Technical Market Indicators: An Overview

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Abstract

Current evidence on the predictability of technical analysis largely concentrates on price-based technical indicators such as moving averages rules and trading range breakout rules. In contrast, the predictability of widely used technical market indicators such as advance/decline lines, volatility indices, and short-term trading indices has drawn limited attention. Although some market indicators have also become popular sentiment proxies in the behavioral finance field to predict returns, the results generally rely on using just one or a few indicators at a time. This approach raises the risk of data snooping, since so many proxies are proposed. We review and examine the profitability of a wide range of 93 market indicators. We give these technical market indicators the benefit of the doubt, but even then we find little evidence that they predict stock market returns. This conclusion continuously holds even if we allow predictability to be state dependent on business cycles or sentiment regimes.

1. Introduction

Technical analysis, a methodology for forecasting the direction of security prices through the study of past market data, is widely used by practitioners. A survey on 692 fund managers shows that 87% of the fund managers place some importance on technical analysis when making their investment decisions (Menkhoff, 2010). However, there has been controversy over whether technical analysis actually helps to predict the markets. Some previous studies (e.g., Brock, Lakonishok, & LeBaron, 1992; Fama & Blume, 1996; Jensen & Bennington, 1970) try to examine the predictability of classic price-based technical indicators. However, these studies cannot provide affirmative evidence of the usefulness of technical analysis because the conclusions are mixed. In a review study, Irwin and Park (2007) find that 56 out of 95 modern studies on technical analysis produce supportive evidence of its profitability.

However, some academics consider that much of the positive evidence is pseudoscience or dubious (Paulos, 2003) because of problems such as data snooping and sample bias. More importantly, most studies only consider price-based technical indicators that are just a subset of all technical indicators. There are other types of technical indicators—so called technical market indicators—that investors and media and finance professionals use frequently as well, such as advance/decline lines, the Arms Index, and volatility indices. Contrary to price-based indicators that use only historical prices information to predict future price movements of individual stocks or the aggregate market, market indicators use a variety of other financial market information, such as trading volumes, investor sentiment survey results, and implied market volatility, to predict the aggregate market.

Market indicators are very important to practitioners. A popular technical analysis book, Achelis (2001, p. 38), states, "Market indicators add significant depth to technical analysis, because they contain much more information than price and volume … the analogy being 'all boats rise in a rising tide'." Many major data vendors, such as MarketWatch and Bloomberg, report these indicators regularly as key market statistics. For example, MarketWatch, among many other data vendors, presents analysis on the Chicago Board Options Exchange (CBOE) volatility index nearly every day. In contrast to the popularity and acceptance these technical market indicators have received from practitioners, however, limited academic scrutiny has been presented on the predictability of these market indicators. Our study tries to fill the gap in the literature by examining the predictability of a wide range of market indicators. We look at all 93 market indicators from the Global Financial Data database,[1] which, to our best knowledge, is one of the most comprehensive ranges of market indicators.

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[1] See www.globalfinancialdata.com. We exclude a few indicators from the Global Financial Database, including New York Stock Exchange (NYSE) money borrowed and NYSE debit balances, since the data end in 1967 and 1970, respectively. We exclude most CBOE volatility indices except that for the

Branch (1976), which comes closest to our work, reviews the predictability of a range of 10 market indicators and documents mixed results. The author points out that the study is limited by insufficient data access, even many more indicators are proposed. Nearly 40 years later, with access to a much broader set of market indicators, including those introduced during those 40 years, we can now conduct a comprehensive study on market indicators. Using a wide range of 93 market indicators, however, we find no evidence that they show predictability for future stock returns. This conclusion consistently holds even if we allow predictability to be state dependent on business cycles or sentiment regimes.

Our range of indicators covers nearly all those available in the Global Financial Data database except a few that do not have sufficient data. In addition, we add common transformations of the raw indicators provided by Global Financial Data. The idea is that the raw data may contain both signal and noise and the technical transformations might reduce the noise in those series. However, we find no significant predictability either from the raw data or from the popular technical transformations. Moreover, we use the longest sample for each indicator available from the database to best avoid the data-snooping problems pointed out by many previous studies (e.g., Lakonishok & Smidt, 1988). The longest sample in our study is nearly 200 years and the overall average sample length is 54 years.

Accounting for the data-snooping bias is particularly important in the field of technical analysis. In particular, the predictability of technical analysis can change over time. Brock, Lakonishok, and LeBaron (1992) find that price-based technical trading strategies beat the market in their 90-year sample from 1897 to 1986. Fang, Jacobsen, and Qin (2013), however, find that the predictability disappears completely on a fresh 25-year sample from 1987 to 2012. Hence, using the longest sample available best prevents such data-driven results. On the other hand, predictability also varies greatly across different market indicators. Hence, using the widest range of market indicators we can obtain also safeguards our results against data-snooping issues.

Our preliminary analysis shows that at a conservative 10% significance level, 30 out of 93 indicators show possible predictability. However, only 10 of these remain significant after we conduct sub-sample robustness checks.[2] Since some indicators exhibit sign-switching predictability in the sub-sample test, we employ rolling window regressions to take a closer look at the stability of indication. This further reduces the number of possible predictive indicators to eight. We then conduct economic significance tests to account for risk and transaction costs and none of the

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Standard & Poor's (S&P) 500, since their sample periods are shorter than 10 years, most not actually starting until 2011. For similar reasons, we do not include the S&P total dividend declarations, the S&P monthly dividend declarations, the S&P 500 monthly advancing/declining stocks, or the S&P 500 index sales per share.

[2] These 10 market indicators are the NYSE short sales volumes–members/specialist/total, the NYSE short interest ratio, the NYSE advances/declines/new highs, the Alternext declines/new highs, and weekly NYSE cumulative highs.

technical trading strategies beats the naïve buy and hold strategy in terms of either the Sharpe ratio or Jensen's α.

We make no conclusions on the predictability of market indicators yet. A recent strand in the literature documents that some return-predicting models are time varying and state dependent (Dangl & Halling, 2009; Henkel, Martin, & Nardari, 2010; Jacobsen, Marshall, & Visaltanachoti, 2010; Yu & Yuan, 2011). For example, Jacobsen, Marshall, and Visaltanachoti (2010) show that an increasing industrial metal index can significantly predict higher stock market returns during contractions but lower market returns during expansions. These two effects offset each other. As a result, the industrial metal index does not show any predictability if not contingent on states of the economy. The underlying reason for the time variation of return predictability is that the same news may be interpreted differently by investors across business cycles (Boyd, Hu, & Jagannathan, 2005; Jacobsen, Marshall, & Visaltanachoti, 2010; McQueen & Roley, 1993).

In the case of technical analysis, the same information can also be interpreted differently across different states of the economy. For instance, a rising value of investors' bearish sentiment index during contractions often indicates a bearish sentiment extreme that signals a potential market reversal. In contrast, a rising value of bearish sentiment during market expansions can signal investors' fear about the future market and thus a decreased market. If that is the case, the observed non-predictability of the market indicators could be due to their time variation or state dependency. This conjecture has been recognized by practitioners[3] and supported by the empirical findings on price-based indicators of Han, Yang, and Zhou (2013), who show that moving average strategies generate much higher abnormal returns in recessions. We hence explicitly test if there is any time variation or state dependency that could also shadow the real predictability of market indicators by using the regime-switching methodology of Jacobsen, Marshall, and Visaltanachoti (2010).

We define our business cycles by using National Bureau of Economic Research (NBER) data. Our results show that 26 (21) market indicators show possible predictability in expansion (contraction) periods in the first place and the numbers are both smaller than the 30 we find in the full sample. Further F-test results testing the statistical difference in predictability between expansion and contraction periods reveal that only 19 indicators show significantly different predictability in one of the business states over the others. That is, most indicators (74 out of 93) do not seem to suffer from the problem where they potentially exhibit predictability in one of the business states but this predictability is shadowed by insignificant predictability in the other business state in the full-sample test. Nevertheless, we continue our economic significance test for those possible 26 (21) predictors under expansions (contractions) separately. During expansion periods, we find one market indicator has a higher

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[3] Edwards, Magee, and Bassetti (2007, p. 17) point out, "One of the keys in long-term chart analysis is realizing that market behaves differently in different economic cycle. … Identifying where you are in an economic cycle … is critical to interpreting the chart patterns evolving at that time."

Sharpe ratio than the buy and hold strategy and another market indicator has a significant positive Jensen's α.[4] During contraction periods, none of the 93 indicators show any economic value. Although it remains possible the two indicators have some predictive value in expansion periods only, our overall results generally do not seem to suggest the business cycle-dependent predictability of the market indicators.

Besides testing the possible time-varying predictability on business cycles that many return predictability studies have considered, we also look at the sentiment cycles recently introduced by Yu and Yuan (2011). They find that the mean–variance tradeoff differs across high- and low-sentiment periods. The intuition for the differences between high- and low-sentiment periods on returns is as follows. During a high-sentiment period, when more irrational investors participate, the price deviates more from its fundamental value, whereas during a low-sentiment period, the price more accurately reflects its fundamentals, with less sentimental noise. We thus are motivated to test if technical market indicators' predictability can differ across sentiment cycles, considering a fundamental belief of technical analysis that the price has already reflected all information and investors' aggregate sentiment is the main driver of price deviation from its fundamental value (Kirkpatrick & Dahlquist, 2010). The test results on sentiment cycles remain largely similar to those on business cycles: 21 (25) indicators show possible predictability in high-sentiment (low-sentiment) periods, while only 10 of them show significantly different predictability across these two regimes. Moreover, after we consider economic significance, none of the market indicators remain predictive. These findings further eliminate the possibility of the state-dependent predictability of the market indicators.

We try to give our market indicators the benefit of the doubt as much as possible. In that sense, our linear regression tests with a general correction for heteroscedasticity may be too restrictive. Therefore, as a robustness check, we verify whether these technical market indicators might work if we reduce noise in the data. We model the heteroscedasticity more explicitly using a GARCH(1,1) model. We follow the same steps above as those under ordinary least squares (OLS) and find consistent results of no predictability. We also check if outliers could affect our results by using robust regressions, particularly because we observe problems such as widening confidence bounds under the OLS rolling window regressions. Only one indicator may possess predictive value when the effect of extreme observations is controlled for. Moreover, we use the Chicago Fed National Activity Index (CFNAI) data alternatively to define business cycles; we also check the possible impact of the recent 2008 financial crisis by omitting this period from our sample; lastly, we also replicate our analysis excluding the top and bottom 5% extreme observations. Our finding of weak predictability remains similar.

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[4] The indicator U.S. mutual fund equity fund redemptions has a higher Sharpe ratio than the buy and hold strategy and the NYSE new highs indicator has a significantly positive Jensen's α.

Can we rely on technical analysis? Our results, from evaluating a comprehensive range of technical market indicators using the longest sample available, do not seem to suggest an affirmative answer to this question. Our main contribution lays in filling the gap in the literature on a comprehensive study of the technical market indicators by providing strong statistical and economic evidence on their practical usage. Our study has particularly important implications for practitioners who rely heavily on technical analysis in making investment decisions.

The rest of the paper is organized as follows. To best serve the overview role of this paper, Section 2 first explicitly reviews current evidence on our market indicators before a formal analysis, including those from the sentiment field. This provides an overall understanding and expectation of the predictability of the market indicators. We then introduce our data and methodology in Section 3, followed by a presentation of the empirical results in Section 4. Section 5 explicitly examines the time-varying predictability of the market indicators and Section 6 provides various robustness checks. We conclude the paper in Section 7.

2. Technical Market Indicators

Fundamentally, technical analysis believes that stock prices follow trends because investors collectively repeat their patterned trading behavior, which is the major driver of stock price fluctuations (Murphy, 1999). Although the patterned behavior may be irrational, by exploring the pattern—the trend—one can effectively anticipate future price movements.

Market indicators can be classified into two groups: market sentiment indicators and market strength indicators. The market sentiment indicators predict market movements based on tracking the bullish or bearish psychology of the market. When bullish (bearish) sentiment dominates the market, stock prices will rise (decline), associated with an increasing demand for (supply of) securities. Market strength indicators measure the strength—the breadth—of market movements. A strong movement with a high breadth reading will last longer and take the market to higher highs or lower lows. Market indicators expand the information set of technicians beyond classic price and volume data to a variety of financial information. Although market indicators are sometimes used in other markets, such as the futures market, they primarily analyze aggregate stock market movements (Achelis, 2001, p. 31). While evaluating overall market conditions remains important even when investing in individual stocks, the measurements of individual stocks' sentiment or the strength of price movements are generally noisy and less reliable with limited data access.

Among the 93 market indicators our paper studies, 65 are raw indicators that extract information from market data directly, such as total market advance/decline issues in a trading day, and the other 28 are transformed indicators that manipulate raw information through some formula. For example, net advances equal raw decline

issues deducted from raw advance issues. This has a benefit for the practitioner. One may favor a few particular transformed indicators when one believes that the transformation can provide further indications over what the raw information can. For instance, in the above example, net advances indicate the strength of a trend on a relative basis, comparing the up and down trend strengths, while the raw advances/declines focus solely on the up/down trend. While many previous studies use transformed indicators only—for example, on advance/decline information, Brown and Cliff (2004) use the advance/decline ratio and Zakon and Pennypacker (1968) use the advance/decline line—our study may shed light on whether using such a transformation has an advantage over using the raw information or whether it actually masks the raw information's true predictability.

Table 1 summarizes our indicators. Panels A and B report our reviews of market sentiment indicators and market strength indicators, respectively. We further classify our indicators into 14 sub-groups based on the type of information they use. As mentioned earlier, many indicators can use the same raw information. For example, our first group of sentiment indicators uses option volumes to proxy for aggregate sentiment, with a rising call (put) volume indicating investors' bullish (bearish) sentiment since they are hedging against a potential market rise (fall). Global Financial Data provides the information from two sources, the CBOE and the OEX. The last indicator is a transformed indicator that uses the ratio of the traded value of put to call options to measure the relative strength of bearish sentiment to bullish sentiment. This gives us a total of five indicators for this group. In the remainder of the paper, we discuss our results by such a grouping. To save space, we review the underlying theory and existing evidence of our indicators explicitly in Table 1 and give a brief overview in the following.

[Please insert Table 1 here.]

2.1 Market Sentiment Indicators

Sentiment is defined by Kirkpatrick and Dahlquist (2010, p. 90) as

> The net amount of any group of market players' optimism or pessimism reflected in any asset or market price at a particular time. When a stock or commodity is trading at a price considerably above or below its intrinsic value, something we will not know until considerably later, the difference or deviation from that value often will be accounted for by sentiment.

Following this definition, we have 50 sentiment indicators in total and we further categorize them into 11 sub-groups based on the type of raw information they use. Sentiment indicators can incorporate various information that past prices cannot

reveal. Some use direct sentiment poll results, such as the American Association of Individual Investors (AAII) and Investors Intelligence (II) sentiment indices, while others use data from the underlying derivative markets but not the stock market directly. For instance, we use put or call option volumes and volatility indices. In addition, a number of sentiment indicators use the statistics of different trading activities, such as odd-lot trading statistics, short sales statistics, mutual fund statistics, and margin account balances. Lastly, the rest of indicators include Barron's confidence index, American Stock Exchange (AMEX) seat prices, and Moody's or S&P 500's aggregate number of positive/negative dividend news.

Technical theories impose different signs on the way that the indicators predict the market, since they view different investors' sentiment differently. A key issue is to distinguish between two major groups of market player sentiment: the uninformed and informed traders. Uninformed traders are passive and trade for liquidity (Wang, 2002). De Long, Shleifer, Summers, and Waldmann (1989, 1990a, 1990b) argue that uninformed traders tend to act strategically on noisy signals and therefore their trading can affect prices in a systematic way that deviates asset prices from fundamental values. According to Kirkpatrick and Dahlquist (2010), this group of investors largely consists of individual traders. They lack sufficient financial knowledge when making their investment decisions and their behavior is that of a crowd; in other words, they make decisions in line with everybody else, regardless of the true financial facts. Thus, the theory refers them as uninformed investors and views their decisions as always wrong, such that trading against them will result in significant gains. So-called contrarian indicators measure this group of investors' sentiments. Examples of our contrarian indicators include odd-lot trading statistics, short sales of general public investors, and survey sentiment indices. In contrast, informed traders, who are sophisticated investors that have adequate financial knowledge, build their decisions on precise analysis of the market. Theory views their decisions as always true and accurate. Professional speculators, position traders, hedge fund managers, professional arbitrageurs, and insiders are considered to be in this category (Kirkpatrick & Dahlquist, 2010). Typical sentiment indicators for this group of investors include volatility indices, option trading volumes, and specialists' short sales.

These sentiment indicators have been receiving growing attention. In the academic fields, especially behavioral finance, many sentiment indicators used overlap with those we examine, those used by technical analysis. Since we have many indicators, we review the previous evidence by group in Table 1. In brief, the previous evidence is mixed, even when using the same sentiment proxies. For example, Seneca (1967) finds that the short interest ratio predicts monthly S&P 500 returns negatively from 1946 to 1965. Brown and Cliff (2004), however, suggest that the short interest ratio does not predict S&P 500 returns from 1965 to 1998. This raises the concern of data snooping and calls for using a long sample period to safeguard against the data-snooping issue and to update the results. Moreover, many studies in this field largely employ just one or a few indicators as sentiment proxies to predict the market, which

can also lead to the data-snooping problem, since so many indicators are proposed and some receive relatively more attention than others.[5] Our wide range of indicators also avoids such risk.

2.2 Market Strength Indicators

While market sentiment indicators anticipate how investor behavior shifts market movements, market strength indicators measure the internal strength of these movements. The fundamental goal of technical analysis is to make a profit from tracking these movements, which requires accurate analysis of the timing of trends, addressing such questions as when does the market reach a bottom or a peak and can it reach lower lows or higher highs? Market strength indicators answer these questions by confirming the underlying trend when the trend is strong enough so that a rising or declining market may improve, even reaching higher highs or lower lows, or by disagreeing with the trend when the trend is weak and will deteriorate and, thus, becomes more likely to reverse. Market strength is measured based on whether the majority of individual stocks within the stock exchange participate in the uptrend or the downtrend. We have 43 strength indicators, which mainly use three kinds of information.

1. Volume information. One of the earliest technical theories, the Dow theory, documented the importance of volume: "Bull markets terminate in a period of excessive activity and begin with comparatively light transactions" (Rhea, 1932). Indicators such as the NYSE total volume and total volume turnovers directly measure overall market trading activities. Moving one step further, the short-term trading indices use directional up/down volumes that track the trading volumes of advancing or declining issues separately. A strong trend is normally accompanied by an increasing volume in the same direction (Kirkpatrick & Dahlquist, 2010).

2. The total number of advancing/declining stocks. A trend fueled by only a small number of stocks usually does not last long. One can use raw advance/decline information directly to measure market strength. Therefore we include such raw information for the NYSE, NASDAQ, and Alternext. Alternatively one can calculate the relative strength of the up/down trend through many different mathematical transformations. We include the three most common transformations: the net advances, the advance/decline line, and the percentage net advance for the three markets above. We formulate the transformation used in

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[5] While some of the indicators in the database are discussed heavily in the literature, such as sentiment poll results and volatility indices, others receive much less attention. In particular, two groups of our indicators—exchange seat prices and the market aggregate number of dividend announcements—have not been studied in the previous literature to the best of our knowledge. While we find closely related studies that can help explain these indicators (as discussed in Table 1), we have not found their exact application by technical analysts on our best effort; however, we include these indicators in our study for completeness.

Table 1. Moreover, for the NYSE we have raw and transformed indicators data for both daily and weekly intervals.

3. The total number of stocks that reach their periodic highs or lows. The underlying uptrend strengthens when more stocks advance to their periodic highs and vice versa. We also include the raw new highs/lows for the NYSE, NASDAQ, and Alternext and three common transformations of the raw information (net new highs, cumulative highs, and percentage net new highs). The data for the NYSE are again available at daily and weekly intervals.

3. Data and Methodology

3.1 Sample and Data

We evaluate the technical indicators' forecastability on the S&P 500, which proxies for the overall U.S. stock market. The returns are calculated as the log differences of current prices and prices from one period ahead. The S&P 500 contains the 500 most actively traded large-cap common stocks in the U.S. stock market. As one of the most historically extensive indices, the S&P 500 became available at daily, weekly and monthly frequencies in 1938, 1918, and 1791, respectively.

We study the S&P 500 for several reasons. First, the long data series naturally shield against the potential data-snooping problem pointed out by Lakonishok and Smidt (1988) and Lo and MacKinlay (1990). Second, we have a wide range of technical indicators with sufficiently long data series designed specifically for the sophisticated U.S. market. The 500 stocks are listed on either the NYSE or the NASDAQ, the two largest American stock exchanges. This means that the S&P 500 index correlates highly with the NYSE and NASDAQ indices, which enables us to study technical indicators that contain information from both of these markets. Third, public investors hold the majority of the stocks in the U.S. market. Such heavy involvement of public investors satisfies the essential theoretical condition for many of the sentiment indicators, that uninformed investor sentiment becomes so influential that it can shift market movements. Last, the S&P 500 provides us with a sufficient number of stocks to ensure considerable market breadth when examining the market strength indicators.

We obtain the return and indicator data from Global Financial Data.[6] Our sample frequencies vary across the 93 indicators, with one annual indicator, 28 monthly indicators, 18 weekly indicators, and 46 daily indicators that anticipate different terms of market trends. We use the longest samples available for each of the indicators; the annual indicator starts in 1820 and the oldest monthly, weekly, and daily indicators

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[6] See www.globalfinancialdata.com.

start in 1918, 1932, and 1938, respectively.[7] Most of our sample periods end in 2010 or 2011, subject to data availability. That is, the oldest market indicator (NYSE seat prices) has nearly 200 years of history and the 93 indicators have an average sample length of 54 years.

As discussed in the previous section, we have several different indicator types: ratios (e.g., the NYSE short interest ratio), index numbers (e.g., the AAII bullish index), dollar units (e.g., AMEX seat prices), or simply unit numbers (such as option volumes, or the number of dividend news announcements). We report the mean, standard deviation, minimum, and maximum values of their periodic changes in Appendix 1.

In addition, to test the robustness of our results, we perform sub-sample analyses for each of our indicators. Since the sample periods vary greatly across indicators, we do not define universal sub-sample periods. Instead, we split each indicator's full sample into two equal sub-samples. We also study state dependent predictability. We use two sources to define business cycles independently, following Jacobsen, Marshall, and Visaltanachoti (2010): NBER data[8] and CFNAI[9] data. The NBER business cycle data start in 1854, with a monthly frequency, and we classify a year as in expansion (contraction) if over seven months of the year are in expanding (contracting) periods. We define each week/day as expanding (contracting) if the month of the week/day falls within an expanding (contracting) month. The CFNAI data start in 1967. We classify a period as a contraction period when the CFNAI-MA3 is less than -0.7 and an expansion period when the CFNAI-MA3 is greater than -0.7. Unlike the NBER data, the CFNAI data are published in real time and are thus free of hindsight bias. We use these data to double-check our NBER results.

For the sentiment regimes, we use Baker and Wurgler's (2006)[10] sentiment index, following Yu and Yuan (2011), to define high-/low-sentiment regimes. We classify a year as a high-sentiment (low-sentiment) year if the prior year has a positive (negative) value of the index. Baker and Wurgler (2006) calculate the index as the first principle component of six measures of investor sentiment, which are the closed-end fund discount, the NYSE share turnover, the number of IPOs, the average first-day return of IPOs, the equity share in new issues, and the dividend premium. The first principle calculation eliminates noise and captures the common component of the different sentiment measures. Furthermore, the authors first regress the six sentiment measures on a set of macroeconomic variables to remove business cycle information and then use the residuals as input for first principle component analysis. Therefore our sentiment time varying analysis does not overlap with the business cycle-varying analysis.

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[7] The data on market sentiment indicators II bearish percentage and II bullish percentage are available from 1963, at the II website www.investorsintelligence.com. We use the longest sample period from Global Financial Data, which starts in 1987.
[8] See http://www.nber.org/cycles.html.
[9] See http://www.chicagofed.org/webpages/publications/cfnai/.
[10] See http://people.stern.nyu.edu/jwurgler/.

3.2 Methodology

We run standard OLS regression to test the predictability of each of the 93 technical indicators:

$$R_t = \alpha_t + \beta I_{t-1} + \varepsilon_t \qquad (1)$$

where

- R_t represents the daily/weekly/monthly/annual log returns of the S&P 500 index,
- I_{t-1} represents periodic percentage changes of the technical indicators from one period ahead, and
- ε_t represents the residual term.

The methodology simply tests whether periodic variations of the technical indicators anticipate the next period's stock market returns. The parameter β captures the relation between market returns and the technical indicator. We use a conservative 10% significance level.

We also run the following regression for state-dependent predictability, following Jacobsen, Marshall, and Visaltanachoti (2010):

$$R_t = \alpha_t + \beta_1 D_{t-1} I_{t-1} + \beta_2 (1-D_{t-1}) I_{t-1} + \varepsilon_t \qquad (2)$$

where

- R_t represents the periodic return on the S&P 500 at time t,
- I_{t-1} represents the percentage change of the technical indicator one period ahead,
- D_{t-1} represents a dummy variable that equals one (zero) during expansions (contractions) for business cycle analysis and one (zero) during high-sentiment (low-sentiment) periods for sentiment cycle analysis,
- and ε_t represents the residual term.

The parameters β_1 and β_2 from equation (2) measure the predictability of the market indicators in expansion and contraction periods for business cycle analysis, respectively, or the predictability in high- and low-sentiment periods for sentiment cycle analysis, respectively. We further perform an F-test to test the statistical differences between β_1 and β_2. We use a conservative 10% significance level and apply White's standard error corrections on all t-statistics and χ-statistics to counter heteroskedasticity issues.

4. Empirical Results

4.1 Main OLS Results

Table 2 presents our main OLS results for the full sample in the first three columns, followed by the OLS results for two equal-fold sub-samples. For each sample, we report the sample periods, β estimates, and White standard error-corrected t-statistics. Panels A and B present the results for the market sentiment and market strength indicators, respectively.

[Please insert Table 2 here.]

The full-sample results show that 30 out of the total 93 market indicators predict the market at the 10% significance level. This includes 18 market sentiment indicators and 12 market strength indicators. In regard to the different underlying information, five groups of indicators (option volumes, Barron's confidence index, exchange seat prices, total volumes, and total volume turnovers) exhibit no predictability at all. On the other hand, short sales volumes, volatility indices, and raw total market advance/decline indicators seem to perform better than the other indicators at first glance; all of them show (marginal) significance in predicting the market, except the NASDAQ 100 volatility index.

Although 30 indicators show some preliminary predictability, we also need to consider an important and relevant question: Do they work in the way that technical theory expects? In other words, can one really make a profit from following the technical textbook? Our results provide a mixed answer to this question, with 10 of the 30 market indicators showing significant predictability, but with signs opposite from the expected. Eight sentiment indicators predict the market differently from what theory implies. Typical contrarian indicators such as the NYSE short interest ratio, the AAII bullish index, and U.S. mutual fund equity fund redemptions do not actually exhibit a contrarian nature. Instead, they capture the correct market direction. Hence, the traditional market wisdom that trading against uninformed investors no longer seems to hold here. In contrast, indicators on savvy investors, such as NYSE members/specialists, who are supposed to be correct, are also unreliable. For example, the increase in savvy short sales should predict a downward market. However, our results show that it is actually associated with a future market rise. Similarly, two market strength indicators, weekly NYSE advances and weekly NYSE cumulative highs, which should predict the market positively, actually have negative signs. Such results imply that, even though these market indicators show a significant relation with future returns, trading on them in the way indicated by theory will incur losses.

In addition, the predictability of the same market strength information varies with the way it is used. First, the predictability depends on whether raw or transformed information is used. Interestingly, at both daily and weekly frequencies, all eight raw advance/decline indicators (marginally) predict the market, in contrast with none of

the transformed indicators. Hence, transformation of advance/decline information does not provide any further insight into market trends, it even appears to cause information loss. Furthermore, different underlying predictive horizons can incur variations in a particular indicator's predictability. At daily frequencies, raw advances predict the market positively and raw declines predict the market negatively, which is in line with theory. However, such relations reverse at weekly frequencies. In addition, the new highs/new lows indicators work better in their raw forms at daily frequencies, whereas they only work in their transformed forms at weekly frequencies.

The mixed full-sample results make it difficult to conclude yet whether the market indicators are useful or not, with 30 out of the 93 indictors showing some preliminary predictability, especially considering that they provide different indications than expected by the underlying theory and the predictability can differ with the method of using the information. We then further test the general stability of the indication by splitting the full samples into two sub-samples of equal length. Note that since the original full-sample lengths vary across indicators, the two sub-samples also have different lengths for different indicators.

Our sub-sample results cast further doubt on the predictive power of the market indicators. Only 10 market indicators remain predictive in both of the sub-samples: three different types of investors' short-sales volumes, the NYSE short interest ratio, daily NYSE advances and declines, daily Alternext declines, daily new highs of the NYSE and Alternext, and weekly NYSE cumulative highs. We highlight the 10 predictive market indicators in boxes. If we further group these indicators by their underlying information, only some short sales statistics and market advances/declines or new highs/lows information may still contain some predictive value.

The sub-sample results have several additional implications. First, Branch (1976) suggests that the predictability of technical indicators may disappear over time, since they will attract more investors to exploit their predictability after they are found to work. In this case, we should find more efficient technical indicators in the first sub-sample. However, we discover similar numbers of efficient technical indicators in the first and second sub-samples, with only 10 indicators actually showing statistical significance in the latter half of the sample period. Nevertheless, most market indicators (52 out of 93) show no predictability in either sub-sample; it appears that these 52 indicators have never worked across their full history, which can be as long as 193 years (the sample of NYSE seat prices starts in 1820). It seems that the argument that predictability is gradually exploited over time does not hold.

Second, one may argue that the development of financial markets enabled some trading methods that masked the true informational content of some historically useful technical indicators and led to the loss of their predictability. For example, Kirkpatrick and Dahlquist (2010) argue that margin debt, which was previously a very reliable indicator, is no longer an accurate gauge of investor sentiment because investors can, through using derivatives, hold positions outside the Federal Reserve

requirements for margins. Our results, however, do not appear to support such an argument, since margin debt does not work in the first sub-sample before 1963, when stock index derivatives were not as widely used by the public as they are now. We actually also find no predictability for the rest of the margin account statistics indicators. This further supports the view that predictability does not seem to decrease over time but, rather, probably to a large extent never existed.

Of our 93 market indicators, only 10 survive the sub-sample analysis. It should be noted that the weekly NYSE cumulative highs predict the market differently in the two sub-sample periods, positively in the first sub-sample and negatively in the second. This raises an intriguing question: Even though the 10 market indicators are overall predictors of the market in the long run, do the indications they supply remain the same over time? How stable is the parameter β? We perform rolling window regressions to answer these questions.

4.2 Rolling Window Regressions

We run a 10-year[11] rolling window regression on the 10 indicators that survive the sub-sample test. For each indicator, we first run the original OLS regression on the first 10 years of the sample and then move the sample one month forward by replacing the observations in the first month of the previous 10 years with those of the latest one month and repeat the OLS regression. Thus, the new regression window remains 10 years but rolls one month forward. We repeat this process until the last observation in the full sample is included in the last regression. The observed β should maintain at a relatively stable level if the indicator predicts the market consistently over time.

[Please insert Figure 1 here.]

Figure 1 plots the rolling OLS β values in solid lines and their 90% confidence bounds in dotted lines over time. On average, all three of the NYSE short sales–members/specialists/total maintain reasonable consistency in predicting the market, except for the short period in 2001, when the market was closed because of the 911 attack. Surprisingly, members' and specialists' short sales are persistently positively related to the market over time. That is, when the informed NYSE members, or the specialists, increase their short positions to hedge against a market fall, the market actually rises. Besides, we discover an intriguing pattern for the short interest ratio: The sign of β keeps switching between positive and negative over time. This casts

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[11] One could argue that a regression window of 10 years is not adequate. For example, Jacobsen and Dannenburg (2003) suggest that, for monthly observations, 50 years of data are required to produce reliable GARCH estimates. However, in our case we use the longest sample available for each indicator and some of these indicators have a full history of only around 50 years (e.g., Alternext new highs). Our primary focus also lies in the stability of predictability across time and not the exact magnitude of the β value; a 10-year window for our rolling window regressions should serve such a goal.

strong doubts on its predictability, since it seems difficult to follow the varying indication it provides from time to time. In addition, the wide confidence bounds make it even harder to rely on such predictability.

For the market strength indicators, the five raw indicators (NYSE advances/declines/new highs and Alternext declines/new highs) generally predict the market consistently over time, although at the same time, except for NYSE declines, the market indicators often experience periods with relatively wide confidence bounds for the β estimates. For example, NYSE advances have a wider confidence bound from late 1947 to late 1958 and from early 1987 to late 1997. The same is also the case for NYSE new highs after the 2008 financial crisis period. In contrast, the large fluctuation of β largely eliminates the NYSE weekly cumulative highs as reliable market predictors. The rolling window regression shows that for NYSE weekly cumulative highs, β is positive before 1974 (positive and close to zero from 1947 to 1953), when it switches sign and remains negative and close to zero for the following 10 years to 1984. Then its sign switches again to be positive until 1997, whereafter it becomes almost always negative. This probably explains why, in the sub-sample test, NYSE weekly cumulative highs predict the market differently in the two sub-samples.

The rolling window regression results warn us about the danger of using short interest ratios and NYSE cumulative highs as market predictors, even though they all exhibit statistical significance in the full sample and sub-samples on first examination. This again emphasizes the importance of using a long sample period. The other eight indicators generally present relatively stable predictability, although to some degree they are exposed to the problem of wide confidence bounds. We perform several robustness checks to address this problem in Section 6 and the results remain largely the same.

4.3 Economic Significance

Our last step takes into account transaction costs and examines the risk-adjusted returns of investing on the eight indicators that provide relatively reliable indication over time. We use the methodology of Driesprong, Jacobsen, and Maat (2008) to test the economic significance of the market indicators. For each of the eight market indicators, we calculate our portfolio return by using OLS estimates, as follows:

- We first split the sample into two equal lengths and we estimate the OLS model parameters α_t and β_t using the first half of our sample.
- At time $t + 1$, we use α_t, β_t, and the last market indicator change I_t to calculate the expected return $E(R_{t+1})$. Then we compare $E(R_{t+1})$ with the same period's risk-free rate r_{t+1}^f.[12] We fully invest in the market if $E(R_{t+1})$ is higher than

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[12] We source our risk-free rate data from Global Financial Data using three-month U.S. Treasury bill rates.

r_{t+1}^f , so that the portfolio return $r_{t+1}^P = r_{t+1}^m$, and we fully invest in risk-free assets if $E(R_{t+1})$ is lower than r_{t+1}^f; thus $r_{t+1}^P = r_{t+1}^f$.

- We re-estimate our model every period to update the model whenever a new observation becomes available and then calculate our portfolio returns.
- Similarly to Driesprong, Jacobsen, and Maat (2008), we assume a switching cost of 0.10% between the market and risk-free assets, in accordance with Solnik (1993).

We then compare the risk and return pattern of our portfolio with that of a naive buy and hold portfolio; we document the results in Table 2. We first report the mean, standard deviation, and Sharpe ratio for the buy and hold strategy and columns 7 to 9 report those of the technical strategy. We calculate the Sharpe ratio as

$$\text{Sharpe ratio} = (r_t^P - r_t^f)/\sigma_t^P$$

where r_t^P represents the returns of the technical trading strategies; r_t^f represents the risk-free rate, which equals the U.S. three-month Treasury bill rates; and σ^P represents the standard deviation of r_t^P. The next column reports the *t*-values, testing the null hypothesis that the Sharpe ratio of the buy and hold strategy equals that of the technical strategy. The significance test is performed according to the methodology proposed by Lo (2002) and de Roon, Eiling, Gerard, and Hillion (2011), which assumes that the excess returns $r_t^P - r_t^f$ are independent and identically distributed normal.

[Please insert Table 3 here.]

The last four columns report the α and β estimates and their associated *t*-values for Jensen's α estimation. We estimate Jensen's α using the regression

$$r_t^P - r_t^f = \alpha + \beta (r_t^m - r_t^f) + \varepsilon_t$$

where r_t^p, r_t^f, and r_t^m represent the returns of the technical trading strategies, risk-free rate, and market returns, respectively. The term α then captures the excess return on a given systematic risk level β of the technical trading strategy by using the buy and hold strategy as the benchmark.

Compared with the buy and hold strategy, the technical strategies generally have both lower returns and lower risks. Three technical strategies (NYSE advances, declines, and new highs) even have negative returns, on average, before considering risks, which suggests investing on risk-free assets will be more mean–variance efficient. Furthermore, in terms of the Sharpe ratio that measures the price for each unit of risk, none of the technical strategies significantly outperforms the buy and hold strategy. In fact, most technical strategies have negative Sharpe ratios that underperform investing on risk-free assets. The results of Jensen's α estimation provide more or less similar implications. Although all the β estimates are significantly below one, indicating lower risk levels, none of the technical trading strategies produce a more positive

excess return, captured by α, than the buy and hold strategy at this level of risk. Overall, our OLS results indicate none of the 93 market indicators generate returns outperforming the market.

5. Time-Varying Predictability

Our conclusion may be too restrictive yet if return predictability is state dependent. Prior literature has shown that some return predictability models' effectiveness varies across business cycles (Dangl & Halling, 2009; Henkel, Martin, & Nardari, 2010; Jacobsen, Marshall, & Visaltanachoti, 2010) or across sentiment regimes (Stambaugh, Yu, & Yuan, 2011). Several of our market indicators exhibit sign-switching predictability across time, for example, the short interest ratio and weekly NYSE cumulative highs. If some of the technical market indicators have time-varying or state-dependent predictability, it remains possible that they have not been picked out by our full-sample and sub-sample tests. Hence, in this section, we implicitly investigate the time variation and state dependency of the 93 indicators.

5.1 Business Cycle-Varying Predictability

Han, Yang, and Zhou (2013) find that the moving average trading strategies generate much higher abnormal returns in recessions. Chordia and Shivakumar (2002) discover similar evidence for momentum strategies, which generate positive returns only during expansions. On the other hand, Griffin, Ji, and Martin (2003) claim profitable momentum strategies in both good and bad economic states. All these studies provide evidence for business cycle-related predictability but do not pay attention to the market indicators. We seek to fill the gap here for the effect of market indicators on business cycle-varying predictability, if any.

We use the monthly NBER business cycle data[13] that start in 1854 to define expansion and contraction periods.[14] We report the regression results in Table 4. The first two columns repeat our full-sample results again for comparison. Columns 3 to 6 report β_1 and β_2, which measure the predictability of the market indicators in expansions and contractions, with White standard error-corrected t-statistics. The last column reports the F-test results, testing the statistical differences between β_1 and β_2.

[Please insert Table 4 here.]

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[13] See http://www.nber.org/cycles.html.
[14] Our indicators have different frequencies and we define expansions and contractions as follows: The only annual indicator, NYSE seat prices, starts in 1820, whereas, due to data availability on business cycles, our time-varying evaluation on the annual indicator starts in 1854. We classify a year as in expansion (contraction) if over seven months of the year are in expanding (contracting) periods. We define each week/day as in expansion (contraction) if the month it falls in is expanding (contracting).

Generally, market indicators' predictability does not seem to strengthen under different business states. We have 26 predictive indicators in expansions and 21 in contractions, suggesting overall market indicators do not seem to work better in one business state. In addition, compared with the 30 significant results discovered under the full sample, our results seem to suggest that predictability is not strengthened even if we allow it to be time varying across business cycles. The *F*-test results give a similar message, that the predictability of most market indicators (74 out of the total 93) in contractions is not statistically different from that in expansions. This largely eliminates the possibility that these indicators work better in one business state and not the other, offsetting overall predictability.

To allow the maximum benefit of the doubt, we perform economic significance tests for indicators that exhibit significant predictability in any of the expansion or contraction periods and we tabulate the results in Tables 5 and 6, respectively. Generally, the technical trading strategies have lower risk levels than the buy and hold strategies in both business states, although they largely do not beat the buy and hold strategies in returns for each unit of risk as measured by the Sharpe ratio. Jensen's α results largely tell the same story: The technical trading strategies usually have low β levels, which means low systematic risk, but they do not generate excess returns to the market at the risk level β either. We have two exceptions in the expansion periods. Equity fund redemptions have a Sharpe ratio significantly higher than the market's and a marginally significant Jensen's α and NYSE net new highs have a significant positive Jensen's α and a marginally significantly higher Sharpe ratio. These two indicators may show some predictability during expansion periods only; however, this finding does not alter our main conclusions.

[Please insert Table 5&6 here.]

5.2 Sentiment Regime-Varying Predictability

We also test a second set of possible predictability regimes: the sentiment regimes introduced by Yu and Yuan (2011). These authors find a significantly positive mean–variance relationship during low-sentiment periods but no relation during high-sentiment periods in which sentiment shifts price away from its fundamental values. Stambaugh, Yu, and Yuan (2012) also document that a set of asset pricing anomalies becomes stronger during high-sentiment periods. Their finding could have an impact on the predictability of market indicators. Many market indicators work on the basis of measuring investor sentiment, which technical analysis believes is the force that drives prices from their fundamental values (Kirkpatrick & Dahlquist, 2010). We therefore wonder whether these market indicators show stronger predictability during high-sentiment periods in which such forces become stronger. If this is the case, the full-sample analysis can miss such predictability.

Following Yu and Yuan (2011), we use the annual Baker and Wurgler (2006) sentiment index to define sentiment periods. Baker and Wurgler calculate a composite sentiment index as the first principle component of six measures of investor sentiment, namely, the closed-end fund discount, the NYSE share turnover, the number of IPOs, the average first-day return of IPOs, the equity share in new issues, and the dividend premium. The first principle calculation eliminates noise and captures the common component of the different sentiment measures. Furthermore, the authors first regress the six sentiment measures on a set of macroeconomic variables to remove business cycle information and they then use the residuals as input for first principle component analysis. Therefore, our sentiment time-varying analysis does not overlap with the business cycle-varying analysis above. We then classify a year as a high-sentiment year if the prior year has a positive Baker andWurgler (2006) index value. We use the same regime-switching methodology as above and define the dummy variable as equal to one (zero) during high-sentiment (low-sentiment) periods.

We present the sentiment regime-varying results in Table 7.[15] Again, we first recall the full-sample results in the first two columns and then subsequently present the results during high- and low-sentiment periods; lastly, we present the *F*-test results, testing the differences between high- and low-sentiment periods.

[Please insert Table 7 here.]

We find a total of 21 and 25 market indicators predicting the market during high- and low-sentiment periods, respectively. Contrary to what was expected, we do not discover more predictive indicators during high-sentiment periods, when sentiment becomes more important in driving prices. Instead, we even have a few more predictive indicators during the low-sentiment period. Moreover, both numbers of significant predictors are less than the 30 found under the full-sample periods. Moreover, the *F*-test results also show that, statistically, 83 out of the 93 indicators do not predict the market differently in two regimes. This finding contributes to the view that separate high- and low-sentiment regimes does not seem to increase the predictability of the market indicators.

To further check if any of the single-state predictive indicators show true predictive value, we also perform similar economic significance tests as that above and document the results in Tables 8 and 9 for the two regimes. However, we find that none of the market indicators outperform the market in terms of the Sharpe ratio or

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[15] Notice that the full-sample results are for the longest sample available for each of the indicators, while the sentiment regime varying results are for the period from 1967 to 2011 where the sentiment index is available. This may cause some unusual effect during comparison. For example, the NYSE Total Volume predicts returns in both regimes but not the full-sample. However this would not affect our main conclusion since we perform further analysis for the best benefit of doubt, also those indicators whose sample starts after 1967 would not suffer from this problem.

Jensen's α. The results show that predictability does not strengthen under different sentiment regimes and our main conclusion in the full-sample remains robust.

[Please insert Table 8&9 here.]

6. Robustness Checks

6.1 GARCH (1,1) Specifications

In the previous OLS rolling window regression analysis, quite a few of our market indicators exhibit a widening of the confidence bounds problem. This may be a sign of volatility clustering. In fact, the volatility clustering problem in stock return data has been documented as early as 1963 Mandelbrot (1963). Many previous researchers argue a GARCH model can encounter such a problem. Bollerslev, Chou, and Kroner (1993) survey this strand of studies in depth and also note that small numbers of GARCH parameters seem sufficient to model variance dynamics over very long sample periods. Although we use White standard errors to correct for the heteroskedasticity problem in the OLS results, a robustness check using a GARCH(1,1) model may provide further confidence in the results. The GARCH(1,1) model specifies the same linear relation between market returns and the change of market indicators, but assumes normally distributed standard errors whose variance is restricted as

$$R_t = \alpha + \beta I_{t-1} + \varepsilon_t$$
$$\varepsilon_t \mid \phi_{t-1} \sim N(0, \sigma^2)$$
$$\sigma^2 = \alpha_0 + \alpha_1 \varepsilon_{t-1}^2 + \alpha_2 \sigma_{t-1}^2$$

We replicate our OLS analysis above by using the GARCH(1,1) model and present our results for the full sample and sub-samples in Table 10. In the full sample, we discover a total of 21 predictive market indicators at the 10% significance level, which is less than the 30 discovered in the OLS estimation. After the sub-sample analysis, 10 market indicators remain predictive; while most of them are the same as those found by the OLS regressions, the GARCH(1,1) model picks up NYSE free credit balances and S&P monthly extra dividends as market predictors, but drops the short interest ratio and NYSE cumulative highs featured in the OLS results. We then test the economic significance of the 10 indicators using the GARCH (1,1) estimates and we present the results in Table 11. None of the market indicators beats the market under GARCH(1,1) model either.

[Please insert Table 10&11 here.]

6.2 Robust Regressions

Outliers can be another issue that causes instability of indication. We replicate our analysis using robust regressions to control the effect of potential outliers. Robust regressions limit the influence of outliers through estimating a scale parameter that downweights the observations that have large residuals. Robust regressions mainly control outliers on the dependent variable side. We follow the M-estimation method introduced by Huber (1973) to obtain our β estimates and we report the results in Table 12.

[Please insert Table 12 here.]

We have 32 indicators predict the full-sample returns, compared to the 30 under the OLS. The sub-sample analysis also gives us 10 indicators that provide relatively stable indication over time. Nine of these indicators are same as those under the OLS sub-sample analysis, while the robust regressions drop NYSE weekly cumulative highs but add the CBOE S&P 500 volatility index. The economic significance results in Table 13 for the 10 indicators use outlier robust estimates to calculate our portfolio returns and we largely do not discover any predictability of the market indicators, with one exception: Only NYSE total short sales seem to provide some profitability after controlling for risk and transaction costs; it has both a higher Sharpe ratio and Jensen's α than the buy and hold strategy. However, our main conclusion stays same.

[Please insert Table 13 here.]

6.3 Other Checks

We also perform several additional robustness checks. First, we only test the economic significance of the market indicators that show significant predictability in both sub-samples under several alternative models, namely, OLS, GARCH (1,1), and robust regression models. This may be too restrictive. We loosen our criteria and additionally test the economic significance of those indicators that show significant predictability in the full-sample analysis but not in the sub-sample analysis. We present results for the OLS, GARCH(1,1), and robust regressions in the Appendix. We find no additional predictability under the OLS and the GARCH(1,1) models. However, we find NYSE weekly advances and NYSE net new highs have both higher Sharpe ratios than the market and a positive Jensen's α under the robust regression model. Although these two indicators may show some practical value, this does not alter our main conclusion that market indicators generally show very limited predictability.

Moreover, we use an alternative dataset to define the business cycles, the CFNAI[16] data, which start in 1967. We classify a period as a contraction period when the CFNAI-MA3 is less than -0.7 and an expansion period when the CFNAI-MA3 is greater than -0.7. Compared with the NBER data, the CFNAI data are published in real time and are thus free of hindsight bias. We follow the same steps as the above time-varying analysis and present our results in the Appendix. The results remain similar and no indicator predicts the market significantly under either contractions or expansions. Last but not least, we check whether our results are sensitive to the 2008 financial crisis period. We also remove the top and bottom 5% extreme observations from the distribution of each market indicator to control for outliers from the predictive variable direction. Our results remain robust; we do not present these results here to save space and they are available upon request.

7. Conclusion

We review the predictability of a wide range of 93 technical market indicators in predicting the S&P 500 returns. This adds to the literature with evidence from widely used but less examined market indicators, to more conclusively answer the question of whether technical analysis is useful or not. Overall, we do not find the market indicators generate profits that beat the buy and hold strategy. This result does not change if we consider the possibility of regime-switching predictability on business cycles or sentiment cycles. Moreover, our results remain robust if we use a GARCH (1,1) or robust regression method. With previous mixed findings on price-based technical indicators, it is still not easy to provide a simple positive or negative answer to the broad question of whether or not technical analysis is useful. Our results, at least, make the answer not inconclusive with evidence from the family of market indicators missing.

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[16] See http://www.chicagofed.org/webpages/publications/cfnai/.

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Table 1: Overview of Technical Market Indicators

Market Indicators	Sample Period	Notes and Formulars	More References
		Panel A: Market Sentiment Indicators	
1. Option Volumes:			
CBOE Calls Volume	1989 - 2011	This group of indicators uses data from closely-related option market instead of from stock market itself to predict returns. Due to financial institutions' larger presence in the derivatives market, these indicators are viewed as primarily a measure of institutional sentiment (Brown & Cliff, 2004). A call (put) option gives its holder the right, but not the obligation to buy (sell) the underlying security at a pre-specified price. Therefore, a rising call (put) volume indicates investors' fear about a potential price increase (decrease), and reflects their bullish (bearish) sentiment. We study volumes of put/call options listed on Chicago Board of Exchange (CBOE) and Standard & Poor's 100 index (OEX), the volumes are published daily in their dollar values. Different from using the volumes directly, the ratio of traded value of puts to calls is calculated from dividing the CBOE daily dollar puts volume to the corresponding calls volume. It compares the relative strength of bullish/bearish sentiment. The ratio is lower (higher) during bullish (bearish) sentiment periods. While previous studies mainly focus on the put/call ratio only, Brown and Cliff (2004) and Wang, Keswani and Taylor (2006) both document that the put/call ratio does not predict stock returns.	Dennis & Mayhew (2002); Feldman (2010); Kurov (2010); Simon & Wiggins (2001).
CBOE Puts Volume	1989 - 2011		
OEX Calls Volume	1989 - 2011		
OEX Puts Volume	1989 - 2011		
CBOE Ratio of Traded Value of Puts to Calls*	1986 - 2011		
2. Odd-lots Volumes:			
NYSE Odd Lot Purchases	1970 - 2011	The odd-lotters refer to small individual investors who usually trade at an amount less than the standard unit of trading. Their trading activities became popular contrarian indicators in the 1960s and the 1970s. When they turn bullish (bearish), odd lot purchases (sales) increase in contrast to actual market declines (increases). NYSE publishes its odd lot trading statistics daily since 1970. Studies including Lakonishok and Maberly (1990), Zweig (1973), and Gup (1973) confirm the accuracy of odd-lot trading indicators. In contrast, Brown and Cliff (2004) find that the odd-lot sales to purchases ratio does not predict market returns, Neal and Wheatly (1998) also find that the ratio does not predict the size premium while the other two sentiment proxies they use do.	Abraham & Ikenberry (1994); Branch (1976); Brown & Cliff (2005); Dyl & Maberly (1992); Gup (1973); Kaish (1969); Kewley & Stevenson (1967).
NYSE Odd Lot Sales	1970 - 2011		
NYSE Odd Lot Shorts	1970 - 2011		
3. Short Sales Volumes:			
NYSE Short Sales-Members	1940 - 2008	Investors short sell to hedge against a future market decline. Technical theory insists that informed investors (for example, NYSE members and specialists) always build their short selling decisions on reliable savvy analysis, such that their short selling activities indicate future market declines. However the exact opposite holds for uninformed investors (general public), the market moves upwards when they short sale. We study the weekly short sales information published by the NYSE. After 2008, The NYSE is no longer compiling this data on a weekly basis. Instead, they report daily data of non-specialist, specialist and total short sales. Since the definitions remain similar, and the weekly data before 2008 gives us a much longer sample period, we focus on data before 2008. Reilly and Whitford (1982) find the specialist short sales ratio (specialists' short sales/total short sales) has no merit in predicting stock returns from 1971 to 1979, while Fosback (1993) suggests the contrary that the ratio predicts the market during 1941 to 1975. However, Bowlin and Rozeff (1987) argue the above two studies can be misleading since they both use nonindependent observations, they correct this problem and find that the specialist short-interest ratio is inversely related to subsequent NYSE stock returns. Nevertheless, Brown and Cliff (2004) and Branch (1976) both study the specialists shorts and conclude they fail in predicting the stock returns. Branch (1976) also studies the members' short sales and finds no merit of it in predicting stock returns. Zweig (1973) on the other hand, finds that floor traders (NYSE members) are subject to the same overemotional pressures as individual investors so that they sell (buy) at bottoms (peaks) too. Lastly, the public short sales have drawn much less attention in the literature, although practical technical analysis textbooks like Summa (2004) and Kirkpatrick and Dahlquist (2010) view it as a contrarian indicator.	Glushkov (2006); Lamont & Stein (2004).
NYSE Short Sales-General Public	1940 - 2008		
NYSE Short Sales-Specialists	1940 - 2008		
NYSE Short Sales-Total	1940 - 2008		
4. Short Interests:			
NYSE Short Interest Ratio*	1931 - 2010	NYSE Short Interest Ratio = NYSE Short Interest Shares / Average Daily Trading Volume	Biggs (1966); Gup (1973); Hanna (1976); Lamont & Stein (2004); Mayor (1968); Shiller (2000); Smith (1968).
NYSE Short Interest Shares	1931 - 2010	NYSE Short Interest Shares represent the monthly number of shares investors have sold short, but have not yet covered or closed out for securities listed on the NYSE, NYSE Arca and NYSE Amex. Short interest shares predict the market by watching whether the majority of investors think the market is likely to fall. When the amount of short interest shares decreases (increases) that indicates the uninformed investors' bullish (bearish) sentiment, the market moves downward (upward). The NYSE Short Interest Ratio is a monthly technical indicator calculated by dividing the NYSE Short Interest Shares over the average daily trading volume over the past 30 days. This ratio indicates how quick it takes to cover the short position in days. A high ratio -that is, heavy short sell of uninformed investors- predicts a bullish market. Seneca (1967) and Kerrigan (1974) find a significant negative relation between the short-interest ratio and future S&P500 returns. However, Woolridge and Dickinson (1994) suggest a positive but insignificant relationship between short interest ratio changes and individual stock prices. Similarly, Brown and Cliff (2004) and Vu and Caster (1987) also find results that do not support the predictive role of the short interest ratio.	

5. AAII/II Sentiment Indices:			
AAII Bearish Index	1989 - 2010	Sentiment survey results provide a direct measure of investors' view on the future market. American Association of Individual Investors (AAII) selects a random sample of its members each week to conduct a sentiment survey, and the association gathers each participant's opinion of the market movements in the next six months; up, down, or the same. The percentages of these opinions over the total responses form the bearish, bullish and neutral sentiment indices. One vote per member is accepted for each weekly survey. AAII sentiment indices predict the market contrarily, as they represent the uninformed individual investors' views. Similar to AAII indices, Investors Intelligence indices represent survey results run over more than 130 investment newsletter writers asking for their predictions about the market; the survey answers are classified as bearish, bullish, or neutral. They are also contrarian indicators. Solt and Statman (1988) find no statistically significant relation between the sentiment of investment newsletter writers and subsequent stock returns. Using the same set of data, Clarke and Statman (1998) confirm the results, they also find past returns and market volatility affect sentiment. In contrast, Lee, Jiang and Indro (2001) find the magnitude of bullish (bearish) changes in sentiment leads to downward (upward) revisions on volatility and higher(lower) future excess returns by using II indices as sentiment proxies. Fisher and Statman (2000) study both the AAII and II indices. They find investor sentiment differ across groups, AAII indices predict the stock returns contrarily while II indices play no predictive role. De Bondt (1993) also finds AAII indices predict future returns.	Han (2008); Sanders, Irwin & Leuthold (1997); Wang, Keswani & Taylor (2005).
AAII Bullish Index	1989 - 2010		
AAII Neutral Index	1989 - 2010		
Investors Intelligence Bearish Percentage	1987 - 2010		
Investors Intelligence Bullish Percentage	1987 - 2010		
6. Confidence Index			
Barron's Confidence Index	1932 - 2010	$$\text{Barron's Confidence Index} = \frac{\text{average yield on 10 Barron's top grade corporate bonds}}{\text{average yield on 10 Barron's intermediate grade corporate bonds}}$$ Barron's-a leading American financial magazine-uses information from the bond market to calculate a sentiment index each week, and the index is referred to as the Barron's Confidence Index. As one of the most historically extensive sentiment indicators, it dates back to 1932. Barron's confidence index measures the discrepancy between the yields of high and low risk bonds that are largely held by institutional investors (Gaumnitz & Salabar, 1969). These informed investors are willing to accept a lower premium in yield for high risk bonds when they have more confidence with the economy, indicating a rising index value. And the exact opposite holds as well. Ring(1974) supports the view that the smart money will move from speculative to quality bonds during bearish market, and back during bullish market, and he documents that the index is a better forecaster of tops than bottoms. In contrast, Branch (1976) does not support Barron's Confidence Index as a stable market predictor in different sample frequencies, neither do Gaumnitz and Salabar (1969).	Malek (2000); Tabell & Tabell (1964).
7. Exchange Seat Prices:			
AMEX Seat Prices	1921 – 1993	Exchange seat prices capture professional investors' sentiment. It rises when market activities and stock prices rise, reflecting the prosperity of the brokerage industry, which provides professional services to the capital markets (Schwert, 1977). The AMEX seat prices are available monthly and the NYSE seat prices are available annually. They focus on long term forecasting, while most other sentiment indicators capture relatively short term variation. NYSE seat prices is the only annual sentiment indicator we examined, and it also has the longest sample period across all of our sentiment indicators-it starts in 1820 which means nearly 200 years of data. Keim and Madhavan (2000) document supportive evidence to the view that NYSE seat prices capture market sentiment, although Schwert (1977) finds no evidence that the seat returns predict market returns.	Chiang, Gay & Kolb (1987); You & Holder (2008).
NYSE Annual Seat Price	1820 - 2003		
8. Volatility Indices:			

CBOE S&P 500 Volatility Index	1986 – 2011	Volatility index, sometimes called the "fear index", measures the implied volatility for a group of near-term put and call options related	Feldman (2010); Fleming,
CBOE NASDAQ Volatility Index	2001 – 2011	to a specific market index; that is, it represents investors' expected risk of the market over the next 30 days. An increase (decrease) in	Ostdiek & Whaley (1996);
CBOE S&P 100 Volatility Index	1986 – 2011	the volatility index represents bearish (bullish) sentiment of the market. For example, the S&P 500 volatility index hits its historic high	Low (2004); Simon &
AMEX NYSE Arca NASDAQ 100 Volatility Index	2001 – 2011	of 89.53 on October 24, 2008, reflecting investors' serious concern during the financial crisis period. We view the volatility indices as primarily a measure of institutional sentiment because of institutions' large presence in the derivative markets (Brown & Cliff, 2004).	Wiggins (2001).
CBOE DJIA Volatility Index	2005 - 2011	We study 5 different volatility indices that track investors' sentiment for different stock indices. These include 4 CBOE published volatility indices for the S&P500, the NASDAQ, the DJIA and the S&P100, respectively, and the last volatility index is published by the AMEX to track the sentiment on the NASDAQ 100. Previous literature largely focuses on the S&P500 volatility index only. Whaley(1993) describes the construction of the S&P 500 volatility index in detail. The volatility index firstly measures the implied volatility using prices of only 8 S&P100 at-the-money put and call options, and later the input expanded to options based on the broader S&P 500 index (Investopedia). Whaley (2000) documents the S&P100 volatility index as a reliable "investors fear" gauge, higher levels of the index coincide with high degrees of market turmoil. Giot (2003) also shows a negative and statistically significant relationship between the returns of stock and implied volatility indices on the S&P100 and NASDAQ 100 indices. However Brown and Cliff (2004) document results that do not support the volatility index as a reliable predictor of future stock returns.	

9. Margin Account Balances:

NYSE Margin Debt	1918 – 2010	To put it simply, trading on margin means borrowing money from brokers to invest. We use market aggregate margin trading statistics	Fortune (2000); Glushkov
NYSE Free Credit Balances	1931 – 2010	to gauge investors' sentiment. Margin debt measures the total dollar amount of borrowing from brokers. Free credit balances represent	(2006); Kim & Ha (2010).
NYSE Free Credit Balances on Cash Accounts	1971 – 2010	the amount of money in investors' margin accounts that are free to withdraw. Furthermore, balance in a cash account reflects the money left after all purchases, while balance in a margin account includes cash, as well as proceeds from short sales, along with money	
NYSE Free Cash Balances in Margin Accounts	1971 - 2010	used to meet margin requirements, and excess margin and buying power (Investopedia). Investors trade on margin when they forecast a bullish market, therefore, the margin debt rises and the free credit balance decreases as investors fully invest all their available funds. In contrast, during bearish sentiment periods, the margin debt declines and the free credit balance increases, reflecting less active trading. We use monthly released margin account statistics that monitor the overall margin trading within the NYSE. There is controversy on if margin account statistics are contrarian indicators or not. Brown and Cliff (2004) view margin borrowing as a bullish indicator that move in the same direction as the market, and they find that the percentage changes of margin borrowing does not predict the market. Chen and Gu (2009) also document that margin debt borrowers' trading activities follow stock market trends rather than lead the market trends. In contrast, Hirose, Kato and Bremer (2008) report that information about margin buying helps predict future stock returns, especially for small-firm stocks at short horizons in Japanese stock market where margin trading is dominated by individual investors.	

10. Mutual Fund Balances:

USA Mutual Fund Equity Funds Total Net Assets	1984 – 2010	Investment fund statistics can reflect both informed and uninformed investors' sentiment, as it connects these two groups of market	Branch (1976); Edward &
USA Mutual Fund Equity Funds Cash Percentage	1968 – 2010	players (the uninformed fund participants and the sophisticated fund managers). Theoretically, individual investors invest when they are confident with the market growth. Hence, the money inflows (outflows) measured by new sales (redemptions) of investment funds	Zhang (1998); Fant (1999); Friesen & Sapp
USA Mutual Fund Equity Funds Cash Percentage	1984 – 2010	represent individual investors' bullish (bearish) sentiment. They contrarily predict the market. However, the investment fund cash percent and liquid assets represent the level of cash, or cash equivalents, that fund managers keep for redemptions after investments.	(2007); Randall, Suk & Tully (2003); Warther
USA Mutual Fund Equity Funds New Sales	1984 – 2010	Thus, a higher cash percent represents savvy investors' bearish sentiment, indicating a market drop. We study the monthly aggregate statistics of mutual funds that invest in the equity market only, and then examine those for mutual funds that invest in both equity and	(1995).
USA Mutual Fund Equity and Bond Fund Net Assets	1954 – 2010	bond markets. Using data from 1933 to 1993, Neal and Wheatley (1998) find evidence that fund net redemptions predict the size premiums. However Brown and Cliff (2004) find that the net redemptions do not predict market returns, neither the cash percentage	
USA Mutual Fund Equity and Bond Fund Net Assets	1954 – 2010	by using monthly data from 1965 to 1998. Branch (1976) also examines the cash percentages, and the author documents that some	
USA Mutual Fund Equity and Bond Fund Net Assets	1954 – 2010	mutual funds reduce cash position before price increases while other do such during and after price increase. So that mutual funds influence stock prices but they in turn are also influenced by stock price changes. Some studies examine the predictive ability of fund	
USA Mutual Fund Equity and Bond Fund Redemptions	1954 – 2010	flows between different funds, like Frazzini and Lamont (2008), Ben-Rephael, Kandel and Wohl (2012) and Hendricks, Patel and Zeckhauser(1993). We, instead, focus on the aggregate mutual fund trading statistics.	
USA Mutual Fund Equity and Bond Fund Redemptions	1954 – 2010		

11. Market Aggregate Number of Dividend News:

Moody's Monthly Decreased Dividends	1956 – 2011	Researchers have extensively tested the fundamental information (for example, earnings information) contained in dividend	Deshmukh, Goel & Howe
Moody's Monthly Extra Dividends Declared	1956 – 2011	announcements at individual stock level (for example, Nissim & Ziv, 2001; Benartzi, Michaely & Thaler, 1997), as well as the	(2013); Michaely, Thaler
Moody's Monthly Increased Dividends Declared	1956 – 2011	sentiment information contained at this level. Baker and Wurgler (2006), for example, argue that non-dividend paying stocks are likely & Womack (1995). to be disproportionately sensitive to broad waves of investor sentiment. At the aggregate market level, previous studies like Denis and	
Moody's Monthly Omitted Dividends	1956 – 2011	Osobov (2008) use the aggregate dollar amount of dividend to predict future returns. We, instead, look at if the aggregate number of	
Moody's Monthly Resumed Dividends	1956 - 2011	dividend announcements predicts the aggregate market returns. Since dividend policies largely represent managers' forecast on future returns (Baker & Wurgler, 2004), we view them as institutional sentiment gauges. Positive dividend news includes increased, resumed, or extra, dividends, while negative dividend news means decreased, or omitted, dividends. The simple rationale states that if more stocks declare positive news, a bullish market is more likely and vice versa. These data are reported in S&P's and Moody's Annual Dividend Records, and to our best knowledge, they have not been studied in previous literature.	

Panel B: Market Strength Indicators

1. Volume Indicators

NYSE Total Volume	1928 - 2011	NYSE Volume Turnover = Total Volume / Average Number of Shares Outstanding NYSE Value Turnover = Total Volume in $USD / Total Market Capitalization	Baker & Wurgler (2007);
Total Volume Turnovers:		Technical analysis widely uses volume information to capture market liquidity and market price movements. Baker and Stein	
NYSE Share Volume Turnover*	1925 - 2010	(2004), for example, note that irrational investors are more likely to trade, which will add liquidity to the market, when they are	
NYSE Annual Share Value Turnover*	1934 - 2010	optimistic and betting on rising stocks rather than when they are pessimistic and betting on falling stocks. Also, Lo, Mamaysky and Wang (2000) document that high volume accompanying a positive price trend suggests that there may be more information content in the trend, e.g., broader participation among investors. Moreover, Blume, Easley and O'hara (1994) provide evidence that volume may provide insights regarding the quality of trader's information that cannot be obtained from price statistics. Scheinkman and Xiong (2003) examine the volume turnover, and find volume reveals underlying differences of opinion, which are in turn related to valuation levels when short selling is difficult. We study the raw NYSE total volume as well as two transformed volume turnovers. The turnovers adjust the total volume to the average number of shares outstanding in the same period (note that this number may not remain constant on a daily basis) to reflect the change on investors' trading activities more precisely by eliminating the possibility that increased (decreased) volumes result from more(less) shares (in terms of volume) becoming available for trade, but not from investors' real expectations on the market.	

Short-term Trading Indices:

NYSE Short-term Trading Index*	1965-2011	Short Term Trading Index = (No. of Advancing Issues / No. of Declining Issues) /(Up Volume / Down Volume)	
NASDAQ Short-term Trading Index*	1972-2011	Short-term trading index studies total volumes of uptrending and downtrending stocks in a market separately. It is sometimes referred to as the Arms Index or TRIN as first introduced by Richard W. Arms, Jr. in 1967. The short-term trading index incorporates two sorts of information; the market breadth information and the volume information. The formula shows that a high short-term trading index results from current lifts in the number of advancing issues alongside drops of the up volume-the current market follows a weak uptrend with diverged volume movements-and this signals a future downward market. Conversely, a low short-term index occurs when the number of declining issues increases, with no associated downward market volume, so that the energy driving the downward movement is weak and a market reversal will follow. Brown and Cliff (2004) find no merit of the index in predicting future stock returns; Wang, Keswani and Taylor (2005) find similar results. Whereas Simon and Wiggins (2001) find opposite results in the futures market where the index successfully gauges investors' bearish sentiment and predicts future returns.	

2. Daily Total Market Advances & Declines:

NYSE Advances	1928 - 2011	Net Advances$_t$ = Advances$_t$ - Declines$_t$	Feldman (2010)

NYSE Declines	1928 - 2011	Advance $-$ Decline Line (AD Line)$_t$ = Net Advances$_t$ + AD Line$_{t-1}$ (The first value of AD Line simply takes the value of the same period net advances)
NYSE Net Advances*	1928 - 2011	
NYSE AD Line*	1928 - 2011	
NYSE Percentage Net Advances*	1928 - 2011	Percentage Net Advances$_t = \dfrac{\text{Net Advances}_t}{\text{Total Number of Stocks}_t}$

NASDAQ Advances	1972 - 2011	This group of indicators uses the total advances/declines information to measure the strength of the underlying trend. They are often called market breadth indicators. Total advances/declines represent the number of stocks that experiences stock price advances/declines during a specific period. If more stocks experience price advances, a bullish market is more likely, and vice versa. Previous literature studies two forms of the breadth information mainly. Zakon and Pennypacker (1968) study the advance-decline line and they find it is worthless as a leading indicator of the stock market. Brown and Cliff (2004) study the advance/decline ratio and find it worthless in predicting the return either.
NASDAQ Declines	1972 - 2011	
NASDAQ Net Advances*	1972 - 2011	
NASDAQ AD Line*	1972 - 2011	
NASDAQ Percentage Net Advances*	1972 - 2011	
		We study the raw advances/declines information of three major stock exchanges, the NYSE, the NASDAQ, and the Alternext. For the NYSE we also study these indicators in both daily and weekly frequencies to investigate whether their forecast ability differs over different horizons. We also study three popular transformations of the above raw information- the net advances, the advance-decline line, and the percentage net advances. Each of the transformed indicators has unique features. The net advances use the spread between advances and declines to identify the strength of the underlying trend, so that a strong trend not only causes an increased number of advances, but this number should also exceed the number of declines. The advance-decline line takes the historical advance and decline information into account. If an underlying stock market rise is fueled only by a few stocks, and the majority of stocks either decline, or are unchanged, the rise will not last for very long.
Alternext Advances	1959 - 2011	
Alternext Declines	1959 - 2011	
Alternext Net Advances*	1959 - 2011	
Alternext AD Line*	1959 - 2011	
Alternext Percentage Net Advances*	1959 - 2011	
Weekly Total Market Advances & Declines:		The percentage net advances adjust the net advances for the total number of stocks in the market. More stocks being available for trade gives larger potential for the differences between advances and declines (the breadth) to expand. With the development of financial markets, not surprisingly we now have a lot more issues trading within any particular stock exchange. For instance, during the 40 years from 1960 to 2000, the NYSE Issues Traded doubled from 1,528 to 3,083. Thus, market breadth indicators may become more accurate when adjusted for changes in total stock issues within the market, so that the breadth information does not purely result from the market itself, but the investors' real views.
NYSE Weekly Advances	1940 - 2010	
NYSE Weekly Declines	1940 - 2010	
NYSE Net Advances*	1940 - 2010	
NYSE AD Line*	1940 - 2010	

3. Daily Total Market New Highs & New Lows:

NYSE New Highs	1928 - 2011	Net New Highs$_t$ = New Highs$_t$ - New Lows$_t$
NYSE New Lows	1928 - 2011	
NYSE Net New Highs*	1932 - 2011	Cumulative New Highs$_t$ = Net New Highs$_t$ + Cumulative New Highs$_{t-1}$ (The first value of cumulative new highs simply takes the value of the same period net new highs)
NYSE Cumulative Highs*	1932 - 2011	
NYSE Percentage Net New Highs*	1932 - 2011	Percentage Net New Highs$_t = \dfrac{\text{Net New Highs}_t}{\text{Total Number of Stocks}_t}$
NASDAQ New Highs	1974 - 2011	This group of market strength indicators generally follows the same rationale to the advances/declines indicators. New highs (lows) measure the number of advancing (declining) stocks reaching their 52-week periodic highs (lows). If there are more issues reaching their periodic highs than issues reaching their periodic lows, it means that a future uptrend is more likely, and vice versa. Again, similarly to the advances/declines indicators, we also include three transformed indicators to measure the market strength-the underlying uptrend improves when the values of the net new highs, the cumulative highs, and the percentage net new highs increase. Brown and Cliff (2004) find that the high/low ratio does not predict future stock returns.
NASDAQ New Lows	1974 - 2011	
NASDAQ Net New Highs*	1974 - 2011	
NASDAQ Cumulative Highs*	1974 - 2011	
NASDAQ Percentage Net New Highs*	1974 - 2011	
Alternext New Highs	1962 - 2011	

Alternext New Lows	1962 - 2011
Alternext Net New Highs*	1962 - 2011
Alternext Cumulative Highs*	1962 - 2011
Alternext Percentage Net New Highs*	1963 - 2011
Weekly Total Market New Highs & New Lows:	
NYSE Weekly New Highs	1937 - 2010
NYSE Weekly New Lows	1937 - 2010
NYSE Net New Highs*	1937 - 2010
NYSE Cumulative Highs*	1937 - 2010

* Transformed Technical Market Indicators

Market Indicators	Full Sample			Sub-sample 1			Sub-sample 2		
	Period	β (*10⁻³)	t-stats	Period 1	β (*10⁻³)	t-stats	Period 2	β (*10⁻³)	t-stats
Panel A: Market Sentiment Indicators									
Option Volumes:									
CBOE Calls Volume	1989 - 2011	-0.41	-1.17	1989-1999	-0.85	-1.55	2000-2011	-0.23	-0.55
CBOE Puts Volume	1989 - 2011	-0.01	-0.12	1989-1999	-0.02	-0.52	2000-2011	0.07	0.20
OEX Calls Volume	1989 - 2011	0.00	-1.26	1989-1999	0.00	-1.51	2000-2011	0.00	-1.29
OEX Puts Volume	1989 - 2011	0.00	0.25	1989-1999	0.00	0.16	2000-2011	0.00	0.34
CBOE Ratio of Traded Value of Puts to Calls	1986 - 2011	0.63	0.77	1986-1998	-0.07	-0.04	1999-2011	1.11	1.36
Odd-lots Volumes:									
NYSE Odd Lot Purchases	1970 - 2011	0.00	**-4.90**	1970-1990	1.07	1.38	1991-2011	0.00	**-4.05**
NYSE Odd Lot Sales	1970 - 2011	0.11	0.27	1970-1990	0.78	1.25	1991-2011	-0.05	-0.10
NYSE Odd Lot Shorts	1970 - 2011	0.00	1.14	1970-1990	-0.04	-0.48	1991-2011	0.00	1.18
Short Sales Volumes:									
NYSE Short Sales-Members	1940 - 2008	6.68	**7.15**	1940-1974	6.76	**4.85**	1975-2008	6.64	**5.26**
NYSE Short Sales-General Public	1940 - 2008	2.63	**2.58**	1940-1974	0.93	0.97	1975-2008	7.18	**3.06**
NYSE Short Sales-Specialists	1940 - 2008	5.90	**5.82**	1940-1974	6.99	**4.93**	1975-2008	5.30	**3.77**
NYSE Short Sales-Total	1940 - 2008	6.80	**5.59**	1940-1974	5.74	**4.04**	1975-2008	7.88	**4.27**
Short Interests:									
NYSE Short Interest Ratio	1931 - 2010	-23.19	**-2.22**	1931-1970	-23.16	**-2.22**	1971-2010	-23.19	**-2.22**
NYSE Short Interest Shares	1931 - 2010	-2.93	-0.12	1931-1970	-2.92	-0.12	1971-2010	-2.93	-0.12
AAII/II Sentiment Indices:									
AAII Bearish Index	1989 - 2010	0.02	0.01	1989-1999	-1.02	-0.38	2000-2010	0.77	0.31
AAII Bullish Index	1989 - 2010	6.39	**2.26**	1989-1999	5.17	1.55	2000-2010	7.50	**1.66**
AAII Neutral Index	1989 - 2010	-8.70	**-2.83**	1989-1999	-3.05	-0.92	2000-2010	-10.75	**-2.65**
Investors Intelligence Bearish Percentage	1987 - 2010	-1.04	-0.11	1987-1998	-5.17	-0.44	1999-2010	1.19	0.09
Investors Intelligence Bullish Percentage	1987 - 2010	-0.36	-0.03	1987-1998	8.19	0.74	1999-2010	-9.74	-0.50
Confidence Index:									
Barron's Confidence Index	1932 - 2010	36.44	0.78	1932-1970	43.62	0.73	1971-2010	25.05	0.33
Exchange Seat Prices:									
AMEX Seat Prices	1921 - 1993	3.38	0.48	1921-1958	12.74	0.82	1959-1993	-3.32	-0.76
Volatility Indices:									
CBOE S&P 500 Volatility Index	1986 - 2011	7.01	**1.74**	1986-1998	3.54	0.50	1999-2011	13.10	**3.04**
CBOE NASDAQ Volatility Index	2001 - 2011	13.28	**2.10**	2001-2005	5.21	0.74	2006-2011	17.22	**1.99**
CBOE S&P 100 Volatility Index	1986 - 2011	7.33	**1.96**	1986-1998	4.09	0.60	1999-2011	12.16	**3.14**
AMEX NYSE Arca NASDAQ 100 Volatility Index	2001 - 2011	4.00	0.61	2001-2005	0.11	0.02	2006-2011	5.61	0.62
CBOE DJIA Volatility Index	2005 - 2011	13.39	**1.90**	2005-2007	11.24	**2.52**	2008-2011	15.75	1.13
Margin Account Balances:									
NYSE Margin Debt	1918 - 2010	-0.72	-0.02	1918-1963	2.05	0.05	1964-2010	-12.29	-0.24
NYSE Free Credit Balances	1931 - 2010	80.49	**2.11**	1931-1970	120.88	**2.07**	1971-2010	48.63	0.95
NYSE Free Credit Balances on Cash Accounts	1971 - 2010	22.34	0.63	1971-1990	-5.56	-0.11	1991-2010	57.21	1.06
NYSE Free Cash Balances in Margin Accounts	1971 - 2010	1.66	0.04	1971-1990	-30.90	-1.00	1991-2010	88.08	1.12
Mutual Fund Balances:									
USA Mutual Fund Equity Funds Total Net Assets	1984 - 2010	92.74	1.44	1984-1996	18.63	0.19	1997-2010	129.87	1.41
USA Mutual Fund Equity Funds Cash Percentage	1968 - 2010	-20.76	-0.69	1968-1988	-1.97	-0.06	1989-2010	-59.02	-0.99
USA Mutual Fund Equity Funds Redemptions	1984 - 2010	-4.74	**-2.89**	1984-1996	-5.73	**-5.22**	1997-2010	6.10	0.25
USA Mutual Fund Equity Funds New Sales	1984 - 2010	6.59	0.54	1984-1996	5.99	0.44	1997-2010	4.21	0.17
USA Mutual Fund Equity and Bond Fund Net Assets	1954 - 2010	10.50	**6.14**	1954-1981	91.76	1.32	1982-2010	9.76	**8.05**
USA Mutual Fund Equity and Bond Fund Cash Percent	1954 - 2010	-17.87	-0.78	1954-1981	-2.94	-0.10	1982-2010	-34.84	-0.91
USA Mutual Fund Equity and Bond Fund Liquid Assets	1954 - 2010	13.26	0.51	1954-1981	26.58	0.86	1982-2010	-5.70	-0.13
USA Mutual Fund Equity and Bond Fund Redemptions	1954 - 2010	-10.50	-0.91	1954-1981	-13.13	-0.99	1982-2010	-8.53	-0.46
USA Mutual Fund Equity and Bond Fund New Sales	1954 - 2010	7.89	0.85	1954-1981	7.28	0.68	1982-2010	8.73	0.53
Number of Dividend News:									
Moody's Monthly Decreased Dividends	1956 - 2011	40.61	1.57	1956-1984	90.97	**3.22**	1985-2011	-35.03	-0.73
Moody's Monthly Extra Dividends Declared	1956 - 2011	-63.32	-1.38	1956-1984	-161.23	**-1.91**	1985-2011	-41.05	-0.80
Moody's Monthly Increased Dividends Declared	1956 - 2011	-97.86	**-1.97**	1956-1984	-125.17	**-2.17**	1985-2011	-57.17	-0.66
Moody's Monthly Omitted Dividends	1956 - 2011	7.60	0.24	1956-1984	35.53	0.99	1985-2011	-40.49	-0.72
Moody's Monthly Resumed Dividends	1956 - 2011	15.28	0.81	1956-1984	73.86	**2.09**	1985-2011	-1.88	-0.07
S&P Monthly Dividend Decreases Declared	1955 - 2010	0.43	0.45	1955-1982	1.37	**1.70**	1983-2010	-1.09	-0.53
S&P Monthly Extra Dividends Declared	1955 - 2010	4.48	**2.17**	1955-1982	5.27	**2.23**	1983-2010	3.60	0.99
S&P Monthly Increased Dividends Declared	1955 - 2010	2.11	0.57	1955-1982	8.39	1.39	1983-2010	-0.79	-0.20
S&P Monthly Omitted Dividends Declared	1955 - 2010	0.88	0.68	1955-1982	0.22	0.10	1983-2010	1.25	0.91
S&P Monthly Resumed Dividends Declared	1955 - 2010	2.85	**1.89**	1955-1982	3.29	**2.18**	1983-2010	2.39	1.02

Table 2 Continued

Market Indicators	Full Sample			Sub-sample 1			Sub-sample 2		
	Period	β (*10⁻³)	t-stats	Period 1	β (*10⁻³)	t-stats	Period 2	β (*10⁻³)	t-stats

Market Indicators	Period	β $(\times 10^{-3})$	t-stats	Period 1	β $(\times 10^{-3})$	t-stats	Period 2	β $(\times 10^{-3})$	t-stats
Panel B: Market Strength Indicators									
Total Volume:									
NYSE Total Volume	1928 - 2011	0.09	0.83	1928-1969	0.07	0.71	1970-2011	0.65	**3.48**
Total Volume Turnovers:									
NYSE Share Volume Turnover	1925 - 2010	5.39	0.13	1925-1967	84.20	**1.72**	1968-2010	-70.03	-1.27
NYSE Annual Share Value Turnover	1934 - 2010	28.23	0.64	1934-1971	40.38	0.85	1972-2010	-43.56	-0.37
Short-term Trading Indices:									
NYSE Short-term Trading Index	1965-2011	-0.49	**-2.15**	1965-1987	-1.12	**-2.94**	1988-2011	0.07	0.24
NASDAQ Short-term Trading Index	1972-2011	-0.01	-1.16	1972-1991	-0.18	-1.18	1992-2011	-0.01	-1.15
Daily Total Market Advances & Declines:									
NYSE Advances	1928 - 2011	0.51	**2.98**	1928-1969	0.43	**2.12**	1970-2011	0.77	**2.44**
NYSE Declines	1928 - 2011	-0.72	**-3.65**	1928-1969	-0.53	**-2.36**	1970-2011	-1.18	**-3.19**
NYSE Net Advances	1928 - 2011	0.00	0.49	1928-1969	0.00	-0.33	1970-2011	0.00	0.99
NYSE AD Line	1928 - 2011	0.00	-0.35	1928-1969	0.00	-0.41	1970-2011	0.00	-0.12
NYSE Percentage Net Advances	1940 - 2011	0.00	0.36	1928-1969	0.00	-0.51	1970-2011	0.00	0.99
NASDAQ Advances	1972 - 2011	0.23	1.48	1972-1991	0.35	**2.34**	1992-2011	0.00	-0.01
NASDAQ Declines	1972 - 2011	-0.10	**-3.41**	1972-1991	-0.09	**-4.65**	1992-2011	-0.76	-1.09
NASDAQ Net Advances	1972 - 2011	0.00	-0.50	1972-1991	0.01	0.55	1992-2011	0.00	-0.97
NASDAQ AD Line	1972 - 2011	0.00	-0.22	1972-1991	0.00	-0.53	1992-2011	0.00	0.16
NASDAQ Percentage Net Advances	1972 - 2011	0.00	-0.51	1972-1991	0.01	0.55	1992-2011	0.00	-0.97
Alternext Advances	1959 - 2011	1.18	**4.02**	1959-1984	1.53	**5.38**	1985-2011	0.47	0.65
Alternext Declines	1959 - 2011	-1.04	**-2.46**	1959-1984	-1.06	**-1.85**	1985-2011	-0.98	**-2.03**
Alternext Net Advances	1959 - 2011	0.01	0.80	1959-1984	0.00	0.74	1985-2011	0.01	0.50
Alternext AD Line	1959 - 2011	0.00	-0.03	1959-1984	0.00	-0.14	1985-2011	0.00	0.07
Alternext Percentage Net Advances	1959 - 2011	0.01	0.60						
				1963-1986	0.00	-0.31	1987-2011	0.01	0.87
Weekly Total Market Advances & Declines:									
NYSE Weekly Advances	1940 - 2010	-1.49	**-3.33**	1940-1974	-1.14	-1.50	1975-2010	-1.69	**-3.38**
NYSE Weekly Declines	1940 - 2010	0.65	1.21	1940-1974	-0.28	-0.39	1975-2010	1.75	**2.05**
NYSE Net Advances	1940 - 2010	0.00	0.22	1940-1974	0.00	-0.17	1975-2010	0.00	0.35
NYSE AD Line	1940 - 2010	-1.20	-0.52	1940-1974	-1.16	-0.49	1975-2010	-47.20	-0.85
Daily Total Market New Highs & New Lows:									
NYSE New Highs	1928 - 2011	0.14	**3.61**	1932-1971	0.71	**4.86**	1972-2011	0.10	**9.80**
NYSE New Lows	1932 - 2011	-0.13	-1.50	1932-1971	-0.12	-1.23	1972-2011	-0.15	-0.93
NYSE Net New Highs	1932 - 2011	0.04	**1.77**	1932-1971	0.05	1.44	1972-2011	0.03	1.37
NYSE Cumulative Highs	1932 - 2011	-0.01	-0.34	1932-1971	0.00	-0.09	1972-2011	-0.01	-0.30
NYSE Percentage Net New Highs	1932 - 2011	0.04	1.60	1932-1971	0.05	1.04	1972-2011	0.03	1.37
NASDAQ New Highs	1974 - 2011	-0.16	-0.43	1974-1992	0.63	**1.67**	1993-2011	-0.71	-1.20
NASDAQ New Lows	1974 - 2011	0.25	1.26	1974-1992	-0.24	-1.01	1993-2011	0.67	**2.23**
NASDAQ Net New Highs	1974 - 2011	-0.01	-0.21	1974-1992	-0.03	-0.54	1993-2011	0.01	0.21
NASDAQ Cumulative Highs	1974 - 2011	0.03	0.98	1974-1992	0.01	0.21	1993-2011	0.04	1.20
NASDAQ Percentage Net New Highs	1974 - 2011	-0.01	-0.22	1974-1992	-0.03	-0.55	1993-2011	0.01	0.19
Alternext New Highs	1962 - 2011	0.20	**2.23**	1962-1986	0.14	**2.40**	1987-2011	0.40	**1.69**
Alternext New Lows	1962 - 2011	-0.06	-0.89	1962-1986	-0.27	**-2.31**	1987-2011	0.01	0.09
Alternext Net New Highs	1962 - 2011	0.00	0.11	1962-1986	-0.05	-0.98	1987-2011	0.04	0.79
Alternext Cumulative Highs	1962 - 2011	-0.03	-0.88	1962-1986	-0.03	-0.67	1987-2011	-0.04	-0.70
Alternext Percentage Net New Highs	1962 - 2011	0.01	0.30	1963-1986	-0.03	-0.54	1987-2011	0.04	0.71
Weekly Total Maket New Highs & New Lows:									
NYSE Weekly New Highs	1937 - 2010	0.11	0.26	1937-1973	0.17	0.32	1974-2010	0.05	0.07
NYSE Weekly New Lows	1937 - 2010	-0.30	-0.74	1937-1973	-0.33	-0.76	1974-2010	-0.09	-0.08
NYSE Net New Highs	1937 - 2010	0.11	**1.88**	1937-1973	0.12	1.78	1974-2010	0.10	1.32
NYSE Cumulative Highs	1937 - 2010	-0.01	**-3.62**	1937-1973	0.54	**2.19**	1974-2010	-0.01	**-3.55**

This table reports the OLS results of the regression model $R_t = \alpha_t + \beta I_{t-1} + \varepsilon_t$ for full samples and two equal length sub-samples. R_t represents S&P 500 periodic returns calculated as log differences of the S&P 500 Index values, I_{t-1} represents periodic percentage changes of market indicators. We obtain all data from the Global Financial Data. The *t*-statistics reported are White standard errors corrected and marked in bold if significant at 10% significance level. Panel A and Panel B report results for market sentiment and market strength indicators respectively.

Table 3: OLS Economic Significance Test

Market Indicators	Frequency	N	Buy & Hold Strategy			Technical Strategy							
			Mean $(*10^{-3})$	Std. Dev. $(*10^{-2})$	Sharpe Ratio $(*10^{-2})$	Mean $(*10^{-3})$	Std. Dev. $(*10^{-2})$	Sharpe Ratio $(*10^{-2})$	t-stats	α $(*10^{-3})$	t-stats	β	t-stats
Panel A: Market Sentiment Indicators													
NYSE Short Sales-Members	Weekly	1743	1.28	2.27	0.84	0.93	1.70	-0.97	1.06	-0.27	-0.97	0.57	**16.34**
NYSE Short Sales-Specialists	Weekly	1742	1.28	2.27	0.84	1.03	1.62	-0.42	0.69	-0.16	-0.57	0.51	**13.69**
NYSE Short Sales-Total	Weekly	1742	1.28	2.27	0.84	1.13	1.69	0.18	0.38	-0.06	-0.23	0.56	**15.76**
Panel B: Market Strength Indicators													
NYSE Advances	Daily	11024	0.24	1.06	0.85	-0.08	0.69	-3.35	**5.15**	-0.28	**-5.51**	0.40	**17.23**
NYSE Declines	Daily	11024	0.24	1.06	0.85	-0.05	0.84	-2.36	**5.13**	-0.26	**-5.25**	0.62	**20.14**
Alternext Declines	Daily	6608	0.30	1.18	1.57	-0.07	0.99	-1.87	**4.79**	-0.32	**-4.45**	0.69	**15.48**
NYSE New Highs	Daily	10307	0.26	1.07	1.07	0.15	0.98	-0.02	**2.52**	-0.10	**-2.38**	0.82	**62.32**
Alternext New Highs	Daily	6109	0.26	1.20	1.24	0.14	1.15	0.26	**2.78**	-0.11	**-2.67**	0.93	**62.96**

This table compares risk and return characteristics of buy and hold strategies with those of market-indicator-based technical strategies that show significant predictability in both sub-samples under the OLS regressions. We report means, standard deviations and Sharpe ratios for buy and hold strategies and technical strategies, respectively, then we report *t*-statistics testing the null hypothesis that the Sharpe ratios of the two strategies are equal. We then report Jensen's α estimation results for technical strategies in the last four columns. α values indicate excess returns generated by the technical strategies at given risk level β over market returns. We also present associated *t*-statistics testing their differences from zero for α and β values. All *t*-statistics are White standard errors corrected and marked in bold if significant at 10% significance level.

Market Indicators	Full Sample β (*10⁻³)	t-stats	Expansions β1 (*10⁻³)	t-stats	Contractions β2 (*10⁻³)	t-stats	Chi-statistic
Panel A: Market Sentiment Indicators							
Option Volumes:							
CBOE Calls Volume	0.00	1.15	-0.31	-0.88	-3.22	-0.90	0.65
CBOE Puts Volume	-0.01	-0.12	0.01	0.18	-0.77	-0.25	0.06
OEX Calls Volume	0.00	-1.26	0.00	-1.17	-1.72	-1.31	1.73
OEX Puts Volume	0.00	0.25	0.00	0.27	1.55	1.18	1.40
CBOE Ratio of Traded Value of Puts to Calls	0.63	0.77	0.72	0.78	4.19	1.23	0.97
Odd-lots Volumes:							
NYSE Odd Lot Purchases	0.00	**-4.90**	0.00	**-5.89**	-0.23	-0.16	0.20
NYSE Odd Lot Sales	0.11	0.27	0.30	0.59	-0.02	-0.02	0.06
NYSE Odd Lot Shorts	0.00	1.14	0.00	1.11	0.01	1.53	1.26
Short Sales Volumes:							
NYSE Short Sales-Members	6.68	**7.15**	5.20	**4.63**	9.65	**4.81**	**3.74**
NYSE Short Sales-General Public	2.63	**2.58**	1.53	**1.67**	7.84	**2.64**	**4.13**
NYSE Short Sales-Specialists	5.90	**5.82**	4.92	**3.46**	7.41	**4.67**	1.36
NYSE Short Sales-Total	6.80	**5.59**	5.13	**4.22**	11.57	**4.94**	**5.94**
Short Interests:							
NYSE Short Interest Ratio	-23.19	**-2.22**	-20.54	**-2.01**	-45.56	-1.48	0.60
NYSE Short Interest Shares	-2.93	-0.12	-3.87	-0.16	-2.32	-0.04	0.00
AAII/II Sentiment Indices:							
AAII Bearish Index	0.02	0.01	1.19	0.65	-3.43	-0.45	0.35
AAII Bullish Index	6.39	**2.26**	2.09	0.76	19.05	**2.22**	**3.53**
AAII Neutral Index	-8.70	**-2.83**	-5.89	**-1.85**	-24.61	**-2.79**	**4.03**
Investors Intelligence Bearish Percentage	-1.04	-0.11	7.12	0.75	-56.87	-1.27	1.96
Investors Intelligence Bullish Percentage	-0.36	-0.03	-8.97	-0.92	28.17	0.74	0.89
Confidence Index:							
Barron's Confidence Index	36.44	0.78	-54.55	-1.13	182.58	**1.82**	**4.54**
Exchange Seat Prices:							
AMEX Seat Prices	3.38	0.48	3.95	0.69	-0.25	-0.01	0.01
NYSE Annual Seat Price	-16.55	-0.73	-31.32	-0.91	-33.93	-0.37	0.00
Volatility Indices:							
CBOE S&P 500 Volatility Index	7.01	**1.74**	5.56	1.13	176.30	1.47	0.86
CBOE NASDAQ Volatility Index	13.28	**2.10**	17.01	**3.21**	15.40	0.53	0.10
CBOE S&P 100 Volatility Index	7.33	**1.96**	6.19	1.36	12.57	1.11	0.27
AMEX NYSE Arca NASDAQ 100 Volatility Index	4.00	0.61	10.92	**2.67**	-5.71	-0.38	1.11
CBOE DJIA Volatility Index	13.39	**1.90**	9.81	**2.24**	22.21	0.97	0.28
Margin Account Balances:							
NYSE Margin Debt	-0.72	-0.02	-17.78	-0.42	35.82	0.41	0.30
NYSE Free Credit Balances	80.49	**2.11**	56.75	1.62	176.92	1.45	0.90
NYSE Free Credit Balances on Cash Accounts	22.34	0.63	32.78	0.96	-64.18	-0.42	0.39
NYSE Free Cash Balances in Margin Accounts	1.66	0.04	-22.78	-0.70	69.74	0.81	1.02
Mutual Fund Balances:							
USA Mutual Fund Equity Funds Total Net Assets	92.74	1.44	-6.10	-0.08	376.29	**3.05**	**7.25**
USA Mutual Fund Equity Funds Cash Percentage	-20.76	-0.69	25.89	0.88	-288.05	**-2.68**	**7.91**
USA Mutual Fund Equity Funds Redemptions	-4.74	**-2.89**	-4.53	**-3.08**	-2.93	-0.05	0.00
USA Mutual Fund Equity Funds New Sales	6.59	0.54	1.20	0.10	56.28	1.05	1.00
USA Mutual Fund Equity and Bond Fund Net Assets	10.50	**6.14**	6.24	1.26	269.91	**2.33**	**2.80**
USA Mutual Fund Equity and Bond Fund Cash Percent	-17.87	-0.78	10.37	0.47	-240.46	**-2.57**	**6.80**
USA Mutual Fund Equity and Bond Fund Liquid Assets	13.26	0.51	26.46	1.03	-72.82	-0.73	0.94
USA Mutual Fund Equity and Bond Fund Redemptions	-10.50	-0.91	-8.75	-0.76	-15.27	-0.37	0.02
USA Mutual Fund Equity and Bond Fund New Sales	7.89	0.85	3.31	0.37	27.69	0.97	0.66
Number of Dividend News:							
Moody's Monthly Decreased Dividends	40.61	1.57	66.23	**2.80**	4.40	0.07	0.79
Moody's Monthly Extra Dividends Declared	-63.32	-1.38	-30.23	-0.68	-413.47	**-2.01**	**3.31**
Moody's Monthly Increased Dividends Declared	-97.86	**-1.97**	-93.18	**-1.85**	-75.62	-0.47	0.01
Moody's Monthly Omitted Dividends	7.60	0.24	39.20	1.26	-98.80	-1.14	2.23
Moody's Monthly Resumed Dividends	15.28	0.81	32.23	**1.93**	10.13	0.13	0.08
S&P Monthly Dividend Decreases Declared	0.43	0.45	0.60	0.62	3.34	0.60	0.23
S&P Monthly Extra Dividends Declared	4.48	**2.17**	7.31	**3.79**	-12.79	-1.64	**6.26**
S&P Monthly Increased Dividends Declared	2.11	0.57	7.93	1.43	-2.87	-0.75	2.63
S&P Monthly Omitted Dividends Declared	0.88	0.68	1.21	0.89	-2.23	-0.46	0.46
S&P Monthly Resumed Dividends Declared	2.85	**1.89**	4.72	**3.75**	-3.18	-0.67	2.66

Table 4 Continued

Market Indicators	Full Sample β (*10⁻³)	t-stats	Expansions β1 (*10⁻³)	t-stats	Contractions β2 (*10⁻³)	t-stats	Chi-statistic
Panel B: Market Strength Indicators							
Total Volume:							
NYSE Total Volume	0.09	0.83	0.05	0.67	1.59	**1.84**	**3.14**
Total Volume Turnovers:							
NYSE Share Volume Turnover	5.39	0.13	34.14	1.08	16.04	0.14	0.02
NYSE Annual Share Value Turnover	28.23	0.64	35.07	0.84	18.58	0.05	0.00
Short-term Trading Indices:							
NYSE Short-term Trading Index	-0.49	**-2.15**	-0.33	-1.25	-1.39	**-2.12**	2.30
NASDAQ Short-term Trading Index	-0.01	-1.16	0.00	0.58	-0.02	-0.93	1.02
Daily Total Market Advances & Declines:							
NYSE Advances	0.51	**2.98**	0.84	**5.15**	-0.15	-0.38	**5.40**
NYSE Declines	-0.72	**-3.65**	-0.80	**-4.53**	-0.62	-1.31	0.12
NYSE Net Advances	0.00	0.49	0.00	0.22	0.00	0.24	0.02
NYSE AD Line	0.00	-0.35	0.00	-0.96	0.00	0.70	0.92
NYSE Percentage Net Advances	0.00	0.36	0.00	0.08	0.00	0.19	0.02
NASDAQ Advances	0.23	1.48	0.36	1.06	0.22	1.17	0.14
NASDAQ Declines	-0.10	**-3.41**	-0.08	**-5.74**	-1.68	-1.45	1.90
NASDAQ Net Advances	0.00	-0.50	0.00	-0.59	0.02	1.05	1.29
NASDAQ AD Line	0.00	-0.22	0.00	0.36	-0.01	-0.76	0.70
NASDAQ Percentage Net Advances	0.00	-0.51	0.00	-0.60	0.02	1.05	1.29
Alternext Advances	1.18	**4.02**	1.18	**3.22**	1.20	**2.42**	0.00
Alternext Declines	-1.04	**-2.46**	-0.80	**-2.05**	-2.66	**-2.29**	2.31
Alternext Net Advances	0.01	0.80	0.00	0.07	0.02	0.75	0.52
Alternext AD Line	0.00	-0.03	-0.01	-0.96	0.01	0.47	0.49
Alternext Percentage Net Advances	0.01	0.60	0.00	-0.07	0.03	0.79	0.62
Weekly Total Market Advances & Declines:							
NYSE Weekly Advances	-1.49	**-3.33**	-0.44	-0.77	-2.35	**-4.08**	**5.61**
NYSE Weekly Declines	0.65	1.21	0.71	1.31	0.79	0.55	0.00
NYSE Net Advances	0.00	0.22	0.00	0.27	-0.03	-0.19	0.04
NYSE AD Line	-1.20	-0.52	-1.24	-0.53	1.54	0.02	0.00
Daily Total Maket New Highs & New Lows:							
NYSE New Highs	0.14	**3.61**	0.52	**3.89**	0.11	**7.73**	**9.38**
NYSE New Lows	-0.13	-1.50	-0.16	-1.58	0.01	0.07	0.63
NYSE Net New Highs	0.04	**1.77**	0.05	**2.34**	-0.06	-1.24	**4.76**
NYSE Cumulative Highs	-0.01	-0.34	0.00	0.18	-0.02	-0.50	0.28
NYSE Percentage Net New Highs	0.04	1.60	0.05	**2.08**	-0.06	-1.30	**4.55**
NASDAQ New Highs	-0.16	-0.43	0.24	0.73	-0.99	-1.03	1.47
NASDAQ New Lows	0.25	1.26	0.02	0.08	1.10	**1.65**	2.40
NASDAQ Net New Highs	-0.01	-0.21	-0.01	-0.40	-0.01	-0.11	0.02
NASDAQ Cumulative Highs	0.03	0.98	0.03	0.89	0.04	0.26	0.01
NASDAQ Percentage Net New Highs	-0.01	-0.22	-0.01	-0.41	-0.01	-0.12	0.02
Alternext New Highs	0.20	**2.23**	0.17	**2.41**	0.36	0.97	0.25
Alternext New Lows	-0.06	-0.89	-0.16	-0.13	0.20	0.35	0.13
Alternext Net New Highs	0.00	0.11	-0.03	-0.59	0.07	1.16	1.60
Alternext Cumulative Highs	-0.03	-0.88	-0.05	-1.16	-0.10	-1.32	0.42
Alternext Percentage Net New Highs	0.01	0.30	-0.02	-0.49	0.07	1.18	1.51
Weekly Total Maket New Highs & New Lows:							
NYSE Weekly New Highs	0.11	0.26	0.29	0.62	-0.21	-0.23	0.23
NYSE Weekly New Lows	-0.30	-0.74	-0.45	-1.02	0.07	0.09	0.29
NYSE Net New Highs	0.11	**1.88**	0.08	1.43	0.31	**2.24**	2.32
NYSE Cumulative Highs	-0.01	**-3.62**	-0.01	**-7.07**	-6.04	**-4.57**	**20.82**

This table reports the OLS results of the regression model $R_t = \alpha_t + \beta_1 D_{t-1} I_{t-1} + \beta_2 (1-D_{t-1}) I_{t-1} + \varepsilon_t$. R_t represents S&P 500 periodic returns calculated as log differences of the S&P 500 Index values, I_{t-1} represents periodic percentage changes of market indicators. D_{t-1} is a dummy variable that equals 1(0) during NBER business cycle expansions(contractions). Therefore β_1 and β_2 measure the predictability of a market indicator during expansions and contractions respectively. We replicate the full sample OLS results for comparison in the first two columns, then we report β_1 and β_2 with associated t-statistics, and the last column reports *chi*-statistics testing the null hypothesis that β_1 and β_2 are equal. We obtain all data from the Global Financial Data. The t-statistics and *chi*-statistics reported are White standard errors corrected and marked in bold if significant at 10% significance level. Panel A and Panel B report results for market sentiment and market strength indicators respectively.

Market Indicators	Frequency	N	Buy & Hold Strategy			Technical Strategy							
			Mean (*10⁻³)	Std. Dev. (*10⁻²)	Sharpe Ratio (*10⁻²)	Mean (*10⁻³)	Std. Dev. (*10⁻²)	Sharpe Ratio (*10⁻²)	t-stats	α (*10⁻³)	t-stats	β	t-stats
Panel A: Market Sentiment Indicators													
NYSE Odd Lot Purchases	Daily	5202	0.25	1.17	1.30	0.31	0.85	2.49	1.16	0.13	1.61	0.54	**22.54**
NYSE Short Sales-Members	Weekly	1760	1.28	2.27	0.85	1.27	1.47	1.19	0.17	0.11	0.40	0.43	**11.74**
NYSE Short Sales-General Public	Weekly	1738	1.28	2.27	0.85	1.61	1.63	3.21	1.34	0.43	1.55	0.52	**13.56**
NYSE Short Sales-Specialists	Weekly	1758	1.28	2.27	0.85	1.49	1.45	2.74	0.95	0.33	1.23	0.42	**11.44**
NYSE Short Sales-Total	Weekly	1756	1.28	2.27	0.85	1.46	1.50	2.45	0.83	0.30	1.09	0.45	**12.11**
NYSE Short Interest Ratio	Monthly	458	5.29	4.51	1.34	6.55	3.48	5.34	1.27	1.17	1.10	0.60	**10.96**
AAII Neutral Index	Weekly	563	-0.21	2.66	-2.43	0.23	1.33	-1.58	0.20	-0.06	-0.13	0.25	**5.96**
CBOE NASDAQ Volatility Index	Daily	1254	0.01	1.57	-0.29	-0.01	0.35	-1.93	0.47	-0.05	-0.57	0.05	**5.62**
AMEX NYSE Arca NASDAQ 100 Volatility Index	Daily	1253	0.01	1.57	-0.30	-0.05	0.35	-2.94	0.75	-0.09	-0.95	0.05	**5.61**
CBOE DJIA Volatility Index	Daily	732	-0.03	1.88	-0.20	0.01	0.00	0.00	0.04	0.00	N/A	0.00	N/A
USA Mutual Fund Equity Funds Redemptions	Monthly	144	1.29	4.87	-3.16	4.91	3.94	5.27	**1.71**	2.06	1.12	0.69	**7.28**
Moody's Monthly Decreased Dividends	Monthly	310	6.16	4.57	5.76	5.24	3.56	4.81	0.25	-0.53	-0.39	0.61	**9.02**
Moody's Monthly Increased Dividends Declared	Monthly	310	6.16	4.57	5.76	5.65	3.61	5.89	0.04	-0.16	-0.12	0.63	**9.26**
Moody's Monthly Resumed Dividends	Monthly	310	6.16	4.57	5.76	5.66	3.46	6.16	0.10	1.11	0.81	0.52	**6.73**
S&P Monthly Extra Dividends Declared	Monthly	317	6.36	4.54	5.03	6.38	2.99	7.71	0.58	0.82	0.61	0.44	**6.37**
S&P Monthly Resumed Dividends Declared	Monthly	312	7.30	4.43	7.01	7.23	3.28	9.25	0.55	0.01	0.01	0.58	**8.33**
Panel B: Market Strength Indicators													
NYSE Advances	Daily	10975	0.24	1.06	0.86	0.00	0.67	-2.24	**3.71**	-0.19	**-3.88**	0.39	**17.56**
NYSE Declines	Daily	10975	0.24	1.06	0.86	0.09	0.76	-0.83	**2.33**	-0.12	**-2.28**	0.51	**19.56**
NASDAQ Declines	Daily	4955	0.25	1.18	1.33	0.30	0.87	2.44	1.08	0.13	1.50	0.55	**22.04**
Alternext Advances	Daily	6573	0.30	1.18	1.59	-0.08	0.47	-4.15	**4.13**	-0.22	**-4.27**	0.14	**8.22**
Alternext Declines	Daily	6573	0.30	1.18	1.59	-0.28	0.62	-6.34	**6.49**	-0.46	**-6.90**	0.27	**11.51**
NYSE New Highs	Daily	10260	0.26	1.07	1.07	0.14	0.14	-0.83	1.39	-0.02	**-2.22**	0.00	**5.08**
NYSE Net New Highs	Daily	10093	0.31	1.08	1.51	0.35	0.83	2.39	1.29	0.10	**1.84**	0.60	**26.43**
NYSE Percentage Net New Highs	Daily	10091	0.26	1.08	1.01	0.30	0.82	1.86	1.24	0.09	1.64	0.59	**23.05**
Alternext New Highs	Daily	6076	0.26	1.20	1.25	0.27	0.94	1.74	0.58	0.07	0.88	0.62	**19.22**
NYSE Cumulative Highs	Weekly	1937	1.64	2.32	2.63	1.74	1.63	4.34	0.98	0.40	1.52	0.49	**15.56**

This table compares risk and return characteristics of buy and hold strategies with those of market-indicator-based technical strategies that show significant predictability during NBER expansion periods. We report means, standard deviations and Sharpe ratios for buy and hold strategies and technical strategies, respectively. Then we report *t*-statistics testing the null hypothesis that the Sharpe ratios of the two strategies are equal. We then report Jensen's α estimation results for technical strategies in the last four columns. α values indicate excess returns generated by the technical strategies at given risk level β over market returns. We also present associated *t*-statistics testing their differences from zero for α and β values. All t-statistics are White standard errors corrected and marked in bold if significant at 10% significance level. The estimations are based on the OLS regression results.

Table 6: NBER Contractions Economic Significance Test

| Market Indicators | Frequency | N | Buy & Hold Strategy | | | Technical Strategy | | | | | | | |
			Mean (*10⁻³)	Std. Dev. (*10⁻²)	Sharpe Ratio (*10⁻²)	Mean (*10⁻³)	Std. Dev. (*10⁻²)	Sharpe Ratio (*10⁻²)	t-stats	α (*10⁻³)	t-stats	β	t-stats
Panel A: Market Sentiment Indicators													
NYSE Short Sales-Members	Weekly	1780	1.26	2.26	0.76	1.18	0.82	1.10	0.13	0.07	0.39	0.14	**2.98**
NYSE Short Sales-General Public	Weekly	1783	1.26	2.26	0.76	1.11	0.66	0.26	0.18	0.00	0.03	0.09	**2.01**
NYSE Short Sales-Specialists	Weekly	1781	1.26	2.26	0.76	1.09	0.77	0.01	0.28	-0.02	-0.10	0.12	**2.72**
NYSE Short Sales-Total	Weekly	1782	1.26	2.26	0.76	1.12	0.77	0.39	0.14	0.01	0.07	0.12	**2.69**
AAII Bullish Index	Weekly	563	-0.21	2.66	-2.43	0.36	0.87	-0.86	0.32	-0.01	-0.04	0.11	**2.54**
AAII Neutral Index	Weekly	563	-0.21	2.66	-2.43	0.56	1.22	1.02	0.79	0.25	0.57	0.21	**2.44**
Barron's Confidence Index	Weekly	2063	1.24	2.31	0.92	0.99	0.54	-0.81	0.63	-0.06	-0.49	0.06	**3.69**
USA Mutual Fund Equity Funds Total Net Assets	Monthly	321	6.46	4.54	5.22	3.39	1.47	-4.74	1.42	-0.03	-0.06	0.05	**2.20**
USA Mutual Fund Equity Funds Cash Percentage	Monthly	321	6.46	4.54	5.22	3.32	1.96	-3.94	1.44	-0.37	-0.39	0.14	**2.33**
USA Mutual Fund Equity and Bond Fund Net Assets	Monthly	147	1.75	4.89	-2.22	1.41	1.92	-7.44	0.51	0.14	0.14	0.07	**1.82**
USA Mutual Fund Equity and Bond Fund Cash Percent	Monthly	241	4.92	4.36	3.44	2.92	1.59	-3.18	0.83	0.26	0.38	0.06	**2.21**
Moody's Monthly Extra Dividends Declared	Monthly	310	6.16	4.57	5.76	2.06	1.74	-8.42	**2.10**	-1.12	-1.22	0.10	**1.72**
Panel B: Market Strength Indicators													
NYSE Total Volume	Daily	10844	0.24	1.06	0.84	0.15	0.17	0.00	0.64	-0.01	-0.85	0.01	**2.63**
NYSE Short-term Trading Index	Daily	5725	0.28	1.14	1.51	-0.02	0.47	-2.70	**2.88**	-0.16	**-2.90**	0.15	**7.97**
Alternext Advances	Daily	6472	0.30	1.18	1.59	0.01	0.32	-3.22	**3.13**	-0.12	**-3.40**	0.06	**6.07**
Alternext Declines	Daily	6472	0.30	1.18	1.59	-0.01	0.43	-2.94	**3.16**	-0.15	**-3.15**	0.11	**7.32**
NYSE Weekly Advances	Weekly	1841	1.47	2.26	2.01	0.93	0.94	-0.94	1.17	-0.17	-0.83	0.17	**3.98**
NYSE New Highs	Daily	10130	0.26	1.07	1.07	0.16	0.16	0.77	0.22	0.00	0.42	0.01	**3.28**
NASDAQ New Lows	Daily	4534	0.24	1.21	1.26	0.02	0.50	-1.32	1.57	-0.10	-1.50	0.15	**7.48**
NYSE Net New Highs	Weekly	1927	1.61	2.32	2.52	0.90	0.51	-2.52	**1.77**	-0.16	-1.22	0.05	1.48
NYSE Cumulative Highs	Weekly	1937	1.64	2.32	2.63	0.88	1.23	-1.26	**1.77**	-0.33	-1.36	0.28	**7.48**

This table compares risk and return characteristics of buy and hold strategies with those of market-indicator-based technical strategies that show significant predictability during NBER contraction periods. We report means, standard deviations and Sharpe ratios for buy and hold strategies and technical strategies, respectively. Then we report t-statistics testing the null hypothesis that the Sharpe ratios of the two strategies are equal. We then report Jensen's α estimation results for technical strategies in the last four columns. α values indicate excess returns generated by the technical strategies at given risk level β over market returns. We also present associated t-statistics testing their differences from zero for α and β values. All t-statistics are White standard errors corrected and marked in bold if significant at 10% significance level. The estimations are based on the OLS regression results.

Market Indicators	Full Sample		High Sentiment		Low Sentiment		Chi-statistic
	β (*10⁻³)	t-stats	$\beta1$ (*10⁻³)	t-stats	$\beta2$ (*10⁻³)	t-stats	
Panel A: Market Sentiment Indicators							
Option Volumes:							
CBOE Calls Volume	0.00	1.15	-0.19	-0.45	-0.65	-1.10	0.40
CBOE Puts Volume	-0.01	-0.12	0.01	0.38	-0.24	-0.48	0.26
OEX Calls Volume	0.00	-1.26	0.00	-1.21	-0.31	-1.40	1.95
OEX Puts Volume	0.00	0.25	0.00	0.25	0.18	0.55	0.30
CBOE Ratio of Traded Value of Puts to Calls	0.63	0.77	0.59	0.50	0.82	0.74	0.02
Odd-lots Volumes:							
NYSE Odd Lot Purchases	0.00	**-4.90**	-0.14	-0.21	0.00	**-6.68**	0.04
NYSE Odd Lot Sales	0.11	0.27	0.61	1.17	-0.16	-0.24	0.87
NYSE Odd Lot Shorts	0.00	1.14	0.01	1.46	0.00	0.29	1.61
Short Sales Volumes:							
NYSE Short Sales-Members	6.68	**7.15**	7.39	**4.92**	7.63	**4.43**	0.01
NYSE Short Sales-General Public	2.63	**2.58**	6.79	**2.25**	4.70	**2.16**	0.32
NYSE Short Sales-Specialists	5.90	**5.82**	5.93	**3.63**	6.51	**3.64**	0.06
NYSE Short Sales-Total	6.80	**5.59**	8.62	**3.62**	8.45	**4.30**	0.00
Short Interests:							
NYSE Short Interest Ratio	-23.19	**-2.22**	-9.58	-0.32	67.65	**2.19**	**3.33**
NYSE Short Interest Shares	-2.93	-0.12	43.55	0.86	11.86	0.29	0.25
AAII/II Sentiment Indices:							
AAII Bearish Index	0.02	0.01	1.82	0.68	-2.05	-0.75	1.05
AAII Bullish Index	6.39	**2.26**	4.98	1.32	7.87	**1.92**	0.27
AAII Neutral Index	-8.70	**-2.83**	-10.55	**-2.44**	-6.71	-1.55	0.40
Investors Intelligence Bearish Percentage	-1.04	-0.11	14.85	1.12	-18.18	-1.39	**3.14**
Investors Intelligence Bullish Percentage	-0.36	-0.03	-7.94	-0.56	5.39	0.34	0.39
Confidence Index:							
Barron's Confidence Index	36.44	0.78	-95.13	-1.20	38.75	0.46	1.33
Exchange Seat Prices:							
AMEX Seat Prices	3.38	0.48	4.63	0.28	-2.62	-0.63	0.19
NYSE Annual Seat Price	-16.55	-0.73	31.87	0.30	65.06	0.55	0.05
Volatility Indices:							
CBOE S&P 500 Volatility Index	7.01	**1.74**	4.71	0.77	12.19	**2.44**	0.90
CBOE NASDAQ Volatility Index	13.28	**2.10**	3.00	0.46	18.48	**1.99**	1.86
CBOE S&P 100 Volatility Index	7.33	**1.96**	5.61	1.00	10.80	**2.30**	0.50
AMEX NYSE Arca NASDAQ 100 Volatility Index	4.00	0.61	3.22	0.61	3.96	0.44	0.00
CBOE DJIA Volatility Index	13.39	**1.90**	9.06	**1.93**	15.91	1.37	0.30
Margin Account Balances:							
NYSE Margin Debt	-0.72	-0.02	-55.63	-0.83	35.59	0.47	0.85
NYSE Free Credit Balances	80.49	**2.11**	2.42	0.04	67.13	1.08	0.60
NYSE Free Credit Balances on Cash Accounts	22.34	0.63	58.72	1.11	-7.45	-0.16	0.87
NYSE Free Cash Balances in Margin Accounts	1.66	0.04	-38.28	-1.03	50.08	0.95	1.91
Mutual Fund Balances:							
USA Mutual Fund Equity Funds Total Net Assets	92.74	1.44	49.93	0.65	142.33	1.50	0.66
USA Mutual Fund Equity Funds Cash Percentage	-20.76	-0.69	-74.82	-1.65	21.77	0.56	2.60
USA Mutual Fund Equity Funds Redemptions	-4.74	**-2.89**	-5.32	**-4.64**	10.52	0.35	0.28
USA Mutual Fund Equity Funds New Sales	6.59	0.54	2.44	0.18	16.16	0.60	0.21
USA Mutual Fund Equity and Bond Fund Net Assets	10.50	**6.14**	127.09	**2.09**	9.66	**11.91**	**3.74**
USA Mutual Fund Equity and Bond Fund Cash Percent	-17.87	-0.78	-61.17	-1.42	6.46	0.20	1.59
USA Mutual Fund Equity and Bond Fund Liquid Assets	13.26	0.51	-7.66	-0.19	-190.00	0.63	0.34
USA Mutual Fund Equity and Bond Fund Redemptions	-10.50	-0.91	-18.90	-0.99	-5.32	-0.28	0.25
USA Mutual Fund Equity and Bond Fund New Sales	7.89	0.85	15.15	0.99	5.21	0.39	0.24
Number of Dividend News:							
Moody's Monthly Decreased Dividends	40.61	1.57	40.15	0.92	28.67	0.63	0.03
Moody's Monthly Extra Dividends Declared	-63.32	-1.38	-49.04	-0.81	-72.71	-0.96	0.06
Moody's Monthly Increased Dividends Declared	-97.86	**-1.97**	-29.62	-0.32	-159.24	**-1.93**	1.07
Moody's Monthly Omitted Dividends	7.60	0.24	23.30	0.46	-19.25	-0.36	0.32
Moody's Monthly Resumed Dividends	15.28	0.81	39.00	**2.02**	-14.91	-0.46	2.05
S&P Monthly Dividend Decreases Declared	0.43	0.45	0.34	0.13	0.58	0.72	0.01
S&P Monthly Extra Dividends Declared	4.48	**2.17**	5.04	1.46	3.07	0.91	0.17
S&P Monthly Increased Dividends Declared	2.11	0.57	-0.93	-0.26	7.81	1.08	1.19
S&P Monthly Omitted Dividends Declared	0.88	0.68	1.10	0.73	-0.07	-0.03	0.19
S&P Monthly Resumed Dividends Declared	2.85	**1.89**	7.01	**3.16**	0.71	0.35	**4.72**

Table 7 Continued

Market Indicators	Full Sample β (*10⁻³)	t-stats	High Sentiment β1 (*10⁻³)	t-stats	Low Sentiment β2 (*10⁻³)	t-stats	Chi-statistic
	β (*10⁻³)	t-stats	β1 (*10⁻³)	t-stats	β2 (*10⁻³)	t-stats	Chi-statistic
Panel B: Market Strength Indicators							
Total Volume:							
NYSE Total Volume	0.09	0.83	0.61	**2.24**	0.54	**1.74**	0.03
Total Volume Turnovers:							
NYSE Share Volume Turnover	5.39	0.13	23.08	0.57	-113.88	**-1.69**	**3.05**
NYSE Annual Share Value Turnover	28.23	0.64	194.47	1.43	-207.02	-1.47	**4.28**
Short-term Trading Indices:							
NYSE Short-term Trading Index	-0.49	**-2.15**	-0.49	-1.11	-0.49	**-2.01**	0.00
NASDAQ Short-term Trading Index	-0.01	-1.16	0.00	0.85	-0.02	-1.28	2.02
Daily Total Market Advances & Declines:							
NYSE Advances	0.51	**2.98**	1.18	**2.39**	0.66	**1.88**	0.74
NYSE Declines	-0.72	**-3.65**	-1.13	**-3.47**	-1.31	**-2.57**	0.08
NYSE Net Advances	0.00	0.49	0.00	0.79	0.00	0.75	0.11
NYSE AD Line	0.00	-0.35	0.00	0.19	-0.01	-0.71	0.53
NYSE Percentage Net Advances	0.00	0.36	0.00	0.79	0.00	0.76	0.11
NASDAQ Advances	0.23	1.48	-0.13	-0.28	0.28	1.65	0.65
NASDAQ Declines	-0.10	**-3.41**	-0.07	**-11.09**	-1.27	**-2.46**	**5.35**
NASDAQ Net Advances	0.00	-0.50	0.00	0.43	0.00	-0.94	0.54
NASDAQ AD Line	0.00	-0.22	0.00	0.44	0.00	-0.46	0.41
NASDAQ Percentage Net Advances	0.00	-0.51	0.00	0.41	0.00	-0.94	0.51
Alternext Advances	1.18	**4.02**	1.32	**1.87**	1.01	**3.54**	0.16
Alternext Declines	-1.04	**-2.46**	-1.16	**-2.06**	-0.87	**-1.95**	0.16
Alternext Net Advances	0.01	0.80	-0.01	-0.35	0.01	1.04	0.80
Alternext AD Line	0.00	-0.03	0.00	0.31	0.00	0.08	0.04
Alternext Percentage Net Advances	0.01	0.60	0.00	0.00	0.01	1.06	0.83
Weekly Total Market Advances & Declines:							
NYSE Weekly Advances	-1.49	**-3.33**	0.47	0.47	-2.24	**-5.14**	**6.16**
NYSE Weekly Declines	0.65	1.21	1.64	1.46	0.41	0.40	0.64
NYSE Net Advances	0.00	0.22	0.01	0.75	-0.01	-0.36	0.58
NYSE AD Line	-1.20	-0.52	-3.08	-0.03	-21.32	-0.38	0.03
Daily Total Maket New Highs & New Lows:							
NYSE New Highs	0.14	**3.61**	0.13	0.66	0.11	**8.51**	0.01
NYSE New Lows	-0.13	-1.50	-0.33	-1.19	-0.18	-1.01	0.22
NYSE Net New Highs	0.04	**1.77**	0.03	1.25	0.00	0.10	0.40
NYSE Cumulative Highs	-0.01	-0.34	-0.02	-0.50	0.00	0.13	0.24
NYSE Percentage Net New Highs	0.04	1.60	0.03	1.35	0.00	0.16	0.42
NASDAQ New Highs	-0.16	-0.43	-0.17	-0.43	-0.13	-0.22	0.00
NASDAQ New Lows	0.25	1.26	0.31	0.79	0.21	0.96	0.04
NASDAQ Net New Highs	-0.01	-0.21	-0.03	-0.71	0.04	0.70	0.96
NASDAQ Cumulative Highs	0.03	0.98	0.06	**1.91**	-0.01	-0.25	1.81
NASDAQ Percentage Net New Highs	-0.01	-0.22	-0.03	-0.76	0.04	0.75	1.09
Alternext New Highs	0.20	**2.23**	0.60	**2.39**	0.29	**1.82**	1.07
Alternext New Lows	-0.06	-0.89	-0.03	-0.14	-0.07	-0.82	0.03
Alternext Net New Highs	0.00	0.11	-0.04	-0.64	0.04	0.71	0.89
Alternext Cumulative Highs	-0.03	-0.88	-0.08	-1.59	0.00	0.04	1.16
Alternext Percentage Net New Highs	0.01	0.30	-0.03	-0.58	0.04	0.81	0.95
Weekly Total Maket New Highs & New Lows:							
NYSE Weekly New Highs	0.11	0.26	1.42	**2.26**	-0.24	-0.37	**3.43**
NYSE Weekly New Lows	-0.30	-0.74	0.78	0.52	-0.77	-0.79	0.76
NYSE Net New Highs	0.11	**1.88**	0.66	**2.13**	0.03	0.56	**4.01**
NYSE Cumulative Highs	-0.01	**-3.62**	31.60	0.25	-0.01	**-3.46**	0.06

This table reports the OLS results of the regression model $R_t = \alpha_t + \beta_1 D_{t-1} I_{t-1} + \beta_2 (1-D_{t-1}) I_{t-1} + \varepsilon_t$. R_t represents S&P 500 periodic returns calculated as log differences of the S&P 500 Index values, I_{t-1} represents periodic percentage changes of market indicators. D_{t-1} is a dummy variable that equals 1(0) during high(low) sentiment periods measured by using the Baker and Wurgler (2006) sentiment index. Therefore β_1 and β_2 measure the predictability of a market indicator during expansions and contractions respectively. We replicate the full sample OLS results for comparison in the first two columns, then we report β_1 and β_2 with associated t-statistics, and the last column reports *chi*-statistics testing the null hypothesis that β_1 and β_2 are equal. We obtain all data from the Global Financial Data. The t-statistics and *chi*-statistics reported are White standard errors corrected and marked in bold if significant at 10% significance level. Panel A and Panel B report results for market sentiment and market strength indicators respectively.

Table 8: High Sentiment Periods Economic Significance Test

Market Indicators	Frequency	N	Buy & Hold Strategy			Technical Strategy							
			Mean (*10⁻³)	Std. Dev. (*10⁻²)	Sharpe Ratio (*10⁻²)	Mean (*10⁻³)	Std. Dev. (*10⁻²)	Sharpe Ratio (*10⁻²)	t-stats	α (*10⁻³)	t-stats	β	t-stats
Panel A: Market Sentiment Indicators													
NYSE Short Sales-Members	Weekly	930	0.86	2.36	0.13	0.13	1.03	-6.84	**2.23**	-0.62	**-2.02**	0.20	**5.07**
NYSE Short Sales-General Public	Weekly	970	0.86	2.36	0.13	0.53	1.26	-2.36	0.87	-0.25	-0.70	0.28	**7.01**
NYSE Short Sales-Specialists	Weekly	927	0.86	2.36	0.13	0.58	1.00	-2.45	0.81	-0.21	-0.69	0.18	**5.09**
NYSE Short Sales-Total	Weekly	938	0.86	2.36	0.13	0.24	1.13	-5.19	**1.77**	-0.51	-1.53	0.23	**5.84**
AAII Neutral Index	Weekly	508	-0.14	2.70	-2.19	0.33	1.02	-1.21	0.21	0.02	0.05	0.14	**3.19**
CBOE DJIA Volatility Index	Daily	714	-0.11	1.92	-0.66	0.01	0.00	0.00	0.13	0.00	N/A	0.00	N/A
USA Mutual Fund Equity Funds Cash Percentage	Monthly	228	4.98	4.40	4.22	5.47	2.55	9.19	0.84	1.55	1.11	0.34	**5.90**
USA Mutual Fund Equity Funds Redemptions	Monthly	145	2.09	4.86	-0.85	2.63	3.29	0.38	0.19	-0.36	-0.18	0.47	**5.41**
USA Mutual Fund Equity and Bond Fund Net Assets	Monthly	241	4.78	4.62	3.07	3.80	2.33	1.87	0.20	-0.11	-0.08	0.26	**4.04**
Moody's Monthly Resumed Dividends	Monthly	243	5.77	4.35	5.62	4.46	2.61	4.34	0.23	-0.05	-0.04	0.35	**5.53**
S&P Monthly Resumed Dividends Declared	Monthly	232	6.26	4.51	6.40	4.37	3.09	3.23	0.63	-0.13	-0.08	0.46	**5.14**
Panel B: Market Strength Indicators													
NYSE Total Volume	Daily	5585	0.27	1.14	1.44	0.19	0.70	1.25	0.16	0.04	0.49	0.37	**19.24**
NYSE Advances	Daily	4843	0.27	1.14	1.44	-0.01	0.36	-3.21	**2.99**	-0.11	**-2.23**	0.10	**11.35**
NYSE Declines	Daily	4987	0.27	1.14	1.44	-0.01	0.51	-2.22	**2.61**	-0.12	**-1.88**	0.19	**13.10**
NASDAQ Declines	Daily	4910	0.24	1.18	1.27	0.25	0.75	2.06	0.65	0.09	1.15	0.41	**19.02**
Alternext Advances	Daily	4902	0.27	1.14	1.44	-0.04	0.42	-3.50	**3.30**	-0.14	**-2.58**	0.13	**11.33**
Alternext Declines	Daily	5056	0.27	1.14	1.44	0.01	0.53	-1.83	**2.37**	-0.11	**-1.68**	0.21	**13.89**
NASDAQ Cumulative Highs	Daily	4541	0.23	1.21	1.20	0.26	0.78	2.14	0.75	0.11	1.21	0.42	**18.75**
Alternext New Highs	Daily	4875	0.27	1.15	1.47	0.02	0.49	-1.74	**2.21**	-0.09	-1.37	0.18	**14.00**
NYSE Weekly New Highs	Weekly	1199	1.36	2.34	2.61	0.70	1.27	-0.33	0.32	-0.17	-0.52	0.29	**8.08**
NYSE Net New Highs	Weekly	1151	1.62	2.33	3.78	1.12	1.40	2.72	0.41	0.13	0.40	0.36	**9.97**

This table compares risk and return characteristics of buy and hold strategies with those of market-indicator-based technical strategies that show significant predictability during high sentiment periods. We report means, standard deviations and Sharpe ratios for buy and hold strategies and technical strategies, respectively. Then we report t-statistics testing the null hypothesis that the Sharpe ratios of the two strategies are equal. We then report Jensen's α estimation results for technical strategies in the last four columns. α values indicate excess returns generated by the technical strategies at given risk level β over market returns. We also present associated t-statistics testing their differences from zero for α and β values. All t-statistics are White standard errors corrected and marked in bold if significant at 10% significance level. The estimations are based on the OLS regression results.

Market Indicators	Frequency	N	Buy & Hold Strategy			Technical Strategy							
			Mean ($*10^{-3}$)	Std. Dev. ($*10^{-2}$)	Sharpe Ratio ($*10^{-2}$)	Mean ($*10^{-3}$)	Std. Dev. ($*10^{-2}$)	Sharpe Ratio ($*10^{-2}$)	t-stats	α ($*10^{-3}$)	t-stats	β	t-stats
Panel A: Market Sentiment Indicators													
NYSE Odd Lot Purchases	Daily	5175	0.24	1.17	1.26	0.01	0.89	-0.96	**2.22**	-0.17	**-2.08**	0.56	**25.61**
NYSE Short Sales-Members	Weekly	1002	0.86	2.36	0.13	0.81	0.68	-0.31	0.13	-0.07	-0.34	0.09	**3.32**
NYSE Short Sales-General Public	Weekly	1012	0.86	2.36	0.13	0.83	0.78	-0.05	0.05	-0.05	-0.19	0.12	**4.11**
NYSE Short Sales-Specialists	Weekly	1005	0.86	2.36	0.13	0.76	0.72	-1.00	0.33	-0.14	-0.62	0.10	**3.49**
NYSE Short Sales-Total	Weekly	1009	0.86	2.36	0.13	0.64	0.72	-2.57	0.79	-0.23	-1.01	0.10	**3.66**
NYSE Short Interest Ratio	Weekly	263	4.78	4.62	3.07	2.64	2.74	-2.63	0.96	-0.63	-0.46	0.29	**3.84**
AAII Bullish Index	Weekly	538	-0.14	2.70	-2.19	0.29	1.28	-1.30	0.20	-0.08	-0.16	0.22	**4.70**
CBOE S&P 500 Volatility Index	Daily	2935	0.04	1.36	-0.25	0.05	0.83	-0.26	0.00	-0.08	-0.71	0.39	**14.17**
CBOE NASDAQ Volatility Index	Daily	1069	-0.01	1.58	-0.45	0.20	0.76	1.86	0.79	0.00	-0.02	0.23	**4.98**
CBOE S&P 100 Volatility Index	Daily	2956	0.04	1.36	-0.25	0.14	0.84	0.77	0.66	0.00	0.01	0.39	**14.23**
USA Mutual Fund Equity and Bond Fund Net Assets	Monthly	266	4.78	4.62	3.07	2.23	2.71	-4.18	1.23	-1.03	-0.75	0.30	**4.06**
Moody's Monthly Increased Dividends Declared	Monthly	246	5.77	4.35	5.62	3.90	2.61	2.16	0.59	-0.05	-0.04	0.32	**4.31**
Panel B: Market Strength Indicators													
NYSE Total Volume	Daily	5512	0.27	1.14	1.44	0.08	0.81	-0.27	**1.66**	-0.10	-1.27	0.49	**22.07**
NYSE Share Volume Turnover	Daily	258	4.78	4.62	3.07	4.04	2.34	2.93	0.02	1.00	0.84	0.21	**4.08**
NYSE Short-term Trading Index	Daily	4959	0.27	1.14	1.41	-0.13	0.53	-4.38	**4.22**	-0.27	**-4.13**	0.22	**10.60**
NYSE Advances	Daily	4901	0.27	1.14	1.44	-0.11	0.37	-5.77	**4.69**	-0.24	**-4.76**	0.11	**6.67**
NYSE Declines	Daily	4918	0.27	1.14	1.44	-0.09	0.48	-4.01	**3.83**	-0.23	**-3.77**	0.18	**10.07**
NASDAQ Advances	Daily	4403	0.24	1.18	1.27	-0.12	0.52	-4.01	**3.51**	-0.23	**-3.35**	0.20	**10.82**
NASDAQ Declines	Daily	4273	0.24	1.18	1.27	-0.16	0.50	-4.92	**4.04**	-0.28	**-4.02**	0.18	**9.60**
Alternext Advances	Daily	4931	0.27	1.14	1.44	-0.06	0.41	-4.07	**3.66**	-0.19	**-3.62**	0.13	**8.57**
Alternext Declines	Daily	5100	0.27	1.14	1.44	0.07	0.66	-0.54	1.60	-0.13	**-1.72**	0.32	**12.71**
NYSE Weekly Advances	Weekly	1059	1.36	2.34	2.61	0.63	1.36	-0.86	1.32	-0.22	-0.63	0.34	**6.00**
NYSE New Highs	Daily	5556	0.28	1.15	1.51	0.06	0.85	-0.59	**2.16**	-0.11	-1.47	0.54	**24.73**
Alternext New Highs	Daily	5249	0.27	1.15	1.47	-0.01	0.72	-1.59	**2.66**	-0.16	**-2.13**	0.40	**18.38**
NYSE Cumulative Highs	Weekly	1196	1.64	2.33	3.86	0.94	1.62	1.19	1.19	-0.27	-0.80	0.48	**11.25**

This table compares risk and return characteristics of buy and hold strategies with those of market-indicator-based technical strategies that show significant predictability during low sentiment periods. We report means, standard deviations and Sharpe ratios for buy and hold strategies and technical strategies, respectively. Then we report *t*-statistics testing the null hypothesis that the Sharpe ratios of the two strategies are equal. We then report Jensen's α estimation results for technical strategies in the last four columns. α values indicate excess returns generated by the technical strategies at given risk level β over market returns. We also present associated *t*-statistics testing their differences from zero for α and β values. All t-statistics are White standard errors corrected and marked in bold if significant at 10% significance level. The estimations are based on the OLS regression results.

Market Indicators	Full Sample			Sub-sample 1			Sub-sample 2		
	Period	β (*10⁻³)	t value	Period 1	β (*10⁻³)	t value	Period 2	β (*10⁻³)	t value
Panel A: Market Sentiment Indicators									
Option Volumes:									
CBOE Calls Volume	1989 - 2011	-0.24	-0.84	1989-1999	-0.20	-0.41	2000-2011	-0.24	-0.64
CBOE Puts Volume	1989 - 2011	0.04	0.19	1989-1999	0.01	0.04	2000-2011	0.27	0.67
OEX Calls Volume	1989 - 2011	0.00	0.08	1989-1999	0.00	-0.01	2000-2011	0.01	**11.47**
OEX Puts Volume	1989 - 2011	0.00	0.03	1989-1999	0.00	0.03	2000-2011	0.03	**11.63**
CBOE Ratio of Traded Value of Puts to Calls	1986 - 2011	0.76	1.51	1986-1998	0.81	1.07	1999-2011	0.83	1.19
Odd-lots Volumes:									
NYSE Odd Lot Purchases	1970 - 2011	0.00	-0.01	1970-1990	0.70	1.06	1991-2011	0.00	-0.01
NYSE Odd Lot Sales	1970 - 2011	0.18	0.89	1970-1990	0.80	**1.65**	1991-2011	0.00	-0.01
NYSE Odd Lot Shorts	1970 - 2011	0.00	0.19	1970-1990	-0.04	-0.67	1991-2011	0.00	0.19
Short Sales Volumes:									
NYSE Short Sales-Members	1940 - 2008	6.06	**6.62**	1940-1974	6.21	**5.36**	1975-2008	5.99	**4.06**
NYSE Short Sales-General Public	1940 - 2008	1.21	1.60	1940-1974	-0.14	-0.17	1975-2008	6.44	**4.27**
NYSE Short Sales-Specialists	1940 - 2008	6.05	**6.61**	1940-1974	6.47	**5.66**	1975-2008	5.73	**3.85**
NYSE Short Sales-Total	1940 - 2008	5.80	**6.10**	1940-1974	4.84	**3.97**	1975-2008	7.37	**4.61**
Short Interests:									
NYSE Short Interest Ratio	1931 - 2010	-10.20	-1.30	1931-1970	-10.20	-1.30	1971-2010	-10.20	-1.30
NYSE Short Interest Shares	1931 - 2010	11.10	0.77	1931-1970	10.90	0.76	1971-2010	11.10	0.77
AAII/II Sentiment Indices:									
AAII Bearish Index	1989 - 2010	1.04	0.59	1989-1999	0.54	0.21	2000-2010	0.77	0.31
AAII Bullish Index	1989 - 2010	0.57	0.22	1989-1999	0.98	0.29	2000-2010	0.73	0.18
AAII Neutral Index	1989 - 2010	-3.21	**-1.78**	1989-1999	-0.14	-0.05	2000-2010	-4.90	**-2.01**
Investors Intelligence Bearish Percentage	1987 - 2010	4.22	0.68	1987-1998	5.25	0.57	1999-2010	3.24	0.37
Investors Intelligence Bullish Percentage	1987 - 2010	-3.93	-0.46	1987-1998	-1.74	-0.17	1999-2010	-8.29	-0.57
Confidence Index:									
Barron's Confidence Index	1932 - 2010	-40.30	**-2.02**	1932-1970	-45.10	-1.41	1971-2010	-25.20	-0.95
Exchange Seat Prices:									
AMEX Seat Prices	1921 - 1993	0.76	0.09	1921-1958	15.10	1.15	1959-1993	-8.52	-0.97
NYSE Annual Seat Price	1820 - 2003	-7.86	-0.15	1820-1912	-12.60	-0.19	1913-2003	6.10	0.08
Volatility Indices:									
CBOE S&P 500 Volatility Index	1986 - 2011	-0.88	-0.42	1986-1998	-5.85	**-2.14**	1999-2011	6.25	**1.93**
CBOE NASDAQ Volatility Index	2001 - 2011	4.65	1.15	2001-2005	1.13	0.19	2006-2011	7.89	1.37
CBOE S&P 100 Volatility Index	1986 - 2011	0.77	0.39	1986-1998	-4.98	**-1.79**	1999-2011	7.45	**2.72**
AMEX NYSE Arca NASDAQ 100 Volatility Index	2001 - 2011	4.16	1.17	2001-2005	0.68	0.14	2006-2011	7.88	1.49
CBOE DJIA Volatility Index	2005 - 2011	6.40	1.55	2005-2007	4.42	0.93	2008-2011	11.90	1.61
Margin Account Balances:									
NYSE Margin Debt	1918 - 2010	-8.64	-0.47	1918-1963	1.60	0.07	1964-2010	-36.30	-0.85
NYSE Free Credit Balances	1931 - 2010	72.20	**3.21**	1931-1970	97.90	**2.40**	1971-2010	57.60	**2.00**
NYSE Free Credit Balances on Cash Accounts	1971 - 2010	31.50	1.13	1971-1990	9.48	0.22	1991-2010	63.30	1.60
NYSE Free Cash Balances in Margin Accounts	1971 - 2010	16.20	0.76	1971-1990	-12.60	-0.41	1991-2010	59.60	**1.91**
Mutual Fund Balances:									
USA Mutual Fund Equity Funds Total Net Assets	1984 - 2010	35.50	0.59	1984-1996	-33.40	-0.37	1997-2010	88.40	1.06
USA Mutual Fund Equity Funds Cash Percentage	1968 - 2010	6.99	0.26	1968-1988	8.42	0.19	1989-2010	-29.10	-0.74
USA Mutual Fund Equity Funds Redemptions	1984 - 2010	-4.45	-0.86	1984-1996	-5.48	-0.32	1997-2010	9.00	0.44
USA Mutual Fund Equity Funds New Sales	1984 - 2010	8.76	0.63	1984-1996	10.70	0.53	1997-2010	2.12	0.09
USA Mutual Fund Equity and Bond Fund Net Assets	1954 - 2010	10.60	0.55	1954-1981	102.60	**1.69**	1982-2010	9.67	0.26
USA Mutual Fund Equity and Bond Fund Cash Percent	1954 - 2010	11.00	0.49	1954-1981	13.90	0.45	1982-2010	9.96	0.30
USA Mutual Fund Equity and Bond Fund Liquid Assets	1954 - 2010	28.50	1.24	1954-1981	43.60	1.40	1982-2010	-6.90	-0.20
USA Mutual Fund Equity and Bond Fund Redemptions	1954 - 2010	-8.46	-1.04	1954-1981	-11.80	-1.03	1982-2010	-2.49	-0.20
USA Mutual Fund Equity and Bond Fund New Sales	1954 - 2010	8.26	1.04	1954-1981	5.60	0.53	1982-2010	12.00	0.91
Number of Dividend News:									
Moody's Monthly Decreased Dividends	1956 - 2008	55.70	**2.32**	1956-1984	79.10	**2.70**	1985-2011	19.30	0.47
Moody's Monthly Extra Dividends Declared	1956 - 2009	-62.90	-1.52	1956-1984	-125.60	-1.44	1985-2011	-55.40	-1.16
Moody's Monthly Increased Dividends Declared	1956 - 2009	-109.20	**-2.01**	1956-1984	-114.60	-1.62	1985-2011	-123.30	-1.63
Moody's Monthly Omitted Dividends	1956 - 2009	27.30	1.10	1956-1984	34.40	0.95	1985-2011	10.30	0.28
Moody's Monthly Resumed Dividends	1956 - 2009	26.00	1.41	1956-1984	83.40	**2.35**	1985-2011	6.24	0.31
S&P Monthly Dividend Decreases Declared	1955 - 2010	0.49	0.37	1955-1982	1.78	0.86	1983-2010	-1.18	-0.68
S&P Monthly Extra Dividends Declared	1955 - 2010	6.12	**2.81**	1955-1982	6.92	**2.36**	1983-2010	5.40	**1.69**
S&P Monthly Increased Dividends Declared	1955 - 2010	5.59	1.62	1955-1982	12.80	**2.13**	1983-2010	0.24	0.04
S&P Monthly Omitted Dividends Declared	1955 - 2010	0.94	0.87	1955-1982	0.55	0.34	1983-2010	0.96	0.63
S&P Monthly Resumed Dividends Declared	1955 - 2010	2.59	**1.80**	1955-1982	4.48	1.49	1983-2010	0.85	0.49

Table 10 Continued

Market Indicators	Full Sample			Sub-sample 1			Sub-sample 2		
	Period	β (*10⁻³)	t value	Period 1	β (*10⁻³)	t value	Period 2	β (*10⁻³)	t value
Panel B: Market Strength Indicators									
Total Volume:									
NYSE Total Volume	1928 - 2011	0.03	0.92	1928-1969	0.00	0.02	1970-2011	0.58	**1.98**
Total Volume Turnovers:									
NYSE Share Volume Turnover	1925 - 2010	-20.90	-1.20	1925-1967	31.90	0.72	1968-2010	-60.10	**-2.57**
NYSE Annual Share Value Turnover	1934 - 2010	18.50	0.49	1934-1971	-7.40	-0.12	1972-2010	-16.00	-0.15
Short-term Trading Indices:									
NYSE Short-term Trading Index	1965-2011	-0.66	**-5.57**	1965-1987	-1.21	-10.16	1988-2011	0.06	0.31
NASDAQ Short-term Trading Index	1972-2011	0.00	-0.26	1972-1991	-0.12	-1.03	1992-2011	0.00	-0.28
Daily Total Market Advances & Declines:									
NYSE Advances	1928 - 2011	1.05	**15.06**	1928-1969	1.15	**13.84**	1970-2011	0.88	**6.01**
NYSE Declines	1928 - 2011	-1.29	**-12.92**	1928-1969	-1.36	**-11.76**	1970-2011	-1.14	**-5.80**
NYSE Net Advances	1928 - 2011	0.00	-0.09	1928-1969	0.00	-0.13	1970-2011	0.00	-0.04
NYSE AD Line	1928 - 2011	0.00	-0.79	1928-1969	0.00	-1.28	1970-2011	0.00	-0.16
NYSE Percentage Net Advances	1940 - 2011	0.00	-0.19	1928-1969	0.00	-0.33	1970-2011	0.00	-0.03
NASDAQ Advances	1972 - 2011	0.42	**3.05**	1972-1991	0.55	**4.40**	1992-2011	0.12	0.56
NASDAQ Declines	1972 - 2011	-0.14	**-7.59**	1972-1991	-0.13	**-5.96**	1992-2011	-0.42	-1.17
NASDAQ Net Advances	1972 - 2011	0.00	-0.09	1972-1991	0.00	0.76	1992-2011	0.00	-0.40
NASDAQ AD Line	1972 - 2011	0.00	0.41	1972-1991	0.00	0.61	1992-2011	0.00	0.05
NASDAQ Percentage Net Advances	1972 - 2011	0.00	-0.09	1972-1991	0.00	0.76	1992-2011	0.00	-0.40
Alternext Advances	1959 - 2011	1.03	**9.39**	1959-1984	1.28	**12.22**	1985-2011	0.20	0.71
Alternext Declines	1959 - 2011	-0.76	**-12.51**	1959-1984	-0.77	**-13.32**	1985-2011	-0.64	**-1.77**
Alternext Net Advances	1959 - 2011	0.00	-0.36	1959-1984	0.00	0.67	1985-2011	-0.01	-1.37
Alternext AD Line	1959 - 2011	0.00	-0.78	1959-1984	0.00	-0.30	1985-2011	-0.02	-1.40
Alternext Percentage Net Advances	1959 - 2011	0.00	-0.88	1963-1986	0.00	0.21	1987-2011	-0.01	-1.17
Weekly Total Market Advances & Declines:									
NYSE Weekly Advances	1940 - 2010	-0.53	-1.19	1940-1974	0.46	0.82	1975-2010	-1.74	**-2.07**
NYSE Weekly Declines	1940 - 2010	0.42	0.80	1940-1974	-0.61	-0.92	1975-2010	1.94	**2.42**
NYSE Net Advances	1940 - 2010	0.00	0.10	1940-1974	-0.01	-0.51	1975-2010	0.00	0.20
NYSE AD Line	1940 - 2010	0.27	0.13	1940-1974	0.48	0.26	1975-2010	-97.80	-1.92
Daily Total Maket New Highs & New Lows:									
NYSE New Highs	1928 - 2011	0.14	**8.96**	1932-1971	0.46	**6.50**	1972-2011	0.11	**1.72**
NYSE New Lows	1932 - 2011	-0.30	**-6.78**	1932-1971	-0.34	**-7.50**	1972-2011	-0.15	-1.28
NYSE Net New Highs	1932 - 2011	0.01	1.00	1932-1971	0.01	0.63	1972-2011	0.01	0.63
NYSE Cumulative Highs	1932 - 2011	0.00	-0.07	1932-1971	0.01	0.35	1972-2011	0.01	0.35
NYSE Percentage Net New Highs	1932 - 2011	0.01	0.90	1932-1971	0.01	0.55	1972-2011	0.01	0.55
NASDAQ New Highs	1974 - 2011	0.41	**1.85**	1974-1992	0.68	**2.10**	1993-2011	0.15	0.49
NASDAQ New Lows	1974 - 2011	-0.10	-0.66	1974-1992	-0.26	-1.23	1993-2011	0.08	0.40
NASDAQ Net New Highs	1974 - 2011	-0.01	-0.48	1974-1992	-0.04	-1.23	1993-2011	-0.04	-1.23
NASDAQ Cumulative Highs	1974 - 2011	0.02	0.53	1974-1992	0.02	0.59	1993-2011	0.02	0.59
NASDAQ Percentage Net New Highs	1974 - 2011	-0.01	-0.50	1974-1992	-0.04	-1.24	1993-2011	-0.04	-1.24
Alternext New Highs	1962 - 2011	0.23	**3.10**	1962-1986	0.18	**1.98**	1987-2011	0.39	**1.97**
Alternext New Lows	1962 - 2011	-0.06	-0.66	1962-1986	-0.13	-1.19	1987-2011	0.04	0.31
Alternext Net New Highs	1962 - 2011	-0.01	-0.41	1962-1986	-0.02	-0.64	1987-2011	-0.02	-0.64
Alternext Cumulative Highs	1962 - 2011	-0.02	-0.48	1962-1986	0.03	0.79	1987-2011	0.03	0.79
Alternext Percentage Net New Highs	1962 - 2011	-0.01	-0.19	1963-1986	0.00	-0.07	1987-2011	0.00	-0.07
Weekly Total Maket New Highs & New Lows:									
NYSE Weekly New Highs	1937 - 2010	0.23	0.62	1937-1973	0.49	1.17	1974-2010	-0.67	-0.95
NYSE Weekly New Lows	1937 - 2010	-0.23	-1.08	1937-1973	-0.35	-1.60	1974-2010	0.24	0.35
NYSE Net New Highs	1937 - 2010	0.04	1.21	1937-1973	0.10	1.52	1974-2010	0.01	0.16
NYSE Cumulative Highs	1937 - 2010	-0.01	-0.01	1937-1973	0.56	0.18	1974-2010	-0.01	-0.01

This table reports the GARCH(1,1) results of the regression model $R_t = \alpha_t + \beta I_{t-1} + \varepsilon_t$ for full samples and two equal length sub-samples . R_t represents S&P 500 periodic returns calculated as log differences of the S&P 500 Index values, I_{t-1} represents periodic percentage changes of market indicators. We obtain all data from the Global Financial Data. The *t*-statistics reported are White standard errors corrected and marked in bold if significant at 10% significance level. Panel A and Panel B report results for market sentiment and market strength indicators respectively.

Table 11: GARCH(1,1) Economic Significance Test

Market Indicators	Frequency	N	Buy & Hold Strategy			Technical Strategy							
			Mean ($*10^{-3}$)	Std. Dev. ($*10^{-2}$)	Sharpe Ratio ($*10^{-2}$)	Mean ($*10^{-3}$)	Std. Dev. ($*10^{-2}$)	Sharpe Ratio ($*10^{-2}$)	t-stats	α ($*10^{-3}$)	t-stats	β	t-stats
Panel A: Market Sentiment Indicators													
NYSE Short Sales-Members	Weekly	1740	1.28	2.27	0.84	1.41	1.84	1.69	0.58	0.20	0.77	0.66	**21.94**
NYSE Short Sales-Specialists	Weekly	1738	1.28	2.27	0.84	1.24	1.78	0.81	0.01	0.04	0.14	0.62	**19.05**
NYSE Short Sales-Total	Weekly	1737	1.28	2.27	0.84	1.58	1.88	2.56	1.24	0.37	1.44	0.69	**24.48**
Panel B: Market Strength Indicators													
NYSE Advances	Daily	11024	0.24	1.06	0.85	-0.04	0.86	-2.15	**4.96**	-0.25	**-5.06**	0.64	**20.41**
NYSE Declines	Daily	11024	0.24	1.06	0.85	-0.07	0.91	-2.43	**6.36**	-0.30	**-6.52**	0.73	**38.54**
NASDAQ Advances	Daily	4981	0.25	1.18	1.34	0.19	1.17	0.83	**2.41**	-0.06	**-2.41**	0.98	**171.38**
Alternext Advances	Daily	6608	0.30	1.18	1.57	0.02	1.06	-0.90	**4.27**	-0.25	**-3.83**	0.79	**16.18**
Alternext Declines	Daily	6608	0.26	1.07	1.07	0.22	1.09	0.96	1.28	-0.05	**-0.94**	0.85	**16.26**
NYSE New Highs	Daily	10307	0.30	1.18	1.57	0.27	1.06	1.18	0.73	0.01	0.81	0.97	**303.42**
NYSE New Lows	Daily	10251	0.28	1.08	1.19	0.14	1.04	-0.07	**4.58**	-0.13	**-4.59**	0.93	**116.43**
Alternext New Highs	Daily	6109	0.26	1.20	1.24	0.26	1.20	1.24	N/A	0.00	**N/A**	1.00	**N/A**

This table compares risk and return characteristics of buy and hold strategies with those of market-indicator-based technical strategies that show significant predictability in both sub-samples under the GARCH(1,1) regressions. We report means, standard deviations and Sharpe ratios for buy and hold strategies and technical strategies, respectively. Then we report t-statistics testing the null hypothesis that the Sharpe ratios of the two strategies are equal. We then report Jensen's α estimation results for technical strategies in the last four columns. α values indicate excess returns generated by the technical strategies at given risk level β over market returns. We also present associated t-statistics testing their differences from zero for α and β values. All t-statistics are White standard errors corrected and marked in bold if significant at 10% significance level.

Market Indicators	Full Sample			Sub-sample 1			Sub-sample 2		
	Period	β (*10⁻³)	Chi-stats	Period 1	β (*10⁻³)	Chi-stats	Period 2	β (*10⁻³)	Chi-stats
Panel A: Market Sentiment Indicators									
Option Volumes:		0.00							
CBOE Calls Volume	1989 - 2011	-0.18	0.38	1989-1999	-0.53	1.32	2000-2011	0.00	0.00
CBOE Puts Volume	1989 - 2011	0.02	0.05	1989-1999	0.00	0.00	2000-2011	0.28	0.53
OEX Calls Volume	1989 - 2011	0.00	0.06	1989-1999	0.00	0.10	2000-2011	0.00	0.00
OEX Puts Volume	1989 - 2011	0.00	0.01	1989-1999	0.00	0.01	2000-2011	0.00	0.00
CBOE Ratio of Traded Value of Puts to Calls	1986 - 2011	0.95	**3.89**	1986-1998	-0.06	0.01	1999-2011	1.45	**3.88**
Odd-lots Volumes:									
NYSE Odd Lot Purchases	1970 - 2011	0.00	0.05	1970-1990	0.38	0.43	1991-2011	0.00	0.05
NYSE Odd Lot Sales	1970 - 2011	0.43	**4.28**	1970-1990	0.47	1.04	1991-2011	0.40	**2.84**
NYSE Odd Lot Shorts	1970 - 2011	0.00	0.26	1970-1990	-0.08	1.52	1991-2011	0.00	0.23
Short Sales Volumes:									
NYSE Short Sales-Members	1940 - 2008	6.80	**62.41**	1940-1974	6.40	**11.34**	1975-2008	7.74	**10.22**
NYSE Short Sales-General Public	1940 - 2008	1.78	**5.11**	1940-1974	-1.02	0.38	1975-2008	5.65	**5.91**
NYSE Short Sales-Specialists	1940 - 2008	6.67	**69.89**	1940-1974	6.80	**12.47**	1975-2008	5.53	**5.45**
NYSE Short Sales-Total	1940 - 2008	6.97	**51.78**	1940-1974	5.22	**6.70**	1975-2008	8.69	**11.66**
Short Interests:									
NYSE Short Interest Ratio	1931 - 2010	-13.53	**4.05**	1931-1970	-13.50	**4.03**	1971-2010	-13.53	**4.05**
NYSE Short Interest Shares	1931 - 2010	8.47	0.26	1931-1970	8.50	0.26	1971-2010	8.47	0.26
AAII/II Sentiment Indices:									
AAII Bearish Index	1989 - 2010	-0.14	0.01	1989-1999	-0.41	0.02	2000-2010	0.31	0.02
AAII Bullish Index	1989 - 2010	4.91	**3.69**	1989-1999	4.29	1.69	2000-2010	5.69	2.06
AAII Neutral Index	1989 - 2010	-5.03	**6.24**	1989-1999	-2.89	0.74	2000-2010	-6.41	**5.77**
Investors Intelligence Bearish Percentage	1987 - 2010	3.20	0.22	1987-1998	-1.15	0.01	1999-2010	6.78	0.51
Investors Intelligence Bullish Percentage	1987 - 2010	-2.39	0.08	1987-1998	8.18	0.64	1999-2010	-19.83	2.19
Confidence Index:									
Barron's Confidence Index	1932 - 2010	-35.57	**3.54**	1932-1970	-13.23	0.32	1971-2010	-65.22	**4.36**
Exchange Seat Prices:									
AMEX Seat Prices	1921 - 1993	1.35	0.05	1921-1958	11.17	1.08	1959-1993	-3.42	0.22
NYSE Annual Seat Price	1820 - 2003	-24.60	0.64	1820-1912	-14.60	0.25	1913-2003	-23.90	0.14
Volatility Indices:									
CBOE S&P 500 Volatility Index	1986 - 2011	2.93	**3.70**	1986-1998	-3.10	**3.67**	1999-2011	9.63	**10.11**
CBOE NASDAQ Volatility Index	2001 - 2011	7.81	**3.96**	2001-2005	2.76	0.18	2006-2011	10.97	**4.73**
CBOE S&P 100 Volatility Index	1986 - 2011	4.08	**7.70**	1986-1998	-2.62	2.62	1999-2011	10.21	**13.44**
AMEX NYSE Arca NASDAQ 100 Volatility Index	2001 - 2011	8.81	**8.58**	2001-2005	3.17	0.35	2006-2011	12.79	**11.47**
CBOE DJIA Volatility Index	2005 - 2011	9.34	**7.36**	2005-2007	5.22	1.89	2008-2011	17.06	**6.02**
Margin Account Balances:									
NYSE Margin Debt	1918 - 2010	-17.64	0.82	1918-1963	-12.14	0.27	1964-2010	-14.63	0.13
NYSE Free Credit Balances	1931 - 2010	37.82	2.61	1931-1970	80.49	**4.83**	1971-2010	8.22	0.07
NYSE Free Credit Balances on Cash Accounts	1971 - 2010	31.88	1.18	1971-1990	-14.45	0.13	1991-2010	78.14	**3.30**
NYSE Free Cash Balances in Margin Accounts	1971 - 2010	-24.39	1.38	1971-1990	-30.64	1.51	1991-2010	-13.34	0.12
Mutual Fund Balances:									
USA Mutual Fund Equity Funds Total Net Assets	1984 - 2010	28.92	0.38	1984-1996	-58.41	0.86	1997-2010	65.00	0.84
USA Mutual Fund Equity Funds Cash Percentage	1968 - 2010	-0.93	0.00	1968-1988	4.63	0.02	1989-2010	-7.91	0.03
USA Mutual Fund Equity Funds Redemptions	1984 - 2010	-5.38	1.85	1984-1996	-6.13	**3.02**	1997-2010	10.35	0.24
USA Mutual Fund Equity Funds New Sales	1984 - 2010	0.80	0.00	1984-1996	-4.74	0.12	1997-2010	7.34	0.10
USA Mutual Fund Equity and Bond Fund Net Assets	1954 - 2010	9.40	**4.35**	1954-1981	90.72	2.63	1982-2010	8.66	**3.55**
USA Mutual Fund Equity and Bond Fund Cash Percent	1954 - 2010	-11.45	0.26	1954-1981	-7.15	0.06	1982-2010	-11.12	0.10
USA Mutual Fund Equity and Bond Fund Liquid Assets	1954 - 2010	1.80	0.01	1954-1981	18.18	0.33	1982-2010	-22.92	0.36
USA Mutual Fund Equity and Bond Fund Redemptions	1954 - 2010	-4.95	0.30	1954-1981	-8.58	0.46	1982-2010	-2.44	0.04
USA Mutual Fund Equity and Bond Fund New Sales	1954 - 2010	3.11	0.14	1954-1981	0.82	0.01	1982-2010	6.17	0.21
Number of Dividend News:									
Moody's Monthly Decreased Dividends	1956 - 2008	51.57	2.54	1956-1984	81.32	**3.13**	1985-2011	24.08	0.28
Moody's Monthly Extra Dividends Declared	1956 - 2009	-89.06	1.19	1956-1984	-250.92	**4.08**	1985-2011	0.73	0.00
Moody's Monthly Increased Dividends Declared	1956 - 2009	-108.17	2.14	1956-1984	-97.29	1.05	1985-2011	-109.76	0.90
Moody's Monthly Omitted Dividends	1956 - 2009	17.60	0.20	1956-1984	42.97	0.80	1985-2011	-35.42	0.29
Moody's Monthly Resumed Dividends	1956 - 2009	43.07	1.67	1956-1984	114.27	**6.17**	1985-2011	-22.79	0.23
S&P Monthly Dividend Decreases Declared	1955 - 2010	0.39	0.12	1955-1982	1.17	0.72	1983-2010	-1.26	0.45
S&P Monthly Extra Dividends Declared	1955 - 2010	4.66	**4.97**	1955-1982	5.52	**4.07**	1983-2010	3.86	1.44
S&P Monthly Increased Dividends Declared	1955 - 2010	1.02	0.09	1955-1982	8.27	1.82	1983-2010	-2.02	0.24
S&P Monthly Omitted Dividends Declared	1955 - 2010	1.09	0.63	1955-1982	0.37	0.03	1983-2010	1.30	0.53
S&P Monthly Resumed Dividends Declared	1955 - 2010	3.01	**4.47**	1955-1982	3.08	1.99	1983-2010	2.80	2.21

Table 12 Continued

Market Indicators	Full Sample			Sub-sample 1			Sub-sample 2		
	Period	β (*10⁻³)	Chi-stats	Period 1	β (*10⁻³)	Chi-stats	Period 2	β (*10⁻³)	Chi-stats
Panel B: Market Strength Indicators									
Total Volume:									
NYSE Total Volume	1928 - 2011	0.02	0.12	1928-1969	-0.01	0.07	1970-2011	0.55	**6.16**
Total Volume Turnovers:									
NYSE Share Volume Turnover	1925 - 2010	8.04	0.12	1925-1967	39.02	1.28	1968-2010	-27.24	0.79
NYSE Annual Share Value Turnover	1934 - 2010	38.72	1.14	1934-1971	36.44	0.87	1972-2010	50.18	0.27
Short-term Trading Indices:									
NYSE Short-term Trading Index	1965-2011	-0.46	**19.84**	1965-1987	-1.02	**52.78**	1988-2011	0.15	0.95
NASDAQ Short-term Trading Index	1972-2011	0.00	0.00	1972-1991	-0.17	1.67	1992-2011	0.00	0.00
Daily Total Market Advances & Declines:									
NYSE Advances	1928 - 2011	0.94	**237.72**	1928-1969	1.10	**269.05**	1970-2011	0.60	**22.86**
NYSE Declines	1928 - 2011	-0.87	**109.28**	1928-1969	-0.89	**91.82**	1970-2011	-0.92	**31.37**
NYSE Net Advances	1928 - 2011	0.00	0.43	1928-1969	0.00	0.50	1970-2011	0.00	0.14
NYSE AD Line	1928 - 2011	0.00	0.01	1928-1969	0.00	0.05	1970-2011	0.00	0.04
NYSE Percentage Net Advances	1940 - 2011	0.00	0.33	1928-1969	0.00	0.29	1970-2011	0.00	0.14
NASDAQ Advances	1972 - 2011	0.21	**4.72**	1972-1991	0.34	**8.74**	1992-2011	-0.26	2.28
NASDAQ Declines	1972 - 2011	-0.08	**5.71**	1972-1991	-0.08	**5.74**	1992-2011	-0.28	0.73
NASDAQ Net Advances	1972 - 2011	0.00	0.74	1972-1991	0.00	0.15	1992-2011	0.00	0.58
NASDAQ AD Line	1972 - 2011	0.00	0.01	1972-1991	0.00	0.21	1992-2011	0.00	0.14
NASDAQ Percentage Net Advances	1972 - 2011	0.00	0.74	1972-1991	0.00	0.15	1992-2011	0.00	0.58
Alternext Advances	1959 - 2011	1.06	**46.07**	1959-1984	1.52	**79.34**	1985-2011	0.07	0.06
Alternext Declines	1959 - 2011	-1.58	**102.73**	1959-1984	-3.03	**342.32**	1985-2011	-0.77	**5.49**
Alternext Net Advances	1959 - 2011	0.00	0.35	1959-1984	0.00	0.31	1985-2011	0.00	0.06
Alternext AD Line	1959 - 2011	0.00	0.00	1959-1984	0.00	0.05	1985-2011	0.00	0.12
Alternext Percentage Net Advances	1959 - 2011	0.00	0.07	1963-1986	0.00	0.08	1987-2011	0.00	0.08
Weekly Total Market Advances & Declines:									
NYSE Weekly Advances	1940 - 2010	-0.99	**9.93**	1940-1974	0.50	1.11	1975-2010	-1.95	**20.87**
NYSE Weekly Declines	1940 - 2010	0.67	2.09	1940-1974	-0.34	0.34	1975-2010	1.91	**6.82**
NYSE Net Advances	1940 - 2010	0.00	0.07	1940-1974	-0.01	0.03	1975-2010	0.00	0.10
NYSE AD Line	1940 - 2010	-1.07	0.32	1940-1974	-0.97	0.31	1975-2010	-54.26	1.33
Daily Total Maket New Highs & New Lows:									
NYSE New Highs	1928 - 2011	0.11	**36.67**	1932-1971	0.51	**49.34**	1972-2011	0.10	**22.02**
NYSE New Lows	1932 - 2011	-0.15	**9.75**	1932-1971	-0.20	**16.35**	1972-2011	-0.14	1.61
NYSE Net New Highs	1932 - 2011	0.02	2.01	1932-1971	0.03	**2.74**	1972-2011	0.02	0.54
NYSE Cumulative Highs	1932 - 2011	0.00	0.00	1932-1971	0.00	0.01	1972-2011	0.00	0.01
NYSE Percentage Net New Highs	1932 - 2011	0.02	1.31	1932-1971	0.02	1.19	1972-2011	0.02	0.54
NASDAQ New Highs	1974 - 2011	0.15	0.60	1974-1992	0.43	2.27	1993-2011	-0.14	0.26
NASDAQ New Lows	1974 - 2011	0.06	0.18	1974-1992	-0.23	1.27	1993-2011	0.37	**2.99**
NASDAQ Net New Highs	1974 - 2011	0.01	0.05	1974-1992	0.03	0.74	1993-2011	-0.01	0.11
NASDAQ Cumulative Highs	1974 - 2011	0.02	0.35	1974-1992	0.00	0.01	1993-2011	0.03	0.58
NASDAQ Percentage Net New Highs	1974 - 2011	0.00	0.04	1974-1992	0.03	0.70	1993-2011	-0.01	0.11
Alternext New Highs	1962 - 2011	0.18	**9.29**	1962-1986	0.10	**2.82**	1987-2011	0.47	**11.59**
Alternext New Lows	1962 - 2011	-0.12	**3.68**	1962-1986	-0.25	**5.85**	1987-2011	-0.06	0.51
Alternext Net New Highs	1962 - 2011	-0.01	0.07	1962-1986	-0.01	0.10	1987-2011	0.01	0.02
Alternext Cumulative Highs	1962 - 2011	-0.07	**5.25**	1962-1986	-0.01	0.09	1987-2011	-0.12	**7.37**
Alternext Percentage Net New Highs	1962 - 2011	0.00	0.00	1963-1986	-0.01	0.02	1987-2011	0.01	0.04
Weekly Total Maket New Highs & New Lows:									
NYSE Weekly New Highs	1937 - 2010	0.01	0.00	1937-1973	0.17	0.20	1974-2010	-0.32	0.33
NYSE Weekly New Lows	1937 - 2010	-0.27	1.09	1937-1973	-0.02	0.00	1974-2010	-0.91	1.86
NYSE Net New Highs	1937 - 2010	0.08	**3.74**	1937-1973	0.13	**3.51**	1974-2010	0.06	0.96
NYSE Cumulative Highs	1937 - 2010	-0.01	0.11	1937-1973	0.50	0.41	1974-2010	-0.01	0.12

This table reports the robust regression results of the regression model $R_t = \alpha_t + \beta I_{t-1} + \varepsilon_t$ for full samples and two equal length sub-samples . R_t represents S&P 500 periodic returns calculated as log differences of the S&P 500 Index values, I_{t-1} represents periodic percentage changes of market indicators. We obtain all data from the Global Financial Data. The *t*-statistics reported are White standard errors corrected and marked in bold if significant at 10% significance level. Panel A and Panel B report results for market sentiment and market strength indicators respectively.

Table 13: Robust Regression Economic Significance Test

Market Indicators	Frequency	N	Buy & Hold Strategy			Technical Strategy							
			Mean (*10⁻³)	Std. Dev. (*10⁻²)	Sharpe Ratio (*10⁻²)	Mean (*10⁻³)	Std. Dev. (*10⁻²)	Sharpe Ratio (*10⁻²)	t-stats	α (*10⁻³)	t-stats	β	t-stats
Panel A: Market Sentiment Indicators													
NYSE Short Sales-Members	Weekly	1791	1.06	2.29	-0.17	1.27	1.83	0.93	0.75	0.21	0.81	0.64	**21.46**
NYSE Short Sales-Specialists	Weekly	1789	1.06	2.29	-0.17	1.25	1.78	0.82	0.64	0.18	0.69	0.61	**19.12**
NYSE Short Sales-Total	Weekly	1788	1.06	2.29	-0.17	1.56	1.87	2.47	**1.89**	0.51	**1.99**	0.68	**23.91**
CBOE S&P 500 Volatility Index	Daily	3213	0.04	1.36	-0.23	0.04	1.36	-0.22	0.22	0.00	0.23	1.00	**2408.13**
NYSE Short Interest Ratio	Monthly	478	5.42	4.53	1.91	6.05	4.13	3.64	0.83	0.93	1.12	0.81	**23.54**
Panel B: Market Strength Indicators													
NYSE Advances	Daily	11025	0.24	1.06	0.85	-0.07	0.84	-2.57	**5.34**	-0.28	**-5.54**	0.61	**20.10**
NYSE Declines	Daily	11025	0.24	1.06	0.85	-0.01	0.94	-1.69	**5.46**	-0.24	**-5.58**	0.78	**45.92**
Alternext Declines	Daily	6607	0.30	1.18	1.58	-0.19	0.95	-3.21	**6.07**	-0.04	**-5.9**	0.64	**15.21**
NYSE New Highs	Daily	10306	0.26	1.07	1.07	0.27	1.06	1.20	0.80	0.02	0.9	0.97	**280.78**
Alternext New Highs	Daily	6108	0.26	1.20	1.24	0.18	1.18	0.59	**2.81**	-0.08	**-2.78**	0.97	**177.60**

This table compares risk and return characteristics of buy and hold strategies with those of market-indicator-based technical strategies that show significant predictability in both sub-samples under the robust regressions. We report means, standard deviations and Sharpe ratios for buy and hold strategies and technical strategies, respectively. Then we report t-statistics testing the null hypothesis that the Sharpe ratios of the two strategies are equal. We then report Jensen's α estimation results for technical strategies in the last four columns. α values indicate excess returns generated by the technical strategies at given risk level β over market returns. We also present associated t-statistics testing their differences from zero for α and β values. All t-statistics are White standard errors corrected and marked in bold if significant at 10% significance level.

Market Indicators	Frequency	Sample Period	Type	N	Mean (*10⁻²)	Std Dev	Min	Max
		Panel A: Market Sentiment Indicators						
Option Volumes:								
CBOE Calls Volume	Daily	1989 - 2011	Units	5617	3.88	0.41	-0.94	9.10
CBOE Puts Volume	Daily	1989 - 2011	Units	5621	6.12	1.08	-0.98	65.20
OEX Calls Volume	Daily	1989 - 2011	Units	5520	526.97	267.94	-1.00	19650.20
OEX Puts Volume	Daily	1989 - 2011	Units	5520	1200.18	614.78	-1.00	36312.00
CBOE Ratio of Traded Value of Puts to Calls	Daily	1986 - 2011	Ratio	6429	2.10	0.23	-0.88	6.03
Odd-lots Volumes:								
NYSE Odd Lot Purchases	Daily	1970 - 2011	Units	10472	13.39	11.05	-1.00	1130.84
NYSE Odd Lot Sales	Daily	1970 - 2011	Units	10472	3.40	0.40	-0.91	11.01
NYSE Odd Lot Shorts	Daily	1970 - 2011	Units	10472	108.67	27.82	-1.00	1300.57
Short Sales Volumes:								
NYSE Short Sales-Members	Weekly	1940 - 2008	Units	3570	4.66	0.36	-0.89	9.75
NYSE Short Sales-General Public	Weekly	1940 - 2008	Units	3570	5.68	0.40	-0.76	8.36
NYSE Short Sales-Specialists	Weekly	1940 - 2008	Units	3570	4.83	0.39	-0.91	12.09
NYSE Short Sales-Total	Weekly	1940 - 2008	Units	3570	4.18	0.32	-0.82	6.48
Short Interests:								
NYSE Short Interest Ratio	Monthly	1931 - 2010	Ratio	958	1.73	0.21	-0.73	2.70
NYSE Short Interest Shares	Monthly	1931 - 2010	Units	958	1.16	0.08	-0.33	0.44
AAII/II Sentiment Indices:								
AAII Bearish Index	Weekly	1989 - 2010	Index Number	1133	4.78	0.35	-0.76	3.10
AAII Bullish Index	Weekly	1989 - 2010	Index Number	1133	2.56	0.23	-0.67	1.70
AAII Neutral Index	Weekly	1989 - 2010	Index Number	1133	3.64	0.30	-0.74	2.42
Investors Intelligence Bearish Percentage	Weekly	1987 - 2010	Index Number	1227	0.34	0.08	-0.48	0.78
Investors Intelligence Bullish Percentage	Weekly	1987 - 2010	Index Number	1227	0.25	0.07	-0.31	0.44
Confidence Index:								
Barron's Confidence Index	Weekly	1932 - 2010	Index Number	4132	0.02	0.02	-0.16	0.21
Exchange Seat Prices:								
AMEX Seat Prices	Monthly	1921 - 1993	National Currency	861	2.27	0.24	-0.64	4.25
NYSE Annual Seat Price	Annual	1820 - 2003	National Currency	183	11.44	0.41	-0.43	3.00
Volatility Indices:								
CBOE S&P 500 Volatility Index	Daily	1986 - 2011	Index Number	6430	0.21	0.07	-0.47	3.13
CBOE NASDAQ Volatility Index	Daily	2001 - 2011	Index Number	2560	0.09	0.05	-0.27	0.44
CBOE S&P 100 Volatility Index	Daily	1986 - 2011	Index Number	6430	0.23	0.08	-0.47	3.13
AMEX NYSE Arca NASDAQ 100 Volatility Index	Daily	2001 - 2011	Index Number	2558	0.17	0.07	-0.47	0.92
CBOE DJIA Volatility Index	Daily	2005 - 2011	Index Number	1515	0.27	0.07	-0.28	0.70
Margin Account Balances:								
NYSE Margin Debt	Monthly	1918 - 2010	National Currency	1107	0.73	0.07	-0.34	0.95
NYSE Free Credit Balances	Monthly	1931 - 2010	National Currency	950	0.89	0.06	-0.37	0.33
NYSE Free Credit Balances on Cash Accounts	Monthly	1971 - 2010	National Currency	479	1.01	0.06	-0.18	0.30
NYSE Free Cash Balances in Margin Accounts	Monthly	1971 - 2010	National Currency	479	1.62	0.09	-0.65	0.97
Mutual Fund Balances:								
USA Mutual Fund Equity Funds Total Net Assets	Monthly	1984 - 2010	National Currency	324	1.47	0.05	-0.23	0.19
USA Mutual Fund Equity Funds Cash Percentage	Monthly	1968 - 2010	National Currency	516	0.11	0.07	-0.21	0.28
USA Mutual Fund Equity Funds Redemptions	Monthly	1984 - 2010	National Currency	324	5.91	0.58	-0.90	9.87
USA Mutual Fund Equity Funds New Sales	Monthly	1984 - 2010	National Currency	324	2.95	0.19	-0.49	1.10
USA Mutual Fund Equity and Bond Fund Net Assets	Monthly	1954 - 2010	National Currency	675	2.36	0.34	-0.90	8.81
USA Mutual Fund Equity and Bond Fund Cash Percent	Monthly	1954 - 2010	National Currency	675	0.17	0.07	-0.22	0.30
USA Mutual Fund Equity and Bond Fund Liquid Assets	Monthly	1954 - 2010	National Currency	671	1.24	0.06	-0.17	0.27
USA Mutual Fund Equity and Bond Fund Redemptions	Monthly	1954 - 2010	National Currency	675	2.73	0.17	-0.52	0.63
USA Mutual Fund Equity and Bond Fund New Sales	Monthly	1954 - 2010	National Currency	675	2.84	0.19	-0.48	0.96
Number of Dividend News:								
Moody's Monthly Decreased Dividends	Monthly	1956 - 2011	Units	659	0.31	0.07	-0.24	0.32
Moody's Monthly Extra Dividends Declared	Monthly	1956 - 2011	Units	659	0.15	0.04	-0.25	0.39
Moody's Monthly Increased Dividends Declared	Monthly	1956 - 2011	Units	659	0.12	0.03	-0.13	0.12
Moody's Monthly Omitted Dividends	Monthly	1956 - 2011	Units	659	0.76	0.06	-0.18	0.24
Moody's Monthly Resumed Dividends	Monthly	1956 - 2011	Units	659	0.59	0.09	-0.38	1.27
S&P Monthly Dividend Decreases Declared	Monthly	1955 - 2010	Units	669	36.00	1.40	-0.95	13.00
S&P Monthly Extra Dividends Declared	Monthly	1955 - 2010	Units	673	20.66	0.74	-0.87	3.19
S&P Monthly Increased Dividends Declared	Monthly	1955 - 2010	Units	673	6.25	0.45	-0.91	7.09
S&P Monthly Omitted Dividends Declared	Monthly	1955 - 2010	Units	665	26.61	1.15	-0.95	14.00
S&P Monthly Resumed Dividends Declared	Monthly	1955 - 2010	Units	662	29.99	1.09	-0.90	9.00

Market Indicators	Frequency	Sample Period	Type	N	Mean (*10⁻²)	Std Dev	Min	Max
			Panel B: Market Sentiment Indicators					
Total Volume:								
NYSE Total Volume	Daily	1928 - 2011	Units	22055	6.51	1.19	-0.98	163.25
Total Volume Turnovers:								
NYSE Share Volume Turnover	Monthly	1925 - 2010	Ratio	1032	0.15	0.06	-0.37	0.57
NYSE Annual Share Value Turnover	Monthly	1934 - 2010	Ratio	915	0.30	0.04	-0.34	0.35
Short-term Trading Indices:								
NYSE Short-term Trading Index	Daily	1965-2011	Index Number	11667	15.44	0.74	-0.97	14.17
NASDAQ Short-term Trading Index	Daily	1972-2011	Index Number	9773	162.10	22.20	-1.00	1216.00
Daily Total Market Advances & Declines:								
NYSE Advances	Daily	1928 - 2011	Units	22050	15.79	0.90	-0.97	29.20
NYSE Declines	Daily	1928 - 2011	Units	22050	13.01	0.66	-0.93	22.17
NYSE Net Advances	Daily	1928 - 2011	Units	22022	-61.83	26.56	-893.00	1554.00
NYSE AD Line	Daily	1928 - 2011	Units	22050	-0.80	1.46	-192.00	43.80
NYSE Percentage Net Advances	Daily	1928 - 2011	Units	22022	-63.30	26.36	-881.20	1541.80
NASDAQ Advances	Daily	1972 - 2011	Units	9962	9.84	0.90	-0.96	64.18
NASDAQ Declines	Daily	1972 - 2011	Units	9962	8.77	2.48	-0.99	244.60
NASDAQ Net Advances	Daily	1972 - 2011	Units	9952	-38.01	24.64	-788.00	1144.00
NASDAQ AD Line	Daily	1972 - 2011	Units	9962	84.03	1.55	-38.13	114.24
NASDAQ Percentage Net Advances	Daily	1972 - 2011	Units	9952	-37.84	24.67	-789.41	1147.90
Alternext Advances	Daily	1959 - 2011	Units	13216	5.37	0.43	-0.94	17.80
Alternext Declines	Daily	1959 - 2011	Units	13216	4.25	0.43	-0.97	30.78
Alternext Net Advances	Daily	1959 - 2011	Units	13173	-52.41	11.24	-491.00	299.00
Alternext AD Line	Daily	1959 - 2011	Units	13216	-0.03	0.09	-6.79	3.92
Alternext Percentage Net Advances	Daily	1959 - 2011	Units	11909	-52.30	10.15	-151.72	280.57
Weekly Total Market Advances & Declines:								
NYSE Weekly Advances	Weekly	1940 - 2010	Units	3688	16.75	0.97	-0.94	29.18
NYSE Weekly Declines	Weekly	1940 - 2010	Units	3688	13.99	0.66	-0.92	10.87
NYSE Net Advances	Weekly	1940 - 2010	Units	3683	-129.71	22.92	-671.00	482.50
NYSE AD Line	Weekly	1940 - 2010	Units	3688	0.06	0.16	-6.89	4.03
Daily Total Maket New Highs & New Low:								
NYSE New Highs	Daily	1928 - 2011	Units	20614	19.16	3.01	-0.99	414.00
NYSE New Lows	Daily	1928 - 2011	Units	20558	20.50	1.15	-0.99	58.00
NYSE Net New Highs	Daily	1932 - 2011	Units	20369	3.37	4.05	-207.00	171.00
NYSE Cumulative Highs	Daily	1932 - 2011	Units	20694	0.06	0.02	-0.03	2.17
NYSE Percentage Net New Highs	Daily	1932 - 2011	Units	20281	2.35	3.80	-147.27	170.70
NASDAQ New Highs	Daily	1974 - 2011	Units	9206	7.59	0.46	-0.92	8.50
NASDAQ New Lows	Daily	1974 - 2011	Units	9203	10.11	0.61	-0.95	18.00
NASDAQ Net New Highs	Daily	1974 - 2011	Units	9171	-0.60	3.76	-105.00	65.00
NASDAQ Cumulative Highs	Daily	1974 - 2011	Units	9214	0.14	0.07	-1.33	6.00
NASDAQ Percentage Net New Highs	Daily	1974 - 2011	Units	9167	-0.61	3.76	-104.61	65.13
Alternext New Highs	Daily	1962 - 2011	Units	12219	14.83	1.19	-1.00	89.91
Alternext New Lows	Daily	1962 - 2011	Units	12222	16.50	1.20	-0.99	95.00
Alternext Net New Highs	Daily	1962 - 2011	Units	11929	-4.29	2.55	-82.00	92.00
Alternext Cumulative Highs	Daily	1962 - 2011	Units	12462	0.16	0.24	-9.80	15.00
Alternext Percentage Net New Highs	Daily	1963 - 2011	Units	11291	-2.48	2.57	-84.71	85.43
Weekly Total Maket New Highs & New Lows:								
NYSE Weekly New Highs	Weekly	1937 - 2010	Units	3869	17.32	0.94	-0.95	17.80
NYSE Weekly New Lows	Weekly	1937 - 2010	Units	3869	21.58	1.17	-0.95	27.20
NYSE Net New Highs	Weekly	1937 - 2010	Units	3860	2.08	7.06	-229.00	124.50
NYSE Cumulative Highs	Weekly	1937 - 2010	Units	3869	13.93	8.45	-10.72	525.00

Market Indicators	Frequency	N	Buy & Hold Strategy			Technical Strategy							
			Mean ($*10^{-3}$)	Std. Dev. ($*10^{-2}$)	Sharpe Ratio ($*10^{-2}$)	Mean ($*10^{-3}$)	Std. Dev. ($*10^{-2}$)	Sharpe Ratio ($*10^{-2}$)	t-stats	α ($*10^{-3}$)	t-stats	β	t-stats
Panel A: Market Sentiment Indicators													
NYSE Odd Lot Purchases	Daily	5235	0.25	1.17	1.32	0.05	1.14	-0.34	**4.94**	-0.19	**-4.94**	0.94	**149.70**
NYSE Short Sales-General Public	Weekly	1741	1.28	2.26	0.85	1.28	1.75	1.08	0.16	0.08	0.30	0.61	**17.12**
AAII Bullish Index	Weekly	565	-0.21	2.66	-2.43	-0.50	2.44	-3.83	0.53	-0.38	-0.93	0.84	**26.23**
AAII Neutral Index	Weekly	565	-0.21	2.66	-2.43	0.33	2.29	-0.47	0.74	0.39	0.80	0.74	**15.96**
CBOE S&P 500 Volatility Index	Daily	3213	0.04	1.36	-0.23	-0.15	1.28	-1.71	**2.36**	-0.19	**-2.46**	0.88	**59.02**
CBOE NASDAQ Volatility Index	Daily	1278	0.01	1.57	-0.32	-0.55	1.12	-5.38	**2.28**	-0.57	**-2.63**	0.48	**10.43**
CBOE S&P 100 Volatility Index	Daily	3213	0.04	1.36	-0.23	-0.08	1.27	-1.21	1.49	-0.13	-1.56	0.87	**56.92**
CBOE DJIA Volatility Index	Daily	756	-0.03	1.87	-0.24	-0.31	1.31	-2.42	0.73	-0.29	-0.84	0.45	**8.22**
NYSE Free Credit Balances	Monthly	474	5.48	4.54	2.00	4.93	3.40	1.06	0.27	0.12	0.11	0.53	**9.24**
USA Mutual Fund Equity Funds Redemptions	Monthly	163	2.02	4.85	-0.98	2.02	4.85	-0.98	N/A	0.00	N/A	1	N/A
USA Mutual Fund Equity and Bond Fund Net Assets	Monthly	336	6.53	4.53	6.00	6.50	3.54	7.59	0.41	1.40	1.03	0.58	**7.46**
Moody's Monthly Increased Dividends Declared	Monthly	304	8.25	4.23	9.71	6.61	3.64	6.77	0.94	-0.63	-0.56	0.74	**13.39**
S&P Monthly Extra Dividends Declared	Monthly	335	6.24	4.52	5.43	5.89	3.67	5.75	0.09	0.79	0.60	0.63	**8.16**
S&P Monthly Resumed Dividends Declared	Monthly	330	8.00	4.40	9.42	6.97	3.51	8.89	0.14	0.76	0.55	0.61	**7.78**
Panel B: Market Strength Indicators													
NYSE Short-term Trading Index	Daily	5832	0.28	1.14	1.50	-0.38	0.95	-5.09	**8.34**	-0.60	**-8.55**	0.68	**31.14**
NASDAQ Declines	Daily	4980	0.25	1.18	1.32	0.27	1.17	1.57	1.36	0.03	1.34	0.98	**74.32**
Alternext Advances	Daily	6607	0.30	1.18	1.58	-0.33	0.86	-5.12	**7.14**	-0.54	**-7.24**	0.52	**14.20**
NYSE Weekly Advances	Weekly	1843	1.47	2.26	2.01	1.21	1.97	0.98	0.70	-0.15	-0.63	0.75	**32.10**
NYSE Net New Highs	Daily	10139	0.25	1.08	1.00	0.18	1.00	0.33	**1.78**	-0.06	**-1.67**	0.86	**78.72**
NYSE Net New Highs	Weekly	1929	1.61	2.32	2.52	1.56	1.86	2.86	0.24	0.16	0.62	0.64	**21.87**

This table compares risk and return characteristics of buy and hold strategies with those of market-indicator-based technical strategies that show significant predictability in full sample under the OLS regressions. We report means, standard deviations and Sharpe ratios for buy and hold strategies and technical strategies, respectively. Then we report *t*-statistics testing the null hypothesis that the Sharpe ratios of the two strategies are equal. We then report Jensen's α estimation results for technical strategies in the last four columns. α values indicate excess returns generated by the technical strategies at given risk level β over market returns. We also present associated *t*-statistics testing their differences from zero for α and β values. All *t*-statistics are White standard errors corrected and marked in bold if significant at 10% significance level.

Appendix 3: Additional GARCH（1,1) Economic Significance Test

Market Indicators	Frequency	N	Buy & Hold Strategy			Technical Strategy							
			Mean (*10⁻³)	Std. Dev. (*10⁻²)	Sharpe Ratio (*10⁻²)	Mean (*10⁻³)	Std. Dev. (*10⁻²)	Sharpe Ratio (*10⁻²)	t-stats	α (*10⁻³)	t-stats	β	t-stats
Panel A: Market Sentiment Indicators													
AAII Neutral Index	Weekly	565	-0.21	2.66	-2.43	0.09	2.55	-1.35	0.89	0.26	0.86	0.92	**38.75**
Barron's Confidence Index	Weekly	2065	1.24	2.31	0.92	1.47	2.12	2.06	1.27	0.26	1.41	0.84	**42.79**
Moody's Monthly Decreased Dividends	Monthly	326	6.24	4.45	4.50	4.70	3.83	1.23	1.07	-0.91	-0.80	0.73	**14.28**
Moody's Monthly Increased Dividends Declared	Monthly	304	8.25	4.23	9.71	6.77	3.69	7.11	0.87	-0.54	-0.50	0.76	**14.17**
S&P Monthly Resumed Dividends Declared	Monthly	330	8.00	4.40	9.42	7.37	3.56	9.87	0.12	1.09	0.79	0.63	**7.90**
Panel B: Market Strength Indicators													
NYSE Short-term Trading Index	Daily	5832	0.28	1.14	1.50	-0.38	0.95	-5.09	**8.34**	-0.60	**-8.55**	0.68	**31.14**
NASDAQ Advances	Daily	4980	0.25	1.18	1.32	0.13	1.16	0.35	**3.64**	-0.11	**-3.73**	0.97	**141.00**
NASDAQ Declines	Daily	4980	0.25	1.18	1.32	0.27	1.17	1.57	1.36	0.03	1.34	0.98	**74.32**
Alternext Advances	Daily	6607	0.30	1.18	1.58	-0.33	0.86	-5.12	**7.14**	-0.54	**-7.24**	0.52	**14.20**
NYSE New Lows	Daily	10278	0.27	1.08	1.12	0.15	1.02	0.02	**3.15**	-0.11	**-3.11**	0.88	**95.00**
NASDAQ New Highs	Daily	6708	0.16	0.01	2.05	0.08	0.92	-0.83	**4.94**	-0.25	**-4.81**	0.79	**35.13**

This table compares risk and return characteristics of buy and hold strategies with tose of market-indicator-based technical strategies that show significant predictability in full sample under the GARCH(1,1) regressions. We report means, standard deviations and Sharpe ratios for buy and hold strategies and technical strategies, respectively. Then we report t-statistics testing the null hypothesis that the Sharpe ratios of the two strategies are equal. We then report Jensen's α estimation results for technical strategies in the last four columns. α values indicate excess returns generated by the technical strategies at given risk level β over market returns. We also present associated t-statistics testing their differences from zero for α and β values. All t-statistics are White standard errors corrected and marked in bold if significant at 10% significance level.

Appendix 4: Additional Robust Regression Economic Significance Test

Market Indicators	Frequency	N	Buy & Hold Strategy			Technical Strategy							
			Mean (*10⁻³)	Std. Dev. (*10⁻²)	Sharpe Ratio (*10⁻²)	Mean (*10⁻³)	Std. Dev. (*10⁻²)	Sharpe Ratio (*10⁻²)	t-stats	α (*10⁻³)	t-stats	β	t-stats
Panel A: Market Sentiment Indicators													
CBOE Ratio of Traded Value of Puts to Calls	Daily	3213	0.04	1.36	-0.23	0.03	1.36	-0.33	1.45	-0.01	-1.49	1.00	**1282.28**
NYSE Odd Lot Sales	Daily	5235	0.25	1.17	1.32	0.15	1.15	0.48	**2.95**	-0.09	**-2.93**	0.96	**153.56**
NYSE Short Sales-General Public	Weekly	1720	1.28	2.23	0.85	1.45	2.09	1.71	0.92	0.20	1.03	0.85	**51.83**
AAII Bullish Index	Weekly	565	-0.21	2.66	-2.43	-0.27	2.61	-2.72	0.33	-0.09	-0.39	0.96	**61.89**
AAII Neutral Index	Weekly	565	-0.21	2.66	-2.43	0.28	2.51	-0.63	1.27	0.43	1.24	0.89	**33.57**
Barron's Confidence Index	Weekly	2065	1.24	2.31	0.92	1.44	2.17	1.87	1.25	0.22	1.37	0.88	**48.95**
CBOE NASDAQ Volatility Index	Daily	1278	0.01	1.57	-0.32	-0.28	1.30	-2.56	1.30	-0.30	-1.43	0.67	**18.34**
CBOE S&P 100 Volatility Index	Daily	3213	0.04	1.36	-0.23	0.07	1.36	-0.05	1.61	0.02	1.65	1.00	**491.27**
AMEX NYSE Arca NASDAQ 100 Volatility Index	Daily	1277	0.00	1.57	-0.33	-0.42	1.26	-3.78	**1.88**	-0.44	**-2.10**	0.63	**15.89**
CBOE DJIA Volatility Index	Daily	756	-0.03	1.87	-0.24	-0.40	1.68	-2.47	1.27	-0.39	-1.38	0.79	**17.09**
USA Mutual Fund Equity and Bond Fund Net Assets	Monthly	336	6.53	4.53	6.00	7.04	3.86	8.35	0.75	1.53	1.16	0.71	**8.18**
S&P Monthly Extra Dividends Declared	Monthly	336	6.43	4.53	5.84	5.66	3.91	4.77	0.35	0.08	0.07	0.73	**9.00**
S&P Monthly Resumed Dividends Declared	Monthly	330	8.00	4.40	9.42	7.46	4.00	9.00	0.17	0.31	0.31	0.81	**20.55**
Panel B: Market Strength Indicators													
NASDAQ Advances	Daily	4980	0.25	1.18	1.32	0.21	1.17	0.98	**2.54**	-0.04	**-2.64**	0.99	**249.78**
NASDAQ Declines	Daily	4980	0.25	1.18	1.32	0.24	1.18	1.30	1.22	0.00	-1.26	1.00	**7474.20**
Alternext Advances	Daily	6607	0.30	1.18	1.58	-0.23	0.93	-3.72	**6.41**	-0.47	**-6.30**	0.61	**14.95**
NYSE Weekly Advances	Weekly	1843	1.02	2.26	2.01	1.78	2.16	3.54	**2.16**	0.35	**2.31**	0.91	**64.17**
NYSE New Lows	Daily	10278	0.27	1.08	1.12	0.17	1.06	0.25	**3.84**	-0.09	**-3.90**	0.95	**151.99**
Alternext New Lows	Daily	6110	0.25	1.20	1.17	0.08	1.13	-0.22	**3.00**	-0.15	**-2.64**	0.88	**16.08**
Alternext Cumulative Highs	Daily	5842	0.21	1.21	0.87	0.17	1.20	0.58	**1.81**	-0.03	**-1.78**	0.99	**255.18**
NYSE Net New Highs	Weekly	1929	1.61	2.32	2.52	1.98	2.19	4.35	**2.42**	0.43	**2.57**	0.89	**48.94**

This table compares risk and return characteristics of buy and hold strategies with tose of market-indicator-based technical strategies that show significant predictability in full sample under the GARCH(1,1) regressions. We report means, standard deviations and Sharpe ratios for buy and hold strategies and technical strategies, respectively. Then we report *t*-statistics testing the null hypothesis that the Sharpe ratios of the two strategies are equal. We then report Jensen's α estimation results for technical strategies in the last four columns. α values indicate excess returns generated by the technical strategies at given risk level β over market returns. We also present associated *t*-statistics testing their differences from zero for α and β values. All *t*-statistics are White standard errors corrected and marked in bold if significant at 10% significance level.

Market Indicators	Full Sample		Expansions		Contractions		
	β (*10⁻³)	t value	β1 (*10⁻³)	t value	β2 (*10⁻³)	t value	Chi-statistic
Panel A: Market Sentiment Indicators							
Option Volumes:							
CBOE Calls Volume	0.00	1.15	-0.32	-0.97	-2.29	-0.82	0.49
CBOE Puts Volume	-0.01	-0.12	0.00	0.04	-0.74	-0.31	0.10
OEX Calls Volume	0.00	-1.26	0.00	-1.26	-1.12	-1.04	1.07
OEX Puts Volume	0.00	0.25	0.00	0.25	1.52	1.17	1.38
CBOE Ratio of Traded Value of Puts to Calls	0.63	0.77	0.74	0.90	-0.21	-0.06	0.07
Odd-lots Volumes:							
NYSE Odd Lot Purchases	0.00	**-4.90**	0.00	**-6.24**	-0.33	-0.25	0.06
NYSE Odd Lot Sales	0.11	0.27	0.32	1.16	-0.41	-0.37	0.40
NYSE Odd Lot Shorts	0.00	1.14	0.00	0.14	0.01	1.58	2.02
Short Sales Volumes:							
NYSE Short Sales-Members	6.68	**7.15**	5.93	**3.64**	9.94	**4.28**	2.00
NYSE Short Sales-General Public	2.63	**2.58**	3.74	**1.99**	14.00	**3.91**	**6.42**
NYSE Short Sales-Specialists	5.90	**5.82**	5.21	**2.52**	7.22	**4.79**	0.61
NYSE Short Sales-Total	6.80	**5.59**	6.53	**3.59**	13.48	**4.66**	**4.13**
Short Interests:							
NYSE Short Interest Ratio	-23.19	**-2.22**	25.54	1.09	37.20	0.63	0.03
NYSE Short Interest Shares	-2.93	-0.12	6.02	0.17	51.82	0.69	0.31
AAII/II Sentiment Indices:							
AAII Bearish Index	0.02	0.01	0.57	0.31	3.47	-0.48	0.30
AAII Bullish Index	6.39	**2.26**	3.33	1.21	16.69	**2.10**	2.10
AAII Neutral Index	-8.70	**-2.83**	-6.85	**-2.22**	-18.89	**-1.85**	1.28
Investors Intelligence Bearish Percentage	-1.04	-0.11	4.46	0.48	-30.19	-0.87	0.93
Investors Intelligence Bullish Percentage	-0.36	-0.03	-4.30	-0.44	11.94	0.35	0.21
Confidence Index:							
Barron's Confidence Index	36.44	0.78	-63.15	-1.45	100.32	0.74	1.33
Exchange Seat Prices:							
AMEX Seat Prices	3.38	0.48	-2.91	-0.74	14.42	0.29	0.12
NYSE Annual Seat Price	-16.55	-0.73	78.17	0.81	-339.21	-1.11	1.58
Volatility Indices:							
CBOE S&P 500 Volatility Index	7.01	**1.74**	5.68	1.24	19.06	1.58	1.07
CBOE NASDAQ Volatility Index	13.28	**2.10**	14.90	**2.93**	8.68	0.44	0.09
CBOE S&P 100 Volatility Index	7.33	**1.96**	6.57	1.59	13.78	1.21	0.35
AMEX NYSE Arca NASDAQ 100 Volatility Index	4.00	0.61	10.68	**2.76**	-7.06	-0.45	1.22
CBOE DJIA Volatility Index	13.39	**1.90**	10.25	**2.32**	21.82	0.95	0.24
Margin Account Balances:							
NYSE Margin Debt	-0.72	-0.02	-32.88	-0.59	44.67	0.36	0.33
NYSE Free Credit Balances	80.49	**2.11**	3.60	0.09	149.82	1.05	0.98
NYSE Free Credit Balances on Cash Accounts	22.34	0.63	32.52	0.95	-41.55	-0.29	0.26
NYSE Free Cash Balances in Margin Accounts	1.66	0.04	-24.67	-0.83	133.67	1.28	2.16
Mutual Fund Balances:							
USA Mutual Fund Equity Funds Total Net Assets	92.74	1.44	-3.10	-0.04	311.35	**2.73**	**5.91**
USA Mutual Fund Equity Funds Cash Percentage	-20.76	-0.69	16.95	0.56	-260.10	**-2.56**	**6.82**
USA Mutual Fund Equity Funds Redemptions	-4.74	**-2.89**	-5.35	**-4.17**	29.78	0.56	0.44
USA Mutual Fund Equity Funds New Sales	6.59	0.54	-3.24	-0.27	67.98	**1.70**	**2.92**
USA Mutual Fund Equity and Bond Fund Net Assets	10.50	**6.14**	9.75	**10.51**	203.01	1.52	2.10
USA Mutual Fund Equity and Bond Fund Cash Percent	-17.87	-0.78	13.29	0.51	-206.80	**-2.01**	**4.30**
USA Mutual Fund Equity and Bond Fund Liquid Assets	13.26	0.51	32.62	1.11	-76.53	-0.69	0.93
USA Mutual Fund Equity and Bond Fund Redemptions	-10.50	-0.91	-15.98	-1.22	3.72	0.07	0.14
USA Mutual Fund Equity and Bond Fund New Sales	7.89	0.85	3.23	0.31	26.85	0.75	0.40
Number of Dividend News:							
Moody's Monthly Decreased Dividends	40.61	1.57	27.19	0.85	42.06	0.49	0.03
Moody's Monthly Extra Dividends Declared	-63.32	-1.38	12.32	0.28	-517.81	**-3.05**	9.05
Moody's Monthly Increased Dividends Declared	-97.86	**-1.97**	-74.67	-1.19	-190.32	-1.19	0.44
Moody's Monthly Omitted Dividends	7.60	0.24	-4.29	-0.11	2.62	0.02	0.00
Moody's Monthly Resumed Dividends	15.28	0.81	17.33	0.84	-18.23	-0.24	0.21
S&P Monthly Dividend Decreases Declared	0.43	0.45	-0.16	-0.11	9.41	0.98	0.97
S&P Monthly Extra Dividends Declared	4.48	**2.17**	5.36	**2.08**	-5.88	-0.65	1.45
S&P Monthly Increased Dividends Declared	2.11	0.57	4.01	0.60	0.60	0.14	0.19
S&P Monthly Omitted Dividends Declared	0.88	0.68	0.87	0.60	-6.08	-1.04	1.33
S&P Monthly Resumed Dividends Declared	2.85	**1.89**	3.50	**2.59**	-1.91	-0.38	1.09

Market Indicators	Full Sample		Expansions		Contractions		
	β (*10⁻³)	t value	β1 (*10⁻³)	t value	β2 (*10⁻³)	t value	Chi-statistic
Panel B: Market Strength Indicators							
Total Volume:							
NYSE Total Volume	0.09	0.83	0.51	**3.02**	3.73	**1.85**	2.52
Total Volume Turnovers:							
NYSE Share Volume Turnover	5.39	0.13	-72.86	**-2.18**	-65.27	-0.51	0.00
NYSE Annual Share Value Turnover	28.23	0.64	-11.06	-0.11	-59.14	-0.18	0.02
Short-term Trading Indices:							
NYSE Short-term Trading Index	-0.49	**-2.15**	-0.36	-1.49	-1.09	-1.59	1.00
NASDAQ Short-term Trading Index	-0.01	-1.16	0.00	-0.65	-0.02	-0.93	0.46
Daily Total Market Advances & Declines:							
NYSE Advances	0.51	**2.98**	0.84	**2.82**	0.71	0.99	0.03
NYSE Declines	-0.72	**-3.65**	-0.91	**-3.89**	-1.99	**-1.83**	0.95
NYSE Net Advances	0.00	0.49	0.00	0.31	0.02	**2.10**	**3.89**
NYSE AD Line	0.00	-0.35	0.00	-0.61	0.01	0.65	0.58
NYSE Percentage Net Advances	0.00	0.36	0.00	0.32	0.02	**2.10**	**3.88**
NASDAQ Advances	0.23	1.48	0.22	**1.93**	0.32	0.45	0.02
NASDAQ Declines	-0.10	**-3.41**	-0.08	**-5.22**	-1.80	-1.53	2.14
NASDAQ Net Advances	0.00	-0.50	0.00	-1.12	0.02	1.31	2.27
NASDAQ AD Line	0.00	-0.22	0.00	0.41	-0.01	-0.94	1.03
NASDAQ Percentage Net Advances	0.00	-0.51	0.00	-1.13	0.02	1.31	2.26
Alternext Advances	1.18	**4.02**	0.90	**2.79**	2.16	**1.92**	1.16
Alternext Declines	-1.04	**-2.46**	-1.27	**-4.65**	-2.97	**-2.06**	1.35
Alternext Net Advances	0.01	0.80	0.00	0.28	0.02	0.64	0.29
Alternext AD Line	0.00	-0.03	-0.01	-1.21	0.04	**2.27**	**6.58**
Alternext Percentage Net Advances	0.01	0.60	0.00	0.14	0.02	0.67	0.38
Weekly Total Market Advances & Declines:							
NYSE Weekly Advances	-1.49	**-3.33**	-1.13	-1.62	-2.41	**-4.07**	2.02
NYSE Weekly Declines	0.65	1.21	0.53	0.64	1.79	0.92	0.35
NYSE Net Advances	0.00	0.22	0.00	0.23	0.01	0.11	0.01
NYSE AD Line	-1.20	-0.52	25.61	0.56	-156.05	-1.23	1.83
Daily Total Maket New Highs & New Lows:							
NYSE New Highs	0.14	**3.61**	0.10	**19.92**	0.60	1.03	0.74
NYSE New Lows	-0.13	-1.50	-0.22	-1.44	-0.06	-0.09	0.07
NYSE Net New Highs	0.04	**1.77**	0.02	1.00	0.01	0.16	0.01
NYSE Cumulative Highs	-0.01	-0.34	-0.01	-0.61	0.07	0.78	0.80
NYSE Percentage Net New Highs	0.04	1.60	0.02	1.00	0.01	0.15	0.01
NASDAQ New Highs	-0.16	-0.43	-0.02	-0.07	-0.42	-0.46	0.17
NASDAQ New Lows	0.25	1.26	0.11	0.57	0.76	1.44	1.31
NASDAQ Net New Highs	-0.01	-0.21	-0.01	-0.30	0.02	0.25	0.13
NASDAQ Cumulative Highs	0.03	0.98	0.02	0.69	0.16	1.18	1.01
NASDAQ Percentage Net New Highs	-0.01	-0.22	-0.01	-0.32	0.02	0.24	0.12
Alternext New Highs	0.20	**2.23**	0.24	**2.52**	1.08	1.60	1.51
Alternext New Lows	-0.06	-0.89	-0.04	-0.49	-0.13	-0.23	0.02
Alternext Net New Highs	0.00	0.11	0.00	-0.03	0.15	1.29	1.47
Alternext Cumulative Highs	-0.03	-0.88	-0.02	-0.41	-0.12	**-1.68**	1.52
Alternext Percentage Net New Highs	0.01	0.30	0.00	0.05	0.15	1.28	1.39
Weekly Total Maket New Highs & New Lows:							
NYSE Weekly New Highs	0.11	0.26	0.17	0.27	1.86	**1.67**	1.77
NYSE Weekly New Lows	-0.30	-0.74	-0.45	-0.71	0.51	0.12	0.05
NYSE Net New Highs	0.11	**1.88**	0.10	1.26	0.36	0.63	0.21
NYSE Cumulative Highs	-0.01	**-3.62**	-0.01	**-11.59**	-7.00	**-10.81**	**116.35**

This table reports the OLS results of the regression model $R_t = \alpha_t + \beta_1 D_{t-1}I_{t-1} + \beta_2(1-D_{t-1})I_{t-1} + \varepsilon_t$. R_t represents S&P 500 periodic returns calculated as log differences of the S&P 500 Index values, I_{t-1} represents periodic percentage changes of market indicators. D_{t-1} is a dummy variable that equals 1(0) during CFNAI business cycle expansions(contractions). Therefore β_1 and β_2 measure the predictability of a market indicator during expansions and contractions respectively. We replicate the full sample OLS results for comparison in the first two columns, then we report β_1 and β_2 with associated *t*-statistics, and the last column reports *chi*-statistics testing the null hypothesis that β_1 and β_2 are equal. We obtain all data from the Global Financial Data. The *t*-statistics and *chi*-statistics reported are White standard errors corrected and marked in bold if significant at 10% significance level. Panel A and Panel B report results for market sentiment and market strength indicators respectively.

Market Indicators	Frequency	N	Buy & Hold Strategy			Technical Strategy							
			Mean ($*10^{-3}$)	Std. Dev. ($*10^{-2}$)	Sharpe Ratio ($*10^{-2}$)	Mean ($*10^{-3}$)	Std. Dev. ($*10^{-2}$)	Sharpe Ratio ($*10^{-2}$)	t-stats	α ($*10^{-3}$)	t-stats	β	t-stats
Panel A: Market Sentiment Indicators													
NYSE Odd Lot Purchases	Daily	5218	0.25	1.17	1.32	0.09	0.86	-0.10	1.40	-0.08	-1.00	0.54	**22.68**
NYSE Short Sales-Members*	Weekly	1054	0.87	2.27	0.26	0.99	0.73	2.46	0.64	0.15	0.67	0.12	**4.03**
NYSE Short Sales-General Public	Weekly	1055	0.87	2.27	0.26	0.93	0.75	1.59	0.39	0.08	0.35	0.13	**4.21**
NYSE Short Sales-Specialists*	Weekly	1050	0.87	2.27	0.26	0.63	0.81	-2.29	0.76	-0.23	-0.97	0.15	**4.18**
NYSE Short Sales-Total	Weekly	1050	0.87	2.27	0.26	0.96	0.72	2.00	0.50	0.11	0.52	0.12	**3.83**
AAII Neutral Index	Weekly	525	-0.21	2.66	-2.43	0.14	0.81	-3.58	0.24	-0.28	-0.84	0.11	**2.27**
CBOE NASDAQ Volatility Index	Daily	1274	0.01	1.57	-0.32	-0.18	0.61	-3.85	1.13	-0.18	-1.14	0.15	**7.82**
AMEX NYSE Acra NASDAQ 100 Volatility Index	Daily	1273	0.00	1.57	-0.33	-0.09	0.62	-2.27	0.63	-0.08	-0.53	0.16	**7.90**
CBOE DJIA Average Volatility Index	Daily	752	-0.03	1.87	-0.24	0.00	0.67	-0.12	0.03	0.07	0.30	0.13	**6.22**
USA Mutual Fund Equity Funds Redemptions	Monthly	153	2.09	4.84	-0.79	4.79	3.95	5.85	1.33	1.32	0.69	0.67	**7.20**
USA Mutual Fund Equity and Bond Fund Net Assets	Monthly	207	5.56	4.39	5.45	4.60	2.40	5.98	0.09	0.74	0.52	0.28	**5.08**
S&P Monthly Extra Dividends Declared*	Monthly	200	5.54	4.38	5.44	3.80	1.95	3.32	0.31	0.37	0.32	0.17	**4.08**
S&P Monthly Resumed Dividends Declared*	Monthly	246	7.90	4.46	9.65	3.25	1.95	-1.73	**1.77**	-0.88	-0.79	0.16	**3.47**
Panel B: Market Strength Indicators													
NYSE Total Volume	Daily	5468	0.26	1.16	1.37	0.01	0.60	-1.55	**2.15**	-0.14	**-2.06**	0.25	**10.56**
NYSE Share Volume Turnover	Daily	240	5.56	4.39	5.45	4.14	2.92	3.34	0.40	-0.45	-0.30	0.44	**6.22**
NYSE Advances	Daily	5539	0.26	1.16	1.38	-0.25	0.65	-5.41	**5.31**	-0.39	**-5.33**	0.31	**17.06**
NYSE Declines	Daily	5466	0.26	1.16	1.38	0.03	0.56	-1.25	**1.88**	-0.11	**-1.77**	0.22	**10.43**
NASDAQ Advances	Daily	4971	0.25	1.18	1.32	0.04	0.84	-0.64	**1.83**	-0.12	-1.45	0.52	**21.41**
NASDAQ Declines	Daily	4971	0.25	1.18	1.32	0.30	0.90	2.31	1.02	0.13	1.56	0.59	**22.78**
Alternext Advances	Daily	5468	0.26	1.16	1.37	-0.05	0.53	-2.82	**2.91**	-0.19	**-3.05**	0.19	**9.34**
Alternext Declines	Daily	5468	0.26	1.16	1.37	0.01	0.58	-1.61	**2.17**	-0.14	**-2.10**	0.24	**10.34**
NYSE New Highs	Daily	5502	0.25	1.16	1.33	0.13	0.82	0.32	0.98	-0.04	-0.49	0.51	**22.40**
Alternext New Highs	Daily	5453	0.25	1.16	1.30	-0.04	0.76	-1.84	**2.77**	-0.19	**-2.45**	0.43	**20.64**
NYSE Cumulative Highs	Weekly	1138	1.54	2.34	3.58	0.62	1.43	-0.59	1.60	-0.40	-1.15	0.37	**7.47**

This table compares risk and return characteristics of buy and hold strategies with tose of market-indicator-based technical strategies that show significant predictability in full sample under the GARCH(1,1) regressions. We report means, standard deviations and Sharpe ratios for buy and hold strategies and technical strategies, respectively. Then we report *t*-statistics testing the null hypothesis that the Sharpe ratios of the two strategies are equal. We then report Jensen's α estimation results for technical strategies in the last four columns. α values indicate excess returns generated by the technical strategies at given risk level β over market returns. We also present associated *t*-statistics testing their differences from zero for α and β values. All t-statistics are White standard errors corrected and marked in bold if significant at 10% significance level. The estimations are based on the OLS regression results.

Appendix 7: CFNAI Contractions Economic Significance Test

Market Indicators	Frequency	N	Buy & Hold Strategy			Technical Strategy							
			Mean ($*10^{-3}$)	Std. Dev. ($*10^{-2}$)	Sharpe Ratio ($*10^{-2}$)	Mean ($*10^{-3}$)	Std. Dev. ($*10^{-2}$)	Sharpe Ratio ($*10^{-2}$)	t-stats	α ($*10^{-3}$)	t-stats	β	t-stats
Panel A: Market Sentiment Indicators													
NYSE Short Sales-Members	Weekly	1054	0.87	2.27	0.26	0.99	0.73	2.46	0.64	0.15	0.67	0.12	**4.03**
NYSE Short Sales-General Public	Weekly	1055	0.87	2.27	0.26	0.93	0.75	1.59	0.39	0.08	0.35	0.13	**4.21**
NYSE Short Sales-Specialists	Weekly	1050	0.87	2.27	0.26	0.63	0.81	-2.29	0.76	-0.23	-0.97	0.15	**4.18**
NYSE Short Sales-Total	Weekly	1050	0.87	2.27	0.26	0.96	0.72	2.00	0.50	0.11	0.52	0.12	**3.83**
AAII Bullish Index	Weekly	524	-0.21	2.66	-2.43	0.57	0.69	1.92	0.86	0.14	0.49	0.07	**1.93**
AAII Neutral Index	Weekly	525	-0.21	2.66	-2.43	0.14	0.81	-3.58	0.24	-0.28	-0.84	0.11	**2.27**
USA Mutual Fund Equity Funds Total Net Assets	Monthly	141	2.09	4.84	-0.79	0.61	1.79	-10.46	0.98	-1.44	-1.26	0.09	**2.15**
USA Mutual Fund Equity Funds Cash Percentage	Monthly	241	5.15	4.39	4.65	3.13	2.37	0.08	0.71	-0.32	-0.24	0.25	**3.33**
USA Mutual Fund Equity Funds New Sales	Monthly	141	2.09	4.84	-0.79	0.59	1.50	-12.64	1.11	-0.92	-1.36	0.03	1.14
USA Mutual Fund Equity and Bond Fund Cash Percent	Monthly	243	5.56	4.39	5.45	2.22	2.36	-4.01	1.44	-0.82	-0.62	0.23	**3.07**
Moody's Monthly Extra Dividends Declared	Monthly	252	5.67	4.37	5.67	2.98	1.48	-1.41	0.94	0.14	0.20	0.07	**2.54**
Panel B: Market Strength Indicators													
NYSE Total Volume	Daily	5468	0.26	1.16	1.37	0.01	0.60	-1.55	**2.15**	-0.14	**-2.06**	0.25	**10.56**
NYSE Declines	Daily	5466	0.26	1.16	1.38	0.03	0.56	-1.25	**1.88**	-0.11	**-1.77**	0.22	**10.43**
NYSE Net Advances	Daily	10287	0.31	1.08	1.48	0.16	0.58	0.20	1.34	-0.04	-0.86	0.28	**13.77**
NYSE Percentage Net Advances	Daily	10286	0.31	1.08	1.47	0.16	0.58	0.15	1.38	-0.04	-0.91	0.28	**13.80**
Alternext Advances	Daily	5468	0.26	1.16	1.37	-0.05	0.53	-2.82	**2.91**	-0.19	**-3.05**	0.19	**9.34**
Alternext Declines	Daily	5468	0.26	1.16	1.37	0.01	0.58	-1.61	**2.17**	-0.14	**-2.10**	0.24	**10.34**
Alternext AD Line	Daily	5447	0.30	1.16	1.70	0.07	0.72	-0.41	**1.75**	-0.11	-1.50	0.37	**14.72**
NYSE Weekly Advances	Weekly	1119	1.26	2.35	2.37	0.57	1.22	-1.04	1.20	-0.28	-0.88	0.28	**4.66**
Alternext Cumulative Highs	Daily	4957	0.34	1.17	2.11	0.02	0.74	-0.95	**2.45**	-0.17	**-2.15**	0.38	**14.35**
NYSE Weekly New Highs	Weekly	1126	1.26	2.35	2.37	0.23	1.19	-3.92	**2.16**	-0.62	**-1.92**	0.26	**4.48**
NYSE Cumulative Highs	Weekly	1138	1.54	2.34	3.58	0.62	1.43	-0.59	1.60	-0.40	-1.15	0.37	**7.47**

This table compares risk and return characteristics of buy and hold strategies with tose of market-indicator-based technical strategies that show significant predictability in full sample under the GARCH(1,1) regressions. We report means, standard deviations and Sharpe ratios for buy and hold strategies and technical strategies, respectively. Then we report t-statistics testing the null hypothesis that the Sharpe ratios of the two strategies are equal. We then report Jensen's α estimation results for technical strategies in the last four columns. α values indicate excess returns generated by the technical strategies at given risk level β over market returns. We also present associated t-statistics testing their differences from zero for α and β values. All t-statistics are White standard errors corrected and marked in bold if significant at 10% significance level. The estimations are based on the OLS regression results.

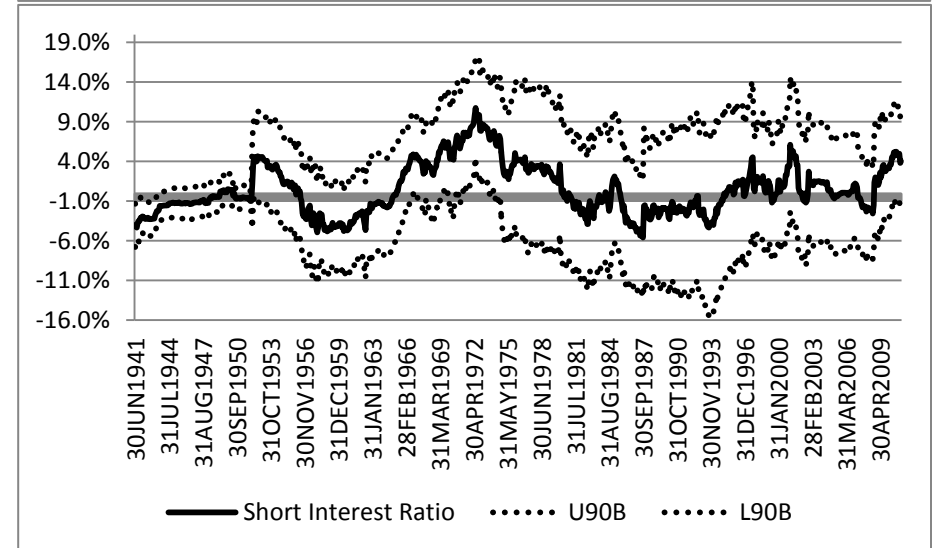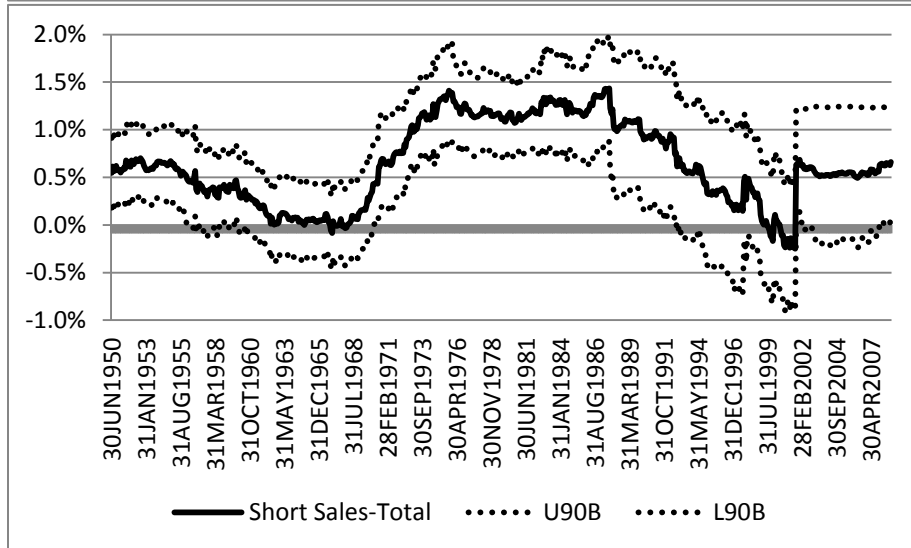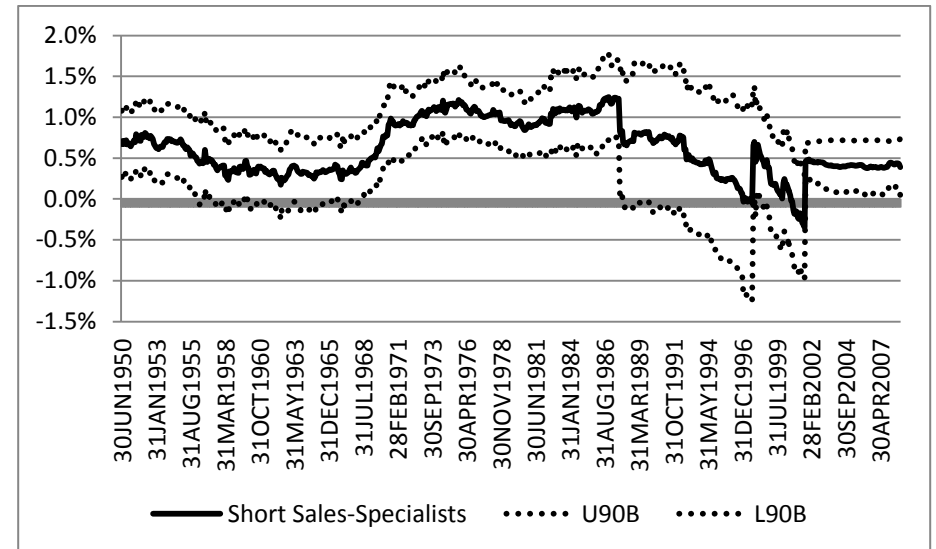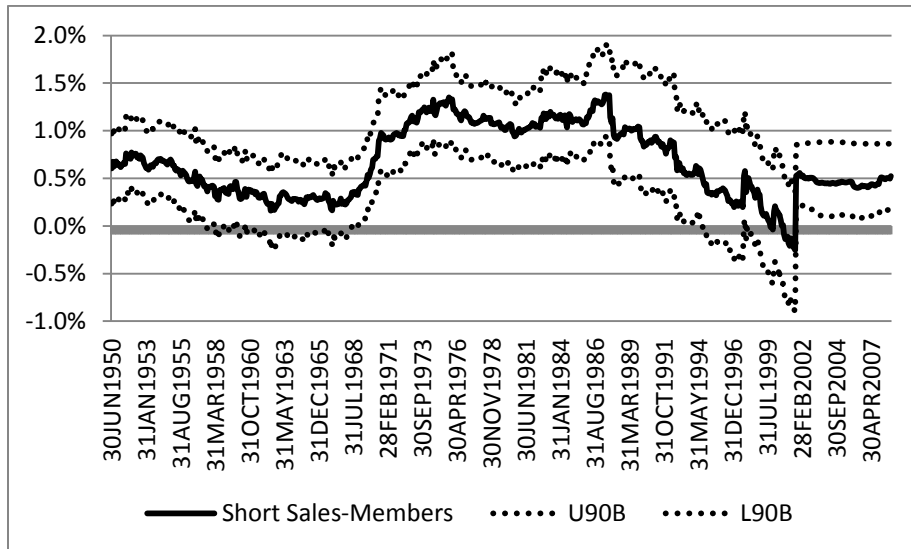# Figure 1: 10-year Rolling Window OLS Regressions

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Figure 1 Continued

Figure 1 Continued