489 ***	-0.470 ***	-0.442 **	-0.467 **	-0.487 ***	-0.500 ***	-0.484 ***	-0.442 **
	(0.159)	(0.164)	(0.162)	(0.165)	(0.158)	(0.151)	(0.173)	(0.180)	(0.172)	(0.181)	(0.182)	(0.177)
EI x HJTZ			-0.354 **						-0.182			
			(0.148)						(0.124)			
EI x PE				-0.078 ***						-0.085 ***		
				(0.024)						(0.022)		
EI x CSPR					0.791 *						0.909 **	
					(0.443)						(0.456)	
EI x TSPR						0.038						0.275 **
						(0.097)						(0.112)
R-Square (%)	36	37	38	37	39	41	36	37	38	37	37	37

Table 6: The Influence of EI_t on the Gross Domestic Product: Pre-Financial Crisis 1987 – 2006

The Table shows the 1-year to 6-year predictive power of the exuberance index (EI_t). $MARGIN_t$ is the margin debt at broker dealers normalized by market capitalization. ΔSNP_t is the log-change in S&P500 total return index in the preceding 4 quarters. $CLEV_t$ is nonfinancial corporate leverage. PE_t is the PE ratio of S&P500 (per $100 earnings). ΔGDP_{t-4} is the log-change in the Gross Domestic Product in the preceding 4 quarters. CPI_t is the change in the Consumer Price Index in the preceding quarter. $HJTZ_t$ is Huang-Jian-Tu-Zhou investor sentiment index. $CSPR_t$ is the Baa-Aaa bond spread. $TSPR_t$ is the US Treasury term spread. The dependent variable is the cumulative log-change in the Gross Domestic Product over various horizons. December 2006 is the last observation. Heteroscedasticity-consistent errors are in parentheses. ***, **, * denote significance at 1, 5 and 10 percent levels.

HORIZON			1 Year						2 Years			
EI		0.388 ***	0.342 ***	0.668 *	0.766 **	0.994 ***		0.700 ***	0.693 ***	0.673	0.863 **	1.397 ***
		(0.103)	(0.103)	(0.389)	(0.320)	(0.190)		(0.135)	(0.135)	(0.429)	(0.386)	(0.248)
EI x HJTZ			-0.221 **						-0.033			
			(0.108)						(0.101)			
EI x PE				-0.012						0.001		
				(0.016)						(0.017)		
EI x CSPR					-0.448						-0.195	
					(0.371)						(0.449)	
EI x TSPR						-0.386 ***						-0.499 ***
						(0.091)						(0.117)
R-Square (%)	37	42	42	42	44	47	43	48	48	48	52	48

HORIZON			3 Years						4 Years			
EI		0.837 ***	0.829 ***	1.159 **	-0.032	1.539 ***		0.888 ***	0.877 ***	1.220 **	-0.359	1.272 ***
		(0.153)	(0.156)	(0.467)	(0.393)	(0.268)		(0.239)	(0.251)	(0.547)	(0.478)	(0.402)
EI x HJTZ			-0.038						-0.051			
			(0.137)						(0.192)			
EI x PE				-0.013						-0.014		
				(0.018)						(0.022)		
EI x CSPR					1.043 **						1.621 **	
					(0.520)						(0.642)	
EI x TSPR						-0.526 ***						-0.362 *
						(0.123)						(0.200)
R-Square (%)	43	43	44	43	43	44	39	44	44	47	44	44

HORIZON			5 Years						6 Years			
EI		0.397 **	0.348 *	2.223 ***	-1.982 ***	0.608 *		0.179	0.125	1.102	-1.366 *	0.392
		(0.185)	(0.194)	(0.493)	(0.650)	(0.352)		(0.258)	(0.266)	(0.718)	(0.757)	(0.472)
EI x HJTZ			-0.408 **						-0.369			
			(0.170)						(0.271)			
EI x PE				-0.078 ***						-0.039 *		
				(0.019)						(0.022)		
EI x CSPR					3.397 ***						2.229 *	
					(0.929)						(1.134)	
EI x TSPR						-0.182						-0.187
						(0.174)						(0.260)
R-Square (%)	37	40	40	40	41	40	13	14	14	14	14	14

Table 7: The Influence of EI_t on Business Investment: Full Sample 1987 – 2014

The Table shows the 1-year to 6-year predictive power of the exuberance index ($\boldsymbol{EI_t}$). $\boldsymbol{MARGIN_t}$ is the margin debt at broker dealers normalized by market capitalization. $\boldsymbol{\Delta SNP_t}$ is the log-change in S&P500 total return index in the preceding 4 quarters. $\boldsymbol{CLEV_t}$ is nonfinancial corporate leverage. $\boldsymbol{PE_t}$ is the PE ratio of S&P500 (per $100 earnings). $\boldsymbol{\Delta BI_{t-4}}$ is the log-change in the business investment component of the Gross Domestic Product in the preceding 4 quarters. $\boldsymbol{CPI_t}$ is the change in the Consumer Price Index in the preceding quarter. $\boldsymbol{HJTZ_t}$ is Huang-Jian-Tu-Zhou investor sentiment index. $\boldsymbol{CSPR_t}$ is the Baa-Aaa bond spread. $\boldsymbol{TSPR_t}$ is the US Treasury term spread. The dependent variable is the cumulative log-change in the business investment component of the Gross Domestic Product over various horizons. December 2014 is the last observation. Heteroscedasticity-consistent errors are in parentheses. ***, **, * denote significance at 1, 5 and 10 percent levels.

HORIZON	1 Year						2 Years					
EI		-0.013	-0.344	1.520 *	2.169 **	0.186		-0.914 **	-1.234 **	0.704	2.991 ***	-0.810 *
		(0.147)	(0.211)	(0.863)	(0.998)	(0.144)		(0.409)	(0.491)	(1.225)	(0.927)	(0.419)
MARGIN	0.050	0.052	0.059	0.055	0.044	0.088	0.054	0.158	0.174	0.171	0.170	0.142
	(0.153)	(0.151)	(0.144)	(0.150)	(0.155)	(0.149)	(0.324)	(0.272)	(0.271)	(0.271)	(0.255)	(0.262)
ΔSNP	0.105 ***	0.105 ***	0.106 ***	0.113 ***	0.089 **	0.098 **	0.134 ***	0.145 ***	0.146 ***	0.153 ***	0.116 ***	0.141 ***
	(0.039)	(0.040)	(0.039)	(0.039)	(0.036)	(0.039)	(0.049)	(0.047)	(0.050)	(0.049)	(0.039)	(0.044)
CLEV	1.002 ***	0.998 ***	1.199 ***	1.066 ***	0.856 ***	1.156 ***	3.025 ***	2.742 ***	2.945 ***	2.819 ***	2.504 ***	2.812 ***
	(0.274)	(0.282)	(0.301)	(0.279)	(0.305)	(0.286)	(0.531)	(0.561)	(0.576)	(0.572)	(0.536)	(0.590)
PE	0.189 **	0.190 **	0.208 **	0.157 *	0.211 **	0.187 **	-0.014	0.034	0.053	-0.002	0.073	0.033
	(0.089)	(0.090)	(0.098)	(0.094)	(0.089)	(0.089)	(0.149)	(0.150)	(0.157)	(0.161)	(0.149)	(0.146)
CPI	-1.085 ***	-1.092 ***	-0.884 **	-1.072 ***	-0.874 **	-0.985 **	-1.859 ***	-2.326 ***	-2.127 ***	-2.317 ***	-1.965 ***	-2.225 ***
	(0.397)	(0.400)	(0.373)	(0.398)	(0.390)	(0.389)	(0.435)	(0.379)	(0.371)	(0.367)	(0.407)	(0.368)
ΔBI_{t-4}	0.303 ***	0.301 ***	0.307 ***	0.264 **	0.278 ***	0.344 ***	0.611 ***	0.446 ***	0.450 ***	0.406 ***	0.401 ***	0.475 ***
	(0.100)	(0.108)	(0.101)	(0.104)	(0.105)	(0.106)	(0.175)	(0.132)	(0.134)	(0.123)	(0.126)	(0.121)
HJTZ	-2.174 ***	-2.184 ***	-3.650 ***	-2.554 ***	-2.122 ***	-2.155 ***	-2.012 **	-2.678 ***	-4.142 ***	-3.087 ***	-2.635 ***	-2.582 ***
	(0.610)	(0.616)	(0.971)	(0.590)	(0.599)	(0.615)	(0.778)	(0.748)	(1.179)	(0.696)	(0.754)	(0.726)
CSPR	-0.789	-0.830	-0.175	-0.561	-3.671	-0.839	2.410	-0.246	0.341	-0.026	-5.507 ***	0.005
	(1.723)	(1.818)	(1.764)	(1.828)	(2.446)	(1.821)	(2.351)	(1.862)	(1.873)	(1.885)	(2.083)	(1.732)
TSPR	3.042 ***	3.037 ***	3.188 ***	2.793 ***	3.112 ***	3.169 ***	5.746 ***	5.388 ***	5.557 ***	5.137 ***	5.581 ***	5.409 ***
	(0.507)	(0.510)	(0.525)	(0.529)	(0.519)	(0.542)	(0.988)	(0.841)	(0.880)	(0.854)	(0.809)	(0.817)
Intercept	-0.306 ***	-0.305 ***	-0.372 ***	-0.311 ***	-0.253 ***	-0.352 ***	-0.765 ***	-0.692 ***	-0.760 ***	-0.699 ***	-0.606 ***	-0.711 ***
	(0.081)	(0.083)	(0.090)	(0.082)	(0.091)	(0.085)	(0.152)	(0.162)	(0.168)	(0.166)	(0.152)	(0.173)
EI x HJTZ			-0.903 **						-0.886 *			
			(0.349)						(0.447)			
EI x PE				-0.062 *						-0.065		
				(0.032)						(0.047)		
EI x CSPR					-2.425 **						-4.326 ***	
					(1.139)						(1.214)	
EI x TSPR						-0.272 *						-0.156
						(0.142)						(0.170)
R-Square (%)	54	54	56	55	56	54	55	62	62	62	64	63

HORIZON	3 Years						4 Years					
EI		-0.651	-0.813 *	0.670	1.412 *	-0.653		0.395	0.084	1.066	0.058	0.611 **
		(0.458)	(0.478)	(1.501)	(0.793)	(0.449)		(0.336)	(0.366)	(1.744)	(1.105)	(0.248)
MARGIN	0.706 *	0.800 **	0.804 **	0.806 **	0.813 **	0.800 **	0.863 *	0.799	0.821 *	0.803 *	0.795 *	0.709
	(0.417)	(0.397)	(0.396)	(0.394)	(0.395)	(0.391)	(0.515)	(0.481)	(0.484)	(0.477)	(0.475)	(0.533)
ΔSNP	0.087	0.097	0.098	0.103	0.084	0.097	0.098	0.092	0.093	0.095	0.094	0.085
	(0.073)	(0.067)	(0.067)	(0.066)	(0.062)	(0.064)	(0.072)	(0.072)	(0.072)	(0.070)	(0.069)	(0.074)
CLEV	6.014 ***	5.810 ***	5.914 ***	5.875 ***	5.673 ***	5.809 ***	8.406 ***	8.527 ***	8.729 ***	8.561 ***	8.550 ***	8.656 ***
	(1.013)	(0.887)	(0.920)	(0.909)	(0.854)	(0.889)	(1.265)	(1.216)	(1.265)	(1.194)	(1.196)	(1.133)
PE	-0.366 *	-0.344 *	-0.333	-0.370 *	-0.329	-0.344 *	-0.704 **	-0.716 **	-0.696 **	-0.730 **	-0.718 **	-0.712 **
	(0.218)	(0.203)	(0.204)	(0.212)	(0.205)	(0.200)	(0.309)	(0.305)	(0.305)	(0.323)	(0.311)	(0.303)
CPI	-1.877 ***	-2.220 ***	-2.107 ***	-2.210 ***	-2.006 ***	-2.222 ***	-1.866 ***	-1.655 ***	-1.436 **	-1.650 ***	-1.690 ***	-1.432 **
	(0.623)	(0.457)	(0.442)	(0.448)	(0.501)	(0.460)	(0.674)	(0.593)	(0.578)	(0.582)	(0.622)	(0.613)
ΔBI_{t-4}	0.390 **	0.294 *	0.294 *	0.255 *	0.288 *	0.293 *	-0.076	-0.020	-0.015	-0.040	-0.019	0.039
	(0.183)	(0.152)	(0.150)	(0.147)	(0.152)	(0.161)	(0.168)	(0.169)	(0.169)	(0.152)	(0.172)	(0.170)
HJTZ	-0.663	-1.139 *	-1.880 **	-1.466 **	-1.110 *	-1.141 *	2.574 **	2.879 ***	1.429	2.711 **	2.877 ***	3.194 ***
	(0.802)	(0.681)	(0.837)	(0.731)	(0.665)	(0.623)	(1.045)	(0.969)	(1.034)	(1.144)	(0.972)	(0.982)
CSPR	-1.823	-3.453	-3.149	-3.348	-5.944 **	-3.459	-5.773 *	-4.790 *	-4.234	-4.745 *	-4.376 *	-3.981
	(2.803)	(2.389)	(2.317)	(2.404)	(2.466)	(2.359)	(2.922)	(2.778)	(2.728)	(2.784)	(2.325)	(2.653)
TSPR	7.035 ***	6.758 ***	6.847 ***	6.559 ***	6.843 ***	6.757 ***	5.574 ***	5.735 ***	5.927 ***	5.635 ***	5.717 ***	5.685 ***
	(1.551)	(1.320)	(1.365)	(1.325)	(1.341)	(1.310)	(1.438)	(1.370)	(1.427)	(1.417)	(1.376)	(1.261)
Intercept	-1.411 ***	-1.361 ***	-1.396 ***	-1.367 ***	-1.316 ***	-1.361 ***	-1.811 ***	-1.840 ***	-1.909 ***	-1.843 ***	-1.847 ***	-1.870 ***
	(0.299)	(0.262)	(0.274)	(0.267)	(0.249)	(0.260)	(0.340)	(0.329)	(0.347)	(0.327)	(0.320)	(0.307)
EI x HJTZ			-0.453						-0.867 **			
			(0.296)						(0.404)			
EI x PE				-0.053						-0.027		
				(0.050)						(0.060)		
EI x CSPR					-2.294 **						0.374	
					(1.134)						(1.344)	
EI x TSPR						0.003						-0.322
						(0.175)						(0.290)
R-Square (%)	51	57	57	58	57	58	55	56	56	56	56	58

HORIZON	5 Years						6 Years					
EI		1.586 ***	1.033 ***	8.412 ***	-0.541	1.287 ***		2.187 ***	1.909 ***	10.953 ***	-2.170 *	1.080 ***
		(0.290)	(0.262)	(1.529)	(0.964)	(0.190)		(0.423)	(0.458)	(2.079)	(1.113)	(0.292)
MARGIN	0.791	0.445	0.492	0.391	0.415	0.571	0.576	-0.215	-0.150	-0.279	-0.380	0.258
	(0.556)	(0.528)	(0.537)	(0.524)	(0.528)	(0.533)	(0.602)	(0.591)	(0.597)	(0.582)	(0.581)	(0.563)
ΔSNP	0.002	-0.051	-0.047	-0.048	-0.039	-0.042	0.042	-0.081	-0.074	-0.083	-0.069	-0.045
	(0.074)	(0.070)	(0.070)	(0.071)	(0.070)	(0.066)	(0.079)	(0.078)	(0.077)	(0.077)	(0.074)	(0.080)
CLEV	10.483 ***	11.046 ***	11.395 ***	11.502 ***	11.197 ***	10.872 ***	10.561 ***	11.150 ***	11.364 ***	11.884 ***	11.411 ***	10.505 ***
	(1.776)	(1.819)	(1.816)	(1.838)	(1.746)	(1.548)	(2.090)	(2.149)	(2.113)	(2.231)	(2.078)	(2.065)
PE	-0.807 *	-0.799 *	-0.768 *	-0.872 **	-0.808 *	-0.800 **	-1.002 **	-0.986 **	-0.969 **	-1.067 **	-1.008 **	-0.994 **
	(0.411)	(0.413)	(0.415)	(0.418)	(0.412)	(0.355)	(0.459)	(0.458)	(0.464)	(0.463)	(0.462)	(0.479)
CPI	-2.304 ***	-1.345 **	-0.972	-1.159 *	-1.567 **	-1.634 **	-2.617 ***	-0.746	-0.532	-0.065	-1.050	-1.838 **
	(0.673)	(0.635)	(0.624)	(0.622)	(0.674)	(0.638)	(0.923)	(0.806)	(0.819)	(0.814)	(0.880)	(0.805)
ΔBI_{t-4}	-0.692 ***	-0.481 **	-0.472 **	-0.704 ***	-0.480 **	-0.563 ***	-0.790 ***	-0.124	-0.152	-0.365	-0.014	-0.439 *
	(0.213)	(0.213)	(0.212)	(0.200)	(0.209)	(0.190)	(0.247)	(0.248)	(0.246)	(0.254)	(0.258)	(0.261)
HJTZ	1.971 **	2.789 ***	0.254	0.678	2.750 ***	2.299 ***	1.510	2.571 **	1.328	-0.267	2.573 **	0.806
	(0.903)	(0.921)	(1.132)	(1.059)	(0.938)	(0.816)	(1.244)	(1.264)	(1.506)	(1.189)	(1.198)	(1.128)
CSPR	-11.568 ***	-7.643 ***	-6.675 ***	-7.235 ***	-5.061 ***	-8.761 ***	-14.637 ***	-4.039	-3.494	-0.804	2.694	-8.374 **
	(2.193)	(2.159)	(2.097)	(2.125)	(1.863)	(1.991)	(3.667)	(3.509)	(3.464)	(3.510)	(3.437)	(3.434)
TSPR	1.278	1.687	2.045 *	0.476	1.563	1.756 *	-1.200	-1.527	-1.297	-3.174 **	-1.987	-1.242
	(1.097)	(1.082)	(1.107)	(1.099)	(1.094)	(0.912)	(1.353)	(1.398)	(1.479)	(1.510)	(1.387)	(1.377)
Intercept	-2.097 ***	-2.229 ***	-2.349 ***	-2.287 ***	-2.276 ***	-2.190 ***	-1.941 ***	-2.082 ***	-2.159 ***	-2.224 ***	-2.166 ***	-1.937 ***
	(0.445)	(0.452)	(0.457)	(0.453)	(0.433)	(0.382)	(0.479)	(0.492)	(0.484)	(0.501)	(0.476)	(0.477)
EI x HJTZ			-1.531 ***						-0.724 *			
			(0.391)						(0.365)			
EI x PE				-0.271 ***						-0.346 ***		
				(0.053)						(0.070)		
EI x CSPR					2.369 **						4.928 ***	
					(1.044)						(1.411)	
EI x TSPR						0.449 *						1.645 ***
						(0.246)						(0.364)
R-Square (%)	55	55	55	55	55	62	46	46	46	47	47	46

Table 8: The Influence of EI_t on Personal Consumption Expenditure: Full Sample 1987 – 2014

The Table shows the 1-year to 6-year predictive power of the exuberance index (EI_t). $\boldsymbol{MARGIN_t}$ is the margin debt at broker dealers normalized by market capitalization. $\Delta\boldsymbol{SNP_t}$ is the log-change in S&P500 total return index in the preceding 4 quarters. $\boldsymbol{CLEV_t}$ is nonfinancial corporate leverage. $\boldsymbol{PE_t}$ is the PE ratio of S&P500 (per $100 earnings). $\Delta\boldsymbol{PCE_{t-4}}$ is the log-change in the personal consumption expenditure component of the Gross Domestic Product in the preceding 4 quarters. $\boldsymbol{CPI_t}$ is the change in the Consumer Price Index in the preceding quarter. $\boldsymbol{HJTZ_t}$ is Huang-Jian-Tu-Zhou investor sentiment index. $\boldsymbol{CSPR_t}$ is the Baa-Aaa bond spread. $\boldsymbol{TSPR_t}$ is the US Treasury term spread. The dependent variable is the cumulative log-change in the business investment component of the Gross Domestic Product over various horizons. December 2014 is the last observation. Heteroscedasticity-consistent errors are in parentheses. ***, **, * denote significance at 1, 5 and 10 percent levels.

HORIZON	1 Year						2 Years					
EI		-0.043	-0.111 **	0.616 **	0.622 **	-0.044		-0.267 ***	-0.230 ***	0.653	0.753 ***	-0.279 ***
		(0.037)	(0.052)	(0.265)	(0.243)	(0.040)		(0.083)	(0.085)	(0.452)	(0.207)	(0.081)
MARGIN	-0.107 **	-0.105 **	-0.104 **	-0.111 **	-0.110 **	-0.105 **	-0.191 **	-0.184 **	-0.186 **	-0.188 **	-0.186 **	-0.184 **
	(0.051)	(0.050)	(0.049)	(0.049)	(0.052)	(0.050)	(0.088)	(0.077)	(0.077)	(0.076)	(0.075)	(0.076)
ΔSNP	0.014	0.015	0.015	0.017	0.009	0.015	0.016	0.018	0.018	0.021	0.010	0.018
	(0.012)	(0.012)	(0.012)	(0.013)	(0.012)	(0.013)	(0.014)	(0.014)	(0.014)	(0.014)	(0.013)	(0.014)
CLEV	0.178 **	0.162 *	0.203 **	0.189 **	0.118	0.161 *	0.721 ***	0.620 ***	0.597 ***	0.661 ***	0.556 ***	0.610 ***
	(0.088)	(0.087)	(0.089)	(0.084)	(0.090)	(0.090)	(0.160)	(0.139)	(0.144)	(0.142)	(0.134)	(0.134)
PE	0.139 ***	0.142 ***	0.149 ***	0.130 ***	0.147 ***	0.142 ***	0.172 ***	0.187 ***	0.183 ***	0.170 ***	0.195 ***	0.187 ***
	(0.034)	(0.033)	(0.032)	(0.032)	(0.034)	(0.034)	(0.041)	(0.043)	(0.042)	(0.044)	(0.042)	(0.042)
CPI	-0.465 ***	-0.479 ***	-0.439 ***	-0.450 ***	-0.404 ***	-0.479 ***	-0.584 ***	-0.662 ***	-0.683 ***	-0.629 ***	-0.552 ***	-0.671 ***
	(0.104)	(0.103)	(0.095)	(0.101)	(0.098)	(0.104)	(0.171)	(0.154)	(0.147)	(0.144)	(0.155)	(0.155)
ΔPCE_{t-4}	0.023	0.009	-0.009	-0.021	0.012	0.009	0.196	0.125	0.137	0.074	0.122	0.116
	(0.184)	(0.183)	(0.174)	(0.182)	(0.188)	(0.184)	(0.174)	(0.161)	(0.157)	(0.151)	(0.156)	(0.155)
HJTZ	-0.400 *	-0.422 **	-0.726 ***	-0.555 ***	-0.388 *	-0.422 **	-0.500	-0.616 **	-0.446	-0.813 ***	-0.579 **	-0.623 **
	(0.204)	(0.202)	(0.243)	(0.210)	(0.198)	(0.204)	(0.319)	(0.297)	(0.333)	(0.288)	(0.283)	(0.296)
CSPR	-0.629	-0.700	-0.623	-0.465	-1.473 **	-0.697	0.331	-0.029	-0.061	0.250	-1.259 **	-0.034
	(0.581)	(0.585)	(0.571)	(0.583)	(0.670)	(0.572)	(0.586)	(0.544)	(0.525)	(0.507)	(0.605)	(0.536)
TSPR	0.563 ***	0.548 ***	0.581 ***	0.446 ***	0.570 ***	0.547 ***	0.826 ***	0.711 ***	0.691 ***	0.574 ***	0.760 ***	0.709 ***
	(0.135)	(0.137)	(0.137)	(0.134)	(0.131)	(0.141)	(0.245)	(0.229)	(0.237)	(0.212)	(0.222)	(0.224)
Intercept	-0.032	-0.029	-0.042	-0.030	-0.013	-0.028	-0.143 ***	-0.117 ***	-0.109 **	-0.120 ***	-0.095 **	-0.114 ***
	(0.029)	(0.028)	(0.029)	(0.028)	(0.030)	(0.029)	(0.046)	(0.039)	(0.042)	(0.039)	(0.038)	(0.038)
EI x HJTZ			-0.182 **						0.100			
			(0.085)						(0.083)			
EI x PE				-0.026 **						-0.036 **		
				(0.010)						(0.016)		
EI x CSPR					-0.734 ***						-1.123 ***	
					(0.275)						(0.251)	
EI x TSPR						0.001						0.022
						(0.036)						(0.039)
R-Square (%)	51	52	53	52	54	52	46	55	56	56	57	57

HORIZON	3 Years						4 Years					
EI		-0.187 *	-0.139	0.893 *	0.165	-0.192 *		0.029	0.058	0.496	0.072	0.133 *
		(0.104)	(0.104)	(0.483)	(0.246)	(0.101)		(0.094)	(0.090)	(0.620)	(0.298)	(0.068)
MARGIN	-0.169	-0.150	-0.151	-0.155	-0.148	-0.150	-0.160	-0.164	-0.166	-0.163	-0.164	-0.208
	(0.119)	(0.110)	(0.110)	(0.106)	(0.110)	(0.101)	(0.147)	(0.138)	(0.140)	(0.136)	(0.138)	(0.137)
ΔSNP	-0.002	0.001	0.001	0.005	-0.001	0.001	-0.005	-0.005	-0.005	-0.004	-0.006	-0.008
	(0.017)	(0.016)	(0.017)	(0.016)	(0.016)	(0.015)	(0.020)	(0.019)	(0.019)	(0.019)	(0.018)	(0.020)
CLEV	1.420 ***	1.352 ***	1.322 ***	1.399 ***	1.329 ***	1.348 ***	2.104 ***	2.114 ***	2.095 ***	2.136 ***	2.111 ***	2.184 ***
	(0.267)	(0.221)	(0.226)	(0.230)	(0.221)	(0.206)	(0.339)	(0.308)	(0.321)	(0.313)	(0.307)	(0.303)
PE	0.210 ***	0.217 ***	0.211 ***	0.197 ***	0.219 ***	0.217 ***	0.125	0.125	0.122	0.115	0.125	0.125
	(0.066)	(0.066)	(0.067)	(0.066)	(0.066)	(0.065)	(0.092)	(0.090)	(0.088)	(0.092)	(0.090)	(0.090)
CPI	-0.572 ***	-0.641 ***	-0.673 ***	-0.596 ***	-0.603 ***	-0.645 ***	-0.601 **	-0.589 ***	-0.608 ***	-0.572 ***	-0.584 ***	-0.503 **
	(0.201)	(0.184)	(0.178)	(0.174)	(0.194)	(0.190)	(0.239)	(0.208)	(0.198)	(0.201)	(0.217)	(0.220)
ΔBI_{t-4}	-0.078	-0.123	-0.109	-0.183	-0.122	-0.127	0.004	0.011	0.019	-0.015	0.011	0.076
	(0.197)	(0.184)	(0.182)	(0.172)	(0.185)	(0.185)	(0.192)	(0.190)	(0.192)	(0.177)	(0.190)	(0.172)
HJTZ	-0.476 *	-0.580 **	-0.358	-0.807 ***	-0.573 **	-0.583 **	0.169	0.190	0.326	0.082	0.190	0.337
	(0.256)	(0.241)	(0.268)	(0.259)	(0.240)	(0.226)	(0.326)	(0.295)	(0.325)	(0.385)	(0.296)	(0.311)
CSPR	-1.378 *	-1.609 **	-1.660 **	-1.271 *	-2.018 ***	-1.611 **	-2.017 **	-1.975 **	-2.001 **	-1.846 **	-2.027 ***	-1.762 *
	(0.741)	(0.706)	(0.693)	(0.647)	(0.661)	(0.687)	(0.992)	(0.888)	(0.878)	(0.812)	(0.711)	(0.893)
TSPR	1.075 ***	0.990 ***	0.961 ***	0.828 ***	1.004 ***	0.988 ***	0.645 *	0.657 *	0.638 *	0.589	0.659 *	0.626 *
	(0.367)	(0.320)	(0.330)	(0.309)	(0.324)	(0.314)	(0.365)	(0.346)	(0.359)	(0.357)	(0.347)	(0.335)
Intercept	-0.270 ***	-0.255 ***	-0.245 ***	-0.258 ***	-0.247 ***	-0.254 ***	-0.373 ***	-0.375 ***	-0.369 ***	-0.378 ***	-0.374 ***	-0.390 ***
	(0.075)	(0.060)	(0.063)	(0.061)	(0.059)	(0.056)	(0.087)	(0.080)	(0.085)	(0.081)	(0.079)	(0.077)
EI x HJTZ			0.132						0.079			
			(0.085)						(0.102)			
EI x PE				-0.043 **						-0.019		
				(0.017)						(0.022)		
EI x CSPR					-0.391						-0.048	
					(0.323)						(0.358)	
EI x TSPR						0.008						-0.167 ***
						(0.054)						(0.063)
R-Square (%)	42	48	48	51	48	53	37	41	41	42	41	44

HORIZON	5 Years						6 Years					
EI		0.179 **	0.114 *	1.895 ***	-0.353	0.164 ***		0.241 **	0.224 **	2.280 ***	-0.317	0.085
		(0.081)	(0.067)	(0.623)	(0.251)	(0.058)		(0.096)	(0.099)	(0.667)	(0.287)	(0.062)
MARGIN	-0.139	-0.178	-0.174	-0.195	-0.186	-0.172	-0.160	-0.228	-0.224	-0.264 *	-0.244	-0.171
	(0.162)	(0.152)	(0.153)	(0.149)	(0.149)	(0.161)	(0.168)	(0.157)	(0.159)	(0.153)	(0.156)	(0.163)
ΔSNP	-0.037 *	-0.043 **	-0.042 **	-0.044 **	-0.040 *	-0.042 **	-0.027	-0.037 *	-0.036 *	-0.041 *	-0.034	-0.034
	(0.020)	(0.020)	(0.020)	(0.020)	(0.020)	(0.020)	(0.023)	(0.022)	(0.022)	(0.022)	(0.021)	(0.022)
CLEV	2.858 ***	2.927 ***	2.969 ***	3.034 ***	2.965 ***	2.918 ***	3.210 ***	3.302 ***	3.315 ***	3.457 ***	3.338 ***	3.186 ***
	(0.399)	(0.408)	(0.404)	(0.417)	(0.392)	(0.380)	(0.471)	(0.494)	(0.478)	(0.508)	(0.492)	(0.476)
PE	0.117	0.120	0.127	0.103	0.119	0.120	0.038	0.039	0.041	0.016	0.036	0.035
	(0.130)	(0.126)	(0.129)	(0.129)	(0.124)	(0.121)	(0.141)	(0.134)	(0.135)	(0.138)	(0.136)	(0.135)
CPI	-0.860 ***	-0.775 ***	-0.734 ***	-0.673 ***	-0.831 ***	-0.785 ***	-1.239 ***	-1.098 ***	-1.083 ***	-0.876 ***	-1.152 ***	-1.214 ***
	(0.264)	(0.235)	(0.223)	(0.211)	(0.237)	(0.252)	(0.384)	(0.344)	(0.338)	(0.301)	(0.353)	(0.362)
ΔBI_{t-4}	-0.239	-0.208	-0.228	-0.321	-0.216	-0.217	-0.247	-0.142	-0.153	-0.179	-0.123	-0.183
	(0.238)	(0.240)	(0.237)	(0.223)	(0.235)	(0.223)	(0.212)	(0.202)	(0.203)	(0.200)	(0.204)	(0.201)
HJTZ	-0.032	0.045	-0.258	-0.455	0.032	0.022	0.409	0.502	0.423	-0.113	0.497	0.251
	(0.269)	(0.258)	(0.332)	(0.347)	(0.265)	(0.270)	(0.367)	(0.345)	(0.415)	(0.370)	(0.341)	(0.342)
CSPR	-3.539 ***	-3.292 ***	-3.238 ***	-2.814 ***	-2.667 ***	-3.320 ***	-5.818 ***	-5.219 ***	-5.191 ***	-3.909 ***	-4.480 ***	-5.416 ***
	(0.931)	(0.841)	(0.832)	(0.736)	(0.730)	(0.873)	(1.475)	(1.344)	(1.304)	(1.082)	(1.341)	(1.363)
TSPR	0.027	0.073	0.117	-0.219	0.043	0.077	-0.190	-0.183	-0.168	-0.602 *	-0.234	-0.172
	(0.321)	(0.311)	(0.315)	(0.302)	(0.315)	(0.300)	(0.393)	(0.364)	(0.386)	(0.361)	(0.357)	(0.366)
Intercept	-0.490 ***	-0.506 ***	-0.519 ***	-0.520 ***	-0.517 ***	-0.504 ***	-0.497 ***	-0.517 ***	-0.522 ***	-0.548 ***	-0.528 ***	-0.492 ***
	(0.095)	(0.098)	(0.098)	(0.098)	(0.094)	(0.090)	(0.105)	(0.109)	(0.106)	(0.111)	(0.109)	(0.106)
EI x HJTZ			-0.178 *						-0.045			
			(0.100)						(0.098)			
EI x PE				-0.068 ***						-0.079 ***		
				(0.022)						(0.023)		
EI x CSPR					0.592 **						0.626 *	
					(0.281)						(0.335)	
EI x TSPR						0.023						0.263 ***
						(0.071)						(0.090)
R-Square (%)	44	46	46	46	47	48	42	46	47	46	46	46

Table 9: Momentum-Based Sentiment Measures: Full Sample 1987 – 2014

Panel A shows the 1-year to 8-year predictive power of the momentum-based sentiment ($\boldsymbol{MomSI_{i,t}}$) and causality ($\boldsymbol{MomCI_{i,t}}$) indices. $\boldsymbol{LEV_t}$ is the first principal of leverage and coverage ratios as described in Step 9). $\boldsymbol{ROA_t}$ is the industry return on assets as described in Step 7). $\boldsymbol{SIZE_t}$ is the market capitalization of the industry from 5 years earlier. $\boldsymbol{y_{i,t-4}}$ is the industry stock market return over the preceding four quarters. The dependent variable is the cumulative stock market log-return of the industry over various horizons. December 2014 is the last observation. Each specification includes industry and year-quarter fixed effects. Heteroscedasticity-consistent errors are in parentheses. Errors are clustered at industry level.

Panel B shows the predictive power of the momentum-based exuberance index $\boldsymbol{MomEI_t}$ over market returns and business investment. $\boldsymbol{MARGIN_t}$ is the margin debt at broker dealers normalized by market capitalization. $\boldsymbol{\Delta SNP_t}$ is the log-change in S&P500 total return index in the preceding 4 quarters. $\boldsymbol{CLEV_t}$ is nonfinancial corporate leverage. $\boldsymbol{PE_t}$ is the PE ratio of S&P500 (per $100 earnings). $\boldsymbol{\Delta GDP_{t-4}}$ is the log-change in Gross Domestic Product in the preceding 4 quarters. $\boldsymbol{CPI_t}$ is the change in the Consumer Price Index in the preceding quarter. $\boldsymbol{HJTZ_t}$ is Huang-Jian-Tu-Zhou investor sentiment index. $\boldsymbol{CSPR_t}$ is the Baa-Aaa bond spread. $\boldsymbol{TSPR_t}$ is the US Treasury term spread. Only the coefficients of key variables are presented for brevity. The dependent variable is noted in the Panel title.

***, **, * denote significance at 1, 5 and 10 percent levels.

Panel A: Industry-Level Effects

HORIZON	1 Year	2 Years	3 Years	4 Years	5 Years	6 Years	7 Years	8 Years
MomCI	-0.012	-0.004	-0.018	-0.032	-0.056 *	-0.091 **	-0.082 **	-0.105 ***
	(0.008)	(0.016)	(0.023)	(0.029)	(0.033)	(0.037)	(0.040)	(0.040)
MomSI	-0.065 **	-0.119 **	-0.136 **	-0.132 *	-0.156 *	-0.106	-0.044	-0.124
	(0.028)	(0.050)	(0.064)	(0.073)	(0.081)	(0.096)	(0.098)	(0.099)
ROA	-0.155	-0.525	-0.516	-0.734	-0.783	-1.262 *	-0.898	-1.070
	(0.251)	(0.385)	(0.490)	(0.543)	(0.656)	(0.678)	(0.767)	(0.813)
LEV	0.000	0.000	0.000	0.010	0.016	0.010	0.018	0.022
	(0.003)	(0.007)	(0.010)	(0.013)	(0.015)	(0.018)	(0.019)	(0.020)
$\boldsymbol{y_{t-4}}$	-0.018	-0.110 ***	-0.158 ***	-0.210 ***	-0.291 ***	-0.326 ***	-0.298 ***	-0.384 ***
	(0.019)	(0.031)	(0.034)	(0.034)	(0.042)	(0.051)	(0.055)	(0.058)
SIZE	-0.050 ***	-0.096 ***	-0.139 ***	-0.180 ***	-0.164 ***	-0.213 ***	-0.244 ***	-0.266 ***
	(0.011)	(0.023)	(0.036)	(0.048)	(0.061)	(0.076)	(0.085)	(0.097)
R-Square (%)	35	31	28	25	28	19	17	13

Panel B: Predictive Power: S&P500 Total Returns

HORIZON	1 Year					2 Years				
MomEI	3.164	3.262	6.267	9.260	6.911 **	7.369 *	7.459 *	-9.133	27.078 **	14.465 ***
	(2.183)	(2.365)	(11.202)	(7.203)	(3.075)	(4.005)	(4.075)	(15.557)	(11.099)	(5.240)
MomEI x HJTZ		0.894					0.969			
		(3.454)					(3.367)			
MomEI x PE			-0.122					0.637		
			(0.423)					(0.603)		
MomEI x CSPR				-7.069					-22.844 *	
				(8.689)					(12.968)	
MomEI x TSPR					-2.313					-5.165 *
					(1.922)					(2.898)
R-Square (%)	21	21	22	21	21	25	25	25	25	25

HORIZON	3 Year					4 Years				
MomEI	7.095	8.023 *	-26.352 *	35.493 **	11.910 *	11.093 **	12.247 **	2.754	25.616	13.964 *
	(4.647)	(4.716)	(13.659)	(16.909)	(6.177)	(4.958)	(5.358)	(13.069)	(19.927)	(7.027)
MomEI x HJTZ		12.365 ***					7.220			
		(3.515)					(4.387)			
MomEI x PE			1.288 **					0.315		
			(0.553)					(0.564)		
MomEI x CSPR				-32.992 *					-17.352	
				(18.079)					(20.121)	
MomEI x TSPR					-3.502					-2.688
					(2.776)					(3.026)
R-Square (%)	21	24	21	22	21	18	18	18	18	19

HORIZON	5 Year					6 Years				
MomEI	4.490	4.761	16.453	8.595	2.719	-4.306	-4.258	1.870	1.784	-5.113
	(5.007)	(5.585)	(15.625)	(19.108)	(6.499)	(5.689)	(6.235)	(16.892)	(21.500)	(5.737)
MomEI x HJTZ		1.281					0.222			
		(4.618)					(4.100)			
MomEI x PE			-0.442					-0.224		
			(0.606)					(0.609)		
MomEI x CSPR				-5.165					-7.838	
				(19.895)					(22.474)	
MomEI x TSPR					2.131					1.238
					(2.991)					(4.852)
R-Square (%)	29	29	29	30	30	20	20	20	20	21

Panel C: Predictive Power: GDP Growth

HORIZON			1 Year					2 Years		
MomEI	0.219	0.231	0.430	1.507 ***	0.508 **	0.811 ***	0.823 ***	-1.218	2.735 ***	1.694 ***
	(0.178)	(0.183)	(0.858)	(0.543)	(0.246)	(0.283)	(0.289)	(1.032)	(0.866)	(0.446)
MomEI x HJTZ		0.111					0.130			
		(0.190)					(0.252)			
MomEI x PE			-0.008					0.078 *		
			(0.034)					(0.042)		
MomEI x CSPR				-1.494 **					-2.230 **	
				(0.594)					(0.940)	
MomEI x TSPR					-0.179					-0.643 ***
					(0.125)					(0.211)
R-Square (%)	39	39	39	40	39	37	37	38	38	42

HORIZON			3 Year					4 Years		
MomEI	1.017 ***	1.093 ***	-1.608 *	3.127 ***	1.426 ***	1.483 ***	1.622 ***	0.493	2.377 **	1.627 ***
	(0.294)	(0.277)	(0.945)	(1.016)	(0.358)	(0.287)	(0.314)	(0.897)	(1.190)	(0.411)
MomEI x HJTZ		1.008 ***					0.864 ***			
		(0.292)					(0.303)			
MomEI x PE			0.101 ***					0.037		
			(0.035)					(0.036)		
MomEI x CSPR				-2.451 **					-1.068	
				(1.206)					(1.338)	
MomEI x TSPR					-0.297					-0.134
					(0.221)					(0.270)
R-Square (%)	35	43	37	39	37	35	36	35	35	37

HORIZON			5 Year					6 Years		
MomEI	1.203 ***	1.325 ***	1.435	1.923	0.845 **	0.435	0.393	1.927	0.071	-0.081
	(0.303)	(0.327)	(1.053)	(1.289)	(0.414)	(0.368)	(0.408)	(1.171)	(1.499)	(0.439)
MomEI x HJTZ		0.575 **					-0.194			
		(0.272)					(0.291)			
MomEI x PE			-0.009					-0.054		
			(0.039)					(0.041)		
MomEI x CSPR				-0.906					0.468	
				(1.373)					(1.638)	
MomEI x TSPR					0.431 *					0.791 **
					(0.257)					(0.375)
R-Square (%)	41	42	41	41	42	36	36	36	36	36

Table 10: Equally-Weighted Firm Betas: Full Sample 1987 – 2014

Panel A shows the 1-year to 8-year predictive power of the sentiment index calculated with equally-weighted firm betas ($\boldsymbol{EwSI_{i,t}}$) and causality ($\boldsymbol{EwCI_{i,t}}$) indices. $\boldsymbol{LEV_t}$ is the first principal of leverage and coverage ratios as described in Step 9). $\boldsymbol{ROA_t}$ is the industry return on assets as described in Step 7). $\boldsymbol{SIZE_t}$ is the market capitalization of the industry from 5 years earlier. $\boldsymbol{y_{i,t-4}}$ is the industry stock market return over the preceding four quarters. The dependent variable is the cumulative stock market log-return of the industry over various horizons. December 2014 is the last observation. Each specification includes industry and year-quarter fixed effects. Heteroscedasticity-consistent errors are in parentheses. Errors are clustered at industry level.

Panel B shows the predictive power of the exuberance index $\boldsymbol{EwEI_t}$ over market returns and business investment. $\boldsymbol{MARGIN_t}$ is the margin debt at broker dealers normalized by market capitalization. $\Delta\boldsymbol{SNP_t}$ is the log-change in S&P500 total return index in the preceding 4 quarters. $\boldsymbol{CLEV_t}$ is nonfinancial corporate leverage. $\boldsymbol{PE_t}$ is the PE ratio of S&P500 (per $100 earnings). $\Delta\boldsymbol{GDP_{t-4}}$ is the log-change in Gross Domestic Product in the preceding 4 quarters. $\boldsymbol{CPI_t}$ is the change in the Consumer Price Index in the preceding quarter. $\boldsymbol{HJTZ_t}$ is Huang-Jian-Tu-Zhou investor sentiment index. $\boldsymbol{CSPR_t}$ is the Baa-Aaa bond spread. $\boldsymbol{TSPR_t}$ is the US Treasury term spread. Only the coefficients of key variables are presented for brevity. The dependent variable is noted in the Panel title.

***, **, * denote significance at 1, 5 and 10 percent levels.

Panel A: Industry-Level Effects

HORIZON	1 Year	2 Years	3 Years	4 Years	5 Years	6 Years	7 Years	8 Years
EwCI	-0.024 ***	-0.036 **	-0.048 *	-0.059 **	-0.079 **	-0.108 ***	-0.108 ***	-0.095 **
	(0.009)	(0.017)	(0.025)	(0.030)	(0.034)	(0.039)	(0.042)	(0.044)
EwSI	-0.117 ***	-0.150 ***	-0.156 ***	-0.177 **	-0.216 ***	-0.283 ***	-0.200 *	-0.182 *
	(0.027)	(0.043)	(0.056)	(0.071)	(0.077)	(0.092)	(0.103)	(0.102)
ROA	-0.144	-0.512	-0.512	-0.729	-0.771	-1.216 *	-0.866	-1.088
	(0.249)	(0.384)	(0.488)	(0.540)	(0.651)	(0.674)	(0.766)	(0.811)
LEV	0.000	0.000	0.000	0.009	0.015	0.008	0.016	0.022
	(0.003)	(0.007)	(0.010)	(0.013)	(0.015)	(0.018)	(0.019)	(0.021)
y_{t-4}	-0.021	-0.116 ***	-0.167 ***	-0.218 ***	-0.302 ***	-0.328 ***	-0.296 ***	-0.404 ***
	(0.018)	(0.030)	(0.033)	(0.034)	(0.041)	(0.051)	(0.056)	(0.058)
SIZE	-0.049 ***	-0.094 ***	-0.135 ***	-0.177 ***	-0.160 ***	-0.210 ***	-0.243 ***	-0.258 ***
	(0.011)	(0.023)	(0.036)	(0.048)	(0.060)	(0.076)	(0.083)	(0.096)
R-Square (%)	35	31	28	25	28	19	17	13

Panel B: Predictive Power: S&P500 Total Returns

HORIZON			1 Year					2 Years		
EwEI	-0.451	-0.636	0.416	4.263 *	-0.819	1.400	1.473	3.455	6.033 *	-0.065
	(0.798)	(0.765)	(2.746)	(2.444)	(1.038)	(1.224)	(1.329)	(3.288)	(3.186)	(1.491)
EwEI x HJTZ		1.040					-0.235			
		(0.730)					(1.011)			
EwEI x PE			-0.032					-0.073		
			(0.096)					(0.107)		
EwEI x CSPR				-5.028 **					-5.016	
				(2.512)					(3.425)	
EwEI x TSPR					0.338					1.466
					(0.805)					(0.955)
R-Square (%)	20	23	20	22	20	20	20	20	20	27

HORIZON			3 Year					4 Years		
EwEI	4.456 ***	4.328 ***	4.539	14.334 **	4.354 ***	2.118	2.001	4.553	11.726	3.152 *
	(1.456)	(1.578)	(3.865)	(6.669)	(1.576)	(1.927)	(2.000)	(6.078)	(9.007)	(1.780)
EwEI x HJTZ		0.398					0.529			
		(0.974)					(0.944)			
EwEI x PE			-0.003					-0.082		
			(0.115)					(0.162)		
EwEI x CSPR				-12.080					-12.193	
				(7.279)					(10.620)	
EwEI x TSPR					0.117					-1.553
					(1.079)					(1.281)
R-Square (%)	22	26	22	22	28	17	17	17	21	17

HORIZON			5 Year					6 Years		
EwEI	0.649	0.696	6.436	2.538	1.425	-0.969	-1.215	0.729	-20.412 **	-0.779
	(1.724)	(1.721)	(5.684)	(7.255)	(1.616)	(1.738)	(1.783)	(5.994)	(8.212)	(1.670)
EwEI x HJTZ		-0.211					0.809			
		(0.510)					(0.750)			
EwEI x PE			-0.196					-0.057		
			(0.150)					(0.160)		
EwEI x CSPR				-2.420					24.862 **	
				(8.896)					(10.737)	
EwEI x TSPR					-1.182					-0.297
					(1.129)					(1.231)
R-Square (%)	29	29	29	32	29	20	20	20	20	20

Panel C: Predictive Power: GDP Growth

HORIZON			1 Year					2 Years		
EwEI	0.028	0.026	0.165	0.471 **	0.080	0.183 **	0.181 **	0.180	0.732 ***	0.117
	(0.060)	(0.062)	(0.243)	(0.225)	(0.092)	(0.083)	(0.090)	(0.281)	(0.264)	(0.112)
EwEI x HJTZ		0.011					0.004			
		(0.051)					(0.069)			
EwEI x PE			-0.005					0.000		
			(0.009)					(0.009)		
EwEI x CSPR				-0.473 **					-0.595 *	
				(0.222)					(0.302)	
EwEI x TSPR					-0.048					0.066
					(0.056)					(0.084)
R-Square (%)	39	39	39	41	39	35	36	35	36	39

HORIZON			3 Year					4 Years		
EwEI	0.460 ***	0.468 ***	0.460 *	1.710 ***	0.517 ***	0.385 ***	0.381 ***	0.462	1.892 ***	0.480 ***
	(0.094)	(0.091)	(0.250)	(0.480)	(0.110)	(0.105)	(0.105)	(0.418)	(0.587)	(0.110)
EwEI x HJTZ		-0.027					0.018			
		(0.058)					(0.068)			
EwEI x PE			0.000					-0.003		
			(0.008)					(0.012)		
EwEI x CSPR				-1.529 ***					-1.912 **	
				(0.537)					(0.730)	
EwEI x TSPR					-0.066					-0.143
					(0.082)					(0.093)
R-Square (%)	39	40	39	41	39	29	30	30	38	30

HORIZON			5 Year					6 Years		
EwEI	0.265 **	0.276 **	0.740	1.039 *	0.425 ***	0.046	0.061	0.551	-1.213	0.095
	(0.115)	(0.119)	(0.507)	(0.589)	(0.104)	(0.115)	(0.123)	(0.560)	(0.750)	(0.107)
EwEI x HJTZ		-0.049					-0.049			
		(0.051)					(0.060)			
EwEI x PE			-0.016					-0.017		
			(0.014)					(0.016)		
EwEI x CSPR				-0.991					1.610 *	
				(0.729)					(0.955)	
EwEI x TSPR					-0.243 **					-0.077
					(0.098)					(0.096)
R-Square (%)	36	36	37	48	42	36	37	36	37	36

Table 11: Global Financial Crises

In this Table, I report the results of a VAR analysis to test the Granger-causality between the annualized exuberance index $\boldsymbol{EI+_t}$ and the crisis index $\boldsymbol{CR_t}$.

Panel A: VAR Estimation

	Mean	EI_{+t-1}	CR_{t-1}	EI_{+t-2}	CR_{t-2}	EI_{+t-3}	CR_{t-3}
EI_{+t}	11.579	0.456 *	-3.455	-0.261	-1.772	0.088	-1.509
	(9.207)	(0.241)	(2.958)	(0.327)	(2.874)	(0.294)	(2.666)
CR_t	0.960	0.043 **	-0.324	0.054 **	0.046	-0.045 **	0.273
	(0.611)	(0.016)	(0.196)	(0.022)	(0.191)	(0.020)	(0.177)

Panel B: Granger-Causality Wald Tests

	Degrees of Freedom	Chi-Square	P-Value
Null: Independent EI_{+t}	3	1.84	0.60
Null: Independent CR_t	3	20.98	<0.01

Table 12: The Influence of EI_t on Stock Market Returns Under Alternative Ambiguity Thresholds: Full Sample 1987 – 2014

The Table shows the 1-year to 6-year predictive power of the exuberance index (EI_t). $MARGIN_t$ is the margin debt at broker dealers normalized by market capitalization. ΔSNP_t is the log-change in S&P500 total return index in the preceding 4 quarters. $CLEV_t$ is nonfinancial corporate leverage. PE_t is the PE ratio of S&P500 (per \$100 earnings). ΔGDP_{t-4} is the log-change of the Gross Domestic Product in the preceding 4 quarters. CPI_t is the change in the Consumer Price Index in the preceding quarter. $HJTZ_t$ is Huang-Jian-Tu-Zhou investor sentiment index. $CSPR_t$ is the Baa-Aaa bond spread. $TSPR_t$ is the US Treasury term spread. The dependent variable is the cumulative S&P500 log-total return over various horizons. December 2014 is the last observation. For brevity, only EI_t and its interactions are shown. The results for the ambiguity threshold of '2' (Panels A.2, B.2, and C.2) are identical to those in Table 3 but are included here for expositional reasons. Heteroscedasticity-consistent errors are in parentheses. ***, **, * denote significance at 1, 5 and 10 percent levels.

Panel A.1: Threshold: 1.7

HORIZON			1 Year					2 Years		
EI	-1.284	-2.271 **	-3.474	8.446 *	-1.005	-2.819	-3.152	0.755	6.644	-3.257 *
	(0.786)	(0.884)	(6.530)	(4.549)	(0.839)	(1.786)	(2.015)	(8.173)	(6.806)	(1.737)
EI x HJTZ		-2.573					-0.880			
		(1.802)					(2.551)			
EI x PE			0.086					-0.141		
			(0.248)					(0.315)		
EI x CSPR				-11.212 **					-10.865	
				(5.099)					(7.498)	
EI x TSPR					-0.667					1.157
					(0.722)					(0.960)
R-Square (%)	21	21	22	25	21	25	26	25	27	27

Panel A.2: Threshold: 2

HORIZON			1 Year					2 Years		
EI	-1.319 *	-2.088 **	-2.471	9.003 *	-0.944	-3.005 *	-2.488	0.531	2.013	-3.393 **
	(0.681)	(0.981)	(5.556)	(4.963)	(0.812)	(1.556)	(2.035)	(7.222)	(5.333)	(1.670)
EI x HJTZ		-2.086					1.426			
		(1.598)					(1.980)			
EI x PE			0.046					-0.140		
			(0.212)					(0.278)		
EI x CSPR				-11.386 **					-5.514	
				(5.576)					(6.191)	
EI x TSPR					-0.567					0.652
					(0.623)					(0.891)
R-Square (%)	21	22	22	24	21	25	26	25	26	26

Panel A.3: Threshold: 2.3

HORIZON			1 Year					2 Years		
EI	-1.555	-1.341	-5.782	13.536 **	-1.336	-4.345 **	-3.852 *	-0.654	2.179	-5.073 **
	(0.967)	(1.165)	(7.181)	(6.260)	(0.996)	(2.021)	(1.978)	(9.539)	(6.461)	(2.022)
EI x HJTZ		0.628					1.452			
		(1.847)					(1.945)			
EI x PE			0.161					-0.141		
			(0.257)					(0.332)		
EI x CSPR				-16.787 **					-7.220	
				(7.119)					(8.277)	
EI x TSPR					-0.464					1.766
					(1.129)					(1.159)
R-Square (%)	21	21	22	27	21	26	26	27	27	29

Panel B.1: Threshold: 1.7

HORIZON			3 Year					4 Years		
EI	-1.065	-1.708	3.367	1.775	-1.000	-0.517	-2.045	13.906	-10.551 *	0.437
	(2.066)	(1.989)	(8.640)	(6.669)	(2.050)	(1.606)	(1.352)	(9.504)	(5.636)	(1.370)
EI x HJTZ		-1.759					-4.229 *			
		(2.105)					(2.350)			
EI x PE			-0.175					-0.571 *		
			(0.306)					(0.341)		
EI x CSPR				-3.263					11.579 *	
				(7.943)					(6.523)	
EI x TSPR					-0.169					-2.199 *
					(0.836)					(1.246)
R-Square (%)	17	18	17	23	20	18	18	18	18	23

Panel B.2: Threshold: 2

HORIZON			3 Years					4 Years		
EI	-1.008	-1.605	4.187	-3.694	-0.453	0.943	-0.153	9.576	-2.545	1.670
	(2.023)	(2.247)	(7.465)	(6.604)	(2.159)	(1.467)	(1.621)	(8.569)	(6.064)	(1.309)
EI x HJTZ		-1.676					-3.055 *			
		(1.769)					(1.737)			
EI x PE			-0.206					-0.343		
			(0.265)					(0.309)		
EI x CSPR				2.972					3.863	
				(7.956)					(7.051)	
EI x TSPR					-0.910					-1.112
					(0.782)					(1.273)
R-Square (%)	18	18	18	20	19	17	18	19	18	22

Panel B.3: Threshold: 2.3

HORIZON			3 Year					4 Years		
EI	-0.645	0.944	-7.383	1.035	-0.467	1.255	1.784	7.806	-2.109	1.610
	(2.556)	(2.314)	(12.193)	(8.655)	(2.658)	(1.831)	(1.756)	(11.680)	(7.051)	(1.589)
EI x HJTZ		4.993 **					1.689			
		(2.381)					(2.291)			
EI x PE			0.257					-0.249		
			(0.399)					(0.407)		
EI x CSPR				-1.872					3.746	
				(11.097)					(8.346)	
EI x TSPR					-0.453					-0.907
					(1.182)					(1.920)
R-Square (%)	17	20	18	19	20	17	17	17	18	20

Panel C.1: Threshold: 1.7

HORIZON			5 Year					6 Years		
EI	1.021	-0.566	20.789 **	-11.857 **	1.045	2.283	0.935	12.455	-6.675	1.565
	(1.459)	(1.358)	(8.732)	(5.372)	(1.353)	(1.836)	(1.678)	(10.909)	(5.106)	(1.584)
EI x HJTZ		-4.495 *					-3.769			
		(2.702)					(2.999)			
EI x PE			-0.778 **					-0.396		
			(0.329)					(0.390)		
EI x CSPR				14.843 **					10.348 *	
				(6.020)					(5.834)	
EI x TSPR					-0.057					1.846
					(1.152)					(1.306)
R-Square (%)	30	30	30	30	30	20	20	20	20	21

Panel C.2: Threshold: 2

HORIZON			5 Years					6 Years		
EI	1.988	0.935	18.082 **	-6.755	0.918	2.095	1.115	15.167	-7.411	0.355
	(1.310)	(1.178)	(7.453)	(5.159)	(1.265)	(1.738)	(1.907)	(9.557)	(5.143)	(1.291)
EI x HJTZ		-2.912 **					-2.572			
		(1.420)					(1.955)			
EI x PE			-0.635 **					-0.510		
			(0.276)					(0.333)		
EI x CSPR				9.703 *					10.630 *	
				(5.736)					(5.839)	
EI x TSPR					1.650					2.768 **
					(1.073)					(1.339)
R-Square (%)	29	29	29	30	30	20	20	20	21	21

Panel C.3: Threshold: 2.3

HORIZON			5 Year					6 Years		
EI	1.966	1.758	13.301 *	-4.996	1.504	2.491	2.136	7.914	1.448	1.843
	(1.775)	(1.878)	(7.567)	(4.532)	(1.648)	(2.007)	(1.942)	(11.479)	(4.768)	(1.510)
EI x HJTZ		-0.678					-1.219			
		(1.698)					(1.986)			
EI x PE			-0.428					-0.202		
			(0.262)					(0.366)		
EI x CSPR				7.770					1.175	
				(5.210)					(6.230)	
EI x TSPR					1.206					1.764
					(1.400)					(2.102)
R-Square (%)	29	30	30	30	30	20	20	20	20	21

Table 13: The Influence of EI_t on GDP Growth Under Alternative Ambiguity Thresholds: Full Sample 1987 – 2014

The Table shows the 1-year to 6-year predictive power of the exuberance index (EI_t). $MARGIN_t$ is the margin debt at broker dealers normalized by market capitalization. ΔSNP_t is the log-change in S&P500 total return index in the preceding 4 quarters. $CLEV_t$ is nonfinancial corporate leverage. PE_t is the PE ratio of S&P500 (per $100 earnings). $\Delta GDP_{t-4}$is the log-change in the Gross Domestic Product in the preceding 4 quarters. CPI_t is the change in the Consumer Price Index in the preceding quarter. $HJTZ_t$ is Huang-Jian-Tu-Zhou investor sentiment index. $CSPR_t$ is the Baa-Aaa bond spread. $TSPR_t$ is the US Treasury term spread. The dependent variable is the cumulative log-change in the Gross Domestic Product over various horizons. December 2014 is the last observation. For brevity, only EI_t and its interactions are shown. The results for the ambiguity threshold of '2' (Panels A.2, B.2, and C.2) are identical to those in Table 7 but are included here for expositional reasons. Heteroscedasticity-consistent errors are in parentheses. ***, **, * denote significance at 1, 5 and 10 percent levels.

Panel A.1: Threshold: 1.7

HORIZON	1 Year					2 Years				
EI	0.011	-0.164 **	0.798 **	0.644 **	0.041	-0.256 *	-0.386 **	0.949 *	0.729 **	-0.268 *
	(0.066)	(0.082)	(0.368)	(0.281)	(0.070)	(0.148)	(0.153)	(0.563)	(0.353)	(0.149)
EI x HJTZ		-0.455 ***					-0.343 **			
		(0.125)					(0.168)			
EI x PE			-0.031 **					-0.048 **		
			(0.014)					(0.021)		
EI x CSPR				-0.729 **					-1.130 **	
				(0.332)					(0.460)	
EI x TSPR					-0.072					0.032
					(0.070)					(0.075)
R-Square (%)	39	42	40	40	39	44	44	46	44	45

Panel A.2: Threshold: 2

HORIZON	1 Year					2 Years				
EI	0.001	-0.100	0.701 *	0.883 **	0.040	-0.258 *	-0.287 *	0.856	0.737 *	-0.271 *
	(0.061)	(0.083)	(0.367)	(0.337)	(0.072)	(0.146)	(0.162)	(0.530)	(0.392)	(0.156)
EI x HJTZ		-0.273 **					-0.080			
		(0.126)					(0.131)			
EI x PE			-0.028 *					-0.044 **		
			(0.014)					(0.020)		
EI x CSPR				-0.973 **					-1.094 **	
				(0.382)					(0.478)	
EI x TSPR					-0.059					0.020
					(0.057)					(0.071)
R-Square (%)	39	40	40	42	39	43	43	44	45	44

Panel A.3: Threshold: 2.3

HORIZON	1 Year					2 Years				
EI	-0.026	-0.089	0.611	1.257 **	0.010	-0.349 *	-0.291 *	-0.109	0.865 *	-0.368 *
	(0.087)	(0.099)	(0.483)	(0.522)	(0.091)	(0.191)	(0.173)	(0.654)	(0.503)	(0.196)
EI x HJTZ		-0.183					0.170			
		(0.122)					(0.144)			
EI x PE			-0.024					-0.009		
			(0.017)					(0.021)		
EI x CSPR				-1.428 **					-1.344 **	
				(0.602)					(0.675)	
EI x TSPR					-0.077					0.046
					(0.086)					(0.083)
R-Square (%)	39	40	39	43	39	44	45	45	45	45

Panel B.1: Threshold: 1.7

HORIZON			3 Year					4 Years		
EI	-0.091	-0.161	0.826	0.697	-0.088	-0.038	-0.103	1.391 *	-0.509	0.039
	(0.152)	(0.145)	(0.667)	(0.473)	(0.153)	(0.126)	(0.115)	(0.715)	(0.423)	(0.102)
EI x HJTZ		-0.193					-0.179			
		(0.172)					(0.197)			
EI x PE			-0.036					-0.057 **		
			(0.024)					(0.026)		
EI x CSPR				-0.905					0.544	
				(0.601)					(0.481)	
EI x TSPR					-0.007					-0.178 **
					(0.070)					(0.087)
R-Square (%)	38	38	38	41	39	35	35	35	36	37

Panel B.2: Threshold: 2

HORIZON			3 Years					4 Years		
EI	-0.131	-0.137	0.925	-0.006	-0.099	0.101	0.036	0.905	0.110	0.206 **
	(0.153)	(0.162)	(0.569)	(0.356)	(0.155)	(0.113)	(0.129)	(0.721)	(0.436)	(0.079)
EI x HJTZ		-0.018					-0.179			
		(0.115)					(0.163)			
EI x PE			-0.042 **					-0.032		
			(0.020)					(0.026)		
EI x CSPR				-0.138					-0.010	
				(0.453)					(0.506)	
EI x TSPR					-0.052					-0.161
					(0.075)					(0.100)
R-Square (%)	40	40	41	40	40	33	33	33	33	35

Panel B.3: Threshold: 2.3

HORIZON			3 Year					4 Years		
EI	-0.130	0.032	0.014	0.444	-0.143	0.152	0.226 *	0.751	-0.020	0.181
	(0.186)	(0.159)	(0.849)	(0.579)	(0.187)	(0.139)	(0.128)	(0.867)	(0.505)	(0.109)
EI x HJTZ		0.509 ***					0.237			
		(0.178)					(0.154)			
EI x PE			-0.006					-0.023		
			(0.027)					(0.030)		
EI x CSPR				-0.639					0.192	
				(0.767)					(0.604)	
EI x TSPR					0.035					-0.075
					(0.102)					(0.144)
R-Square (%)	39	41	39	41	40	33	33	33	33	33

Panel C.1: Threshold: 1.7

HORIZON	5 Year					6 Years				
EI	0.174	-0.037	2.502 ***	-0.968 ***	0.244 **	0.361 **	0.132	2.574 ***	-0.613 *	0.304 **
	(0.118)	(0.110)	(0.694)	(0.323)	(0.095)	(0.145)	(0.139)	(0.702)	(0.350)	(0.123)
EI x HJTZ		-0.596 ***					-0.639 ***			
		(0.187)					(0.178)			
EI x PE			-0.092 ***					-0.086 ***		
			(0.025)					(0.025)		
EI x CSPR				1.316 ***					1.125 ***	
				(0.393)					(0.425)	
EI x TSPR					-0.167 *					0.147
					(0.099)					(0.106)
R-Square (%)	40	41	41	41	44	37	37	37	37	37

Panel C.2: Threshold: 2

HORIZON	5 Years					6 Years				
EI	0.282 **	0.154	2.258 ***	-0.431	0.257 ***	0.349 ***	0.280 *	2.530 ***	-0.464	0.176 *
	(0.110)	(0.103)	(0.675)	(0.394)	(0.081)	(0.131)	(0.143)	(0.635)	(0.381)	(0.099)
EI x HJTZ		-0.354 **					-0.182			
		(0.148)					(0.124)			
EI x PE			-0.078 ***					-0.085 ***		
			(0.024)					(0.022)		
EI x CSPR				0.791 *					0.909 **	
				(0.443)					(0.456)	
EI x TSPR					0.038					0.275 **
					(0.097)					(0.112)
R-Square (%)	37	38	37	39	41	37	38	37	37	37

Panel C.3: Threshold: 2.3

HORIZON	5 Year					6 Years				
EI	0.326 **	0.305 **	2.017 ***	-0.552	0.298 **	0.403 ***	0.339 **	2.554 ***	-0.082	0.288 **
	(0.142)	(0.140)	(0.701)	(0.398)	(0.120)	(0.149)	(0.141)	(0.837)	(0.494)	(0.119)
EI x HJTZ		-0.067					-0.220			
		(0.121)					(0.143)			
EI x PE			-0.064 ***					-0.080 ***		
			(0.024)					(0.027)		
EI x CSPR				0.980 **					0.547	
				(0.452)					(0.603)	
EI x TSPR					0.073					0.315 **
					(0.129)					(0.149)
R-Square (%)	37	38	38	37	40	37	38	38	37	37

Appendix A. Boom Episodes

This appendix covers some well-known credit and asset-price boom episodes. Since credit growth at any rate cannot be intrinsically dangerous, the starting point would ideally be the point at which the growth turns "excessive". In some boom episodes, it is easy to pinpoint that turning point and that date is noted in the analysis below. In other episodes, disagreements may remain. Then, I note the year in which the excess may have started at its earliest. The main conclusion one can draw from this review is that asset price booms fueled by debt are short-lived events. The excessive growth episode typically takes 5 years or less to reach its peak.

Tulip Mania: 1634 – 1636

Source: Thompson (2007)

A tulip price index developed by Thompson (2007) shows that the price of a tulip rose from an index value of 20 in December 1634 to 110 in December 1636. The price growth was motivated by recent victories by German armies over Sweden in the Thirty Years War and the speculation that German princes would increase their demand for their favorite flower after a quick end to the conflict. The direction of the war changed French-supported Swedes resoundingly defeated Germans in October 1636.

Mississippi Bubble: 1717 – 1720

Source: Mackay (1841)

The starting point of the boom can be placed in 1716 with the royal edict that established John Law's bank Banque Générale Privée, which later became Banque Royale de France, or in 1717, the date of incorporation of the Mississippi Company.

South Sea Company: Jan. – Aug. 1720

Source: Mackay (1841)

Even though the South Sea Company was originated by Robert Harley, Earl of Oxford, in 1711 with a monopoly of the trade to the South Seas, it was nothing more than a mechanism to finance British government debt during the War of Spanish Succession. The feverish ascent of the stock price began after the directors of the Company decided to replicate John Law's influence over the French Regent in England by assuming the entire debt of the British government. The Treaty of the Hague (February 1720) with Spain, which opened the South Sea ports to British trade gave the directors the opportunity to raise the funds they needed from the public. The stock price of the company soared from £128 in January to nearly £1,000 by mid-summer before collapsing back to where it started in less than a year (and below by 1722).

South America Lending and Stock Speculation: 1807 – 1810

Source: Tooke (1838) Chapter 4, Section 5; Smart (1910) Chapter 12

After Napoleon I imposed an embargo against British trade with Europe in 1806 and the US passed the Embargo Act in 1807, the opening of South American trade in 1807 became a source of speculation in export industries and joint stock companies (Brazil opened in 1807 following the escape of the Portuguese royal family to Rio de Janeiro after the French invasion of Portugal. The Spanish territories opened to British trade after France invaded its former ally Spain in 1808). The speculation ended with the defeat of Spain by Napoleon and the installation of his brother Joseph as King of Spain in 1809. South American buyers of British goods stopped making payments in 1810.

Panic of 1819: 1817 – 1819

Source: Rothbard (1962)

Starting point of the boom is the inauguration of the Second Bank of the United States in January 1817. Although commerce had been booming since the end of the War of 1812 in the U.S. (in 1815) and the Napoleonic Wars in Europe, unchecked lending practices of the branches of the Second Bank lead to an unsustainable credit boom in the South and the West to fund cotton production.

Chicago Land Craze: 1833 – 1836

Source: Hoyt (1933)

The rise in land prices started in 1833 triggered by growing population and commercial activity. After the Illinois legislature chartered a new State Bank of Illinois to lend against land values in 1835, the price growth reached unrealistic levels. With credit flowing from New York and Britain, some pieces of land reportedly appreciated 3,100 percent over a few months. The end of the boom coincides with the Panic of 1837.

Panic of 1837: 1835 – 1836

Source: Baptist (2014)

This is the first securitization crisis in the U.S. history with funding provided primarily by British investors through major baking houses like Baring Brothers. The collateral was cotton, land, and unfortunately, human lives.

Railroad Bonds and Call Loans: 1869 – 1873, 1879 – 1884

Source: Sprague (1910)

Liquidity crises triggered by insufficient reserves is a common theme of the National Banking Era. Growth in capital and reserves lagged the growth of loans and deposits, respectively, over both periods of credit expansion. In 1873, the immediate trigger of the crisis was the default of Northern Pacific Railroad and Canada Southern Railway at a time when liquidity was already tight on the East Coast due to the seasonal movement of money to the interior during harvest.

The 1884 disturbance was mostly confined to New York and materialized after heavy gold exports reduced bank reserves. The gold flight may be in part due to European displeasure with the expansion of US monetary base with silver dollars coined under the Bland-Allison Act. The reserves and confidence in the system were tested by a drop in stocks, commodities, and railroad securities. In May, the brokerage firm Grant & Ward failed with $700 thousand in assets and $16 million in liabilities. A few days later, the failure of several banking and brokerage firms added to the panic. However, confidence was quickly restored and 1884 did not turn into a full-blown panic after the clearing house rescued its member banks.

Argentina Currency Crisis: 1881 – 1885

Source: Williams (1920)

After the revolution of 1880, the Monetary Law of 1881 established the Argentinian monetary system and mandated the retirement of paper money to be replaced by metallic noted. In 1883, Argentina adopted the gold standard. With the promise of a stable currency and the opening of the credit markets to German and French banks (Baring Brothers was the country's banker until that time), a lending boom began in 1881 to finance the construction of the nation's infrastructure and to pay the civil and military debts incurred in the war of independence and the war against Brazil. However, in 1884, the balance of payments turned negative due to a boom in imports. Gold exchange collapsed in January 1885. Banco Nacional, the financial agent of the government and one of the five issuers of the metallic currency, applied for government relief and suspended species payments.

Argentina Default (Failure of Baring Brothers; Panic of 1890): 1887 – 1890

Source: Williams (1920)

In 1887, Argentina enacted the Law of National Guaranteed Banks, which was an attempt to imitate the National Bank system of the United States. The law required the Argentinian banks to fully back their currency emissions with National Gold Bonds (NGB) issued by the Federal Government. The bonds were to be obtained by gold deposited in the Bureau of Inspection of Banks. The gold was a security for the bank notes. Federal government insured the notes against losses in excess of the gold reserves. Provinces borrowed in European markets to finance their gold purchases, which they later used for purchasing NGBs for their provincial banks. Some NGBs were obtained without full payment of the required gold. The quantity of paper money in circulation surged. In 1888, Baring Brothers failed to place a bond issue in European markets and felt obligated to lend to Argentina itself. Falling commodity prices in 1890 led to the default of the Argentinian government and the failure of Baring. The resulting panic in Britain triggered heavy gold outflows from the US, setting the stage for the Panic of 1893.

Real Estate Boom: 1921 – 1926

Source: Grebler et al. (1956)

Mortgage loan originations rose from $673 million in 1920 ($802 million in 1919) to $3.6 billion in 1925 when the market peaked. Equity investment (cash downpayment) declined from 46 percent to 35 percent over the same period. Florida was the main focus of the bubble. City lots in Miami were reportedly bought and sold as many as ten times in a single day. Charles Ponzi famously developed a subdivision “near Jacksonville”, which was 65 miles west of the city. Mortgage originations in the US have not reached that same level until 1947.

Stock Market Bubble: 1927 (1928?) – 1929

Source: Kindleberger (1978), Galbraith (1955)

1926 is the last year the stock prices ended the year without any appreciation until 1929. In 1927, the Governors of Bank of England, Reichsbank, and Bank of France visited the United

States to ask the Federal Reserve to follow an easier monetary policy to stop the flow of gold from Europe to United States. Government securities were purchased at "considerable volume" to lower the rediscount rate from 4 to 3.5 percent. While some economists point to this event as the starting point of the speculative mania, others point to 1928 as the year when stock prices started rising by "great vaulting leaps".

Failure of Caldwell and Company: 1926 – 1930

Source: Wicker (1980)

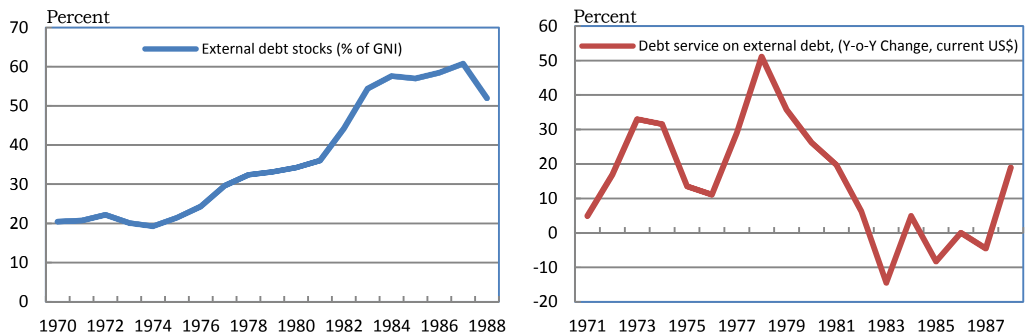
Caldwell and Company of Nashville, Tennessee was the largest investment banking house in the South. It owned controlling interest in the largest chain of banks in the South with assets in excess of $200 million, the largest insurance group in the region with assets totaling $230 million, and a multitude of industrial enterprises, investment trusts, and newspapers, with combined assets around $500 million in 1929. It also controlled the municipal bond issuance market, which was its primary business when it was established in 1917. While bank examiners identified management problems and corruption in its municipal market operations in 1925, the company's stellar growth was between 1927 and 1929 when it expanded its operations beyond municipal bonds, doubled its size and reduced its capital stock from 10 to 4.7 percent of total assets. Its failure in 1930 brought down at least 120 banks associated with it in Tennessee, Arkansas, Kentucky, and North Carolina. Many of these banks were also correspondent banks, which brought down other banks when they failed.

Latin America Debt Crisis: 1977 – 1982

Source: FDIC (1997), Boughton (2001), World Bank World Development Indicators

The debt of Latin American countries began to grow in the early 1970s as they relied on external debt for building their infrastructure. Yet, debt growth alone cannot be evidence of excessive borrowing or risk-taking. I chose 1977 as the year in which then-Fed Chairman Arthur Burns criticized commercial banks for assuming excessive risk in their Third World lending during a speech at the Columbia University Graduate School of Business. In the figures below, I plot the external debt of all Latin American countries as a percent of their Gross National Income and the year-over-year growth of their debt service. Since 1974-75 is a global recession period following the oil shocks, the growth in the debt service burden and the debt-to-GNI ratio is subdued until 1977. The earliest year that marks the beginning of an accelerating growth in debt is 1977. While the oil shock can also be blamed for the heavy borrowing of oil-importing countries, Mexico, which defaulted first in Latin America, was a net oil exporter since the mid-1970s. Mexico's troubles truly began when the Portillo administration, convinced that the country's growth was no longer constrained by balance of payments given its oil reserves, decided to *double* the country's foreign debt and expand public programs between 1979 and 1981.

Figure A.1: Debt Burden in Latin America
The figure depicts the public and private external debt burden in Latin America.



Source: World Bank World Development Indicators

Japan: 1986 – 1990

Source: Okina et al. (2001)

The starting point is the end of the "endaka recession", which is followed by a rapid expansion of credit and an accelerating rise in stock and real estate prices. Stocks peaked in 1989 and land prices in 1990.

Thailand: 1992 – 1996

Source: Lauridsen (1998), Abe (1999)

In 1992, the Anand government removed the interest rate ceilings on loans and liberalized the foreign exchange market by allowing banks to take deposits and borrow from abroad. The external debt doubled from 1992 to 1997 mostly as a result of short-term private sector borrowings. As the end date of the boom episode, I use the November-December 1996 period when the preliminary attacks on the Baht begin.

Dot-com Bubble: 1996 (1998?) – 2000

Source: De Long and Magin (2006)

While one could mark the beginning of the Dot-Com bubble with Greenspan's irrational exuberance speech in December 1996, De Long and Magin place the beginning point of the bubble to the Fall of 1998 based on the long-run real returns realized after that point.

Iceland Banking Crisis: 2004 – 2008

Source: Icelandic Parliament Investigative Committee Report[13]

Iceland began the deregulation of its financial system in 2001 but the process completed with the privatization of the state-controlled banks in 2003. The credit boom began in mid-2004 with the total assets of the largest three banks growing from 20 Billion Euros in 2004 to more than 120 Billion Euros by the end of 2007.

US Housing: 2004 – 2006

Source: Coleman et al. (2008)

Housing market fundamentals had strong explanatory power over house price dynamics until 2004. Starting in that year, fundamentals became insignificant as private-label RMBS issuers displaced Fannie Mae and Freddie Mac as the primary source of mortgage originations.

Greek Default: 2000 – 2009

Source: Media Reports, Reinhart and Rogoff (2010)

2000 is the year in which Greece entered into the Ariadne deal and pledged its lottery revenue for a cash payment. This deal and many others that followed were technically loans but did not appear as such in government statistics. While I take the starting point of fraudulent reporting as the beginning date of the credit boom, debt ratios below 90 percent do not have any significant impact on real growth rates. Therefore, one could argue that the borrowing was not unsustainable or excessive until 2006 when general government debt to GDP ratio broke through its decade-long range between 90 and 100 percent. By that standard, the Greek crisis falls in the 5-year threshold. Otherwise, it is the only exception.

[13] http://www.rna.is/media/skjol/RNAvefurKafli21Enska.pdf link active on February 2, 2016

Appendix B. Industries in EI_t

The Table lists industries that had an observed trend break in their $SI_{i,T}$ ($SIT_{i,T} = 1$) in years leading to 1998:QII, 1999:QI, 2005:QIV, 2006:QII, and 2014:QIV. Those that had a trend break in $ROAT_{i,T}$ and those that have a causation index $CI_{i,T}$ are marked with a '1'. The condition for inclusion in EI_T is $CI_{i,T} \times SIT_{i,T} \times (1 - ROAT_{i,T}) > 0$. Industries meeting this condition are marked with a '*'.

Panel A: 1998:QII

4-Digit NAICS Code	Industry Name	CI	ROAT	Included
2123	Nonmetallic Mineral Mining and Quarrying	1		*
2362	Nonresidential Building Construction			
3113	Sugar and Confectionery Product Manufacturing	1		*
3279	Other Nonmetallic Mineral Product Manufacturing			
3327	Machine Shops; Turned Product; and Screw, Nut, and Bolt Manufacturing	1		*
3342	Communications Equipment Manufacturing			
3362	Motor Vehicle Body and Trailer Manufacturing			
4232	Furniture and Home Furnishing Merchant Wholesalers		1	
4238	Machinery, Equipment, and Supplies Merchant Wholesalers	1		*
4245	Farm Product Raw Material Merchant Wholesalers		1	
4422	Home Furnishings Stores	1		*
4471	Gasoline Stations	1		*
4481	Clothing Stores	1	1	
4512	Book, Periodical, and Music Stores	1		*
4541	Electronic Shopping and Mail-Order Houses	1		*
4869	Other Pipeline Transportation	1		*
5111	Newspaper, Periodical, Book, and Directory Publishers	1		*
5181	Internet Service Providers and Web Search Portals	1		*
5259	Other Investment Pools and Funds	1		*
5311	Lessors of Real Estate	1		*
5321	Automotive Equipment Rental and Leasing	1		*
5616	Investigation and Security Services	1		*
7131	Amusement Parks and Arcades			
7221	Full-Service Restaurants			
7222	Limited-Service Eating Places	1		*

Panel B: 1999:QI

4-Digit NAICS Code	Industry Name	CI	ROAT	Included
2213	Water, Sewage and Other Systems	1		*
2379	Other Heavy and Civil Engineering Construction			
3141	Textile Furnishings Mills			
3221	Pulp, Paper, and Paperboard Mills			
3222	Converted Paper Product Manufacturing	1	1	
3273	Cement and Concrete Product Manufacturing	1		*
3279	Other Nonmetallic Mineral Product Manufacturing			
3314	Nonferrous Metal (except Aluminum) Production and Processing			
3315	Foundries			
3335	Metalworking Machinery Manufacturing	1		*
3341	Computer and Peripheral Equipment Manufacturing	1		*
3346	Manufacturing and Reproducing Magnetic and Optical Media			
3351	Electric Lighting Equipment Manufacturing	1		*
3379	Other Furniture Related Product Manufacturing	1		*
4232	Furniture and Home Furnishing Merchant Wholesalers		1	
4234	Professional and Commercial Equipment and Supplies Merchant Wholesalers	1		*
4235	Metal and Mineral (except Petroleum) Merchant Wholesalers	1		*
4241	Paper and Paper Product Merchant Wholesalers			
4244	Grocery and Related Product Wholesalers	1		*
4421	Furniture Stores			
4441	Building Material and Supplies Dealers	1		*
4471	Gasoline Stations			
4831	Deep Sea, Coastal, and Great Lakes Water Transportation			
4921	Couriers	1		*
5112	Software Publishers	1		*

4-Digit NAICS Code	Industry Name	CI	ROAT	Included
5121	Motion Picture and Video Industries	1		*
5152	Cable and Other Subscription Programming	1		*
5174	Satellite Telecommunications	1		*
5182	Data Processing, Hosting, and Related Services	1		*
5223	Activities Related to Credit Intermediation	1		*
5311	Lessors of Real Estate	1		*
5331	Lessors of Nonfinancial Intangible Assets (except Copyrighted Works)	1		*
6211	Offices of Physicians			
7139	Other Amusement and Recreation Industries			
7222	Limited-Service Eating Places	1		*

Panel C: 2005:QIV

4-Digit NAICS Code	Industry Name	CI	ROAT	Included
1133	Logging			
2111	Oil and Gas Extraction	1		*
2121	Coal Mining	1		*
2122	Metal Ore Mining			
2211	Electric Power Generation, Transmission and Distribution			
2362	Nonresidential Building Construction			
2372	Land Subdivision	1		*
2379	Other Heavy and Civil Engineering Construction			
3132	Fabric Mills	1		*
3222	Converted Paper Product Manufacturing			
3241	Petroleum and Coal Products Manufacturing		1	
3251	Basic Chemical Manufacturing	1		*
3252	Resin, Synthetic Rubber, and Artificial Synthetic Fibers and Filaments Manufacturing			
3255	Paint, Coating, and Adhesive Manufacturing			
3261	Plastics Product Manufacturing			
3311	Iron and Steel Mills and Ferroalloy Manufacturing	1		*
3312	Steel Product Manufacturing from Purchased Steel	1		*
3314	Nonferrous Metal (except Aluminum) Production and Processing	1		*
3334	Ventilation, Heating, Air-Conditioning, and Commercial Refrigeration Equipment Manufacturing			
3339	Other General Purpose Machinery Manufacturing			
3345	Navigational, Measuring, Electromedical, and Control Instruments Manufacturing			
3352	Household Appliance Manufacturing			
3364	Aerospace Product and Parts Manufacturing	1		*
3366	Ship and Boat Building	1	1	
3371	Household and Institutional Furniture and Kitchen Cabinet Manufacturing			
3399	Other Miscellaneous Manufacturing			
4235	Metal and Mineral (except Petroleum) Merchant Wholesalers		1	
4243	Apparel, Piece Goods, and Notions Merchant Wholesalers	1		*
4245	Farm Product Raw Material Merchant Wholesalers			
4251	Wholesale Electronic Markets and Agents and Brokers			
4413	Automotive Parts, Accessories, and Tire Stores			
4421	Furniture Stores	1		*
4511	Sporting Goods, Hobby, and Musical Instrument Stores			
4532	Office Supplies, Stationery, and Gift Stores			
4841	General Freight Trucking	1		*
4842	Specialized Freight Trucking			
4862	Pipeline Transportation of Natural Gas			
4881	Support Activities for Air Transportation			
4883	Support Activities for Water Transportation	1		*
4885	Freight Transportation Arrangement	1		*
5179	Other Telecommunications			
5242	Agencies, Brokerages, and Other Insurance Related Activities		1	
5321	Automotive Equipment Rental and Leasing			
5322	Consumer Goods Rental			
5331	Lessors of Nonfinancial Intangible Assets (except Copyrighted Works)			
6116	Other Schools and Instruction			

Panel D: 2006:QII

4-Digit NAICS Code	Industry Name	CI	ROAT	Included
2111	Oil and Gas Extraction	1		*
2121	Coal Mining	1		*
2122	Metal Ore Mining	1		*
2211	Electric Power Generation, Transmission and Distribution	1		*
2213	Water, Sewage and Other Systems	1		*
2361	Residential Building Construction			
2372	Land Subdivision	1		*
2379	Other Heavy and Civil Engineering Construction	1		*
3118	Bakeries and Tortilla Manufacturing			
3121	Beverage Manufacturing			
3122	Tobacco Manufacturing			
3212	Veneer, Plywood, and Engineered Wood Product Manufacturing			
3222	Converted Paper Product Manufacturing			
3241	Petroleum and Coal Products Manufacturing	1	1	
3251	Basic Chemical Manufacturing	1		*
3252	Resin, Synthetic Rubber, and Artificial Synthetic Fibers and Filaments Manufacturing			
3255	Paint, Coating, and Adhesive Manufacturing			
3261	Plastics Product Manufacturing			
3271	Clay Product and Refractory Manufacturing			
3311	Iron and Steel Mills and Ferroalloy Manufacturing	1		*
3312	Steel Product Manufacturing from Purchased Steel	1		*
3314	Nonferrous Metal (except Aluminum) Production and Processing	1		*
3324	Boiler, Tank, and Shipping Container Manufacturing		1	
3334	Ventilation, Heating, Air-Conditioning, and Commercial Refrigeration Equipment Manufacturing	1		*
3345	Navigational, Measuring, Electromedical, and Control Instruments Manufacturing	1		*
3364	Aerospace Product and Parts Manufacturing	1		*
3371	Household and Institutional Furniture and Kitchen Cabinet Manufacturing	1		*
4235	Metal and Mineral (except Petroleum) Merchant Wholesalers	1	1	
4243	Apparel, Piece Goods, and Notions Merchant Wholesalers	1		*
4244	Grocery and Related Product Wholesalers			
4245	Farm Product Raw Material Merchant Wholesalers			
4421	Furniture Stores	1		*
4481	Clothing Stores			
4482	Shoe Stores	1		*
4511	Sporting Goods, Hobby, and Musical Instrument Stores			
4532	Office Supplies, Stationery, and Gift Stores	1		*
4841	General Freight Trucking	1		*
4842	Specialized Freight Trucking	1		*
4861	Pipeline Transportation of Crude Oil			
4862	Pipeline Transportation of Natural Gas	1		*
4881	Support Activities for Air Transportation			
4883	Support Activities for Water Transportation	1		*
5241	Insurance Carriers			
5242	Agencies, Brokerages, and Other Insurance Related Activities	1	1	
5321	Automotive Equipment Rental and Leasing	1		*
5322	Consumer Goods Rental			
5414	Specialized Design Services			
7131	Amusement Parks and Arcades			
7132	Gambling Industries	1		*
7225	Restaurants and Other Eating Places			

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4-Digit NAICS Code	Industry Name	CI	ROAT	Included
1113	Fruit and Tree Nut Farming	1	1	
2389	Other Specialty Trade Contractors			
3113	Sugar and Confectionery Product Manufacturing	1		*
3115	Dairy Product Manufacturing			
3151	Apparel Knitting Mills	1		*
3152	Cut and Sew Apparel Manufacturing	1		*
3259	Other Chemical Product and Preparation Manufacturing			

4-Digit NAICS Code	Industry Name	CI	ROAT	Included
3341	Computer and Peripheral Equipment Manufacturing		1	
3343	Audio and Video Equipment Manufacturing			
3344	Semiconductor and Other Electronic Component Manufacturing	1		*
3346	Manufacturing and Reproducing Magnetic and Optical Media	1		*
3371	Household and Institutional Furniture and Kitchen Cabinet Manufacturing			
4245	Farm Product Raw Material Merchant Wholesalers			
4251	Wholesale Electronic Markets and Agents and Brokers	1		*
4413	Automotive Parts, Accessories, and Tire Stores	1		*
4422	Home Furnishings Stores	1		*
4431	Electronics and Appliance Stores	1		*
4461	Health and Personal Care Stores	1		*
4482	Shoe Stores	1		*
4483	Jewelry, Luggage, and Leather Goods Stores			
4511	Sporting Goods, Hobby, and Musical Instrument Stores	1	1	
4521	Department Stores	1		*
4869	Other Pipeline Transportation			
5121	Motion Picture and Video Industries	1		*
5122	Sound Recording Industries			
5182	Data Processing, Hosting, and Related Services			
5239	Other Financial Investment Activities	1		*
5241	Insurance Carriers			
5312	Offices of Real Estate Agents and Brokers	1		*
5331	Lessors of Nonfinancial Intangible Assets (except Copyrighted Works)			
5415	Computer Systems Design and Related Services	1		*
5417	Scientific Research and Development Services	1		*
5613	Employment Services			
5619	Other Support Services			
6111	Elementary and Secondary Schools			
6113	Colleges, Universities, and Professional Schools			
6211	Offices of Physicians	1		*
6216	Home Health Care Services	1		*
6221	General Medical and Surgical Hospitals	1		*
7132	Gambling Industries			
8111	Automotive Repair and Maintenance			
8129	Other Personal Services			

Appendix C. Sentiment Trend-Break and *EI* Inclusion History of Select Industries

The Table shows whether an industry has a trend break in its sentiment index ($\boldsymbol{SIT_{i,T} = 1}$) in a particular quarter (denoted by '*') and whether it is included in $\boldsymbol{EI}$ (denoted by '†').

(Table on the Next Page)

	Mar-87	Jun-87	Sep-87	Dec-87	Mar-88	Jun-88	Sep-88	Dec-88	Mar-89	Jun-89	Sep-89	Dec-89
Oil and Gas Extraction												
Iron and Steel Mills and Ferroalloy Manufacturing				*	*	†	*	*				
Steel Product Manufacturing from Purchased Steel						*						
Boiler, Tank, and Shipping Container Manufacturing							*	*	*			
Pipeline Transportation of Crude Oil	*	*										
Pipeline Transportation of Natural Gas												
Residential Building Construction										†		
Nonresidential Building Construction												
Land Subdivision												
Lime and Gypsum Product Manufacturing			†	*								
Household Appliance Manufacturing				†	†	†	†	*	*	*	*	
Furniture Stores												
Home Furnishings Stores												
Computer and Peripheral Equipment Manufacturing						*		*				
Communications Equipment Manufacturing	*	*	*		*	*	*	*	*			*
Semiconductor and Other Electronic Component Manufacturing	*	*		*	*	*						
Manufacturing and Reproducing Magnetic and Optical Media										*	*	
Electronic Shopping and Mail-Order Houses			*								*	
Software Publishers				*			*	*	*	*		
Internet Service Providers and Web Search Portals	*	*					*					
Data Processing, Hosting, and Related Services												
Computer Systems Design and Related Services	*	*										
Securities and Commodity Contracts Intermediation and Brokerage	*	*	*	*	*					*		
Insurance Carriers											*	
Depository Credit Intermediation										*		
Nondepository Credit Intermediation											*	*

	Mar-90	Jun-90	Sep-90	Dec-90	Mar-91	Jun-91	Sep-91	Dec-91	Mar-92	Jun-92	Sep-92	Dec-92
Oil and Gas Extraction							*	*	*	*	*	*
Iron and Steel Mills and Ferroalloy Manufacturing	*	†	*	*	*	*	†	*	*	*	*	*
Steel Product Manufacturing from Purchased Steel								*				
Boiler, Tank, and Shipping Container Manufacturing			*									
Pipeline Transportation of Crude Oil												
Pipeline Transportation of Natural Gas								†	†	†	†	*
Residential Building Construction							*					*
Nonresidential Building Construction								†		†		
Land Subdivision												
Lime and Gypsum Product Manufacturing		*										
Household Appliance Manufacturing						*						
Furniture Stores		*	*									
Home Furnishings Stores												
Computer and Peripheral Equipment Manufacturing		†										
Communications Equipment Manufacturing										*	*	*
Semiconductor and Other Electronic Component Manufacturing		*										
Manufacturing and Reproducing Magnetic and Optical Media	*	*										
Electronic Shopping and Mail-Order Houses												
Software Publishers												
Internet Service Providers and Web Search Portals			*		*	*	†	*				
Data Processing, Hosting, and Related Services	†		*	*	*	*	†	†				
Computer Systems Design and Related Services		*	*	*	*	*	*	*	*	*	*	
Securities and Commodity Contracts Intermediation and Brokerage	*	*										
Insurance Carriers				*	*	*						
Depository Credit Intermediation												
Nondepository Credit Intermediation												

	Mar-93	Jun-93	Sep-93	Dec-93	Mar-94	Jun-94	Sep-94	Dec-94	Mar-95	Jun-95	Sep-95	Dec-95
Oil and Gas Extraction	†		*									
Iron and Steel Mills and Ferroalloy Manufacturing	*	*										
Steel Product Manufacturing from Purchased Steel			*	†								
Boiler, Tank, and Shipping Container Manufacturing												
Pipeline Transportation of Crude Oil												
Pipeline Transportation of Natural Gas	†	†										
Residential Building Construction	*											
Nonresidential Building Construction										*		
Land Subdivision												
Lime and Gypsum Product Manufacturing												
Household Appliance Manufacturing												
Furniture Stores												
Home Furnishings Stores												
Computer and Peripheral Equipment Manufacturing			*								†	†
Communications Equipment Manufacturing		†							†	†		
Semiconductor and Other Electronic Component Manufacturing	*	*									†	
Manufacturing and Reproducing Magnetic and Optical Media												
Electronic Shopping and Mail-Order Houses										†		
Software Publishers										†		*
Internet Service Providers and Web Search Portals		*	*									
Data Processing, Hosting, and Related Services												
Computer Systems Design and Related Services											*	*
Securities and Commodity Contracts Intermediation and Brokerage												
Insurance Carriers												
Depository Credit Intermediation			*									
Nondepository Credit Intermediation	†											

	Mar-96	Jun-96	Sep-96	Dec-96	Mar-97	Jun-97	Sep-97	Dec-97	Mar-98	Jun-98	Sep-98	Dec-98
Oil and Gas Extraction												
Iron and Steel Mills and Ferroalloy Manufacturing												
Steel Product Manufacturing from Purchased Steel							*					
Boiler, Tank, and Shipping Container Manufacturing												
Pipeline Transportation of Crude Oil												
Pipeline Transportation of Natural Gas												
Residential Building Construction						*						
Nonresidential Building Construction			*		*	*	*		*	*	*	
Land Subdivision					*	*	*					
Lime and Gypsum Product Manufacturing											†	
Household Appliance Manufacturing											*	
Furniture Stores												
Home Furnishings Stores			†	†	*	†		*	†	†	*	
Computer and Peripheral Equipment Manufacturing									†			
Communications Equipment Manufacturing	†	*	†							*		
Semiconductor and Other Electronic Component Manufacturing						*	*	*				*
Manufacturing and Reproducing Magnetic and Optical Media											*	*
Electronic Shopping and Mail-Order Houses	†	†	†	†			*	*	*	†	*	
Software Publishers	†	†									†	†
Internet Service Providers and Web Search Portals		†	†				†	†	†	†	†	
Data Processing, Hosting, and Related Services												†
Computer Systems Design and Related Services	*	*	†									
Securities and Commodity Contracts Intermediation and Brokerage		†	†	†			†					
Insurance Carriers						†						
Depository Credit Intermediation	*	*	*	*	*	†	†	†				
Nondepository Credit Intermediation			†	†	*	†						

	Mar-99	Jun-99	Sep-99	Dec-99	Mar-00	Jun-00	Sep-00	Dec-00	Mar-01	Jun-01	Sep-01	Dec-01
Oil and Gas Extraction												
Iron and Steel Mills and Ferroalloy Manufacturing						*						
Steel Product Manufacturing from Purchased Steel				*		*						
Boiler, Tank, and Shipping Container Manufacturing												
Pipeline Transportation of Crude Oil											*	*
Pipeline Transportation of Natural Gas												
Residential Building Construction												
Nonresidential Building Construction												
Land Subdivision												
Lime and Gypsum Product Manufacturing												
Household Appliance Manufacturing												
Furniture Stores	*	*										
Home Furnishings Stores											†	*
Computer and Peripheral Equipment Manufacturing	†			†	*	*						
Communications Equipment Manufacturing				†	†							
Semiconductor and Other Electronic Component Manufacturing						*						*
Manufacturing and Reproducing Magnetic and Optical Media	*					†	*	*		*		
Electronic Shopping and Mail-Order Houses		*	†				*	*	*			
Software Publishers	†	†										
Internet Service Providers and Web Search Portals					†	†	†	†		†		
Data Processing, Hosting, and Related Services	†	†	†	†	*							†
Computer Systems Design and Related Services					†	†	†					
Securities and Commodity Contracts Intermediation and Brokerage		†										
Insurance Carriers												
Depository Credit Intermediation												
Nondepository Credit Intermediation												

	Mar-02	Jun-02	Sep-02	Dec-02	Mar-03	Jun-03	Sep-03	Dec-03	Mar-04	Jun-04	Sep-04	Dec-04
Oil and Gas Extraction												
Iron and Steel Mills and Ferroalloy Manufacturing		*								*	*	
Steel Product Manufacturing from Purchased Steel		*										
Boiler, Tank, and Shipping Container Manufacturing												
Pipeline Transportation of Crude Oil	*	*										
Pipeline Transportation of Natural Gas								*				*
Residential Building Construction		*			*						†	
Nonresidential Building Construction		*						*				*
Land Subdivision		*										
Lime and Gypsum Product Manufacturing												
Household Appliance Manufacturing												
Furniture Stores											*	*
Home Furnishings Stores	*	*		*	*	*	*					
Computer and Peripheral Equipment Manufacturing												
Communications Equipment Manufacturing							*		*	*	*	*
Semiconductor and Other Electronic Component Manufacturing								*				
Manufacturing and Reproducing Magnetic and Optical Media									*		*	*
Electronic Shopping and Mail-Order Houses							*					
Software Publishers												
Internet Service Providers and Web Search Portals												
Data Processing, Hosting, and Related Services												
Computer Systems Design and Related Services												
Securities and Commodity Contracts Intermediation and Brokerage						*	*	*	*	*	*	*
Insurance Carriers		†										
Depository Credit Intermediation	*				†	†	*					
Nondepository Credit Intermediation								*				

	Mar-05	Jun-05	Sep-05	Dec-05	Mar-06	Jun-06	Sep-06	Dec-06	Mar-07	Jun-07	Sep-07	Dec-07
Oil and Gas Extraction		†		†	†	†	†	†	†	†	†	†
Iron and Steel Mills and Ferroalloy Manufacturing		*	*	†		†			†		†	
Steel Product Manufacturing from Purchased Steel			†	†	*	†		†	†			
Boiler, Tank, and Shipping Container Manufacturing					*	*	†	*	*	†	†	†
Pipeline Transportation of Crude Oil	*	*	*			*	†					
Pipeline Transportation of Natural Gas	*	*	*	*	*	†	†	†	†			
Residential Building Construction						*	*	*	*	*		
Nonresidential Building Construction				*	*							
Land Subdivision		†		†	*	†						
Lime and Gypsum Product Manufacturing							*	*	*		*	
Household Appliance Manufacturing		*		*								
Furniture Stores		†	†	†	†	†	†	†	†	†	†	
Home Furnishings Stores								*	*	*	*	*
Computer and Peripheral Equipment Manufacturing												
Communications Equipment Manufacturing	*	*										
Semiconductor and Other Electronic Component Manufacturing												
Manufacturing and Reproducing Magnetic and Optical Media		*										
Electronic Shopping and Mail-Order Houses												
Software Publishers												
Internet Service Providers and Web Search Portals												
Data Processing, Hosting, and Related Services							†	†	†			
Computer Systems Design and Related Services												
Securities and Commodity Contracts Intermediation and Brokerage	†	†	†							†		
Insurance Carriers					*	*	*	†	†	†		
Depository Credit Intermediation							†	†	†	†	†	
Nondepository Credit Intermediation												

	Mar-08	Jun-08	Sep-08	Dec-08	Mar-09	Jun-09	Sep-09	Dec-09	Mar-10	Jun-10	Sep-10	Dec-10
Oil and Gas Extraction		†	†				*		*	*	*	*
Iron and Steel Mills and Ferroalloy Manufacturing			*		*		*	*	*	*	*	*
Steel Product Manufacturing from Purchased Steel			†	*						*	*	*
Boiler, Tank, and Shipping Container Manufacturing												
Pipeline Transportation of Crude Oil							†		†	†	†	†
Pipeline Transportation of Natural Gas					†	†	†					
Residential Building Construction		*										
Nonresidential Building Construction		*	*									
Land Subdivision		*				*	*	*		*		
Lime and Gypsum Product Manufacturing											†	
Household Appliance Manufacturing												
Furniture Stores												
Home Furnishings Stores												
Computer and Peripheral Equipment Manufacturing												
Communications Equipment Manufacturing												
Semiconductor and Other Electronic Component Manufacturing												
Manufacturing and Reproducing Magnetic and Optical Media												
Electronic Shopping and Mail-Order Houses												
Software Publishers												
Internet Service Providers and Web Search Portals												
Data Processing, Hosting, and Related Services												
Computer Systems Design and Related Services												
Securities and Commodity Contracts Intermediation and Brokerage			*									
Insurance Carriers												
Depository Credit Intermediation			†									*
Nondepository Credit Intermediation			*	*	*						*	*

	Mar-11	Jun-11	Sep-11	Dec-11	Mar-12	Jun-12	Sep-12	Dec-12	Mar-13	Jun-13	Sep-13	Dec-13
Oil and Gas Extraction	*	*	*									
Iron and Steel Mills and Ferroalloy Manufacturing		*	*	*		*						
Steel Product Manufacturing from Purchased Steel	*											
Boiler, Tank, and Shipping Container Manufacturing												
Pipeline Transportation of Crude Oil	†	†	†	†	†	†	†					
Pipeline Transportation of Natural Gas												
Residential Building Construction									*	*	*	
Nonresidential Building Construction												*
Land Subdivision												
Lime and Gypsum Product Manufacturing												
Household Appliance Manufacturing												
Furniture Stores	*								†	†		
Home Furnishings Stores												
Computer and Peripheral Equipment Manufacturing												
Communications Equipment Manufacturing												†
Semiconductor and Other Electronic Component Manufacturing												†
Manufacturing and Reproducing Magnetic and Optical Media					†			†	†	†	†	
Electronic Shopping and Mail-Order Houses												
Software Publishers												
Internet Service Providers and Web Search Portals												
Data Processing, Hosting, and Related Services												
Computer Systems Design and Related Services												
Securities and Commodity Contracts Intermediation and Brokerage												
Insurance Carriers										*	†	†
Depository Credit Intermediation												
Nondepository Credit Intermediation												

	Mar-14	Jun-14	Sep-14	Dec-14
Oil and Gas Extraction				
Iron and Steel Mills and Ferroalloy Manufacturing				
Steel Product Manufacturing from Purchased Steel				
Boiler, Tank, and Shipping Container Manufacturing				
Pipeline Transportation of Crude Oil				
Pipeline Transportation of Natural Gas		†		
Residential Building Construction				
Nonresidential Building Construction	*			
Land Subdivision				
Lime and Gypsum Product Manufacturing				
Household Appliance Manufacturing				
Furniture Stores				
Home Furnishings Stores				†
Computer and Peripheral Equipment Manufacturing				*
Communications Equipment Manufacturing				
Semiconductor and Other Electronic Component Manufacturing		†	†	†
Manufacturing and Reproducing Magnetic and Optical Media			†	†
Electronic Shopping and Mail-Order Houses				
Software Publishers				
Internet Service Providers and Web Search Portals				
Data Processing, Hosting, and Related Services		†	*	*
Computer Systems Design and Related Services			†	†
Securities and Commodity Contracts Intermediation and Brokerage				
Insurance Carriers	*	†	*	*
Depository Credit Intermediation	*			
Nondepository Credit Intermediation				