Dissecting the Returns on Deep Value Investing

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Abstract

Following Ben Graham's "net current asset value" (NCAV) rule for stock selection ("net net" strategy), we provide evidence that buying stocks in companies with per share NCAV greater than the current share price produced superior risk-adjusted returns over the 1975- 2010 period. The risk factors that explain the returns associated with these firms include market risk, market liquidity, a factor capturing overreaction (long-term reversal), and a relative distress factor. The only firm characteristics that drive excess stock returns for such firms are the analyst coverage, stock price per share, and turnover. Controlling for firm size and common risk factors, we find that returns are higher among net-net stocks with low analyst coverage, low stock price per share and lower trading volume.

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JEL Codes: G11, G12

The concept of value investing was formalized by Benjamin Graham and David Dodd in their seminal treatise on the subject Security Analysis (1934). Value investing is designed to combine safety of capital with the potential for high returns. One of the many techniques for finding such opportunities, according to Graham and Dodd, is the concept of "net net." A firm with current share price less than the liquidation value per share is defined as a "net net" opportunity. Graham and Dodd advocate purchasing net- net assets because there is no rational reason for a firm to be selling below its liquidation value, as that is the value one should expect to receive if the firm enters bankruptcy. Thus, it is the floor of potential values of the firm as a going concern. The concept of net-net combines safety of capital (or margin of safety), since there is little room for the stock price to drop any further, and strong up-side potential since most such firms see their share prices rise eventually.

The net-net strategy has been successfully used in practice by Benjamin Graham in the early and mid- twentieth century, yielding excess returns from 1930s to 1956. A small number of studies analyzethis strategy (Greenblatt et al, 1981; Oppenheimer, 1986; and Vu, 1988) . These studies show that that the Graham's net-net strategy for value investing has consistently generated excess returns in 1960s and 1970s. However, the interpretation of the excess returns to value strategies offered in the literature has been controversial. Some argue that the excess return associated with net-net strategy is attributed disproportionately to small firms, and therefore, what is really being observed is a small firm size effect (Vu, 1988). Others argue that value strategies are fundamentally riskier (e.g., Fama and French; 1993, 1996) because such strategies attempt to provide a risk compensation explanation of value premiums. On the other hand, many other researchers (Shleifer and Vishney, 1997; and Daniel and Titman, 1997) dispute whether the Fama and French three factor models (1993 and 1996) really measure risk induced equity return premiums. For example, Shleifer and Vishny (1997) suggest that firms that are selling below their liquidation value are likely to be those identified by as an "extreme circumstance" where arbitrage cannot eliminate the anomaly. According to Shleifer and Vishny, 1997 (pp. 50 - 51):

> ... increasing one's equity position in an industry that is perceived to be underpriced carries substantial fundamental risk, and hence reduces the attractiveness of the trade. Another important factor determining the attractiveness of any arbitrage concerns the horizon over which mispricing is eliminated. ... Markets in which fundamental uncertainty is high and slowly resolved are likely to have a high long-run, but a low short-run, ratio of expected alpha to volatility. For arbitrageurs who care about interim consumption and whose reputations are permanently affected by their performance over the next year or two, the ratio of reward to risk over shorter horizons may be more relevant.

Given the apparent difficulties in exploiting the net-net' opportunity, we are interested in exploring how some investment professionals have had continued success using a net-net strategy to generate high profits..[4] In this study, we argue that the excess return associated with investing in deep value stocks is due to the lack of a liquid market and the length of time required to realize returns. Since net- net issues are likely to be less liquid, price movements may be infrequent and relatively large. This leads to the potential for market moving trades, where the price impact of a buy or sell trade is large enough to wipe out any economic gain from holding the asset. There are several other possible reasons why net-net issues are likely to be mispriced. These include small firm size effect, low analyst coverage, high leverage, low institutional ownership, low price/share and low turnover. For example, if fewer analysts cover a stock, the information disseminates more slowly (e.g., Hong, Lim, and Stein, 2000). Short

[4] For example, the Graham-Newman fund, the Baupost Group (managed by Seth Klarman), see here: http://www.hedgefundletters.com/category/baupost-group/; and Third Avenue Management: http://www.thirdavenuefunds.com/ta/index.aspx.

selling a stock is likely to be more difficult if there are few institutional investors ready to lend shares (e,g, Nagel, 2005). Similarly, a stock with low price/share and low turnover is likely to be more expensive for sophisticated investors to arbitrage (Campbell, Hilscher, and Szilagyi, 2008),. Finally, it is possible that financial distress risk associated with net net stocks may carry a premium.

Our purpose in this paper is to examine the sources of excess returns generated by a net-net strategy. We examine which risk factors and firm features can explain the returns on a net -net strategy. Our research can also shed light on why these firms became so underpriced in the first place. This topic is not only interesting from an investment point of view but also is useful to investors who are faced with risk of investing in small firms. Finally, since all firms invested in our sample are value firms, our work helps identify which factors are correlated with the value premium.

We document that the average monthly return on a net-net portfolio is nearly 5% while the average monthly return on the equal-weighted CRSP is only 1.4% over the same period. We find that the market risk of net- net stocks is quite high. Surprisingly, the small-firm premium in our study does not have any significant explanatory power, nor does the value premium. The momentum factor, from Carhart (1997), has some explanatory power, as does the long-term reversal factor from DeBondt and Thaler (1985). Net- net firms are good candidates for explanation by way of the reversal factor because they are likely to be incorrectly undervalued, based on the firm's fundamental characteristics. We also note that the leverage factor, based on Ferguson and Shockley (2003), has some explanatory power. It is still puzzling that all risk factors described above leave an unexplained alpha of between 4 and 5% per month.

We explore the relation between firm characteristics and the return anomaly in some detail. We find that firms that fall into the net- net category are typically small firms with high book-to-market ratios and low analyst coverage. Such firms also have significantly lower volume than the CRSP mean, and some of those firms are actually less illiquid than the CRSP mean. Net-net firms with per-share price of $5 or greater tend to be more liquid than the CRSP mean. In contrast, net-net firms with per-share price of $3-$5 are much less liquid than the CRSP mean. Controlling for risk factors and firm characteristics we show that the trading volume and analyst coverage are two key factors explaining the excess returns available to net-net firms.

2. Data and Methods

Benjamin Graham first described his “net current asset value” (NCAV) rule for stock selection in the 1934 edition of *Security Analysis*. Graham proposed that investors purchase stocks trading at a discount to NCAV because the NCAV represented “a rough measure of liquidating value” and “there can be no *sound* reason for a stock’s selling continuously below its liquidating value” (Graham and Dodd [1934]). According to Graham, it meant the stock was “too cheap, and therefore offered an attractive medium for purchase.” Graham applied his NCAV rule in the operations of his investment company, Graham-Newman Corporation, through the period 1930 to 1956. He reported that stocks selected on the basis of the rule earned, on average, around 20 per cent per year (Oppenheimer [1986]).

Graham, as a value investor, focused on the margin of safety offered by an investment. He defined the margin of safety as the difference between the intrinsic value of the investment and the market value of the investment. Stocks that are trading at a discount to their liquidation value therefore offer the highest margin of safety of any stocks. The liquidation value is the expected value the firm's assets would fetch if the firm declared bankruptcy and was liquidated. Since this value is not observable, Graham used the net net current asset value as a proxy for the liquidation value.

The net -net current asset value per share (NCAV) is called the "net net" because it is the discounted current assets less current and long-term liabilities. Thus it is net of current liabilities and net of long-term liabilities. We use the following calculation, consistent with the original formulation by Graham and Dodd (1934):

NCAV = [Cash + 0.75*Net Receivables + 0.5*Inventory – (Total Liabilities + Preferred Stock)]/ Shares Outstanding (1)

This is not the only way to calculate the NCAV. Oppenheimer (1986) does not discount receivables and inventory directly. Rather, Oppenheimer took the sum of all liabilities and preferred stock and subtracted it from current assets; this result was then divided by the number of common shares outstanding. Oppenheimer's hypothetical investor bought a security if its November closing price was no more than two-thirds of its NCAV.

The operational form we use to calculate NCAV is deliberately simplified to handle a large number of firms at once. To employ the original method of Graham and Dodd, one would need to devote time to analyzing each firm's business and the economic environment. Our method likely biases downward our performance results, since it is not as detailed an analysis as one would obtain from a case-by-case valuation. On the other hand, our performance net of cost involved in identifying undervalued firms may actually be higher, since our cost of identifying undervalued firms is quite low.

As one can view the NCAV rule as identifying deep value stocks, called “net nets,” investigations of the NCAV rule fall into the literature about value investing and the long-run outperformance of value stocks over growth stocks. The value investing literature is large and growing. It is populated by such well-known work as Fama and French (1992, 1996, 1998), Lakonishok, Shleifer, and Vishny (1992, 1994) and many others. Chan and Lakonishok (2004) provide a review and update of the empirical data regarding the value investing premium. They demonstrate that, aside from the late 1990s, value stocks outperformed growth stocks and had lower risk. This phenomenon is not limited to the U.S.

Our sample begins with all firms on the CRSP and COMPUSTAT databases from 1975 to 2010. We retain firms whose common stock trades on the NYSE, AMEX or NASDAQ, and have the required accounting data. Necessary accounting data includes Cash, Net Receivables, Inventory, Total Liabilities, Preferred Stock, Total Common Equity, and Deferred Taxes. Before delimiting the test portfolios, we calculate the following firm characteristic variables[5]. Unless noted otherwise, all variables are measured as of two months prior to the portfolio formation period.

Size: the natural logarithm of the market value of equity of the firm.

BM: the natural logarithm of the book value of equity to the market value of equity. Book value of equity is calculated as the book value of common equity plus deferred taxes.

Dvol: the natural logarithm of the dollar volume (average price times monthly volume).

Price: the natural logarithm of the inverse of the share price.

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[5] We follow the recent literature in defining the relevant firm characteristics. See, for example; Brennan, Chordia, Subrahmanyam (1998) and Asparouhova et al. (2010).

Yield: the trailing twelve months' dividends divided by the closing share price two months' prior

Amihud: Amihud (2002) measure of liquidity. First, the ratio of the absolute return divided by dollar volume is calculated. The sum of daily ratios is then divided by the number of trading days with volume greater than zero each month. The monthly value is then divided by the average monthly value each year. This final result is used as the firm characteristic.

Ret23: the combined return from three months and two months prior to the current month.

Ret46: as Ret23, but using months four through six.

Ret712: as Ret23, but using months seven through twelve.

Analysts: The number of analysts offering an estimate of the firm's EPS for the next fiscal year, obtained from IBES.

Anl_Chg_3: The average annual change in Analysts over the past three years.

Anl_Chg_2: As Anl_Chg_3, but for the past two years.

Anl_Chg: As Anl_Chg, but for the past year.

Institutional Own: Percentage of the firm's shares outstanding owned by any institutions, measured in the present year

The stock selection method is then to include all firms that have a current share price below the NCAV. This leads to the selection of many low-priced firms that are highly illiquid.

To mitigate against microstructure concerns, we use two price filters to construct test portfolios. The filters are $3/share, for which we obtain a sample of 3,732 firm-years; and $5/share, for which we obtain a sample of 1,949 firm-years.

We calculate the NCAV in using December accounting data, and compare it to the November close price, consistent with Oppenheimer (1986). Since firms selling at a discount to NCAV tend to be small and illiquid, we assume we are not able to purchase shares immediately. Instead, we use a portfolio holding period from March 1st to the end of February the following year. As a robustness check, we use a holding period from July 1st to the end of June the following year, with similar results.

To calculate portfolio returns, we use three weighting schemes: equal-weighting, value-weighting, and lagged-returns weighting. This last technique is discussed in Asparouhova et al. (2010b). Equal-weighting often leads to upwardly-biased portfolio returns, and both equal- and value-weighting can lead to biased coefficient estimates in returns regressions. This is due to microstructure noise. Asparouhova et al. (2010b) show that using one-period lagged gross returns as a weighting mechanism eliminates much of the bias. While the coefficient estimates of the factors in our models are somewhat sensitive to the weighting scheme, results regarding the excess returns (alpha) generated by the net nets strategy are not sensitive to the weighting scheme.

The main contribution of this paper is to explain the source of the excess returns offered by the "net nets" strategy. We do so by applying various risk factor and firm characteristic models to individual security returns. Using pooling regressions and Fama-Macbeth style regressions, we calculate excess returns (alpha) using CAPM; the Fama-French 3-factor model;

augmented Fama-French using Carhart's (1997) Momentum factor and reversal factors (DeBondt and Thaler, 1985).

We use two other risk factors that may seem somewhat surprising: the leverage factor and distress factor suggested by Ferguson and Shockley (2003). Since net nets are not highly leveraged, the leverage factor may not have much explanatory power. But, because Ferguson and Shockley show the leverage and distress factor subsume the Fama-French SMB and HML factors, we include leverage in our analysis.

The distress factor is more interesting. Because of the inclusion of such factors as EBIT, retained earnings, and sales, firms that recently have experienced declining sales or profitability may appear to be distressed, even though they continue to have low debt relative to their assets. Thus the distress factor can explain returns to a net nets portfolio if those returns are due to a mispricing based on recent poor performance.

We also use a series of firm characteristics consistent with Asparouhova et al. (2010b). The use of firm characteristics does not explain excess returns. In fact, based on the characteristics of the net nets firms, the unexplained returns rise to around 10%.

We chose common factors that are used to explain returns on portfolios of stocks, including the small firm effect and value premium, as documented by Fama and French (1992). Since NCAV stocks tend to be small and are deeply discounted, these two factors are likely candidates for explaining the excess returns.

Since a stock, in order to become an NCAV candidate, must have been a recent loser in the stock market, the returns attributed to a portfolio of NCAV stocks could be explained by the long-term reversal pattern documented by DeBondt and Thaler (1985). Their model demonstrated that excess returns can be generated by purchasing recent losers and selling recent winners, and holding such a portfolio for 3 – 5 years.

Since deep value stocks are expected to be low-liquidity stocks, it is likely that trading is non-synchronous. To deal with this timing issue, we apply Dimson's (1979) correction to all our factor models. We begin with four lags and four leads, and sequentially drop those lags and leads that are insignificant. This procedure leaves us with two lags and two leads in our reported results.

The other aspect of low-liquidity is the apparent liquidity premium in stock returns (see, e.g., Acharya and Pedersen (2005)). Liquidity is negatively correlated with required return. The stocks that would appear in a net nets portfolio are likely to be highly illiquid, so liquidity factors should be able to explain a large portion of the returns available from a net nets strategy.

The other challenge of our data set is the upward bias in returns that is likely in an equally-weighted portfolio. Asparouhova et al. (2010a & 2010b) show that the upward bias in returns is particularly prevalent among small, low price, and illiquid stocks. These features perfectly describe our sample. Thus we use three weighting schemes in our regressions: equal weighting, value (or size) weighting, and the returns weighting as advocated by Asparouhova et al (2010a & 2010b)

Different weighting schemes simply require the use of weighted least squares. The weighting variable is either the one-period-lagged market capitalization of the firm (size), or the one-period-lagged gross return of the firm. Asparouhova et al. (2010b) have shown that returns weighting is the best weighting mechanism for reducing the bias we are likely to have.[6]

The availability of net nets investment opportunities is highly time dependent. As shown in Table 1, the opportunities for investment are high following an economic downturn, such as in 1975, 1983, 1991, 2002 – 2003, and 2009 – 2010. The only anomaly is 1999, a period of high valuation. It was also an active IPO period, which could drive up the number of opportunities.

Mean and median monthly returns also vary considerably over the time frame. Using a $5 filter, the lowest return observed is in 2008 at -0.06%, and the highest is in 2009, at 19.78%. For the $3 filter, the lowest return is -3.79% in 2008, and the highest is 20.51% in 1990. Compare these values to the S&P 500, which has a low of -3.79% in 2008, and a high of 2.49% in 1995. It appears that the net nets investment policy offers a set of returns the mass of which is concentrated above zero, even though the dispersion is much greater than the returns on the broad market.

Table 2 shows summary statistics for the individual stock returns (Panel A), measured against three benchmarks: the equal-weighted CRSP (EWCRSP), the value-weighted CRSP (VWCRSP), and the S&P 500. Panel B shows the returns for the net nets stocks organized into three portfolios: equal-weighted (EW), value-weighted (VW), and returns-weighted (RW). The returns-weighted portfolio weights each investment according to the natural logarithm of one plus the stock's return in the prior month.

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[6] We use several other regression approaches to estimate our models. These include a basic OLS with White's standard errors; GMM models with various estimation kernels; and models to correct for clustering by year (see Petersen, 2009).

The portfolios display significantly different returns than the individual stock return data because for the individual stocks we do not assume that the stock is held for the entire year. In creating the portfolios, we assume the stocks are purchased March 1st, and held until the end of February. Thus the portfolios show considerably larger minimum and maximum returns, but lower standard deviations.

Before moving on to the results of our investigation, it is important to get a sense of this group of stocks. Table 3 presents summary statistics of various firm characteristics. The table also shows the mean, median, and standard deviation for each characteristic. We also present the mean, median and standard deviation for the CRSP data set and IBES data set for the analyst data. The t-statistics presented in the table are testing the mean of the net nets firm against the mean of the CRSP/IBES firm. The characteristics are defined at the beginning of this section. Note that the CRSP/IBES data sets are trimmed at the 1% and 99% levels across all characteristics to minimize the effect of outliers.

Firms trading below their net current asset value are small, with a mean market capitalization of just over $40 million using the $5 filter, or $30 million using the $3 filter. The CRSP mean is $92.5 million. By definition, the book-to-market ratios are high for the firms in a net nets portfolio: 1.65 for the $5 filter, and 1.75 for the $3 filter.

Volume is statistically significantly lower for the $5 filter and the $3 filter. The log of dollar volume is presented in Table 3. These differences make the results for Amihud’s measure of illiquidity somewhat puzzling. According to the Amihud measure, Illiquid firms in the $5 portfolio are significantly less illiquid than the CRSP average, although more illiquid than the median CRSP firm. The difference in measures of liquidity indicates that firms in the $5 portfolio have lower dollar volume but trade more often, since the Amihud measure adjusts for non-zero trading days. This difference indicates it is important to control for liquidity in multiple ways.

The average dividend yield across the net nets portfolios is similar to the average dividend yield for the CRSP firms, though the median net net firm does not pay dividends. Nevertheless, dividend yields are statistically insignificantly different from the CRSP mean.

The number of analysts following a firm is much smaller than the IBES mean and median. The mean number of analysts following a net nets firm is less than one, and the trend is negative. The median is zero. In fact, two-thirds of the net nets firms have no analyst following. Institutional ownership is 13.5% on average, with a median of zero. Thus the institutional interest in ‘net nets’ firms are quite shallow to begin with.

We now turn to various factor and characteristic models to determine what risks are driving the apparent excess returns on the net nets strategy.

3. Results

In this section we identify the relevant risk factors and firm characteristics that help explain the excess returns available to a net nets strategy. We begin with a simple CAPM model using Dimson’s correction with two lags and two leads. The results are presented in Table 4. Net nets have a significant market risk factor. The contemporaneous beta is nearly 1.5, and the one-month lagged beta is nearly 0.5. Summing together all the significant betas we calculate a beta greater than two. However, we are left with alphas greater than 4%, no matter the model and weighting scheme.

We follow this analysis with Fama-Macbeth regressions using the monthly cross-sectional average factor estimates. These results are presented in Table 5. Now the alpha for the $5 filter is just above 2%, but is statistically insignificant. The alpha for the $3 filter is still above 4%, and remains significant. We also note that the one-month lagged beta is significant for the $3 filter, but not the $5 filter, indicating an important liquidity difference between the two portfolios.

Stocks that pass the “net nets” screen are small firms with high book-to-market ratios. Firms with low book-to-market ratios are labelled “glamour” or “growth” stocks and those with high book-to-market ratios are labelled “value” stocks. As one can appreciate, a firm trading at a discount to its net current assets is essentially an extreme version of a value stock.

The small firm effect is well documented (see Banz [1981], and Fama and French [1992]). Essentially, small firms have outperformed large firms historically. Some researchers, like Fama and French, suggest that the small firm effect is a proxy for distress risk, and so investors require some premium to compensate for this risk. The value premium is also important. Many studies have uncovered the fact that firms with low book value of equity-to-market value of equity ratios underperform firms with high book-to-market ratios (see Fama and French [1992, 1995, 1996], Lakonishok, Shleifer, and Vishny [1994]). The value premium itself exists, but the reasons for the value premium remain an area of active research (Chan and Lakonishok [2004]).

So, the question becomes, since the NCAV portfolios are populated by small value stocks, do those two premiums jointly explain the excess returns offered by investing in said portfolios? The answer is no.

We apply the Fama-French 3-factor model, again using Dimson's correction. The SMB and HML factors are generally not significantly related to the returns on the net nets stocks, but the 2-period leads of the factors are. The 2-period lead of SMB has a beta of around 0.7 with the $5 filter, and 0.33 with the $3 filter. The 2-period lead of HML has a beta of nearly 0.9 with the $5 filter, and between 0.4 and 0.5 with the $3 filter. The exact estimate depends on the weighting scheme. The alpha remains significant, however, sitting between 3% and 4%.

We do not report Fama-Macbeth regressions for this model because we do not have sufficient degrees of freedom to obtain reasonable estimates. Using a model with fewer lags and leads yields results similar to those presented in Table 5: the alpha on the $3 filter remains, but the $5 alpha is lower and insignificant. These results are available upon request.

Since alpha remains positive and significant, we augment the Fama-French 3-factor model with the Carhart (1997) momentum factor and the liquidity factor suggested by Pastor and Stambaugh (2003)..

The momentum factor, as documented by Jegadeesh and Titman (1993) and Carhart (1997), is based on the technique of buying recent winners and selling recent losers. The momentum portfolios have a shorter holding period than the long-term reversal portfolios. Since NCAV stocks are recent losers, we should expect the momentum factor to be negatively related to the returns on NCAV portfolios.

The reversal factor is based on the behavioral idea that investors overreact to news, good or bad. In our context, the heavy weight on the reversal factor indicates that investors have overreacted to bad news about the companies, pushing their stock prices to unreasonably low levels. It takes a long time for the stock prices to recover because the firms are small and illiquid, so there is little investor activity.

The leverage and distress factors capture the effects of debt that are not captured by the traditional beta and Fama-French factors. Ferguson and Shockley (2003) that including a leverage factor and a distress factor explain a great deal of the variation in stock returns that are explained by the SMB and HML factors of Fama and French. We expect the leverage factor to have little explanatory power for the net nets returns since the net nets firms have low debt. The distress factor is expected to have more power because it is based on Altman's Z-score, where income and sales are potential sources of distress. Thus, if the firms are underpriced because of recent poor income and sales performance, they might appear to be distressed.

We calculate the factor returns for leverage and distress somewhat differently from Ferguson and Shockley (2003). They separate the leverage portfolio into three groups, and the distress portfolio into two. Using their method, the factors have no explanatory power in our model. Therefore, we recalculate the leverage and distress factors using the method of Fama-French. Specifically, we separate the leverage and distress portfolios into deciles, and calculate the factor return as the difference in returns between the top decile and bottom decile. This separation allows us to achieve some explanatory power from the distress factor.

The results from this estimation appear in Table 7. Rather than explaining the alpha further, the momentum and liquidity factors raise the alpha. One-month lagged and two-month lead momentums are both significant and negative risk factors. The liquidity factor of Pastor and Stambaugh (2003) is not a significant factor.

We present the largest set of risk factors in Table 8. In addition to the three Fama-French factors, the momentum and liquidity factors, we include the long-term reversal factor, a leverage factor, and a distress factor. These last two are based on the work of Ferguson and Shockley (2003). The long-term reversal is significant and with a large coefficient, the leverage and distress factors are not important. The market risk premium and the long-term reversal factors are the most important factors in the factor-based models.

The factor models are not sufficient to explain the excess returns available to a net nets strategy, although we are able to get the alphas down to around 3% using just the Fama-French three-factor model. Therefore we examine whether or not firm characteristics can reduce the alphas to zero. The characteristics used are those that have been found the most relevant for explaining returns in the literature (see Asparouhova et al., 2010b). The variables were defined at the beginning of Section 2.

The results of the characteristics regressions are presented in Table 9. We did not include a size-weighted least squares model because the size of the firm is an explanatory variable in all the models. Thus we only estimate an OLS model and a returns-weighted least squares model.

First we note that size and book-to-market are negatively correlated with returns. Since the independent variables are expressed as deviations from the mean, these results indicate that firms larger than the average have lower returns than firms smaller than the average, which is consistent with the small firm premium. However, it also means that firms with an above-average book-to-market have higher returns than firms with a below-average book-to-market. This is puzzling since the value premium should work in the opposite way. We also note that past returns are significant predictors of future returns, but the negative sign indicates a reversal pattern. That is consistent with the findings from our factor models.

Much recent work in asset pricing has been devoted to documenting the liquidity effect. See, for example, Amihud and Mendelson [1986], Datar et al. [1998], Pastor and Stambaugh [2003], and Chordia et al. [2001]. Liquidity is typically considered to be the ease with which one may transact in large amounts of stock without having a meaningful impact on stock price. Clearly, stocks identified by the net nets strategy are likely to be highly illiquid. Since investors demand a premium for holding illiquid stocks, this factor is a potentially very good explanation of the excess returns from a net nets strategy.

We find that the two measures of liquidity, Dvol and Illiq, behave in the expected fashion. Amihud’s measure, Illiq, is positively related to stock returns. We observe many more investment opportunities after market downturns. Thus it is reasonable to think that the firms identified by the net nets strategy were victims of a flight to liquidity, where investors sell less liquid firms and purchase more liquid firms as a means of risk management.

Our measures of institutional awareness, Analyst and Analyst Change, and Institutional Own, are not strong explanatory characteristics. Only one factor, Analyst Change, is statistically significant, and it has a negative coefficient. Thus a decrease in analyst coverage is associated with higher returns in the case of net nets stocks.

Even though most of the firm characteristics are significant, we are left with our highest alphas yet. The alpha is in the 9-11% range for the $5 filter, and in the 10-12% range for the $3 filter. These results indicate that firms with these features should have lower returns on average than the actual firms we identify with a net nets investment strategy.

To this point we have not been able to explain fully the excess returns available to a net nets strategy. Our final strategy is to estimate a model including risk factors and firm characteristics. In Table 10, we present the final model for each portfolio. The important risk factors are the market premium, the liquidity factor of Pastor and Stambaugh (2003), Debondt and Thaler's (1985) reversal factor, and the leverage and distress factors adopted from Ferguson and Shockley (2003).

The characteristics we use are somewhat modified versions of variables used in prior analysis. The variables Price, Yield, and Size are the same as those defined by Amihud's (2002), in section 2. Volume is a dummy variable equal to one if the firm's monthly dollar volume is above the sample median, and zero otherwise. Analyst is a dummy variable equal to one if the firm has any analyst followings in a given year, and zero otherwise. Similarly, Institution is a dummy set to one if the firm has any institutional holdings in the year, and zero otherwise. We use categorical variables rather than continuous variables because it appears the category matters more than variation within the category, based on the statistical significance of variables and goodness-of-fit tests (i.e. adjusted R-squared).

Our final model fully explains the excess returns generated the net nets strategy. In addition to the risk factors, the characteristics of primary importance are analyst followings and turnover. Firms with low or no an analyst coverage and with below median volume are the source of excess returns in this strategy.

4. Conclusion

The investment strategy of purchasing stock that is priced below the net current asset value (current assets less all liabilities and preferred stock) has been a consistently reliable source of high returns. The purpose of our study is to dissect and explain those returns. Our study makes two main contributions to the literature on value investing. First, we extend prior research (Oppenheimer, 1986;, and Vu, 1988) and analyze whether excess return associated with the net current asset value (net-net) strategy persists during the sample period from 1975 to 2010. Using traditional asset pricing models including Fama-French three factors (1993, 1996), Carhart's (1997) momentum factor, and Pastor and Stambaugh's (2003) liquidity risk factor among others, we find that the net-net strategy has generated significant risk-adjusted returns over the 1975-2010 period. These results are consistent with findings of Oppenheimer (1986) and Vu (1988) indicating persistence of return anomaly among net-net firms.

Second, this paper discusses a number of possible explanations for excess returns on net-net firms. We use common risk factor models along with firm characteristics including analyst coverage, institutional ownership, price per share, and trading volume to explain excess returns (alpha) associated with net-net firms.. The risk factors that explain the returns to the deep value investing strategy include market risk, market liquidity, a factor capturing overreaction (long-term reversal), and a relative distress factor. The only firm characteristics that drive excess returns among net-net firms are the analyst coverage, price per share, and turnover. Our results show that controlling for firm size and market-related risk factors, excess returns are higher among net-net stocks with low analyst coverage, low stock price per share and lower trading volume.

We have selected a portfolio of stocks that are evidently underpriced. That makes them an attractive investment, but to realize the gains, investors must have a fairly lengthy investment horizon. Our results also present another puzzle. Recently, there has been much attention paid to small public firms going private because of a lack of visibility or analyst coverage (see, e.g., Mehran and Peristiani, 2011). Why do the firms indentified in this study not go private? This is an interesting puzzle that will be explored in the future.

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Table 1: Net nets Returns by Year

This table shows the number (N) of net net firms purchased during year beginning in March, along with the average and median monthly returns (Mean, Median), and the standard deviation of returns (Std. Dev.). Results are separated for the $5 and $3 filters.

	NCAV Total Return - $5 filter				NCAV Total Return - $3 filter			
Year	N	Mean	Median	Std. Dev.	N	Mean	Median	Std. Dev.
1975	136	5.35%	1.85%	17.50%	270	5.90%	1.10%	18.37%
1976	74	11.28%	7.65%	16.68%	163	7.91%	4.00%	18.08%
1977	27	2.97%	2.67%	7.26%	47	3.92%	3.01%	8.47%
1978	15	2.86%	0.00%	11.89%	80	3.46%	0.00%	19.09%
1979	24	4.60%	0.86%	16.92%	64	5.15%	0.00%	17.82%
1980	21	9.27%	4.82%	22.38%	35	7.52%	6.92%	18.60%
1981	14	0.65%	0.86%	5.62%	25	3.80%	1.22%	13.47%
1982	16	5.91%	1.41%	9.96%	16	5.91%	1.41%	9.96%
1983	53	2.27%	1.79%	9.95%	62	3.10%	1.06%	11.16%
1984	15	9.30%	2.86%	31.27%	30	5.33%	-0.69%	26.98%
1985	24	5.17%	0.00%	14.99%	35	6.53%	0.00%	17.85%
1986	4	16.07%	-3.93%	49.58%	36	-0.46%	-3.18%	19.25%
1987	0	0.00%	0.00%	0.00%	11	-1.52%	-3.45%	12.45%
1988	19	3.05%	0.00%	11.18%	50	0.84%	0.00%	11.24%
1989	26	3.31%	1.00%	15.16%	55	3.74%	0.00%	16.88%
1990	1	0.00%	0.00%	.	7	20.51%	2.38%	38.13%
1991	54	5.74%	0.31%	22.63%	127	6.30%	2.38%	21.78%
1992	70	10.69%	2.30%	35.91%	94	7.99%	0.76%	32.37%
1993	19	4.48%	0.00%	15.67%	84	7.06%	1.47%	20.63%
1994	29	10.95%	7.58%	22.00%	31	9.77%	5.17%	21.98%
1995	44	0.00%	0.00%	9.72%	64	1.42%	0.00%	11.70%
1996	71	2.61%	0.00%	21.77%	87	2.52%	0.00%	21.09%
1997	61	3.41%	3.28%	16.06%	82	2.27%	1.91%	17.54%
1998	27	12.11%	5.71%	21.29%	52	8.21%	4.87%	22.24%
1999	170	6.51%	1.36%	29.21%	267	8.76%	2.05%	32.60%
2000	96	8.96%	0.70%	44.54%	135	10.24%	0.68%	48.58%
2001	58	12.25%	3.36%	31.75%	84	10.23%	2.74%	28.31%
2002	107	1.54%	0.31%	16.65%	202	1.34%	0.19%	17.32%
2003	277	11.24%	6.08%	24.59%	592	13.26%	6.92%	27.36%
2004	92	0.32%	-0.25%	14.23%	150	1.15%	-0.02%	14.22%
2005	31	8.31%	3.46%	32.91%	66	4.54%	0.55%	23.86%
2006	15	6.14%	2.36%	17.23%	15	6.14%	2.36%	17.23%
2007	9	1.63%	0.88%	6.32%	19	0.25%	-0.28%	9.02%
2008	3	-0.06%	1.05%	5.36%	13	-3.79%	-2.22%	11.15%
2009	194	19.78%	8.43%	99.20%	445	13.84%	7.01%	67.68%
2010	31	7.58%	2.60%	16.95%	57	7.48%	2.63%	18.96%

Table 2: Returns on "Net Nets" and CRSP Portfolios

This table presents summary statistics for the entire sample for the net nets portfolios. Our results are based on purchasing the stocks in March and holding for 12 months, whereupon the entire portfolio is liquidated. We present three benchmarks: the value-weighted CRSP (VWCRSP) and equal-weighted CRSP (EWCRSP), and the S&P 500. In panel A, we present averages of individual stock returns. In panel B, we form the stocks into equal-weighted (EW), value-weighted (VW) and return-weighted (RW) portfolios.

Panel A: Individual Stock Returns - 12 month Buy and Hold

	$5 Filter			$3 Filter			Benchmarks		
	Returns	Excess Returns	Num. Firms	Returns	Excess Returns	Num. Firms	VWCRSP	EWCRSP	S&P500
Mean	6.01%	5.59%	54	5.57%	5.13%	101	1.07%	1.45%	0.78%
Median	1.98%	1.55%	28	1.47%	1.03%	63	1.44%	1.73%	1.12%
Std. Dev.	21.27%	21.27%	60	21.21%	21.21%	123	4.27%	5.24%	4.13%
Min	-0.06%	-0.49%	0	-3.79%	-3.93%	7	-3.72%	-4.36%	-3.79%
Max	19.78%	19.78%	277	20.51%	19.93%	592	2.81%	4.82%	2.49%

Panel B: Portfolio Returns - 12 month Buy and Hold

	$5 Filter			$3 Filter		
	EW	VW	RW	EW	VW	RW
Mean	4.77%	4.85%	4.60%	5.28%	5.33%	5.14%
Median	3.24%	3.36%	2.74%	1.48%	1.61%	1.43%
Std. Dev.	10.91%	10.99%	11.10%	13.56%	13.62%	13.46%
Min	-28.47%	-28.31%	-29.27%	-24.84%	-24.12%	-23.95%
Max	57.33%	60.72%	61.59%	116.22%	116.22%	116.22%

Table 3: Summary Statistics of Firm Characteristics

This table displays the characteristics of the net nets firms. We separate the sample into the $5 filter and $3 filter groupings. We also present the summary statistics for the entire CRSP (IBES for analyst data) dataset for a basis of comparison. Size is the natural logarithm of the firm's market capitalization, in millions. BM is the ratio of the book value of equity to the market value of equity. Dvol is the natural logarithm of the monthly dollar volume. Invprc is the natural log inverse of the price of the firm's shares. Yield is the trailing twelve months' dividends over the price two months prior. Illiq is the Amihud measure of liquidity. Ret23, Ret46, and Ret712 are the compounded returns for months lagged 2 and 3, 4 through 6, and 7 through 12, respectively. Analysts is the mean number of analysts offering earnings per share guidance for the firm for the next forecast period. Anl_Chg is the annual change in the Analysts measure, and Anl_Chg_2 and Anl_Chg_3 are the two- and three-year changes in the Analysts measure.

	$5 Filter				$3 Filter				CRSP/IBES		
Variable	Mean	Median	Std Dev	T-stat	Mean	Median	Std Dev	T-stat	Mean	Median	Std Dev
Size	17.5321	17.5361	1.4167	-25.0915	17.1963	17.2280	1.4292	-48.4193	18.3426	18.3284	0.8918
BM	1.6490	1.3152	1.6690	19.9239	1.7482	1.3810	1.6884	30.6611	0.8909	0.8189	0.3385
Dvol	10.0705	10.1291	2.3643	-9.9411	9.7100	9.7692	2.3317	-23.2105	10.6064	10.4790	1.3168
Price	-2.1028	-2.0314	0.6069	14.1391	-1.7288	-1.6535	0.6511	52.8300	-2.2985	-2.2822	0.3020
Yield	0.0230	0.0000	0.1130	0.6222	0.0255	0.0000	0.1418	1.7668	0.0214	0.0162	0.0195
Amihud	0.3895	0.0976	0.7156	-11.2523	0.8854	0.1653	2.5549	7.3731	0.5734	0.0444	1.6093
Ret23	0.1911	0.0746	0.6560	11.5146	0.1709	0.0706	0.5516	16.6373	0.0189	0.0212	0.0699
Ret46	0.2367	0.0784	0.9146	9.9868	0.2125	0.0818	0.7595	14.6288	0.0285	0.0266	0.0874
Ret712	0.2478	0.0222	1.5355	5.4920	0.1677	0.0000	1.2511	5.4161	0.0555	0.0557	0.1174
Analysts	0.7898	0.0000	1.4750	-132.8330	0.8893	0.0000	1.5427	-160.8248	5.7353	3.1670	6.2847
Anl_Chg_3	-0.2905	0.0000	1.0434	-32.8403	-0.2962	0.0000	1.0852	-40.9400	0.5771	0.1667	3.5849
Anl_Chg_2	-0.3481	0.0000	1.1760	-26.9138	-0.3062	0.0000	1.2247	-32.5125	0.4092	0.0379	2.8859
Anl_Chg	-0.2132	0.0000	0.8671	-20.4870	-0.1458	0.0000	0.9320	-21.5988	0.2044	0.0000	1.8229
Instition Own	14.1215	0.0000	22.4264	27.6416	13.3947	0.0000	21.1047	38.3547	0.0000	0.0000	0.0000

Table 4: Single stock return regressions

This table presents the results of regressing individual excess (over the risk-free rate) stock returns on the Fama-French market premium, using Dimson's beta correction. Market Premium is the coefficient estimate of the stock's beta. Mkt_Prem_Lag and Mkt_Prem_Lag2 are the one-period and two-period lags of the market premium, and Mkt_Prem_Lead and Mkt_Prem_Lead2 are the one-period and two-period leads of the market premium. OLS indicates the results are from a standard OLS estimation of the model. RWLS indicates the results are from a returns-weighted least-squares model, and VWLS indicates a value-weighted model. P-values appear below the coefficient estimates.

	$5 filter			$3 filter		
	OLS	RWLS	VWLS	OLS	RWLS	VWLS
Intercept	0.0433	0.0438	0.0440	0.0422	0.0425	0.0435
	0.0001	0.0001	0.0001	0.0001	0.0001	0.0001
Market Premium	1.4128	1.4410	1.4533	1.3624	1.3968	1.3881
	0.0001	0.0001	0.0001	0.0001	0.0001	0.0001
Mkt_Prem_Lag	0.4947	0.4024	0.5066	0.5174	0.4949	0.5209
	0.0100	0.0412	0.0112	0.0001	0.0001	0.0001
Mkt_Prem_Lag2	0.3307	0.2698	0.3598	0.2097	0.1797	0.2216
	0.0815	0.1586	0.0676	0.0659	0.1232	0.0605
Mkt_Prem_Lead	0.1527	0.0840	0.1431	0.0762	0.0210	0.0706
	0.4559	0.6877	0.5015	0.5369	0.8696	0.5816
Mkt_Prem_Lead2	0.1768	0.1148	0.2039	0.1480	0.1433	0.1603
	0.4035	0.6011	0.3543	0.2488	0.2847	0.2296
N	1924	1924	1924	3647	3647	3647
Adj. R-Squared	0.0310	0.0279	0.0306	0.0407	0.0384	0.0393

Table 5: Fama-Macbeth Regressions

This tables shows the results of Fama-Macbeth regressions of the CAPM model using Dimson's correction. We use two lags and two leads of the excess return on the market as explanatory variables. Market Premium is the coefficient estimate of the stock's beta. Mkt_Prem_Lag and Mkt_Prem_Lag2 are the one-period and two-period lags of the market premium, and Mkt_Prem_Lead and Mkt_Prem_Lead2 are the one-period and two-period leads of the market premium. OLS indicates the results are from a standard OLS estimation of the model. RWLS indicates the results are from a returns-weighted least-squares model, and VWLS indicates a value-weighted model. P-values appear below the coefficient estimates.

	$5 filter			$3 filter		
	OLS	RWLS	VWLS	OLS	RWLS	VWLS
Intercept	0.0206	0.0219	0.0214	0.0457	0.0461	0.0467
	0.4678	0.4411	0.4535	0.0287	0.0294	0.0261
Market Premium	1.1812	1.1378	1.1833	1.4536	1.4220	1.4645
	0.0136	0.0148	0.0136	0.0001	0.0001	0.0001
Mkt_Prem_Lag	0.1022	0.0372	0.0921	0.7353	0.6933	0.7286
	0.7660	0.9171	0.7896	0.0104	0.0176	0.0115
Mkt_Prem_Lag2	0.0387	-0.0037	0.0417	0.1395	0.1076	0.1418
	0.8544	0.9868	0.8447	0.4117	0.5398	0.4101
Mkt_Prem_Lead	0.1125	0.0884	0.1037	0.0254	-0.0314	0.0220
	0.3909	0.5119	0.4340	0.8666	0.8242	0.8861
Mkt_Prem_Lead2	-0.1967	-0.2571	-0.1901	-0.2685	-0.2951	-0.2643
	0.3156	0.2030	0.3285	0.0859	0.0740	0.0957
N	35	35	35	36	36	36

Table 6: Single stock return regressions: Fama-French Model

This table presents the results of regressing individual excess (over the risk-free rate) stock returns on the Fama-French 3-factor model, using Dimson's beta correction. Market Premium is the coefficient estimate of the stock's beta. Mkt_Prem_Lag and Mkt_Prem_Lag2 are the one-period and two-period lags of the market premium, and Mkt_Prem_Lead and Mkt_Prem_Lead2 are the one-period and two-period leads of the market premium. SMB and HML are the small-minus-big and high BM-minus-low BM factors. OLS indicates the results are from a standard OLS estimation of the model. RWLS indicates the results are from a returns-weighted least-squares model, and VWLS indicates a value-weighted model. P-values appear below the coefficient estimates.

		$5 filter			$3 filter	
	OLS	RWLS	VWLS	OLS	RWLS	VWLS
Intercept	0.0313	0.0328	0.0315	0.0360	0.0371	0.0372
	0.0053	0.0050	0.0072	0.0001	0.0001	0.0001
Market Premium	1.6215	1.7078	1.6835	1.4029	1.4718	1.4374
	0.0001	0.0001	0.0001	0.0001	0.0001	0.0001
Mkt_Prem_Lag	0.4013	0.2825	0.4202	0.4416	0.4253	0.4525
	0.0658	0.2023	0.0633	0.0007	0.0016	0.0008
Mkt_Prem_Lag2	0.1709	0.1542	0.1652	0.1184	0.1118	0.1088
	0.4208	0.4762	0.4536	0.3600	0.4030	0.4176
Mkt_Prem_Lead	-0.0753	-0.1390	-0.0985	-0.0301	-0.0603	-0.0470
	0.7441	0.5512	0.6811	0.8274	0.6726	0.7435
Mkt_Prem_Lead2	0.3431	0.2621	0.3860	0.2123	0.2101	0.2338
	0.1209	0.2508	0.0934	0.1091	0.1280	0.0898
SMB	-0.1345	-0.1623	-0.1990	0.0740	0.0010	0.0181
	0.6026	0.5366	0.4573	0.6489	0.9950	0.9142
SMB_Lag	0.3326	0.3868	0.3947	0.1023	0.1171	0.1310
	0.2205	0.1552	0.1606	0.5538	0.5062	0.4635
SMB_Lag2	0.1978	0.0971	0.2129	0.2813	0.2179	0.2932
	0.4494	0.7202	0.4323	0.0930	0.2136	0.0907
SMB_Lead	-0.2994	-0.5091	-0.3393	-0.2271	-0.3713	-0.2412
	0.2744	0.0711	0.2327	0.1842	0.0355	0.1731
SMB_Lead2	0.6739	0.7403	0.7050	0.3303	0.3183	0.3466
	0.0147	0.0086	0.0139	0.0542	0.0696	0.0510
HML	0.4681	0.5080	0.4410	0.2371	0.2237	0.2155
	0.1107	0.0937	0.1482	0.1985	0.2443	0.2604
HML_Lag	0.2994	0.2924	0.3645	0.2348	0.2223	0.2712
	0.3062	0.3266	0.2319	0.2019	0.2408	0.1559
HML_Lag2	-0.2567	-0.3509	-0.2681	-0.4249	-0.4772	-0.4478
	0.3441	0.2068	0.3411	0.0116	0.0062	0.0103
HML_Lead	-0.1178	-0.2045	-0.1594	0.1103	0.1321	0.0859
	0.7053	0.5236	0.6220	0.5696	0.5128	0.6693
HML_Lead2	0.8853	0.8292	0.9656	0.4617	0.4010	0.5221
	0.0032	0.0072	0.0019	0.0136	0.0390	0.0071
N	1924	1924	1924	3647	3647	3647
Adj. R-Squared	0.0419	0.0404	0.0425	0.0481	0.0466	0.0470

Table 7: Single Stock Regressions, Five Factors

This table presents the results of regressing individual excess (over the risk-free rate) stock returns on the Fama-French 3-factor model augmented with momentum and liquidity factors, using Dimson's beta correction. Market Premium is the coefficient estimate of the stock's beta. Mkt_Prem_Lag and Mkt_Prem_Lag2 are the one-period and two-period lags of the market premium, and Mkt_Prem_Lead and Mkt_Prem_Lead2 are the one-period and two-period leads of the market premium. SMB and HML are the small-minus-big and high BM-minus-low BM factors. Momentum is the Carhart momentum factor, and Pastor is the liquidity factor developed by Pastor and Veronesi. OLS indicates the results are from a standard OLS estimation of the model. RWLS indicates the results are from a returns-weighted least-squares model, and VWLS indicates a value-weighted model. P-values appear below the coefficient estimates.

	$5 filter			$3 filter		
	OLS	RWLS	VWLS	OLS	RWLS	VWLS
Intercept	0.0522	0.0518	0.0538	0.0437	0.0436	0.0456
	(<.0001)	(<.0001)	(<.0001)	(<.0001)	(<.0001)	(<.0001)
Market Premium	1.3834	1.4331	1.4413	1.2133	1.2400	1.2513
	(<.0001)	(<.0001)	(<.0001)	(<.0001)	(<.0001)	(<.0001)
Mkt_Prem_Lag	0.0271	-0.0910	0.0072	0.2351	0.2348	0.2217
	(0.9116)	(0.7154)	(0.9775)	(0.1165)	(0.1315)	(0.1551)
Mkt_Prem_Lag2	0.0269	0.0537	-0.0048	0.2008	0.2400	0.1797
	(0.9128)	(0.8330)	(0.9850)	(0.1860)	(0.1295)	(0.2570)
Mkt_Prem_Lead	-0.1331	-0.1463	-0.1459	-0.0064	0.0148	-0.0112
	(0.5974)	(0.5698)	(0.5774)	(0.9667)	(0.9256)	(0.9441)
Mkt_Prem_Lead2	0.0571	0.0055	0.0577	0.0586	0.0669	0.0510
	(0.8110)	(0.9823)	(0.8161)	(0.6840)	(0.6572)	(0.7334)
SMB	0.0153	0.0673	-0.0488	0.2539	0.2258	0.2038
	(0.9550)	(0.8070)	(0.8621)	(0.1356)	(0.1963)	(0.2474)
SMB_Lag	0.3340	0.3660	0.3890	0.1810	0.1738	0.2103
	(0.2255)	(0.1891)	(0.1730)	(0.3037)	(0.3357)	(0.2483)
SMB_Lag2	0.0477	-0.0478	0.0468	0.1978	0.1405	0.1951
	(0.8612)	(0.8661)	(0.8686)	(0.2535)	(0.4378)	(0.2773)
SMB_Lead	-0.4165	-0.6015	-0.4713	-0.2732	-0.3961	-0.2992
	(0.1350)	(0.0369)	(0.1028)	(0.1168)	(0.0281)	(0.0969)
SMB_Lead2	0.4217	0.4893	0.4347	0.2151	0.1901	0.2171
	(0.1364)	(0.0910)	(0.1384)	(0.2194)	(0.2899)	(0.2311)
HML	0.2660	0.3056	0.2338	0.0748	0.0514	0.0520
	(0.3847)	(0.3343)	(0.4625)	(0.6983)	(0.7985)	(0.7955)
HML_Lag	-0.0227	0.0026	0.0133	0.0887	0.0882	0.1104
	(0.9407)	(0.9934)	(0.9668)	(0.6492)	(0.6607)	(0.5859)
HML_Lag2	-0.4045	-0.4672	-0.4321	-0.3692	-0.3992	-0.3970
	(0.1722)	(0.1282)	(0.1607)	(0.0461)	(0.0380)	(0.0389)
HML_Lead	-0.1060	-0.1423	-0.1215	0.1159	0.1613	0.1122
	(0.7455)	(0.6729)	(0.7201)	(0.5723)	(0.4508)	(0.5988)
HML_Lead2	0.6472	0.5933	0.6951	0.3839	0.3340	0.4181
	(0.0378)	(0.0651)	(0.0314)	(0.0494)	(0.1009)	(0.0391)
Momentum	-0.0112	0.0151	0.0073	-0.0469	-0.0369	-0.0333
	(0.9491)	(0.9333)	(0.9679)	(0.6684)	(0.7449)	(0.7680)
Momentum_Lag	-0.8486	-0.7982	-0.9278	-0.3850	-0.3536	-0.4306
	(<.0001)	(<.0001)	(<.0001)	(0.0006)	(0.0019)	(0.0002)
Momentum_Lag2	-0.0488	0.1393	-0.0509	0.1874	0.2676	0.1842
	(0.7846)	(0.4344)	(0.7820)	(0.0916)	(0.0181)	(0.1079)
Momentum_Lead	0.1124	0.1199	0.1290	0.0376	0.0222	0.0527
	(0.5375)	(0.5306)	(0.4955)	(0.7411)	(0.8535)	(0.6547)
Momentum_Lead2	-0.4571	-0.4618	-0.4667	-0.3234	-0.3021	-0.3291
	(0.0227)	(0.0271)	(0.0247)	(0.0109)	(0.0232)	(0.0123)
Pastor	0.2613	0.3488	0.2581	0.2932	0.3681	0.2895
	(0.1236)	(0.0450)	(0.1426)	(0.0059)	(0.0009)	(0.0089)

Pastor_Lag	-0.1079	-0.1191	-0.1234	-0.0657	-0.1054	-0.0715
	(0.5255)	(0.4948)	(0.4844)	(0.5423)	(0.3441)	(0.5232)
Pastor_Lag2	-0.2173	-0.1821	-0.2332	-0.2399	-0.2476	-0.2546
	(0.1972)	(0.2990)	(0.1830)	(0.0239)	(0.0260)	(0.0212)
Pastor_Lead	0.1781	0.1918	0.1731	0.0380	0.0245	0.0337
	(0.2896)	(0.2700)	(0.3209)	(0.7157)	(0.8219)	(0.7555)
Pastor_Lead2	-0.1412	-0.1928	-0.1368	-0.0783	-0.0962	-0.0749
	(0.4370)	(0.3071)	(0.4677)	(0.4809)	(0.4107)	(0.5152)
N	1924	1924	1924	3647	3647	3647
Adj. R-Squared	0.0623	0.0589	0.0643	0.0587	0.0575	0.0582

Table 8: Single Stock Regressions, Seven Factors

This table presents the results of regressing individual excess (over the risk-free rate) stock returns on the Fama-French 3-factor model augmented with momentum, liquidity, leverage and distress factors, using Dimson's beta correction. Market Premium is the coefficient estimate of the stock's beta. Mkt_Prem_Lag and Mkt_Prem_Lag2 are the one-period and two-period lags of the market premium, and Mkt_Prem_Lead and Mkt_Prem_Lead2 are the one-period and two-period leads of the market premium. SMB and HML are the small-minus-big and high BM-minus-low BM factors. MOM is the Carhart momentum factor, and Pastor is the liquidity factor developed by Pastor and Veronesi. D/E is the leverage factor, and Z-score is the distress factor based on Altman's Z-Score, as developed by Ferguson and Shockley. OLS indicates the results are from a standard OLS estimation of the model. RWLS indicates the results are from a returns-weighted least-squares model, and VWLS indicates a value-weighted model. P-values appear below the coefficient estimates.

	$5 filter			$3 filter		
	OLS	RWLS	VWLS	OLS	RWLS	VWLS
Intercept	0.0537	0.0513	0.0553	0.0410	0.0399	0.0430
	(<.0001)	(<.0001)	(<.0001)	(<.0001)	(<.0001)	(<.0001)
Market Premium	1.1836	1.2593	1.2201	1.0808	1.1087	1.1015
	(<.0001)	(<.0001)	(<.0001)	(<.0001)	(<.0001)	(<.0001)
Mkt_Prem_Lag	0.1357	0.0404	0.1352	0.3196	0.3329	0.3168
	(0.5978)	(0.8791)	(0.6130)	(0.0411)	(0.0415)	(0.0512)
Mkt_Prem_Lag2	-0.0210	-0.0456	-0.0567	0.1155	0.1180	0.0902
	(0.9378)	(0.8704)	(0.8399)	(0.4838)	(0.4938)	(0.6001)
Mkt_Prem_Lead	-0.2542	-0.2688	-0.2666	-0.0775	-0.0642	-0.0797
	(0.3493)	(0.3344)	(0.3451)	(0.6365)	(0.7058)	(0.6404)
Mkt_Prem_Lead2	0.0632	0.0701	0.0646	0.0895	0.1291	0.0860
	(0.8077)	(0.7955)	(0.8107)	(0.5653)	(0.4272)	(0.5951)
SMB	-0.5501	-0.5472	-0.6475	-0.0924	-0.1718	-0.1582
	(0.1031)	(0.1125)	(0.0643)	(0.6533)	(0.4177)	(0.4581)
SMB_Lag	0.4545	0.5243	0.5443	0.1582	0.1792	0.2061
	(0.1720)	(0.1194)	(0.1140)	(0.4451)	(0.4001)	(0.3364)
SMB_Lag2	-0.1682	-0.3379	-0.1847	-0.0667	-0.1602	-0.0801
	(0.6033)	(0.3088)	(0.5820)	(0.7435)	(0.4478)	(0.7048)
SMB_Lead	-0.3125	-0.4648	-0.3400	-0.1813	-0.2771	-0.1901
	(0.3699)	(0.1972)	(0.3481)	(0.3838)	(0.2004)	(0.3801)
SMB_Lead2	0.3921	0.5029	0.3831	0.2198	0.2013	0.2072
	(0.2704)	(0.1705)	(0.3009)	(0.3070)	(0.3662)	(0.3547)
HML	-0.2937	-0.3573	-0.3723	-0.3058	-0.4098	-0.3565
	(0.4655)	(0.3895)	(0.3734)	(0.2209)	(0.1146)	(0.1696)
HML_Lag	0.3258	0.3985	0.4161	0.2162	0.2585	0.2724
	(0.4225)	(0.3429)	(0.3243)	(0.3938)	(0.3275)	(0.3007)
HML_Lag2	-0.6926	-0.8773	-0.7335	-0.7329	-0.8458	-0.7716
	(0.0793)	(0.0305)	(0.0734)	(0.0025)	(0.0007)	(0.0021)
HML_Lead	-0.2885	-0.2992	-0.2878	-0.0635	-0.0251	-0.0619
	(0.4852)	(0.4865)	(0.5033)	(0.8002)	(0.9241)	(0.8128)
HML_Lead2	0.5345	0.5846	0.5476	0.4736	0.4658	0.4956
	(0.2212)	(0.2006)	(0.2294)	(0.0792)	(0.1019)	(0.0786)
Momentum	-0.0900	-0.0842	-0.0815	-0.0491	-0.0516	-0.0413
	(0.6485)	(0.6785)	(0.6900)	(0.6783)	(0.6741)	(0.7361)
Momentum_Lag	-0.9194	-0.8246	-0.9911	-0.4142	-0.3724	-0.4545
	<.0001	<.0001	<.0001	(0.0005)	(0.0024)	(0.0002)
Momentum_Lag2	-0.1765	0.0006	-0.1836	0.1136	0.1817	0.1063
	(0.3581)	(0.9977)	(0.3558)	(0.3413)	(0.1365)	(0.3900)

Momentum_Lead	0.0995	0.1240	0.1139	-0.0041	-0.0235	0.0087
	(0.6244)	(0.5595)	(0.5902)	(0.9731)	(0.8561)	(0.9457)
Momentum_Lead2	-0.5352	-0.5480	-0.5601	-0.4253	-0.4206	-0.4409
	(0.0193)	(0.0210)	(0.0186)	(0.0023)	(0.0039)	(0.0024)
Pastor	0.2436	0.3219	0.2365	0.2756	0.3507	0.2693
	(0.1732)	(0.0807)	(0.2033)	(0.0134)	(0.0025)	(0.0203)
Pastor_Lag	-0.0623	-0.0499	-0.0747	-0.0067	-0.0180	-0.0086
	(0.7312)	(0.7885)	(0.6923)	(0.9532)	(0.8784)	(0.9423)
Pastor_Lag2	-0.2505	-0.2049	-0.2671	-0.2342	-0.2337	-0.2480
	(0.1560)	(0.2636)	(0.1458)	(0.0354)	(0.0445)	(0.0324)
Pastor_Lead	0.1106	0.1522	0.1039	-0.0423	-0.0425	-0.0503
	(0.5449)	(0.4207)	(0.5842)	(0.7050)	(0.7151)	(0.6648)
Pastor_Lead2	-0.1176	-0.1636	-0.1112	-0.0697	-0.0901	-0.0631
	(0.5299)	(0.4000)	(0.5667)	(0.5419)	(0.4523)	(0.5943)
LT-REV	1.1253	1.3061	1.2371	0.7850	0.9044	0.8542
	(0.0255)	(0.0118)	(0.0183)	(0.0090)	(0.0037)	(0.0064)
LT-REV_Lag	0.0958	-0.0842	0.0716	0.1554	0.0526	0.1286
	(0.8531)	(0.8745)	(0.8946)	(0.6206)	(0.8721)	(0.6956)
LT-REV_Lag2	0.5368	0.6233	0.5492	0.7387	0.7898	0.7608
	(0.2997)	(0.2418)	(0.3118)	(0.0188)	(0.0152)	(0.0211)
LT-REV_Lead	0.2154	0.0900	0.1936	0.3077	0.2427	0.2892
	(0.6772)	(0.8669)	(0.7196)	(0.3247)	(0.4586)	(0.3749)
LT-REV_Lead2	0.3119	0.1293	0.3690	0.1103	0.0693	0.1446
	(0.5399)	(0.8075)	(0.4856)	(0.7149)	(0.8265)	(0.6454)
D/E	-0.0117	-0.0676	-0.0059	-0.1214	-0.1801	-0.1200
	(0.9567)	(0.7615)	(0.9790)	(0.3372)	(0.1725)	(0.3659)
D/E_Lag	0.5311	0.4580	0.5747	0.2262	0.1959	0.2514
	(0.0083)	(0.0269)	(0.0063)	(0.0659)	(0.1233)	(0.0510)
D/E_Lag2	-0.1260	-0.2372	-0.1594	-0.1060	-0.1787	-0.1230
	(0.5407)	(0.2581)	(0.4605)	(0.3974)	(0.1648)	(0.3492)
D/E_Lead	0.0486	0.0476	0.0667	0.0436	0.0367	0.0502
	(0.8190)	(0.8304)	(0.7650)	(0.7288)	(0.7825)	(0.7039)
D/E_Lead2	0.0163	-0.0273	0.0141	0.1292	0.1096	0.1314
	(0.9407)	(0.9037)	(0.9512)	(0.3313)	(0.4282)	(0.3480)
Z-score	0.4378	0.3783	0.4689	0.4690	0.4631	0.4994
	(0.2039)	(0.2872)	(0.1981)	(0.0216)	(0.0293)	(0.0212)
Z_Lag	-0.5607	-0.6122	-0.6152	-0.2714	-0.3653	-0.3035
	(0.1026)	(0.0821)	(0.0897)	(0.1884)	(0.0873)	(0.1651)
Z_Lag2	-0.4367	-0.3098	-0.4623	-0.1754	-0.1276	-0.1985
	(0.1829)	(0.3602)	(0.1824)	(0.3770)	(0.5374)	(0.3459)
Z_Lead	0.2618	0.2108	0.2386	0.1514	0.1099	0.1297
	(0.4485)	(0.5594)	(0.5136)	(0.4616)	(0.6114)	(0.5521)
Z_Lead2	0.3125	0.2580	0.3151	0.1433	0.1074	0.1350
	(0.3896)	(0.4982)	(0.4129)	(0.5058)	(0.6357)	(0.5554)
N	1924	1924	1924	3647	3647	3647
Adj. R-Squared	0.0727	0.0693	0.0754	0.0666	0.0664	0.0663

Table 9: Characteristic Regressions

This table displays regressions of individual firm stock returns on the characteristics of the firm.. Size is the natural logarithm of the firm's market capitalization, in millions. BM is the ratio of the book value of equity to the market value of equity. Dvol is the natural logarithm of the monthly dollar volume. Invprc is the natural log inverse of the price of the firm's shares. Yield is the trailing twelve months' dividends over the price two months prior. Illiq is the Amihud measure of liquidity. Ret23, Ret46, and Ret712 are the compounded returns for months lagged 2 and 3, 4 through 6, and 7 through 12, respectively. Analyst is the mean number of analysts offering earnings guidance for the company. Analyst Change is the two-year change in the Analyst variable. Institutional Holdings is the percentage of the firm's shares outstanding held by institutions. All independent variables except Illiq are measured as the deviation from the mean. OLS indicates the model was estimated using standard OLS. RWLS indicates the model was estimated using returns weighted least squares. P-values appear below the coefficient estimates. Panel A shows the results for the $5 filter, and Panel B shows the results for the $3 filter.

Panel A: $5 filter

Parameter	RWLS	RWLS	RWLS	RWLS	RWLS	RWLS
Intercept	0.1056	0.0910	0.1154	0.1036	0.1047	0.1030
	<.0001	<.0001	<.0001	<.0001	<.0001	<.0001
Size	0.0154	-0.0390	0.0181	-0.0484	-0.0460	-0.0457
	0.0949	0.0013	0.1046	0.0005	0.0013	0.0015
BM	-0.0191	-0.0108	-0.0202	-0.0123	-0.0126	-0.0133
	0.0017	0.0797	0.0019	0.0566	0.0531	0.0440
Price		-0.0391		-0.0465	-0.0440	-0.0425
		0.0252		0.0121	0.0188	0.0242
Volume		0.0434		0.0567	0.0552	0.0552
		<.0001		<.0001	<.0001	<.0001
Yield		0.0398			0.0462	0.0410
		0.6374			0.6100	0.6525
Ret23			0.0179	-0.0038	-0.0041	-0.0041
			0.2513	0.8083	0.7919	0.7953
Ret46			-0.0246	-0.0355	-0.0359	-0.0359
			0.0206	0.0008	0.0007	0.0007
Ret712			-0.0162	-0.0213	-0.0208	-0.0207
			0.0209	0.0021	0.0027	0.0028
Amihud			0.0022	0.0272	0.0251	0.0259
			0.8932	0.0992	0.1251	0.1154
Analyst					-0.0069	-0.0093
					0.3178	0.2421
Analyst Change					-0.0163	-0.0141
					0.0340	0.0951
Institutional Hldgs.						0.0003
						0.5419
N	1867	1742	1742	1742	1742	1742
R-squared	0.0103	0.0353	0.0166	0.0522	0.0523	0.0525

Panel B: $3 filter						
Parameter	RWLS	RWLS	RWLS	RWLS	RWLS	RWLS
Intercept	0.1143	0.1030	0.1238	0.1169	0.1241	0.1227
	<.0001	<.0001	<.0001	<.0001	<.0001	<.0001
Size	0.0182	-0.0502	0.0205	-0.0515	-0.0519	-0.0514
	0.0018	<.0001	0.0018	<.0001	<.0001	<.0001
BM	-0.0181	-0.0115	-0.0189	-0.0149	-0.0158	-0.0162
	<.0001	0.0032	<.0001	0.0001	<.0001	<.0001
Price		-0.0241		-0.0286	-0.0311	-0.0304
		0.0317		0.0104	0.0067	0.0082
Volume		0.0495		0.0532	0.0549	0.0549
		<.0001		<.0001	<.0001	<.0001
Yield		0.0674			0.0771	0.0755
		0.1111			0.0671	0.0732
Ret23			0.0200	-0.0013	-0.0044	-0.0042
			0.0852	0.9123	0.7057	0.7148
Ret46			-0.0246	-0.0358	-0.0376	-0.0375
			0.0023	<.0001	<.0001	<.0001
Ret712			-0.0181	-0.0228	-0.0229	-0.0228
			0.0007	<.0001	<.0001	<.0001
Amihud			0.0002	0.0044	0.0043	0.0045
			0.9320	0.0964	0.1077	0.0927
Analyst					-0.0107	-0.0129
					0.0178	0.0154
Analyst Change					-0.0160	-0.0148
					0.0014	0.0051
Institutional Hldgs.						0.0003
						0.4311
N	3568	3215	3215	3215	3215	3215
R-squared	0.0138	0.0476	0.0203	0.0590	0.0635	0.0636

Table 10: Full Model

This table presents the results of regressing individual excess (over the risk-free rate) stock returns on the Fama-French 3-factor model augmented with momentum, liquidity, leverage and distress factors, using Dimson's beta correction. Market Premium is the coefficient estimate of the stock's beta. Mkt_Prem_Lag and Mkt_Prem_Lag2 are the one-period and two-period lags of the market premium, and Mkt_Prem_Lead and Mkt_Prem_Lead2 are the one-period and two-period leads of the market premium. SMB and HML are the small-minus-big and high BM-minus-low BM factors. MOM is the Carhart momentum factor, and Pastor is the liquidity factor developed by Pastor and Veronesi. D/E is the leverage factor, and Z-score is the distress factor based on Altman's Z-Score, as developed by Ferguson and Shockley. The risk factors are supplemented by some of the firm characteristics. Volume is a dummy variable equal to one if the firm has above-median dollar volume. Analyst is a dummy variable equal to one if the firm has any analysts offering guidance. Institution is a dummy variable equal to one if the firm has any institutional holdings. Amihud is the Amihud measure of liquidity. Price is the inverse of the firm's stock price. Yield is the dividend yield, and Size is the natural logarithm of the firm's market capitalization. Results shown are for returns weighted least squares regressions. OLS and size weighted least squares give similar results. P-values appear next to coefficient estimates for each filter ($5 and $3).

	$5 filter		$3 filter	
Parameter	Estimate	Pr > |t|	Estimate	Pr > |t|
Intercept	0.0034	0.8933	0.0015	0.9298
Volume	0.0876	0.0002	0.1013	<.0001
Analyst	-0.0311	0.2020	-0.0355	0.0247
Institution	0.0088	0.6854	0.0087	0.5266
Amihud	0.0098	0.5481	0.0029	0.2752
Price	-0.0507	0.0058	-0.0422	0.0002
Yield	0.0102	0.9097	0.0371	0.3698
Size	-0.0012	0.9228	-0.0062	0.4366
Market Premium	1.1971	<.0001	1.1634	<.0001
Mkt_Prem_Lag	0.2642	0.2655	0.4001	0.0061
Mkt_Prem_Lag2	0.4318	0.0622	0.2842	0.0463
Mkt_Prem_Lead	-0.0414	0.8728	0.0216	0.8931
Mkt_Prem_Lead2	0.2000	0.4553	0.1253	0.4477
Pastor	0.2287	0.2242	0.1911	0.1119
Pastor_Lag	-0.2188	0.2392	-0.2468	0.0399
Pastor_Lag2	-0.3852	0.0326	-0.4157	0.0003
Pastor_Lead	0.2955	0.1242	0.0236	0.8451
Pastor_Lead2	-0.0309	0.8740	0.0342	0.7798
LT-Rev	0.6808	0.0966	0.7164	0.0056
LT-Rev_Lag	0.2927	0.4913	0.3280	0.2245
LT-Rev_Lag2	0.5003	0.2198	0.5034	0.0457
LT-Rev_Lead	-0.3207	0.4695	-0.0404	0.8860
LT-Rev_Lead2	0.3576	0.3989	0.2223	0.3934
D/E	0.0128	0.9556	-0.0244	0.8630
D/E_Lag	0.3067	0.1551	0.2104	0.1236
D/E_Lag2	-0.0687	0.7467	-0.0530	0.6880
D/E_Lead	0.1209	0.5930	0.0606	0.6655
D/E_Lead2	-0.2132	0.3424	-0.0731	0.6019
Z-score	0.5074	0.1765	0.6637	0.0052
Z_Lag	0.0778	0.8361	-0.0002	0.9994
Z_Lag2	-0.4147	0.2509	-0.2088	0.3683
Z_Lead	0.2583	0.4970	0.4122	0.0882
Z_Lead2	0.4140	0.2758	0.3461	0.1618

	Size	BM	Volume	Price	Yield	Ret23	Ret46	Ret712	Analyst	Anl_Chg_2	Amihud	Institution Own
BM	-0.3748											
Volume	0.6783	-0.3756										
Price	-0.4690	0.1658	-0.3173									
Yield	0.0672	0.0691	-0.0138	0.0322								
Ret23	0.0482	-0.1273	0.1446	-0.0382	-0.0358							
Ret46	0.0610	-0.1277	0.1435	-0.0483	-0.0165	0.0165						
Ret712	0.0280	-0.1154	0.1021	-0.0012	-0.0300	-0.0458	-0.0211					
Analyst	0.3536	-0.1236	0.3305	-0.0388	-0.0191	0.0231	0.0322	0.0266				
Anl_Chg_2	-0.1740	0.0555	-0.1347	-0.0534	0.0497	-0.0689	-0.0725	-0.0072	-0.2515			
Amihud	-0.5141	0.2447	-0.4905	0.2081	-0.0307	-0.0516	-0.0536	-0.0701	-0.2698	0.1293		
Institution Own	0.2197	0.0801	0.1694	-0.0768	0.0538	0.0145	0.0227	-0.0133	0.5360	-0.4345	-0.2009	
Mkt Prem	0.0396	-0.0278	0.0190	0.0727	-0.0049	0.0372	-0.0466	-0.0143	0.0957	-0.0990	-0.0274	0.1270
SMB	0.0113	-0.0109	0.0250	0.0313	-0.0006	0.0027	-0.0259	-0.0099	-0.0019	-0.0387	-0.0303	0.0103
HML	0.0270	-0.0303	0.0199	-0.0503	-0.0144	0.0679	-0.0348	-0.0095	0.0141	0.0122	-0.0448	-0.0082
MOM	-0.0382	0.0245	-0.0011	-0.0586	0.0283	-0.0540	0.0363	0.0667	-0.1621	0.1244	0.0708	-0.1660
LT-REV	0.0231	-0.0704	0.0292	-0.0463	-0.0384	0.0683	-0.0559	0.0038	-0.0382	0.0076	-0.0225	-0.0216
D/E	-0.0441	0.0025	-0.0605	-0.0064	0.0137	-0.0151	-0.0171	0.0253	0.0522	-0.0046	0.0673	0.0452
Z-score	-0.0027	-0.0091	-0.0052	-0.0131	0.0135	0.0192	-0.0501	-0.0149	-0.0113	-0.0157	0.0284	-0.0039
Pastor	-0.0134	0.0238	-0.0005	-0.0044	0.0215	0.0256	-0.0150	-0.0282	0.0144	-0.0123	0.0219	0.0456

Appendix A: Correlation Matrix for Characteristics and Risk Factors

Appendix A: Correlation Matrix for Characteristics and Risk Factors (continued)

	Mkt Prem	SMB	HML	MOM	LT-REV	D/E	Z-score
BM							
Volume							
Price							
Yield							
Ret23							
Ret46							
Ret712							
Analyst							
Anl_Chg_2							
Amihud							
Institution Own							
Mkt Prem							
SMB	0.1586						
HML	-0.1460	-0.2844					
MOM	-0.3015	-0.1408	-0.1439				
LT-REV	0.1505	0.2703	0.4250	0.0594			
D/E	0.1311	-0.1043	-0.2498	0.0754	-0.2535		
Z-score	0.1915	0.1623	0.0035	-0.2925	0.0387	0.0649	
Pastor	0.2338	0.0328	0.0200	-0.1364	0.0349	-0.0346	0.2120