Testing behavioral finance models of market under- and overreaction: do they really work?

Asad Kausar *

Lecturer in Accounting and Finance
Manchester Business School
University of Manchester
Crawford House, Oxford Road,
Manchester, M13 9PL
Tel: 44 (0) 161 275 0122
Fax: 44 (0) 161 275 4023
Email: Asad.Kausar@mbs.ac.uk

and

Richard J Taffler

Martin Currie Professor of
Finance and Investment
Management School and Economics
University of Edinburgh
William Robertson Building
50 George Square
Edinburgh EH8 9JY
Tel: 44 (0) 131 651 1375
Fax: 44 (0) 131 651 3068
Email: Richard.Taffler@ed.ac.uk

Version 1.2: November 29 2005

*** Corresponding author**

Testing behavioral finance models of market under- and overreaction: do they really work?

ABSTRACT

We test the predictions of the three main behavioral finance theories of market under- and overreaction using out-of-sample data conditional on the nature of the news using the going-concern audit opinion (bad news event) and its withdrawal (good news event). We find strong support for the Daniel, Hirshleifer and Subrahmanyam (1998) model for our bad news as well as the good news case suggesting that market underreaction to going-concern opinions is a consequence of prior market overreaction resulting from incorrect classification of going-concern firms by investors into trending regimes. In contrast, we find no support for the Barberis, Shleifer and Vishny (1998) or Hong and Stein (1999) models in our event-study setting in either the bad or good news cases. Our results have a number of implications relating to the value of such theoretical behavioral finance models in practice. We also highlight the central role of the limits-to-arbitrage assumption when testing such behavioral finance theories.

Testing behavioral finance models of market under- and overreaction: do they really work?

1. Introduction

The behavioral finance paradigm is increasingly becoming a serious alternative to market efficiency in explaining many of the empirical anomalies observed over the past few decades (e.g., Shiller, 2003). The crux of behavioral finance is the idea that investors make small errors in processing value-relevant information which causes market prices to deviate from what a rational expectations model (such as the efficient market hypothesis) would predict.

This paper focuses on two important empirical (ir)regularities which have attracted much attention in the recent finance literature, market underreaction and market overreaction; proponents of behavioral finance argue these result from irrational investor behavior. In an attempt to provide an explanation for these phenomena, behavioral theorists have developed models based on psychological concepts or the existence of heterogeneous investor groups. Most notable among such models are Daniel, Hirshleifer and Subrahmanyan (1998), henceforth DHS, Barberis, Shleifer and Vishny (1998), henceforth BSV, and Hong and Stein (1999), henceforth HS. Not surprisingly, these models work well on the anomalies they were designed to explain (Fama, 1998). Consequently, in assessing their contribution to the finance literature, it is necessary to assess the out-of-sample predictive ability of these models (e.g., Chan, Frankel and Kothari, 2004; Rubinstein, 2001; Hirshleifer, 2001; Hong and Stein, 1999; Fama, 1998). The only scientific way to do this is to develop empirically rejectable hypotheses (Barberis and Thaler, 2002; Fama, 1998).

However, very limited attempts have been made to test these models explicitly in an out-of-sample context to date. This is mainly due to the strict assumptions required to find systematic

mispricing which would allow formal tests of the models. Chan, Frankel and Kothari (2004) discuss these assumptions and point out that their inability to find evidence of mispricing consistent with behavioral theories could be the result of abundant arbitrage opportunities, not necessarily because such models lack descriptive ability. This suggests that their tests are hindered by the lack of limits-to-arbitrage problem, which is a serious limitation when seeking to test behavioral finance models.[1] They further suggest that future research might attempt to test the predictions of these models in contexts that a priori exhibit limited arbitrage.

Our aim in this paper is to test the predictions of the three main behavioral finance models of market under- and overreaction using unambiguous mandatory public accounting signals. More specifically, we employ going-concern audit report disclosures to provide clean and direct tests of these models. The going-concern environment has special characteristics that overcome the limitations of previous studies and so make it an ideal context for such analyses. This is because, firstly, in the case of these mainly small financial-distressed firms the important limits-to-arbitrage condition is met, and provides a plausible explanation for the observed mispricing (market underreaction) to persist for a period of one year after the publication of a going-concern audit opinion (post-going-concern drift) (Kausar, Taffler and Tan, 2005; Taffler, Lu and Kausar, 2004). Second, use of going-concern opinions (GC) as our events allows us to test these models in different domains – good and bad news, which is increasingly an important consideration in applying such models (e.g., Chan, 2003; Dichev and Piotroski, 2001; Womack, 1996; Bernard and Thomas, 1989). Going-concern opinions cast doubt on the ability of the firm to continue to operate in its present form and highlight an increased risk of bankruptcy. Similarly, the opposite is true when such an opinion is lifted (going-concern withdrawal) in a subsequent audit report. Finally,

[1] For the limits-to-arbitrage argument see e.g., Shleifer and Vishny (1997).

testing these models will also permit us to seek a behavioral explanation for the post-going-concern drift anomaly.

To assess the out-of-sample validity of the DHS, BSV, and HS behavioral finance models, we examine the medium-term market performance of firms following the publication of going-concern (bad news) and going-concern withdrawn (good news) audit report opinions. More specifically, we categorize our bad and good news sample firms into trending, mean-reverting and momentum regimes to test the DHS, BSV, and HS models respectively. This particular classification of our tests is based on two considerations. First, in a medium-horizon event-study context all three behavioral finance models predict market underreaction. Second, the assumptions and arguments each model uses to generate market underreaction are quite distinct, and call for such a classification. For example, the DHS model predicts underreaction as a consequence of overreaction, BSV seek to capture market underreaction by employing the idea of a mean-reverting regime, and HS argue that underreaction comes from the gradual diffusion of information. We argue that representation of these models as tests of various market regimes is not only appropriate, but also necessary, to provide a valid basis on which empirical testing of these models in an event-study framework can be conducted.

We examine the medium-term market response to the publication of going-concern and going-concern withdrawal audit opinions and find that the market underreacts to GC opinions (bad news) and responds rationally to GC withdrawal opinions (good news), consistent with Kausar, Taffler and Tan (2005). In our hypothesis test we find strong evidence in favor of the DHS model in both the bad news and good news domains, using our full sample of going-concern and going-concern withdrawal firms. Interestingly, though, when we categorize our GC firms into upward trending and downward trending regimes, and then compute the difference between the two portfolios, the

resulting market mispricing becomes much worse compared to the full GC sample (-26% vs -16%). However, in the good news case market mispricing only becomes evident upon categorization of our GC withdrawal firms into trending regimes (upward and downward). Nonetheless, a strategy of going long in the downward-trending portfolio and short in the upward-trending portfolio after the release of the good news (GC withdrawals) apparently earns, on average, a return of 88% over a one-year period absent all costs.

On the other hand, categorization of sample firms based on the BSV and HS models is not supported by the data, in either the bad or good news domains. As such, we have no evidence that these two behavioral finance models are able to explain market under- and overreaction outside the context of their original framework. Our results have a number of important implications and provide much needed direct empirical evidence on whether the existence of behavioral biases among investors generates anomalous market behavior in practice.

The remainder of this paper is organized as follows: section 2 develops our hypotheses, and section 3 describes our data and test methodology. Section 4 reports the results of our analyses, and section 5 concludes.

2. Hypothesis development

This section develops testable hypotheses based on the three behavioral finance models of Daniel, Hirshleifer, and Subrahmanyam (1998) (DHS), Barberis, Shleifer and Vishny (1998) (BSV), and Hong and Stein (1999) (HS) conditional on the nature of the news event (bad or good). We first briefly discuss each of the three models and then present our hypotheses.

2.1 Overview of the Models

In Daniel, Hirshleifer and Subrahmanyan (1998), investors are overconfident and exhibit biased self-attribution. The authors define "overconfidence" to mean that investors believe too strongly in their own private information, which leads to systematic overreaction to private information and underreaction to public information. "Biased self-attribution" means that investors attach too much significance to signals that confirm their prior beliefs and too little significance to information signals that contradict them. DHS use the idea that investors overreact to their private information and adjust only slowly when the public signal contradicts it. Underreaction is not caused by the signal itself but is only a consequence of initial overreaction and then rectification of this initial mispricing. Conversely, if the signal confirms investors' beliefs, then overreaction will continue and the price will move further out of line with rational valuation. In this setting, drift following a public event/signal can be seen as either continued overreaction or the subsequent reversal of the earlier mispricing.

Barberis, Shleifer and Vishny (1998) build a model of the behavior of a representative investor based on the concepts of representativeness and conservatism. In their terminology, "representativeness" means that investors ignore the laws of probability and behave as if the events they have recently observed are typical of the return (or earnings) generating process. "Conservatism" means that investors are slow to update their prior beliefs in response to new information. These two behavioral tendencies, and a particular model structure involving two states of nature, namely, mean reversion and trending regimes, combine to produce underreaction in some circumstances and overreaction in others. For example, BSV state that underreaction will tend to occur when investors think they are in a mean-reverting regime and expect the (earnings)

signal to reverse in the following period (i.e., a signal at time t will have an opposite sign to a signal in time t+1). However, if the new signal is inconsistent with their expectations (i.e., is of the same sign) investors will react to this new signal with conservatism causing the market to underreact to this new information.

Finally, Hong and Stein (1999) model the phenomena of underreaction and overreaction by focusing on a market composed of heterogeneous investors. They identify two types of investor: "newswatchers" who trade on private information, and "momentum traders" who trade on simple forecasts by extrapolating past price changes. The authors also assume that private information diffuses gradually across the newswatcher population. Their infinite-horizon model predicts that stock prices will underreact to information in short to medium run, but will overreact in the long run. For example, when newswatchers are active, prices will adjust slowly to new information causing an underreaction, but never an overreaction. Similarly, when momentum traders are active they will trade on the basis of past price changes, thereby generating momentum and causing prices to overshoot in the longer run, arbitraging away any underreaction left behind by the newswatchers.

Although, the three papers employ different motivations to drive their models, pricing implications arising could be somewhat similar. For example, representativeness and overconfidence can produce similar return patterns and so can conservatism and biased self-attribution. Similarly, the use of heterogeneous groups in Hong and Stein (1999) causes underreaction in the short-run because of gradual diffusion of private information (i.e., conservatism) and overreaction in the long-run because of incorrect extrapolation of past price

trends.[2] This inherent problem creates difficulties for researchers seeking to isolate pervasive behavioral biases, if any, affecting security prices.

To overcome this problem we formulate our hypotheses in such a way that allows us to test each model separately. This is because we are seeking an explanation for the underreaction phenomenon and each model has a different model structure or set of assumptions generating market underreaction. As such, we explicitly use Barberis, Shleifer and Vishny's (1998) framework of trending and mean-reverting regimes to differentiate between the DHS and BSV models. For the HS model we rely on their assumption of gradual information diffusion and categorize firms by momentum regime, by which we simply mean post-event return continuation in the same direction as pre-event returns i.e., if prices are going up they will continue to go up and vice versa. Using past research as a guide we use pre-event long-term raw returns to categorize our GC firms into trending regime and medium-term raw returns to categorize GC firms into mean-reverting and momentum regimes.[3]

2.2 Hypotheses

In the DHS model, the underreaction phenomenon is the result of the correction of an initial market overreaction to private information occurring some time (long-term) prior to the event being released in the public domain. As mentioned above, to test this prediction we view the DHS model as a test of the trending regime where investors become increasing overconfident when their

[2] See Chan, Frankel, and Kothari (2004) for detailed discussion.
[3] Chan, Frankel and Kothari (2004), using accounting measures, fail to find evidence in favour of behavioral hypotheses. However, Daniel (2004) interprets this as being consistent with some behavioral models because he argues that investors misinterpret non-accounting information. To abstract from this debate we use past returns as a source of future return predictability, as any misinterpretation of information (accounting or non-accounting) should ultimately be reflected in stock prices.

private signals are confirmed by public signals (due to self-attribution bias) leading them to over-infer from a series of good news announcements and form upward trending expectations. This leads to initial overreaction and later to return-reversals when ultimately the public signal disconfirms the past upward trend resulting in a delayed market response to the new bad news public signal due to biased-self attribution. Conversely, the opposite holds true for a series of bad news announcements. This argument implies that once investors form upward (downward) trending expectations regarding future firm performance based on prior long-term performance, the market should underreact to the new news event if it contradicts the trend. We use the notion of upward trending regime for firms with high past performance and downward trending regime for firms with low past performance and establish our hypotheses for bad and good news cases separately in the alternative form:

H1B: GC firms categorized to an upward trending regime should exhibit higher levels of market underreaction compared to GC firms categorized to a downward trending regime on publication of the going-concern opinion (bad news).

H1G : GC withdrawal firms categorized to a downward trending regime should exhibit higher levels of market underreaction compared to GC withdrawal firms categorized to an upward trending regime on publication of the going-concern withdrawal opinion (good news).

BSV's model uses a mean-reverting regime scenario to explain the phenomenon of market underreaction to news events. In their model, market overreaction and underreaction are two separate phenomena and do not necessarily drive each other as suggested by DHS and HS. BSV

argue that underreaction obtains if investors believe in a mean-reverting regime and expect that subsequent firm stock price performance will be in the opposite direction to prior medium-term performance. However, if investors do not observe such a pattern then they will underreact to new information due to conservatism i.e., they will update their beliefs slowly in the face of new conflicting evidence. To test this proposition separately in our bad and good news domains, we initially classify a subset of our sample firms as mean-reverting and then categorize those firms with low medium-term performance to a downward mean-reverting regime, and firms with high medium-term performance to an upward mean-reverting regime. This enables us to establish our alternative hypotheses H2B and H2G:

H2B: GC firms categorized to a downward mean-reverting regime should exhibit higher levels of market underreaction compared to GC firms categorized to an upward mean-reverting regime on publication of the going-concern opinion (bad news).

H2G: GC withdrawal firms categorized to an upward mean-reverting regime should exhibit higher levels of market underreaction compared to GC withdrawal firms categorized in a downward mean-reverting regime on publication of the going-concern withdrawal opinion (good news).

Finally, market underreaction in the HS model obtains primarily from gradual diffusion of private information among newswatchers. Hong, Lim and Stein (2000), in the case of momentum, report results which are supportive of the HS model. They argue that if momentum arises from gradual information flow, then there should be more momentum (underreaction) in those stocks for

which information emerges more slowly, such as small poorly-followed firms. Past research shows that going-concern firms are generally small in size with very low analyst following (Kausar, Taffler and Tan, 2005; Taffler, Lu and Kausar, 2004). So our going-concern context provides an ideal opportunity for out-of-sample tests of the HS model in the bad news, as well as the good news, case. For expositional convenience and consistency we term this a test of the momentum regime where, due to gradual information flow, post-event period returns tend to have the same sign as the medium-term pre-announcement period returns. To develop our hypotheses we categorize our sample firms that have low medium-term performance into a downward momentum regime, and firms with high medium-term performance into an upward momentum regime, and establish our hypotheses in the alternative form. H3B represents the bad news scenario, while H3G is a test of the HS model in the good news case.

H3B: GC firms categorized to a downward momentum regime should exhibit higher levels of market underreaction compared to GC firms categorized to an upward momentum regime on publication of the going-concern opinion (bad news).

H3G : GC withdrawal firms categorized to an upward momentum regime should exhibit higher levels of market underreaction compared to GC withdrawal firms categorized to a downward momentum regime on publication of the going-concern withdrawal opinion (good news).

3. Data and test methods

3.1. Web-based Sample Collection Procedure

We use Thomson Financial's free-text search facility to identify firms with going-concern audit reports on SEC's EDGAR database from 1994 to 2002. The main combination of keywords used is "raise substantial doubt" and "ability to continue as a going-concern". This search gives us 14,761 going-concern opinions published in 10-K filings.

We locate the searched companies on the *Center for Research in Security Prices (CRSP) Database* as investigating longer-run stock price performance is our primary objective. Of the 14,761 firm-years, 9,896 are not found in the CRSP database. We then search each remaining company on the SEC's EDGAR database. From the remaining 4,865 firm-years, we further eliminate firms if their previous year's audit report is not clean or if they are financial firms, utilities, in a development stage, filed for Chapter 11 prior to the GC publication date, are foreign (incorporated outside U.S.) or have insufficient data in CRSP/COMPUSTAT. Our final sample consists of 845 first-time GC firm-year observations for the 1994-2002 period (i.e. approximately 94 firm-years per year). Firms in this sample that survive and have their going-concern opinion withdrawn in the subsequent year, with sufficient data in CRSP/COMPUSTAT, are classified as our GC withdrawal sample (the good news case). These 122 firms represent 15% of our initial GC sample and around 30% of those surviving for one year after a first-time GC audit report.

3.2. Descriptive Statistics

Our data consists of 845 (122) non-finance, non-utility industry firms with first-time going-concern (going-concern withdrawn) audit reports published between the beginning of 1994 and the end of 2002 with stocks fully listed on the NYSE, AMEX or NASDAQ. These firms have 59 different 2-digit SIC codes indicating no significant degree of industry clustering. Returns data and market values are taken from the CRSP database. All other financial data are taken from COMPUSTAT and analyst coverage from IBES. Z-scores, measuring bankruptcy risk (Altman, 1968), are computed using data drawn from COMPUSTAT. Following Shumway (1997) and Shumway and Warther (1999), delisting returns are included in monthly returns. To abstract from the influence of outliers, extreme observations for all our continuous variables except market value and momentum (MOM) (defined as monthly average of prior 11-month raw returns to one month before the going-concern event) are set at the 1^{st} and the 99^{th} percentiles respectively. These percentiles are derived from population statistics and not from sample statistics.

Table 1 provides descriptive statistics. As can be seen from Panel A, not surprisingly, our going-concern (bad news) firms which, by definition, are in financial distress, have low market capitalization (mean size = $34m) and are highly loss making (mean return on assets = –77%). Low current ratio (mean = 1.36) and high mean ratio of total interest bearing debt to total assets (38%), together with average z-score = –1.7, where z <1.8 means a high probability of failure, equally demonstrate the high risk profile of the firm sample. Similarly, on average, these firms are associated with a significant decline in pre-event stock prices (mean MOM = -4%). On the other hand, our going-concern withdrawal (good news) firms have much improved financial figures. Market data shows that these firms are significantly larger in size (mean size = $117m) compared

to the going-concern sample, and experience a substantial rise in stock price prior to the publication of the going-concern withdrawal audit report (mean MOM = 8%). The accounting ratios also show a significant improvement in firm characteristics.

Table 1 here

Panel B shows 18% of our GC population have negative book value of equity, compared with 11% of our going-concern withdrawal (GCW) sample (p=0.03). Firms are five times more likely to enter into bankruptcy/liquidation (delisting codes: 400, 572, 574) in the year following the publication of the going-concern opinion than after a going-concern withdrawal opinion (p=0.00). Similarly, 39% firms delist due to performance reasons (delisting codes: 550 to 585) in the year after the publication of a going-concern opinion but only 12% delist after a going-concern withdrawn opinion (p=0.00). This again confirms the distressed state of our GC sample, whereas our GCW sample has bankruptcy and delisting rates closer to the population base rates suggesting a significant improvement in the financial health of GCW firms after the publication of their initial GC opinion. Finally, there are no significant differences between GC and GCW firms in terms of dividend payment, proportion of firms that are subsequently acquired, or analyst coverage.

3.3. Tests of Hypotheses

This section describes our classification of going-concern and going-concern withdrawal firms into categories based on their prior long-term and medium-term stock price performance. We also discuss our procedures for operationalizing our hypotheses for empirical testing.

Trending regime: We use a trending regime scenario as the test of the DHS model and employ prior long-term returns to classify going-concern and going-concern withdrawal firms into trending categories. More specifically, GC (GCW) firms with positive monthly average of prior 36-month (t-36 to t-1) raw returns are classified as upward trending firms, and GC (GCW) firms with similar period negative raw returns are classified as downward trending firms. We postulate that if investors believe firms to be in a trending regime, then firms with positive prior long-term returns (upward trending) should experience most of the reversal phenomenon after the publication of the GC bad news as this news would contradict their beliefs about these firms. That is subsequent positive performance due to incorrect extrapolation of past trends. Similarly, the opposite is predicted for our good news case i.e., downward trending firms should perform better relative to the upward trending firms. The formation of categories based on past trending regimes, designed to test hypotheses H1B and H1G, are illustrated in figures 1a and 1b. As can be seen, our prediction based on the DHS model is that the difference between portfolio A (upward trending firms) and portfolio B (downward trending firms) in both cases should be negative and significant.

Figure 1 here

Mean-reverting regime: As mentioned above, a mean-reversion scenario is employed to test the BSV model. To test its predictive ability we need a measure than can classify our going-concern (going-concern withdrawal) firms, or perhaps a subset of these, as mean-reverting firms. To do so we use the idea that if returns of our sample firms exhibit negative autocorrelation at medium-term horizons then this would be consistent with the idea of mean-reversion in returns. We thus derive a

serial correlation coefficient for each stock and then, based on this measure, use firms with negative correlation coefficients to test the mean-reverting regime scenario.

More precisely, for each sample firm i, we estimate the serial correlation coefficient (CORR) of its six-month returns, using 25 overlapping observations over the three-year period prior to the GC (GCW) publication month.[4,5] CORR captures the prior long-term return pattern, and GC (GCW) firms with negative CORR are subject to a mean-reverting pattern in returns over the prior three-year period. We only work with negative CORR firms as positive CORR would be indicative of a trending regime for which we have already conducted explicit tests above. We then further split the GC (GCW) mean-reversion sample into two groups based on the sign of each firm's most recent six-month monthly average return prior to the GC (GCW) event (i.e., t-6 to t-1). The two portfolios formed are an upward mean-reverting firm portfolio i.e., mean-reverting firms with positive prior medium-term return, and a downward mean-reverting firm portfolio i.e., mean-reverting firms with negative medium-term return performance. In this setting, based on the BSV model for our bad news case, we expect that a downward mean-reverting regime firm should underreact to a new GC bad news signal as this public signal will contradict investor beliefs of mean-reversion (i.e. expected subsequent positive performance). For the good news case, investors are expected to underreact to upward mean-reverting regime firms because the good news signal (GCW) will be inconsistent with their belief of mean-reversion. This categorization of our sample firms into mean-reverting regimes, designed to test hypotheses H2B and H2G, is illustrated in figures 2a and 2b. As can be seen our prediction based on the BSV model is that the difference

[4] We construct our CORR measure analogous to Hong, Lim and Stein's (2000) RHO measure. However, the nature of the tests we conduct using CORR are quite different. We require a minimum of 12 overlapping observations for each firm to construct our CORR measure but not all firms in our GC bad news sample meet this criterion, so we work with the reduced GC firm set. All but two of our GCW (good news) firms have a minimum of 12 overlapping observations.
[5] Computation of the CORR variable is analogous to a strategy of investing for six-months based on prior six-month monthly average return. It is because of such a procedure that there are no overlapping returns in the first five months and last six months of the three-year period.

between portfolio A (upward mean-reverting firms) and portfolio B (downward mean-reverting firms) in both our bad and good news cases is expected to be significantly positive.

Figure 2 here

Momentum regime: We use HS's argument of gradual diffusion of private information to form momentum regime scenarios. Firms with positive pre-event medium-term raw returns are expected to exhibit a positive return pattern post-event, and firms with negative pre-event raw returns are expected to exhibit a negative post-event return pattern. To test this proposition, we form two portfolios by splitting our full GC sample based on the sign of prior monthly average six-month returns (t-6 to t-1). The two portfolios are an upward momentum portfolio i.e., firms with positive prior six-month average raw returns, and a downward momentum portfolio i.e., firms with negative prior six-month average raw returns. One important thing to note is that for upward and downward momentum firms if the new news event return (bad or good) is consistent in sign with its prior medium-term return performance, then the normal momentum regime pattern is expected in the post-event announcement period at least in the medium-term.

However, what to expect when the sign of the new news event return (good or bad) is inconsistent with the prior six-month pre-event return pattern is not entirely clear. If investors ignore the public news announcement then we expect return continuation, but if they incorporate the information contained in the signal in their valuation models then we would expect the more rational response of no abnormal performance following the GC (GCW) signal. The logic is simple: momentum traders follow medium-term price trends. If the news event is simultaneously observed and is consistent with the trend, they are likely to continue to follow their existing

strategy (i.e., selling if the trend is bad and buying if the trend is good). But if the news signal is inconsistent with the previous trend in price movements, they would react more rationally by modifying their investment strategies. In our empirical tests we rely on the more conservative approach of no abnormal response if the observed news signal is inconsistent with past medium-term momentum. The formation of portfolios based on upward (downward) momentum regimes, designed to test hypotheses H3B and H3G, are illustrated in figures 3a and 3b. As can be seen, our prediction based on the HS model is that the difference between portfolio A (upward momentum regime firms) and portfolio B (downward momentum regime firms), for both our bad and good news cases, will be greater than zero and significant.

Figure 3 here

3.3.1 Long-horizon Event-study Approach

We use a long-horizon event study approach to test our behavioral hypotheses presented in section 2 above. This also enables use to provide a possible explanation for the apparent market underreaction of GC bad news highlighted by previous studies (e.g., Kausar, Taffler, and Tan, 2005). Therefore, we collect monthly returns for 48 months, 36-months pre- and 12-months post-annual report publication month. We term the annual report publication month as the GC (GCW) announcement month (t=0) and exclude it from our analyses. The returns for both events (announcement of a GC audit report and announcement of a GC withdrawn audit report) are studied in parallel on an event-time basis. This means that our GC withdrawal firms are rebased in event time according to their GC withdrawn audit report publication date. We use the 10-K filing

date taken from SEC's EDGAR database as the first formal announcement date of a going-concern opinion.[6] Monthly holding-period stock returns are taken from CRSP. For delisted firms, we augment the CRSP stock return series with the final month delisting return also provided by the CRSP database. Subsequent monthly returns are represented by the equivalent monthly return on the S&P 600 Small Cap. Index.

3.3.2. Return Generating Methodology

Two approaches are commonly used for generating returns over variable time horizons, BHAR (buy-and-hold abnormal return) and CAR (cumulative abnormal return). However, there is some disagreement in the recent methodological studies on the best method. Barber and Lyon (1997) favor BHARs as they involve compounding returns and reflect actual investor experience. On the other hand, Fama (1998) argues for summing short-term abnormal returns and recommends CARs due to their desirable statistical properties which permit cleaner tests of mispricing. We argue that if mispricing is strong then both methods can be considered as complementary approaches for computing abnormal returns. Nonetheless, long-run abnormal return measurement problems using BHARs usually occur over the 3-5 year time horizon (Kothari and Warner, 1997; Barber and Lyon, 1997), whereas, we restrict ourselves to a one-year time period only. As such, our main results employ the BHAR measurement metric; our CAR results are substantively identical to our main results.[7]

[6] Textual search of press articles using Factiva provided only six cases (less than 1%) of prior publication of news of forthcoming GCs in our sample firms.
[7] We do not report CAR results, however, they are available upon request from the first author.

The return on a buy-and-hold investment in sample firm i less the return on a buy-and-hold investment in an asset/portfolio with an appropriate expected return known as the buy-and-hold abnormal return (BHAR) is given by:

$$BHAR_{in} = \prod_{t=1}^{n}[1 + R_{it}] - \prod_{t=1}^{n}[1 + E(R_{it})] \quad (1)$$

where R_{it} is the simple return on sample firm i in period t.

To further corroborate our BHAR-based results, we also report buy-and-hold raw returns (BHRRs) which can be viewed as a more stringent test of market mispricing and could also highlight mis-measurement problems associated with our expected return benchmark. BHRRs are calculated as follows:

$$BHRR_{in} = \prod_{t=1}^{n}[1 + R_{it}] - 1 \quad (2)$$

Due to the small average firm size of our sample, we only consider equally weighted returns as value-weighting could inflate standard errors and would result in low power to detect abnormal performance (Loughran and Ritter, 2000).

3.3.3. Performance Evaluation

We use a control firm approach (Barber and Lyon, 1997) to determine our expected returns. Sample firms are matched to control firms on the basis of specified firm characteristics. Barber

and Lyon (1997) point out the control firm approach eliminates the new listing bias, the rebalancing bias, and the skewness problem.[8] It also yields well-specified test statistics in virtually all the situations they consider. Ang and Zhang (2004) additionally argue that the control firm method overcomes another important problem which is associated with the event firm not being near the centroid of the respective matched portfolio in the reference portfolio approach. This leads to the matched portfolio return not providing a good estimate of expected firm return. They also demonstrate this problem is more acute with small firms which our GC population comprises. We identify a control firm by matching each of our GC and GC withdrawal firms with that non-financial, non-utility industry, non-GC firm with most similar size and book-to-market ratio. More specifically, we first identify all firms with a market value of equity between 70% and 130% of the market value of equity of the sample firm at the end of the GC (GC withdrawal) month; from this set of firms we choose the firm with the book-to-market ratio closest to that of the sample firm.[9]

4. Results

In this section, we study the medium-term market reaction to first-time going-concern opinions. First, for completeness we replicate the results of Kausar, Taffler and Tan (2005) to demonstrate market mispricing of first-time going-concern firms (bad news) as opposed to going-concern withdrawal firms (good news). We then conduct the main analyses of this paper by subjecting our

[8] This is because the sample and control firms must both be listed in the identified event month, sample and control firm returns are calculated without rebalancing and both the sample and control firms are equally likely to experience large positive returns.

[9] For robustness purposes, we also use an extended three factor matched portfolio approach but do not report the results in this paper, as they are qualitatively similar to those reported below using the control firm approach. In addition to this, we run a Carhart (1997) two-step event time approach for our firms; again, the results are very similar. For both these approaches, details of the exact methodology and results are available from the first author.

going-concern and going-concern withdrawn firms to tests of the out-to-sample predictability of the three behavioral finance models under alternative hypotheses H1 to H3.

4.1. Market Response to Bad and Good News

Tables 2 and 3 provide the mean and median post-going-concern opinion announcement month returns. Panel A of table 2 presents buy-and-hold raw returns (BHRRs), and panel B buy-and-hold abnormal returns (BHARs), over the following 12-month period. As can be seen, results are consistent with Kausar, Taffler, and Tan (2005). Twelve-month (6-month) mean BHRRs and BHARs following the GC audit opinions are -3% (-15%) and -16% (-13%). Equivalent median results are -40% (-33%) and -17% (-13%). All the results for our GC sample (bad news) are significant at better than 1% levels, save the 12-month mean BHRR results.

Tables 2 and 3 here

Whereas table 3 shows neither mean BHRR result is significant for our GC withdrawal sample (good news), however, both median BHRR results are significant at better than the 10% level. However, when we adjust our GC withdrawal firms for risk using control firm BHARs, none of the mean or median results is distinguishable from zero.

Tables 2 and 3 demonstrate how the market responds asymmetrically to good and bad news in the financial distress domain: good news is anticipated completely, while bad news is not. Although the market does not, on average, misprice good news firms, however, we nonetheless continue to test the three behavioral models in both the bad and good news domains. This is

because it is quite possible that the mispricing is less severe for our good news firms, and on average disappears, but it might become evident when placed in trending, mean-reverting or momentum categories. The following three sub-sections conduct empirical tests on the DHS, BSV and HS models respectively.

4.2. Trending Regime: Testing the DHS Behavioral Model

Tables 4 and 5 report the differences in return performance between upward trending and downward trending portfolios measured using raw returns over the prior three-year period, and provide tests of hypotheses H1B and H1G. As illustrated in figures 1a, and 1b, post-event returns are derived by subtracting portfolio B returns from those of portfolio A. Differences in mean (median) BHRRs and BHARs subsequent to the publication of the GC (GC withdrawn) opinion for the 12-month period are reported in panel A and panel B respectively. Table 4 relates to the bad news case, while table 5 represents the good news case.

As can be seen, the stories for both our bad news case (table 4) and good news case (table 5) are quite clear. Results strongly support firm categorization into trending regimes. In the going-concern case, table 4 shows the 12-month mean BHAR (BHHR) difference is -26% (-26%), significant at the 1% level. This evidence is further corroborated by the median BHAR (BHRR) difference results, for example, the 12-month median BHAR (BHHR) difference is -19% (-19%), again significant at conventional levels.[10] Our post-going-concern drift appears to be a long-term return reversal phenomenon as predicted by the DHS model. This evidence is consistent with out alternative hypothesis H1B.

[10] To check our results we conduct two additional robustness tests (i) removing extreme outliers, and (ii) removing GC firms that have missing returns in any month in the prior 36-month period. In both cases, our untabulated results strongly support our original results.

A similar picture emerges for our good news case (GC withdrawals). This is more surprising because there is no evidence of mispricing in our full GC withdrawal sample, and categorization based on trending regimes helps predict subsequent returns. Table 5 shows the 12-month mean (median) BHAR difference to be -88% (-51%), significant at better than the 1% level. Our mean (median) BHRR difference also supports our BHAR results, for example, 12-month mean (median) BHRR difference is -77% (-14%), again significant at conventional levels. These findings are consistent with our alternative hypothesis H1G. We thus conclude that investors do form trending categories based on past long-term performance and respond in a biased way to both bad and good news when the new market signal is inconsistent with their expectations.

Tables 4 and 5 here

4.3. Mean-reverting Regime: Testing the BSV Behavioral Model

Tables 6 and 7 report the difference in return performance of upward mean-reverting and downward mean-reverting portfolios measured using raw returns over the prior six months, and provide tests of hypotheses H2B and H2G. Post-event returns are derived by subtracting returns of portfolio B from portfolio A, as illustrated in figures 2a, and 2b. Differences in mean (median) BHRRs and BHARs subsequent to the publication of the GC (GC withdrawn) opinion for the 12-month period are reported in panel A and panel B respectively. Table 6 presents results for the bad news case, whereas table 7 relates to the good news case.

Neither our bad nor good news case results provide any evidence consistent with firm categorization into mean-reverting regimes. For example, panel B of table 6 shows 12-month mean

(median) BHARs of 1% (4%), not significant at conventional levels. Similarly, panel B of table 7 shows 12-month mean (median) BHAR difference is -3% (-6%), not significant at conventional levels, and with signs in the wrong direction. Our BHRR results confirm these findings. Based on these findings we reject both of our alternative hypotheses H2B and H2G. These results contradict the idea of categories based on mean-reverting regimes, and, as such, are inconsistent with the BSV model of market underreaction.

Table 6 and 7 here

4.4. Momentum Regime: Testing the HS Behavioral Model

Tables 8 and 9 present the difference in return performance between upward momentum and downward momentum portfolios measured using raw returns over the past six-months, and provide tests of our hypotheses H3B and H3G. As illustrated in figures 3a, and 3b, post-event returns are derived by subtracting the returns of portfolio B from those of portfolio A. Differences in mean (median) BHRRs and BHARs subsequent to the publication of the GC (GC withdrawn) opinion for the 12-month period are reported in panels A and B respectively. Table 8 reports results for our going-concern opinion (bad news) sample, while table 9 reports results for going-concern withdrawn opinions (good news).

As can be seen, there is no evidence of gradual diffusion of news in either our bad or good news samples after the publication of the going-concern (going-concern withdrawn) opinion. Table 8, panel B shows the 12-month mean (median) BHAR difference is -7% (2%), not significant at conventional levels. Similarly, table 9, panel B, for the good news case, shows 12-month mean

(median) BHAR difference is -5% (-4%); again these results are not significant at conventional levels. In both the cases the signs are also in the wrong direction. The equivalent BHRR results in the respective panel As also portray the same story. These findings lead us to reject alternative hypotheses H3B and H3G. We thus conclude that information does not diffuse gradually among our small, less-followed firms, highlighting clear lack of out-of-sample support for the HS behavioral model.

Tables 8 and 9 here

In a nutshell, we have clear out-of-sample evidence supporting behavioral theories based on trending regimes. In particular, our results are consistent with the DHS model, and show that market underreaction following going-concern opinions (bad news) is a consequence of initial market overreaction, which is visible only after the release of the new news event into the public domain. Interestingly, this mispricing is not limited to our bad news case (GC), and when we categorize our good news (going-concern withdrawal) firms into trending regimes parallel mispricing becomes evident. On the other hand, the behavioral models of BVS and HS find no support whatsoever in our out-of-sample tests, in either of the bad or good news domains. Thus these two models, based respectively on other cognitive biases, and different types of investor, do not appear to have empirical validity, at least in our context.

5. Conclusions

This paper tests the predictions of the three main behavioral finance theories seeking to explain market under- and overreaction in both bad and good news domains and using out-of-sample data. We use going-concern and going-concern withdrawn audit opinions, which are unambiguous mandatory bad and good news signals to provide clear empirical evidence on whether investors appear to suffer from psychological biases while processing price-sensitive information as suggested by behavioral models of market mispricing. To test this assertion, we categorize our going-concern (going-concern withdrawal) firms into trending, mean-reverting and momentum regimes to assess out-of-sample validity of the Daniel, Hirshleifer, and Subrahmanyam (1998) (DHS), Barberis, Shleifer, and Vishny (1998) (BSV) and Hong and Stein (1999) (HS) models respectively. Consistent with Kausar, Taffler, and Tan (2005) we find that the market underreacts to the bad news conveyed by a going-concern audit opinion, whereas it responds rationally to good news as indicated by a subsequent going-concern withdrawal. In our important tests of our hypotheses we find strong support for the DHS model in the bad news as well as the good news case. For our full sample, we find that the market underreacts to the going-concern announcement by -16 percent at the 12-month stage. However, when we categorize our firms into upward trending and downward trending regimes and then compute the difference between the two portfolios, the mispricing increases by almost two-thirds to around -26 percent. Similarly, and more surprisingly though, when we categorize our GC withdrawal (good news) firms into trending regimes, mispricing now becomes evident and is to the tune of 88%. Both these results are highly significant, and robust to bad model problems. In contrast, categorization of firms in line with

either of the BSV or HS models is not supported by our data, whether in the bad or good news domains.

Our findings have a number of important implications. First, we find out-of-sample evidence consistent with the idea that investors suffer from such behavioral biases as overconfidence and biased-self attribution on which the DHS model is based, both in the bad and good news case. More generally, these results are also consistent with psychological theories based on representativeness. Second, though, explanations based on conservatism or gradual diffusion of news are not supported by our data. Third, based on our empirical analyses we are able to provide a behavioral explanation for the post-going-concern drift anomaly. The market underreaction that we observe after the going-concern announcement is, in fact, return reversals of going-concern firms categorized to an upward trending regime (high past performers) detectable only after the release of the going-concern signal in the public-domain. Finally, our study highlights the centrality of the limits-to-arbitrage assumption in tests of behavioral finance theories.

References

Altman, E.I., 1968, Financial Ratios, Discriminant Analysis and the Prediction of Corporate Bankruptcy, *Journal of Finance,* 23, 589-609.

Ang, J. S., and S. Zhang, 2004, An Evaluation of Testing Procedures for Long Horizon Event Studies, *Review of Quantitative Finance and Accounting,* 23, 251-274.

Barber, B. M., and J. D. Lyon, 1997, Detecting Long-run Abnormal Stock Returns: The Empirical Power and Specification of Test Statistics, *Journal of Financial Economics,* 43, 341-372.

Barberis, N., A. Shleifer, and R.W. Vishny, 1998, A Model of Investor Sentiment, *Journal of Financial Economics,* 49, 307-343.

Barberis, N., and R. Thaler, 2002, A survey of behavioral finance, working paper, University of Chicago and the NBER.

Bernard, V. L., and J. K. Thomas, 1989, Post-earnings Announcement Drift: Delayed Price Response or Risk Premium, *Journal of Accounting Research,* 27 (supplement), 1-48.

Carhart, M. M., 1997, On Persistence in Mutual Fund Performance, *Journal of Finance,* 52, 57-81.

Chan, W.S., 2003, Stock Price Reaction to News and No-News: Drift and Reversal after Headlines, *Journal of Financial Economics,* 70, 223-260.

Chan, W.S., R. Frankel and S.P. Kothari, 2004, Testing Behavioral Finance Theories Using Trends and Consistency in Financial Performance, *Journal of Accounting and Economics,* 38, 3-50.

Daniel, K., 2004, Discussion of: "Testing Behavioral Finance Theories Using Trends and Consistency in Financial Performance" (by Wesley Chan, Richard Frankel and S.P. Kothari), *Journal of Accounting and Economics*, 38, 51-64.

Daniel, K., D. Hirshleifer, and A. Subrahmanyan, 1998, Investor Psychology and Security Market Under- and Overreactions, *Journal of Finance*, 53, 1839-1885.

Dichev, I.D., and J. D. Piotroski., 2001, The Long-run Returns Following Bond Ratings Changes, *Journal of Finance,* 56, 173-203.

Fama, E., 1998, Market Efficiency, Long-Term Returns, and Behavioral Finance, *Journal of Financial Economics*, 49, 283-306.

Hong, H., and J. C. Stein, 1999, A Unified Theory of Underreaction, Momentum Trading and Overreaction in Asset Markets, *Journal of Finance*, 54, 2143-2184.

Hong, H., T. Lim, and J. C. Stein, 2000, Bad News Travels Slowly: Size, Analyst Coverage and the Profitability of Momentum Strategies, *Journal of Finance,* 55, 265-295.

Kausar, A., R. Taffler, and C. Tan, 2005, The Accountant as Prophet: Anomalous market reaction to unambiguous mandatory signals, working paper, University of Manchester.

Kothari, S. P., and J. B. Warner, 1997, Measuring Long-horizon Security Price Performance, *Journal of Financial Economics*, 43, 301-339.

Loughran, T., and J. Ritter, 2000, Uniformly Least Powerful Tests of Market Efficiency, *Journal of Financial Economics,* 55, 361-389.

Rubinstein, M., 2001, Rational Markets: Yes or No? The Affirmative Case, *Financial Analysts Journal,* 57, 15-29.

Shleifer, A., and R. W. Vishny, 1997, The Limits of Arbitrage, *Journal of Finance,* 52, 35-55.

Shiller, R., 2003, From Efficient Markets Theory to Behavioral Finance, *Journal of Economic Perspectives*, 17, 83-104.

Shumway, T., 1997, The Delisting Bias in CRSP Data, *Journal of Finance,* 52, 327-340.

_____, and V. A. Warther, 1999, The Delisting Bias in CRSP's NASDAQ Data and its Implication for the Size Effect, *Journal of Finance,* 54, 2361-2379.

Taffler, R. J., J. Lu, and A. Kausar, 2004, In Denial? Market Underreaction to Going-Concern Audit Report Disclosures, *Journal of Accounting and Economics*, 38, 263-296.

Womack, K.L., 1996, Do Brokerage Analysts' Recommendations Have Investment Value?, *Journal of Finance*, 51, 137-167.

Table 1

Data Summary Statistics

This table presents summary statistics relating to our population of 845 (122) non-finance, non-utility industry firms listed on NYSE, AMEX or NASDAQ receiving first-time going-concern (going-concern withdrawn) audit reports between 1.1.1994 and 12.31.2002. Panel A reports continuous financial variables and Panel B other firm characteristics.

Panel A: Continuous financial variables

	Going-concern (n=845)			Going-concern withdrawal (n=122)						
Variable	Mean	Median	St. dev.	Mean	Median	St. dev.	Mean difference	p-value	Median difference	p-value
SIZE	33.79	12.25	133.28	116.82	30.73	229.10	-83.04	0.00	-18.49	0.00
TA	176.18	24.15	1300.78	199.86	29.74	693.56	-23.68	0.84	-5.59	0.12
SALES	147.41	19.79	970.23	195.57	26.60	727.75	-48.15	0.60	-6.81	0.19
ROA	-0.77	-0.48	0.95	-0.35	-0.11	0.81	-0.42	0.00	-0.37	0.00
CR	1.36	0.95	1.42	1.97	1.43	1.74	-0.62	0.00	-0.48	0.00
LEV	0.38	0.32	0.38	0.32	0.22	0.34	0.05	0.13	0.10	0.12
z-score	-1.73	-0.47	8.78	0.26	1.19	10.75	-1.99	0.02	-1.65	0.00
MOM	-0.04	-0.04	0.09	0.08	0.05	0.09	-0.12	0.00	-0.10	0.00

SIZE = market value measured by market capitalization in $ million at the end of the calendar month of audit report publication date, TA = total assets in $ million, SALES = sales in $ million, ROA = return on assets (net income/total assets), CR = current ratio (current assets/current liabilities), LEV = leverage proxy defined as total debt/total assets, Z-SCORE = financial distress z-score (Altman (1968)), and MOM = monthly average of prior 11-months (t-12 to t-2) raw returns before the publication of the GC (GCM withdrawn) audit report.

Table 1 Cont…

Panel B: Other characteristics

	Going-concern (n=845)		Going-concern withdrawal (n=122)		Difference in proportions
Variable	Number of positive cases	% of sample	Number of positive cases	% of sample	(p-value)
EQUITY	687	81.3	109	89.3	0.03
DIVID	213	25.2	38	31.2	0.16
DEAD	43	5.1	1	0.8	0.03
DELIST	332	39.3	15	12.3	0.00
ACQU	51	6.0	5	4.1	0.39
ACOV	303	35.9	41	33.6	0.63

EQUITY = book value of equity dummy (1 if positive, 0 otherwise), DIVID = dividend paid dummy (1 if dividend paid, 0 if nominal or omission), DEAD = bankruptcy dummy (1 if the firm enters into Chapter 11, Chapter 7, voluntary liquidation, or is wound up within one year of the audit report date, 0 otherwise), DELIST = delist dummy (1 if the firm is delisted due to any other reason within one year of the audit report date, 0 otherwise), ACQU = acquired dummy (1 if the firm is acquired within one year of the audit report date, 0 otherwise), and ACOV = analyst coverage dummy (1 if number of analysts > 0, 0 otherwise) is measured by the number of analysts providing earnings estimates on IBES at any time in the quarter centered on the going-concern (going-concern withdrawal) announcement month.

TABLE 2
First Time Firm Going-concern Audit Report Pre-announcement 12-month Buy-and-hold Returns

This table presents buy-and-hold raw (abnormal) returns (BHRRs and BHARs) for our population of 845 non-finance, non-utility industry firms listed on the NYSE, AMEX or NADSAQ which published a going-concern audit report (GC) (bad news) for the first time between 1.1.1994 and 12.31.2002. The 12-month period reported commences on the first day of the month immediately following the going-concern opinion audit report release month. Returns earned by delisted firms are represented by the equivalent monthly return on the S&P 600 Small Cap. Index. Panel A provides mean and median BHRRs and Panel B the equivalent BHARs results using a control firm benchmark.

Each GC firm in our population is matched with that non-finance, non-utility, non-GC firm with most similar size and book-to-market ratios. Specifically, all non-financial, non-utility firms without GC audit reports listed on the NYSE, AMEX or NASDAQ are first identified with a market value of equity between 70% and 130% of that of the sample firm. The control firm is then selected as that firm with book-to-market ratio closest to that of the sample firm.

Panel A: Buy-and-hold raw returns

Months in event time	1	2	3	4	5	6	7	8	9	10	11	12
Mean BHRR	-0.01	-0.04	-0.08	-0.10	-0.14	-0.15	-0.16	-0.15	-0.11	-0.09	-0.05	-0.03
t-value	-0.38	-2.05	-3.34	-3.95	-5.35	-5.77	-5.77	-5.17	-3.22	-2.30	-1.02	-0.67
Median BHRR	-0.08	-0.13	-0.19	-0.24	-0.32	-0.33	-0.36	-0.38	-0.37	-0.35	-0.38	-0.40
Wilcoxon z-value	-4.57	-6.46	-8.71	-9.92	-10.68	-11.59	-11.33	-11.13	-10.37	-10.06	-9.94	-10.09
Sign z-value	-7.02	-8.38	-10.29	-11.12	-12.15	-13.11	-12.49	-12.11	-11.42	-12.04	-11.63	-11.90

Panel B: Buy-and-hold returns derived using a control firm benchmark

Months in event time	1	2	3	4	5	6	7	8	9	10	11	12
Mean BHAR	-0.03	-0.05	-0.08	-0.09	-0.13	-0.13	-0.13	-0.15	-0.13	-0.21	-0.17	-0.16
t-value	-1.69	-2.28	-2.79	-2.76	-3.50	-3.68	-3.54	-3.62	-2.91	-3.70	-2.81	-2.59
Median BHAR	-0.05	-0.06	-0.10	-0.13	-0.13	-0.16	-0.17	-0.18	-0.16	-0.16	-0.16	-0.17
Wilcoxon z-value	-3.40	-4.04	-4.85	-4.87	-4.94	-5.40	-5.14	-5.34	-5.08	-5.14	-4.97	-4.97
Sign z-value	-4.45	-3.99	-4.40	-5.02	-4.88	-6.05	-5.85	-5.85	-5.64	-4.33	-4.61	-4.68

TABLE 3

First Time Firm Going-concern Withdrawal Audit Report Pre-announcement 12-month Buy-and-hold Returns

This table presents buy-and-hold raw (abnormal) returns (BHRRs and BHARs) for our population of 122 non-finance, non-utility industry firms listed on the NYSE, AMEX or NADSAQ which published a going-concern withdrawn audit report (good news) in the year following the publication of going-concern audit report (GC) between 1.1.1994 and 12.31.2002. The 12-month period reported commences on the first day of the month immediately following the going-concern opinion audit report release month. Returns earned by delisted firms are represented by the equivalent monthly return on the S&P 600 Small Cap. Index. Panel A provides mean and median BHRRs and Panel B the equivalent BHARs results using a control firm benchmark.

Each going-concern withdrawal firm in our population is matched with that non-finance, non-utility, non-GC firm with most similar size and book-to-market ratios. Specifically, all non-financial, non-utility firms without GC audit reports listed on the NYSE, AMEX or NASDAQ are first identified with a market value of equity between 70% and 130% of that of the sample firm. The control firm is then selected as that firm with book-to-market ratio closest to that of the sample firm.

Panel A: Buy-and-hold raw returns

Months in event time	1	2	3	4	5	6	7	8	9	10	11	12
Mean BHRR	0.03	0.02	0.04	0.00	-0.03	-0.05	-0.04	0.02	-0.02	0.05	0.09	0.25
t-value	0.75	0.37	0.61	0.07	-0.37	-0.87	-0.57	0.20	-0.24	0.56	0.79	1.44
Median BHRR	-0.05	-0.10	-0.12	-0.12	-0.17	-0.20	-0.21	-0.19	-0.23	-0.21	-0.22	-0.20
Wilcoxon z-value	-1.55	-2.52	-2.01	-2.17	-2.52	-2.66	-2.76	-2.14	-2.00	-2.04	-2.24	-1.82
Sign z-value	-2.59	-3.17	-2.99	-3.17	-3.71	-3.17	-2.99	-3.89	-2.81	-3.53	-3.17	-2.26

Panel B: Buy-and-hold returns derived using a control firm benchmark

Months in event time	1	2	3	4	5	6	7	8	9	10	11	12
Mean BHAR	0.07	0.04	0.00	-0.07	-0.07	-0.04	0.01	0.08	0.04	0.11	0.14	0.28
t-value	1.44	0.62	0.01	-0.67	-0.67	-0.47	0.06	0.85	0.37	0.97	1.16	1.62
Median BHAR	-0.01	-0.04	0.01	-0.01	-0.02	0.00	0.01	0.07	0.00	0.00	-0.01	0.06
Wilcoxon z-value	-0.64	-0.38	0.09	-0.02	-0.46	0.15	0.27	0.40	0.12	-0.17	-0.25	0.58
Sign z-value	-0.36	-1.00	0.09	-0.81	-0.27	0.27	0.27	1.18	0.00	-0.09	-0.45	0.81

TABLE 4

First Time Going-concern Audit Report (Bad News) Post-announcement Month Returns Conditional on Prior Long-term Performance (Trending Regime)

This table presents buy-and-hold raw (abnormal) returns for our population of 845 non-finance, non-utility industry firms listed on the NYSE, AMEX and NASDAQ which published a going-concern audit report (GC) (bad news) for the first time between 1.1.1994 and 12.31.2002. The table provides results for the portfolio of 551 firms with negative pre-event long-term performance and the parallel portfolio made up of the 294 firms with positive pre-event long-term performance. Long-term performance is measured as the monthly average of prior 36-month (t=-36 to t=-1) raw returns. The table provides mean and median differences between the two portfolios along with their significance levels for the 12 months commencing on the first day of the month immediately following the going-concern audit report release month. Panel A presents mean and median difference buy-and-hold raw returns (BHRR), and Panel B the equivalent buy-and-hold abnormal returns (BHARs). Control firms are selected as described in Panel B of table 2.

Panel A: Buy-and-hold raw returns

Months in event time	1	2	3	4	5	6	7	8	9	10	11	12
Mean BHRR difference	-0.11	-0.15	-0.15	-0.18	-0.20	-0.22	-0.26	-0.25	-0.26	-0.27	-0.28	-0.26
t-value	-3.41	-3.85	-3.23	-3.39	-3.75	-4.00	-4.51	-3.99	-3.69	-3.51	-3.03	-2.54
Median BHRR difference	-0.04	-0.08	-0.10	-0.09	-0.10	-0.10	-0.12	-0.19	-0.20	-0.21	-0.19	-0.19
Mann-Whitney Z	-2.96	-3.69	-3.12	-3.17	-3.21	-3.06	-3.56	-3.76	-3.77	-3.65	-3.53	-3.59

Panel B: Buy-and-hold abnormal returns derived using a control firm benchmark

Months in event time	1	2	3	4	5	6	7	8	9	10	11	12
Mean BHAR difference	-0.07	-0.10	-0.12	-0.15	-0.22	-0.24	-0.26	-0.23	-0.27	-0.25	-0.28	-0.26
t-value	-1.88	-2.10	-2.04	-2.24	-2.79	-3.12	-3.28	-2.71	-2.87	-2.07	-2.24	-1.98
Median BHAR difference	-0.04	-0.09	-0.13	-0.11	-0.10	-0.15	-0.17	-0.16	-0.18	-0.17	-0.16	-0.19
Mann-Whitney Z	-2.47	-2.63	-2.42	-2.05	-2.85	-3.15	-3.65	-3.35	-3.36	-2.99	-2.97	-3.22

TABLE 5

First Time Going-concern Withdrawn (Good News) Audit Report Post-announcement Month Returns Conditional on Prior Long-term Performance (Trending Regime)

This table presents buy-and-hold raw (abnormal) returns for our population of 122 non-finance, non-utility industry firms listed on the NYSE, AMEX and NASDAQ which published a going-concern withdrawn audit report in the year following the publication of GC audit report between 1.1.1994 and 12.31.2002. The table provides results for the portfolio of 47 firms with negative pre-event long-term performance and the parallel portfolio made up of the 75 firms with positive pre-event long-term performance. Long-term performance is measured as the monthly average of prior 36-month (t=-36 to t=-1) raw returns. The table provides mean and median differences between the two portfolios along with their significance levels for the 12 months commencing on the first day of the month immediately following the going-concern withdrawn audit report release month. Panel A presents mean and median difference buy-and-hold raw returns (BHRR), and Panel B the equivalent buy-and-hold abnormal returns (BHARs). Control firms are selected as described in Panel B of table 2.

Panel A: Buy-and-hold raw returns

Months in event time	1	2	3	4	5	6	7	8	9	10	11	12
Mean BHRR difference	-0.07	-0.11	-0.22	-0.22	-0.25	-0.22	-0.12	-0.27	-0.29	-0.28	-0.54	-0.77
t-value	-0.81	-1.02	-1.59	-1.61	-1.76	-1.86	-0.78	-1.59	-1.90	-1.57	-2.47	-2.24
Median BHRR difference	-0.04	-0.07	-0.11	-0.06	-0.11	-0.11	-0.16	-0.17	-0.42	-0.20	-0.16	-0.14
Mann-Whitney Z	-0.96	-1.34	-1.81	-1.45	-1.93	-2.02	-2.13	-2.19	-2.93	-2.57	-2.73	-2.43

Panel B: Buy-and-hold abnormal returns derived using a control firm benchmark

Months in event time	1	2	3	4	5	6	7	8	9	10	11	12
Mean BHAR difference	-0.06	-0.11	-0.31	-0.22	-0.30	-0.36	-0.25	-0.40	-0.42	-0.37	-0.62	-0.88
t-value	-0.61	-0.89	-1.51	-1.01	-1.51	-2.02	-1.39	-2.05	-2.05	-1.66	-2.58	-2.49
Median BHAR difference	-0.07	-0.08	-0.07	-0.03	-0.12	-0.24	-0.26	-0.30	-0.46	-0.34	-0.41	-0.51
Mann-Whitney Z	-0.73	-0.65	-1.18	-0.59	-1.84	-2.48	-2.27	-2.53	-2.90	-2.53	-3.03	-2.90

TABLE 6

First Time Going-concern Audit Report (Bad News) Post-announcement Month Returns Conditional on Medium-term Return Performance of Mean-reverting Firms (Mean-reverting Regime)

This table presents buy-and-hold raw (abnormal) returns for our 582 non-finance, non-utility industry firms listed on the NYSE, AMEX and NASDAQ which published a going-concern audit report (GC) for the first time between 1.1.1994 and 12.31.2002. These 582 GC firms are classified as mean-reverting firms based on the negative estimate for each GC firm's serial correlation coefficient (CORR) of its six-month raw returns, using 25 overlapping observations over the three-year period prior to the GC publication month. The remaining 263 GC firms with a positive CORR estimate are dropped from the analysis as a positive CORR estimate indicates a trending firm. Our GC firms are further split into two portfolios based on the sign of each GC firm's monthly average prior six-month raw return (t-6 to t-1). The table provides results for the portfolio of 363 firms with negative pre-event medium-term performance and the parallel portfolio made up of the 219 firms with positive pre-event medium-term performance. The table provides mean and median differences between the two portfolios along with their significance levels for the 12 months commencing on the first day of the month immediately following the going-concern audit report release month. Panel A presents mean and median buy-and-hold raw returns (BHRRs), and Panel B the equivalent buy-and-hold abnormal returns (BHARs). Control firms are selected as described in Panel B of table 2.

Panel A: Buy-and-hold raw returns

Months in event time	1	2	3	4	5	6	7	8	9	10	11	12
Mean BHHR difference	-0.04	-0.06	-0.05	0.02	-0.01	-0.01	-0.03	-0.02	0.01	0.03	0.09	-0.01
t-value	-1.17	-1.43	-1.09	0.32	-0.08	-0.18	-0.45	-0.22	0.11	0.32	0.80	-0.10
Median BHHR difference	-0.03	-0.05	-0.03	0.04	0.05	0.07	0.10	0.10	0.06	0.06	0.10	0.05
Mann-Whitney Z	-1.38	-1.54	-0.63	0.96	1.43	1.16	0.99	0.70	0.73	0.64	0.72	0.32

Panel B: Buy-and-hold abnormal returns derived using a control firm benchmark

Months in event time	1	2	3	4	5	6	7	8	9	10	11	12
Mean BHAR difference	-0.01	-0.01	0.03	0.02	0.00	0.01	-0.04	0.00	-0.04	0.03	0.04	0.01
t-value	-0.16	-0.15	0.41	0.21	-0.05	0.13	-0.39	0.03	-0.34	0.21	0.30	0.06
Median BHAR difference	-0.01	-0.08	0.02	0.08	0.10	0.11	0.10	0.08	0.09	0.03	0.02	0.04
Mann-Whitney Z	-0.99	-0.36	0.60	0.54	0.28	0.35	0.51	0.44	0.56	0.41	0.44	0.79

TABLE 7

First Time Going-concern Withdrawn (Good News) Audit Report Post-announcement Month Returns Conditional on Medium-term Return Performance of Mean-reverting Firms (Mean-reverting Regime)

This table presents buy-and-hold raw (abnormal) returns for our 91 non-finance, non-utility industry firms listed on the NYSE, AMEX and NASDAQ which published a going-concern withdrawn (GCW) audit report in the year following the publication of GC audit report between 1.1.1994 and 12.31.2002. These 91 GCW firms are classified as mean-reverting firms based on the negative estimate for each GCW firm's serial correlation coefficient (CORR) of its six-month raw returns, using 25 overlapping observations over the three-year period prior to the GCW publication month. The remaining 31 GCW firms with a positive CORR estimate are dropped from the analysis as a positive CORR estimate indicates a trending firm. Our GCW firms are further split into two portfolios based on the sign of each GCW firm's monthly average prior six-month raw return (t-6 to t-1). The table provides results for the portfolio of 33 firms with negative pre-event medium-term performance and the parallel portfolio made up of the 58 firms with positive pre-event medium-term performance. The table provides mean and median differences between the two portfolios along with their significance levels for the 12 months commencing on the first day of the month immediately following the going-concern withdrawn audit report release month. Panel A presents mean and median buy-and-hold raw returns (BHRRs), and Panel B the equivalent buy-and-hold abnormal returns (BHARs). Control firms are selected as described in Panel B of table 2.

Panel A: Buy-and-hold raw returns

Months in event time	1	2	3	4	5	6	7	8	9	10	11	12
Mean BHHR difference	0.08	-0.01	0.01	0.10	0.02	-0.12	-0.17	-0.25	-0.14	-0.19	-0.20	-0.02
t-value	0.72	-0.06	0.05	0.57	0.11	-0.80	-0.91	-1.19	-0.74	-0.83	-0.69	-0.05
Median BHHR difference	-0.06	-0.03	-0.12	-0.11	-0.04	-0.13	0.01	-0.10	-0.33	-0.04	-0.07	-0.07
Mann-Whitney Z	-0.75	-1.01	-0.93	-0.46	-0.51	-0.58	0.10	-0.68	-0.85	-0.44	-0.40	-0.45

Panel B: Buy-and-hold abnormal returns derived using a control firm benchmark

Months in event time	1	2	3	4	5	6	7	8	9	10	11	12
Mean BHAR difference	0.15	-0.02	-0.15	-0.05	-0.07	-0.27	-0.15	-0.24	-0.10	-0.17	-0.24	-0.03
t-value	1.15	-0.10	-0.56	-0.24	-0.34	-1.37	-0.76	-1.06	-0.46	-0.65	-0.82	-0.07
Median BHAR difference	-0.04	-0.03	-0.06	0.05	-0.05	-0.04	0.04	-0.20	-0.18	-0.04	-0.05	-0.06
Mann-Whitney Z	-0.07	-0.58	-0.61	0.21	-0.26	-0.73	0.03	-0.63	-0.57	-0.24	-0.43	-0.54

TABLE 8

First Time Going-concern Audit Report (Bad News) Post-announcement Month Returns Conditional on Prior Medium-term Return Performance (Momentum Regime)

This table presents buy-and-hold raw (abnormal) returns for our population of 845 non-finance, non-utility industry firms listed on the NYSE, AMEX and NASDAQ which published a going-concern audit report (GC) for the first time between 1.1.1994 and 12.31.2002. The table provides results for the portfolio of 581 firms with negative pre-event medium-term performance and the parallel portfolio made up of the 264 firms with positive pre-event medium-term performance. Medium-term performance is measured as the monthly average of the prior 6-month (t=-6 to t=-1) raw returns. The table provides mean and median differences between the two portfolios along with their significance levels for the 12 months commencing on the first day of the month immediately following the going-concern audit report release month. Panel A presents mean and median buy-and-hold raw returns (BHRR), and Panel B the equivalent buy-and-hold abnormal returns (BHARs). Control firms are selected as described in Panel B of table 2.

Panel A: Buy-and-hold raw returns

Months in event time	1	2	3	4	5	6	7	8	9	10	11	12
Mean BHHR difference	-0.04	-0.05	-0.06	0.01	0.00	-0.03	-0.04	-0.04	-0.04	-0.06	0.00	-0.07
t-value	-1.09	-1.36	-1.21	0.10	-0.08	-0.45	-0.73	-0.67	-0.53	-0.71	0.04	-0.69
Median BHHR difference	-0.01	-0.03	-0.03	0.03	0.04	0.07	0.07	0.06	0.04	0.06	0.07	0.02
Mann-Whitney Z	-0.91	-1.26	-0.39	1.16	1.57	1.27	1.04	0.59	0.48	0.36	0.38	0.00

Panel B: Buy-and-hold abnormal returns derived using a control firm benchmark

Months in event time	1	2	3	4	5	6	7	8	9	10	11	12
Mean BHAR difference	-0.03	-0.02	0.00	-0.01	-0.03	-0.02	-0.07	-0.04	-0.07	0.01	-0.03	-0.07
t-value	-0.71	-0.36	-0.02	-0.12	-0.42	-0.29	-0.88	-0.46	-0.69	0.11	-0.21	-0.53
Median BHAR difference	-0.02	-0.06	0.02	0.09	0.07	0.10	0.08	0.07	0.13	0.05	0.03	0.02
Mann-Whitney Z	-0.60	-0.44	0.47	0.46	0.34	0.39	0.59	0.53	0.66	0.59	0.74	0.84

TABLE 9

First Time Going-concern Withdrawn (Good News) Audit Report Post-announcement Month Returns Conditional on Prior Medium-term Return Performance (Momentum regime)

This table presents buy-and-hold raw (abnormal) returns for our population of 122 non-finance, non-utility industry firms listed on the NYSE, AMEX and NASDAQ which published a going-concern withdrawn audit report in the year following the publication of GC audit report between 1.1.1994 and 12.31.2002. The table provides results for the portfolio of 39 firms with negative pre-event medium-term performance and the parallel portfolio made up of the 83 firms with positive pre-event medium-term performance. Medium-term performance is measured as the monthly average of the prior 6-month (t=-6 to t=-1) raw returns. The table provides mean and median differences between the two portfolios along with their significance levels for the 12 months commencing on the first day of the month immediately following the going-concern withdrawn audit report release month. Panel A presents mean and median buy-and-hold raw returns (BHRR), and Panel B the equivalent buy-and-hold abnormal returns (BHARs). Control firms are selected as described in Panel B of table 2.

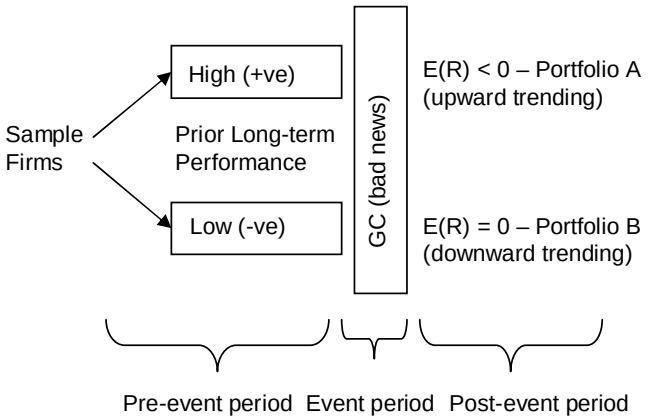
Panel A: Buy-and-hold raw returns

Months in event time	1	2	3	4	5	6	7	8	9	10	11	12
Mean BHHR difference	0.02	-0.09	-0.08	0.01	-0.01	-0.11	-0.15	-0.27	-0.13	-0.16	-0.19	-0.11
t-value	0.25	-0.78	-0.54	0.05	-0.09	-0.88	-1.00	-1.51	-0.80	-0.87	-0.83	-0.31
Median BHHR difference	-0.06	-0.03	-0.17	-0.12	-0.05	0.00	-0.04	-0.13	-0.21	-0.06	-0.03	-0.06
Mann-Whitney Z	-0.94	-1.41	-1.46	-1.06	-0.62	-0.65	-0.36	-0.90	-0.91	-0.49	-0.35	-0.43

Panel B: Buy-and-hold abnormal returns derived using a control firm benchmark

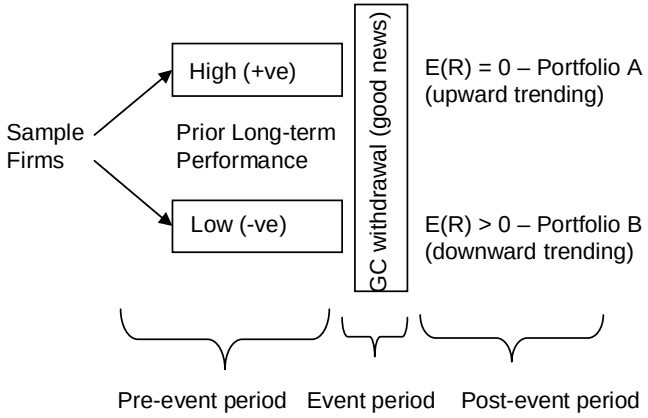
Months in event time	1	2	3	4	5	6	7	8	9	10	11	12
Mean BHAR difference	0.11	-0.05	-0.12	0.15	0.11	-0.06	0.01	-0.15	0.04	-0.06	-0.14	-0.05
t-value	1.08	-0.37	-0.54	0.65	0.52	-0.34	0.06	-0.74	0.18	-0.26	-0.54	-0.13
Median BHAR difference	-0.02	0.03	-0.05	0.05	-0.05	-0.01	0.09	-0.06	-0.10	0.00	-0.02	-0.04
Mann-Whitney Z	-0.87	0.79	-0.58	0.82	-0.92	-0.76	0.81	-0.56	-0.72	0.92	-0.77	-0.61

FIGURE 1
Graphical Illustration of Portfolio Tests of Trending Regime



Prediction $H1_B$: $Rp_A - Rp_B < 0$

Fig 1a : Trending regime – bad news case

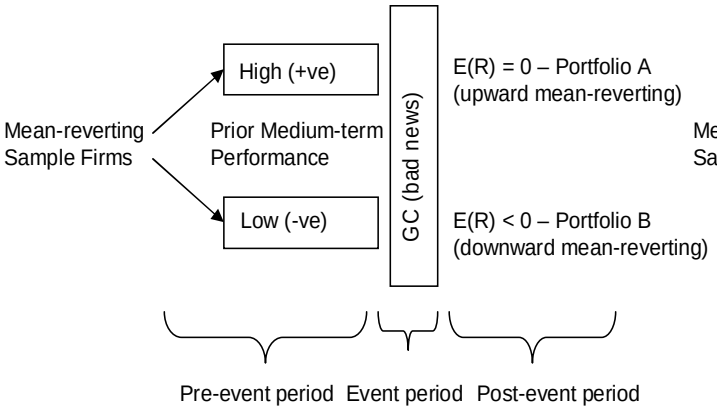


Prediction $H1_G$: $Rp_A - Rp_B < 0$

Fig 1b : Trending regime – good news case

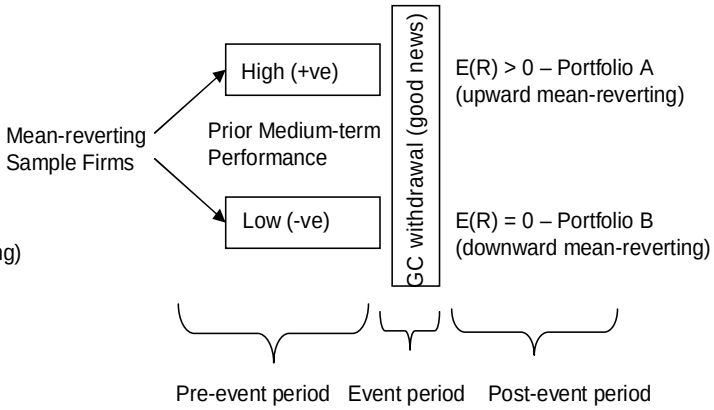
FIGURE 2

Graphical Illustration of Portfolio Tests of Mean-reverting Regime



Prediction $H2_B$: $Rp_A - Rp_B > 0$

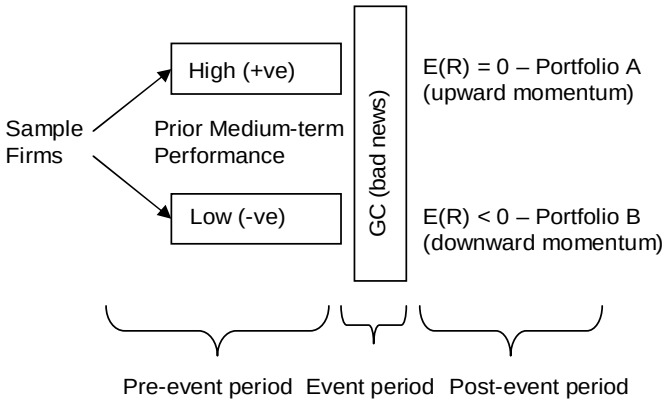
Fig 2a : Mean-reverting regime – bad news case



Prediction $H2_G$: $Rp_A - Rp_B > 0$

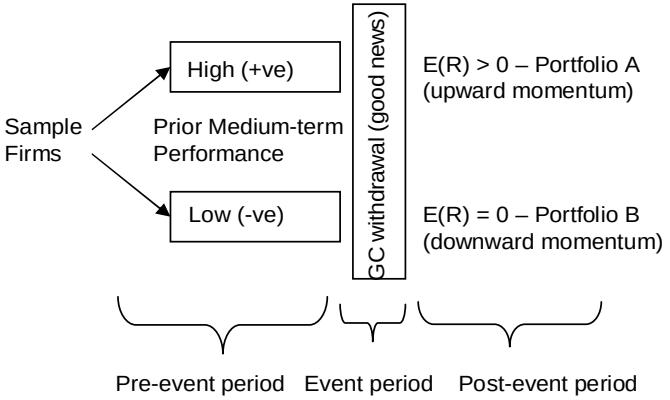
Fig 2b : Mean-reverting regime – good news case

FIGURE 3
Graphical Illustration of Portfolio Tests of Momentum Regime



Prediction $H3_B$: $Rp_A - Rp_B > 0$

Fig 3a : Momentum regime – bad news case



Prediction $H3_G$: $Rp_A - Rp_B > 0$

Fig 3b : Momentum regime – good news case