Ben Graham's Net Nets:

Seventy-Five Years Old and Outperforming

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Abstract

The strategy of buying and holding "net nets" has been advocated by deep value investors for decades, but systematic studies of the returns to such a strategy are few. We detail the returns generated from a net nets strategy implemented from 1984 - 2008, and then attempt to explain the excess returns (alpha) generated by the net nets strategy. We find that monthly returns amount to 2.55%, and excess returns using a simple market model amount to 1.66%. Monthly returns to the NYSE-AMEX and a small-firm index amount to 0.85% and 1.24% during the same time period. Of the various pricing factors suggested by the literature, we find only the market risk, small firm, relative distress, and liquidity factors are significant. However, inclusion of these factors still does not explain the excess return available from the net nets strategy. We extend our analysis by modelling the risk-adjusted excess returns as functions of various portfolio characteristics, including size, book-to-market, volume, and dividend yield, plus a January effect. While we find some explanatory value in these characteristics, we are not able to explain all the risk-adjusted excess returns. We conclude our paper by examining the effect of market impact costs and stricter filters on our portfolios. We find market impact costs are minimal, but stricter filters do reduce returns by up to half. Thus, we conclude that these are stocks for which arbitrage activity is limited and excess returns are persistently available, though variable.

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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]).

In the seventy-fifth anniversary of the publication of *Security Analysis*, the NCAV rule continues to show considerable performance in generating excess returns. This simple method of handicapping data readily available from a company’s balance sheet generates a sizeable return: more than 20% annually. The returns are not explained by common asset pricing models. This anomaly indicates that application of the NCAV rule can identify underpriced firms in a systematic way. Furthermore, this profitability of this method continues to make it an attractive method of stock picking.

The academic interest in Graham's method has been relatively sparse. Greenblatt et al. [1981], Oppenheimer [1986], and Vu [1988] have reviewed the usefulness of the NCAV rule. In his 1986 paper, Oppenheimer presented evidence showing the profitability of the NCAV method for 1970 to 1983. We picked up where Oppenheimer left off, updating the results to December 31, 2008, using Oppenheimer's method of picking stocks

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.

The liquidation value of a firm, for which the NCAV criterion serves as a proxy, is the lowest measure of a firm's value. Firms trading at a discount to NCAV are therefore deeply discounted. Following Fama and French's interpretation of the value premium, these should also be very risky stocks, as the value premium compensates the investor for distress risk. Our work here indicates that this is not the case. In fact, the value premium is not a main driver of returns in the NCAV context. The market risk premium and the small firm effect do explain some of the returns, but the NCAV method generates high excess returns unexplained by any factor we have included.

Based on the failure of the 3-factor model to explain the excess returns, we consider several other factors. We include Carhart's [1997] momentum factor, a long-term reversal factor based on Debondt and Thaler [1985], and two measures of liquidity. Finally, we include relative leverage (D/E) and relative distress (Altman's Z-score) based on the work of Ferguson and Shockley [2003]. Of these, we find the liquidity factor and the relative distress factor important for explaining returns on the net nets strategy. Nevertheless, we are left with an unexplained excess return.

We continue by modifying and applying the method suggested by Chou et al. [2010] and attempt to explain the excess returns using the characteristics of the stocks in the NCAV portfolio. Our findings indicate that average size, book-to-market, trading volume and dividend yield are all important characteristics in explaining risk-adjusted excess returns. We also document a highly significant January effect. However, we are left with a significant and positive intercept, indicating not all of the risk-adjusted excess return can be explained by firm characteristics.

We conclude by investigating the effect of market impact costs, as illustrated by Korajczyk and Sadka (2004) among others, and by applying stricter filter rules. First, market impact costs are very low for this investment strategy, thus we find their impact is minimal. However, applying two separate filters – no stocks included if the price below $1 ($5) - reduces the monthly return to 2.2% (1.6%). Annual excess returns remain economically and statistically significant, however, at 18% (9.8%) on the low end. This value depends on the risk factors included.

Note that our excess returns are not generated by merger premiums paid to the firms in the NCAV portfolios. In fact, in the whole sample, only 5 firms are delisted because of mergers. Another 9 are delisted due to liquidation. Thus, exclusion of these firms does not change the estimates of raw or adjusted returns.

In the remainder of the paper, we discuss the NCAV method, how portfolios are formed, and then measure performance in a variety of ways. We then attempt to explain the returns from the NCAV portfolio.

Data and Methodology

We stay faithful to Oppenheimer's methodology, both in the selection of the securities and the simulation of the hypothetical investor's experience. In calculating NCAV, 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. For these firms, Oppenheimer recorded the NCAV, November closing price, number of shares outstanding, exchange the firm was traded on, and whether the firm had positive earnings or dividends over the preceding twelve months.

We form annual equal-weighted portfolios comprised of all firms that meet the NCAV criteria. We assume all stocks are purchased on December 31st, and held for one year. We assume that the hypothetical investor completely liquidates each portfolio before forming a new portfolio. It is possible that subsequent portfolios hold similar firm's shares as previous portfolios, so long as the firm's shares continue to trade at a one-third or greater discount to NCAV per share. Note that we eliminate as outliers any firms whose stock price is less than one percent of the NCAV per share. Table 1 summarizes the annual distribution of stocks by exchange and year.

Insert Table 1: Occurrence of NCAV stocks by exchange and year about year.

The method of forming portfolios described above constitutes an annual rebalancing of the portfolio, which entails transaction fees. We do not adjust our results for the transaction fees for two reasons. First, our benchmark portfolios are also rebalanced annually, and each benchmark contains many more stocks than the NCAV portfolios. Thus, adjusting returns for transaction fees would favor the NCAV portfolios over the benchmark portfolios. Our second reason for not adjusting returns for transaction fees is that fees are small and have been shrinking over time, and so do not have a material impact on returns in low-turnover portfolios.

It is appropriate to note that the method used here for estimating the “net net” current asset value of the firm per share is not the only method available. Rather than impairing the entire current asset account, Graham and Dodd [1934, p. 496] use a range of impairments across asset types. Cash and near-cash assets are estimated to fetch 100% of current value if liquidated, receivables between 75 and 90%, inventories between 50 and 75%, and fixed assets between 1 and 50%. Martin J. Whitman, of Third Avenue Funds, makes further adjustments to the “net nets” calculation (various Third Avenue shareholder letters).

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, or the further adjustments of Whitman, one would need to devote time to analysing each firm’s business and the economic environment. The upshot of these differences is that 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 effort involved in identifying undervalued firms, may actually be higher, since our cost of identifying undervalued firms is quite low.

Results

The mean monthly return on stocks meeting the NCAV rule in the period we examined, December 31, 1983 to December 31, 2008, was 2.55%. The mean monthly returns for the NYSE-AMEX and Small-Firm indices were 0.85% and 1.24% respectively. This indicates an outperformance by the NCAV portfolio over the NYSE-AMEX Index of 1.70% per month, or 22.42% per annum and an outperformance over the Small-Firm Index of 1.31% per month, or 16.90% per annum.

Table 2 summarizes the results for the 25-year period of the study. Panel A compares returns of NCAV portfolios with returns on both the NYSE-AMEX Index and the Small-Firm Index. While Oppenheimer uses the Ibbotson Small-Firm Index, we use the smallest decile of stocks traded in the CRSP database. These results cover the period December 31, 1983 through December 31, 2008. Panel B represents the 25-year performance of each exchange's securities versus the NYSE-AMEX Index and the Small-Firm Index. Panel C presents results for nine consecutive sub-periods, eight of which are of approximately equal length, and the final of which is incomplete.

Insert Table 2 Performance measures for the 25-year period about here.

Thirty-month holding periods

Graham suggested that a 30-month holding period was appropriate for the NCAV investment practice, rather than the twelve month period we have assumed thus far. Since the 30-month portfolios overlap each other, we create each using unique stocks. Thus, no two portfolios contain the same company's shares. We assume, as above, that the portfolios are created on December 31st of each year, and then held for 30 months. However, portfolios created in 2006 have only 24 months of observations, and portfolios created in 2007 have only 12 months of observations. Rather than eliminate these years from the study, we report results with the above caveat in mind.

Like Oppenheimer, we found that the return and wealth advantage of the NCAV portfolios over the market indices is substantial. Table 3 presents the results for NCAV securities purchased on December 31 and held for 30 months. The table provides comparisons with both the NYSE-AMEX Index in Panel A and the Small-Firm Index in Panel B.

The frequency of outperformance is high, since in 22 of 25 portfolios the NCAV securities beat the NYSE-AMEX portfolio. Furthermore, the magnitude of outperformance is extremely large. On average, the NCAV portfolio displays a 2.56% per month margin over the NYSE-AMEX portfolio. This translates to an average of $19,163.52 difference in wealth after the 30-month holding period. It should be noted that the range of outperformance is very wide. In 1988, the NCAV portfolio underperformed the NYSE-AMEX portfolio by $5,189.95, whereas in 1993 the NCAV portfolio outclassed the NYSE-AMEX portfolio by $84,991.27.

When the NCAV portfolio is compared to the Small-Firm Index, the results are similar to those discussed above. The outperformance is smaller in returns (1.86% per month), and wealth ($14,927.98 average), but otherwise similar to the results comparing the NCAV portfolios to the NYSE-AMEX.

The twelve and thirty-month holding periods reviewed thus far show strong evidence in favor of the NCAV method of picking stocks. The continued superior returns resulting from this method are surprising given that the method has been known and discussed for 75 years. This implies that there are underlying risks that are not recognized in the firms that the

NCAV method chooses. We continue by examining some of those potential risks and their importance in explaining the returns available from the NCAV method.

Insert Table 3 Performance measures for thirty-month holding periods about here.

Do earnings or dividends matter?

To this point, we have not found a factor in that explains the returns on NCAV portfolios. We can use features of the firm, however, to explore the risk-return relationship further. According to Oppenheimer, Graham frequently recommended that it was best to select NCAV securities that had positive earnings and paid a dividend. Oppenheimer's findings seem to contradict this advice. He found that firms operating at a loss seemed to have slightly higher returns and risk than firms with positive earnings. Firms with positive earnings paying dividends provided a lower mean return than portfolios of firms with positive earnings not paying a dividend, but had a lower systematic risk. These findings led Oppenheimer to conclude that choosing only firms that have earnings and pay a dividend will not help the investor.

Our results, presented in Table 4, support Oppenheimer's conclusion. Firms with positive earnings generated monthly returns of 1.96%. By contrast, firms with negative earnings generated monthly returns of 3.38%. Firms with positive earnings paying dividends in the preceding year provided monthly returns of 1.48%, a lower mean return than portfolios of firms with positive earnings with no dividend paid in the preceding year (2.42%), but did have a lower systematic risk.

Insert Table 4 Performance measures by earnings and dividends about here.

The results in this section indicate a rational connection between risk and return. Dividend-paying firms are viewed as less risky because the dividend signals to shareholders that managers believe the future cash flows of the firm are stable enough to accommodate an ongoing dividend.

Degree of undervaluation and performance

Another question an investor may have is: does the depth of discount affect future returns? We have shown so far that the NCAV rule is an extreme form of value investing. A logical question comes up: do the deepest discounted NCAV stocks provide the highest returns in the future? To examine this, Oppenheimer calculated for each security its purchase price as a percentage of NCAV, and divided the population into quintiles according to this variable.

Adopting the same method, we analysed mean returns and risk-adjusted performance. The results are presented in Table 5. Quintile 1 contains the fifth of the firms that have the highest discount, and Quintile 5 contains the firms trading closest to two-thirds of NCAV. With one caveat, our findings generally support Oppenheimer's conclusion: the returns are higher for firms with higher discounts to NCAV. The caveat is as significant as it is perplexing: securities in Quintile 1– those with the lowest purchase price to NCAV – have the lowest returns. As noted earlier, we have eliminated as outliers firms with stock prices less than one percent of the NCAV per share, so we do not believe outliers are driving this result.

Insert Table 5 Performance measures by Quintile of Discount from NCAV/share about here.

In results not reported here, we plot returns for each rank by year. No pattern exists in the ranked returns. Although the returns in rank 2 and rank 3 tend to be the highest, this is not always the case. So, we can say that on average there is a mild positive relationship between the depth of discount and future returns, there is such variability year-over-year that we cannot suggest this is a reliable rule.

Explaining the Excess Returns

We continue our work here by examining potential explanations for the excess returns generated by NCAV portfolios. In the tables presented thus far, we have included information about the market risk of the NCAV portfolios. We examine various other 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.

Finally, 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, NCAV stocks 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 on NCAV portfolios. The remainder of this section explores the relative importance of each asset pricing factor insofar as the factors explain the excess returns on NCAV portfolios.

Market Risk

We incorporate market risk by modelling the returns, net of the risk-free rate, on the NCAV portfolios as a function of the market risk premium. In other words, we model the NCAV using the one-factor Capital Asset Pricing Model (CAPM). This model captures the returns on the NCAV portfolio attributable to movements in the broader stock market.

It appears that the NCAV portfolios are somewhat riskier than the NYSE-AMEX stocks, with a beta greater than 1. However, the beta of the NCAV portfolio is not significantly different from 1, indicating that the NCAV portfolio is about as risky as the NYSE-AMEX portfolio. Furthermore the alpha, or excess return net of market-based return, is positive, and economically and statistically significant. This indicates that more than mere market risk explains the returns on the NCAV portfolios.

Astute readers will likely have noticed that most NCAV stocks are from the Nasdaq, indicating a prevalence of small stocks in the portfolios. This is indeed the case. Thus, the question arises: does the small-firm effect explain the excess returns from the NCAV portfolios?

Firm size and return

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. Since most of the firms held in the NCAV portfolios qualify as small-cap firms, this premium might explain the outsized returns.

We have already partially explored this theory by examining the returns on a portfolio of small-cap firms, and find that the NCAV portfolios outperform, in raw measures, the small-cap firms. In Table 2, Panel A, we present results from regressing the returns on the NCAV portfolio against the returns on the portfolio of small-cap stocks. The NCAV portfolio appears to be less risky than the small-cap stocks with a beta of 0.77, and offers excess returns (alpha) of 1.50% per month.

To this point, our only method of controlling risk has been the traditional market model, which includes only market risk as an explanation of returns. To more fully explore firm size as an explanation of NCAV returns, we employ the Fama-French three factor model, which adds two factors to the traditional market model. The first factor, SMB, captures the small firm effect by calculating the difference between the returns from a portfolio of the smallest 10% of stocks and the returns from a portfolio of the largest 10% of stocks. The second factor, HML, calculates the difference between the returns from a portfolio of stocks with high book-to-market ratios and a portfolio of stocks with low book-to-market ratios. The value premium is a point to which we will return shortly.

Applying the Fama-French three factor model to our data confirms the importance of the small-firm effect. All three factors are statistically relevant as explanatory variables, but the small firm effect is the largest factor. However, there is still an economically significant excess return (alpha) of 1.67% per month. Assuming monthly compounding, this yields an excess return of 21.99% per year after controlling for market risk, the small-firm effect, and the book-to-market effect. This indicates that the small firm effect does not explain the yields available from investing in stocks trading at a discount to NCAV. The results are presented in Table 6.

Insert Table 6 Fama-French 3-factor model about here.

Value premium

The Fama-French three factor model also allows exploration of a related effect: the value stock premium. 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]).

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.

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. As shown in Table 6, the value premium adds a minor amount to the explanation of the results. The excess returns unexplained by market risk, the small firm effect, and the value premium remain positive and economically significant. Thus it appears that some other factor is at play in the generation of the outsized returns generated by the NCAV investing technique.

It is worthwhile to note that the importance of the three factors is not stable over time. The returns on the NCAV portfolios are generally less risky than the market factor, but in two periods (2001 - 2003, 2007 - 2008) the NCAV portfolio has a market beta greater than 1. The size effect also demonstrates considerable variation. It rose to 1.34 in the 1984 - 1985 period, but dropped sharply to -0.12 in the 2007 - 2008 period. Finally, the value premium is generally negligible, but for the 1992 - 1994 period and the 2001 - 2003 period, when it explained some portion of the NCAV returns.

The time sensitive nature of the returns on the NCAV portfolios indicates a certain level of defensiveness in the returns, but that occasionally there is some pro-cyclicality. The pro-cyclicality of the value premium factor (HML) becomes somewhat sensible when one thinks of it the way Fama and French [1992] frame it: as a distress measure. They contend that firms with high book-to-market ratios are more likely to be distressed firms, and so their prices should be depressed. When the firms recover, the prices shoot up. So, the excess returns are related to distress risk.

The value premium factor is significant in the late the early 1990s and 2000s. These are times in the U.S. when the potential for distress was quite high, so that may explain why the NCAV portfolios increased their sensitivity to the value factor during that period. Again, however, this is not a reliable explanation for the bulk of the time period under examination. In the remainder of this section, we use various risk factors to model the excess returns on NCAV portfolios, and test down to a final model specification that best fits the data.

Leverage and Distress

Ferguson and Shockley [2003] offer two factors that make a strong contribution to the explanation of returns: relative leverage (measured by the ratio of debt to equity) and relative distress (measured by Altman's Z-score). Their argument is based on the idea that the market portfolio includes only equity, and so it is important to include measures to debt to obtain an accurate portrait of risk-return sensitivities for a firm. We calculate the relative leverage and relative distress portfolio returns following Chou et al. [2010].

Since our NCAV portfolio is designed such that leverage is minimal, we expect the portfolio to be insensitive to the relative leverage risk factor. The NCAV firms will tend to have very high Z-scores, since they have very low debt. Thus, the NCAV portfolio may be sensitive to this risk factor, but because high distress should lead to higher expected returns, the Z-score risk factor should have a negative loading for the NCAV portfolio.

Our findings for these two factors are presented in Table 7, Model 1 in Panel A. The relative leverage factor is labelled LEV, and relative distress is labelled Altman Z. Our empirical findings indicate that relative leverage is not a relevant risk factor, but the high Z-score yields a negative loading on the relative distress factor, as expected. This model yields an excess monthly return of 1.56%, or 20.4% per annum.

Momentum

As a counterpoint to the reversal factor, we also examine a momentum factor (MOM), as documented by Jegadeesh and Titman [1993] and Carhart [1997]. The momentum factor is based on the technique of buying recent winners and selling recent losers. The momentum portfolios have a shorter holding period and the long-term reversal portfolios. The returns from a momentum-mimicking portfolio are also obtained from Kenneth French's website.

Since NCAV stocks are recent losers, we should expect the momentum factor to be negatively related to the returns on NCAV portfolios, and it is. It is also statistically significant – see Table 7, Model 2 in Panel A. What is especially interesting is that inclusion of the momentum factor washes out the significance of the value factor (HML), and causes it to change sign. This indicates that the momentum factor is an important variable in explaining returns on NCAV portfolios.

Losers that Win

Debondt and Thaler [1985] documented positive excess returns generated from a contrarian investing strategy: buying stocks that have had negative returns in the long-run, and selling stocks that have recently had positive returns in the long-run. Returns from such a portfolio can be applied in the same method as the HML and SMB factors. The data regarding these returns were obtained from Kenneth French's website, with the factor label LT_REV which stands for long-term reversal.

We apply the long-term reversal factor to our data and present the results in Table 7, Model 3 in Panel A. While positive, the factor is not economically or statistically significant. Therefore, long-term reversal does not appear to explain the excess returns on NCAV portfolios.

Liquidity – Or Lack Thereof

As discussed earlier in this section, NCAV stocks tend to be highly illiquid, and since investors require a premium for holding illiquid stocks, this liquidity premium may explain the excess returns on the NCAV portfolios. While it is generally agreed that liquidity is important and that a liquidity premium exists, just how to measure liquidity remains an area of active research (see Liu [2006]). Due to this ongoing discussion, we calculate to liquidity measurements and then tabulate a portfolio returns based on these liquidity measurements.

Our first liquidity measure is based on Amihud [2002]. We calculate a rolling twelve-month average return to dollar volume ratio. The formula is:

$$ILLIQ_t^i = \frac{1}{Days_t^i} \sum_{d=1}^{Days_t^i} \frac{R_{td}^i}{V_{td}^i} \quad (1)$$

where i is the individual stock, t is the twelve-month period, *Days* is the number of trading days in the past twelve months, d is the day index, R is the daily log return on the stock, and V is the daily dollar volume in millions.

We calculate this measure for all firms in the NYSE, AMEX, and Nasdaq exchanges beginning from 1983, so that we have measurements for every month starting from 1984 to 2008. We then rank every firm by ILLIQ every month and group the firms into deciles. We calculate the monthly returns for each decile, and then tabulate a monthly liquidity spread. The monthly liquidity spread is the return from going long on the 30% (35%) least liquid NYSE/AMEX (Nasdaq) stocks and going short on the 30% (15%) most liquid NYSE/AMEX (Nasdaq) stocks. See Liu [2006] for a discussion of this procedure.

The liquidity spread captures the returns from going long the least liquid stocks and shorting the most liquid stocks. The factor is then used to explain the returns from the NCAV portfolios. If indeed illiquidity is a risk for NCAV investors, then this factor should be positively and statistically significant in explaining returns on the NCAV portfolios.

As a robustness check, we employ another liquidity measure. Pioneered by Liu [2006], this measurement is the weighted number of zero-trading days experienced by the stock in the past year. The measurement is calculated as follows:

$$LMx = \left[\#\ of\ zero\ daily\ volume\ in\ prior\ x\ months + \frac{\frac{1}{x\text{-}month\ turnover}}{Deflator} \right] * \frac{21x}{Days} \quad (2)$$

Since monthly measures of volume tend to be very noisy, we continue to use a rolling twelve-month measure of liquidity. Thus, in the formula above, $x = 12$. Turnover is measured as the total volume traded divided by total shares outstanding. We apply the same method of calculating the liquidity spread based on this measure as we did for the ILLIQ measure.

The results of adding in liquidity measures are presented in Table 7, Panel A, models 4 (ILLIQ) and 5 (LM12). While both factors are positive, only ILLIQ is statistically significant. Therefore, we retain that measure as we continue.

We add the liquidity measure in with the Fama-French 3 factors and the momentum factor, which was previously found to be significant, and estimate Model 6. Now we find HML and MOM are insignificant, and so discard these factors and estimate Model 7, where we include Altman Z once again. The fit of this model is the highest of all those estimated, and so we are confident that the market risk, small-firm effect (SMB), relative distress (Altman Z) and liquidity factors (ILLIQ) are the factors that explain the returns on the NCAV portfolios of the ones we have applied.

Taking a closer look at our results, we notice that inclusion of the liquidity factor reduces by one third the coefficient on the small-firm factor. This suggests that part of the weight on the small-firm factor is due to the illiquidity of small firms relative to big firms, and thus exclusion of the liquidity factor leads to a biased coefficient on SMB. We also note that inclusion of the liquidity factor ILLIQ has a substantive effect on the estimate of alpha (α).

Before including the liquidity factor, estimates of monthly alpha were around 1.48% to 1.74% per month, which translates to approximately 19 – 23% per year of excess returns, after adjusting for risk. Including the liquidity factor, monthly alpha is around 4.11%, which translates to 62% per year.

The problem remains, however, that our factor estimates are not stable over time. In Panel B, we present estimates of Model 7 for grouped time periods. We see that the excess return varies inversely with the market risk factor and the small firm factor, but positively with the illiquidity factor. Using a Pearson correlation coefficient, we calculate correlations of excess return, market risk premium, small firm premium, and liquidity premium with market performance as proxied for by the S&P 500. We note that excess returns and liquidity premiums are mildly counter-cyclical, while market risk and small firm premiums are strongly pro-cyclical. These results are available upon request.

Firm Characteristics and Excess Returns

To better understand the nature of the risk-adjusted excess returns, we collect the residuals from our final specification (Model 7 in Table 7) and regress those residuals on several firm characteristics. These results are presented in Table 8. Our method is based on Chou et al. [2010], with some modification. Their method uses individual securities, which is not feasible in our context. We do not tend to hold the same securities for very long, two years at most, in the NCAV portfolio. The security enters the portfolio in the month that the security trades at a price of less than or equal to two-thirds of net current asset value per share. As we rebalance the portfolio annually, the earliest a security can exit is one year after entering the portfolio. In many cases that means the security is in the portfolio for one year maximum. This security rotation leads us to apply the Chou et al. methodology on the portfolio level.

Our method is to run Model 7 and collect the residuals, which are the risk-adjusted excess returns. We then regress these residuals on the following characteristics: the natural logarithm of the average market capitalization of firms in the NCAV portfolio; the natural logarithm of the value-weighted average book-to-market value of equity ratio; the natural logarithm of the value-weighted average dollar volume; the natural logarithm of the inverse of the value-weighted average stock price; the value-weighted average dividend yield; the cumulative return on the portfolio from two months to three months prior to the current month; the cumulative return on the portfolio from four months to six months prior to the current month; the cumulative return on the portfolio from seven months to twelve months prior to the current month. We also include a dummy variable for January and for December to capture tax-loss selling effects.

In our first model, we find that average size, book-to-market, and dollar volume are significant explanatory variables. When we include the month dummy variables, we find that there is a significant January effect, and now dividend yield is marginally statistically significant. Our final model, which provides the best fit, includes size, book-to-market, dollar volume, the dividend yield, and the January dummy. We are left with a statistically significant intercept, indicating that we have not been able to explain fully the risk-adjusted excess return on the NCAV portfolio.

The January Effect

As Oppenheimer notes, the stocks making up the NCAV portfolios tend to be fairly illiquid. As such, it is important to note the January effect that is present in our results. If the investor is unable to execute the trade on December 31st, as we do in our results, the investor may miss out on the best month of returns.

The January effect in our portfolios accounts for 10% of returns in the year, while the other eleven months account for about 2% each. Thus, the January effect is nearly half of the whole year's return. This does not mean, however, that the January effect drives returns on the NCAV portfolios.

We do not report the results here[1], but in regressions of the excess returns on the three-factor model plus a dummy variable capturing the January effect, the intercept is still positive and statistically and economically significant. What is interesting to note is that the January effect appears to have increased since the 1980s. The January effect in the 1980s accounted for approximately 3.5% of excess returns in the 1980s, but the effect is about 6.5% in the 1990s and 2000s. We also document a December effect in the Fama-French 3-factor model, but including a liquidity factor washes out the December effect.

Limits on Trading

Up to this point we have considered transaction costs to be effectively zero because our portfolios generally have few securities in them and we make one round-trip trade in each security each year. It is reasonable to think costs like brokers' fees and the like would be minimized, as a percent or portfolio value, would be minimized in this case. However, since most stocks that qualify for inclusion in our portfolios are small, low liquidity stocks the market impact costs must be estimated as they could be sufficient to wash out seemingly high returns.

Market impact costs have been discussed in a number of trading environments. A good discussion of transaction costs can be found in Avramov et al. (2006). The idea of a market impact cost is that a particular trade can cause the price of the stock to move and this price change naturally reduces the profitability of the trade. For example, a large purchase of a low-liquidity stock will cause the price paid by the purchaser to increase. When the stock is sold, the selling pressure will cause the price received by the seller to decrease. These price

[1] Results are available upon request.

movements are termed market impact costs insofar as they reduce the return to a particular trade.

We use the method described in Korajczyk and Sadka [2004] to estimate market impact costs. Korajczyk and Sadka estimate costs for a momentum strategy using TAQ data. Their data set is for a longer period than the TAQ data so they estimate market impact costs as a function of various firm characteristics and then impute these costs for data outside the TAQ window. We adopt their model for our use here, and use their parameter estimates to calculate market impact costs for our portfolios.

Korajczyk and Sadka present two models for estimating market impact costs, one that is exponentially increasing in the size of the trade (Breen et al. [2002]) and one that is linearly increasing in the size of the trade (Glosten and Harris [1988]). We are able to only use the Breen et al. measure since it is the only one with parameter estimates for Nasdaq stocks, which dominate our sample.

Our method of including market impact costs is straightforward. We apply the model of Korajczyk and Sadka to each of the firms included in the portfolio every year and calculate estimates of the market impact cost function every month. This is λ^{BHK} from Korajczyk and Sadka. We then calculate the dollar cost for buying at the beginning of January and selling at the end of December for three different total investment amounts: $10,000; $1,000,000; and $1,000,000,000. The initial investment is divided equally amongst all stocks identified for investment in January. No rebalancing is done during the year, and the entire portfolio is liquidated in December. We also assume that we cannot trade in any stock that has an unrecorded volume, thus we set such stocks to an investment of 0. The results for this method are presented in Table IX, where we show the dollar return on the portfolio for the year net of costs, and the total market impact costs for each investment size per year.

As one can see the dollar return is highly variable, but the gains tend to be much larger than the losses in any given year. We also note that the market impact costs are highest, as a percent of investment, for the $10,000 portfolio, but are approximately the same for the other two portfolios. Further, the market impact costs are nowhere near large enough to reduce the substantial returns offered by the net nets method of investing. Finally, we note that the average annual return after impact costs is around 20%, consistent with our findings to this point. The reason market impact costs are not detrimental to our returns is because we trade so infrequently. A weekly momentum strategy, for example, buys and sells 52 times per year. We buy and sell once per year.

Our final test is to reduce the pool of investable stocks by increasing the strictness of our filter. To this point, we have only excluded net nets that trade for less than 1% of the net asset value per share. We apply two more filters and re-examine our results. First, we eliminate stocks trading for less than $1 per share, and then stocks trading for less than $5 per share. The results from these filters are presented in Table X.

Average returns are, naturally, decreasing as we add on stricter filters. Nevertheless, they remain high at 2.2% per month ($1 filter) and 1.6% per month ($5 filter). We apply the models shown in Table VII to these new portfolios and calculate high and low excess returns. For the $1 filter rule, we find a low monthly alpha of 1.4% (18% annual) and a high monthly alpha of 3.1% (43.4% annual). For the $5 filter rule, the low monthly alpha is 0.78% (9.8% annual) and the high is 1.8% (24.6% annual). Note that the parameter estimates are quite consistent across samples.

If one were to combine the $5 filter rule with the minimum portfolio investment of $10,000, then the market impact costs may reduce annual excess returns to close to zero. Otherwise, we continue to observe strong performance from the net nets investment rule.

Conclusion

The results are as clear as they are compelling: Seventy five years on, Graham's NCAV rule continues to identify securities that generate above-market returns. It appears that NCAV investment opportunities are more abundant after the market has performed badly, and the returns afforded by the NCAV portfolios outperform the market as the economy recovers.

In the work presented here, we have documented an average monthly return on the NCAV portfolio of 2.55%, compared to an average monthly return of 0.85% on the NYSE-AMEX portfolio and 1.24% on a portfolio of small firms. Risk-adjusted excess returns range from 1.5% per month to 4.5%, depending on the risk adjustment. Furthermore, there is considerable variation over time in the risk-adjusted and non-adjusted returns. For example, in the early 2000s, excess return was on the order of 8.1% per month, whereas in the 2007 – 2008 period excess return was -0.002 % per month.

We include a wide variety of risk factors to model the returns on the NCAV portfolio. The risk factors include: the market risk premium; the small firm factor and value factor from the Fama-French 3 factor model (SMB and HML); relative leverage and relative distress factors, following Ferguson and Shockley [2003]; a momentum factor, following Carhart [1997]; a long-term reversal factor, in the spirit of DeBondt and Thaler [1985]; and two liquidity factors, based on Amihud [2005] and Liu [2006].

We find that market risk, the small firm effect, relative distress, and Amihud's liquidity measure are priced factors in the NCAV portfolios. However, the performance of the NCAV rule is not explained away by these factors. The chief explanatory factor of excess returns is the liquidity premium. In our final model, we document risk-adjusted excess returns of 4.11% per month. Adapting the procedure documented in Chou et al. [2010], we model the monthly excess return series as a function of the characteristics of the firms in the NCAV portfolio.

The characteristics used include averages of: firm size, book-to-market, dollar volume, the inverse of the stock price, dividend yield, and cumulative returns for selected recent months. We also include a dummy variable for January and for December. Our results indicate that average firm size, book-to-market, volume, and the dividend yield are important firm characteristics in explaining excess returns. We also note that excess returns are higher in January. In fact, half of all total returns can be attributed to January. Thus, missing out on January's price advance can be critical.

In our final section we consider the effect of market impact costs on returns, in addition to applying stronger filters to the stock selection phase. We find that market impact costs are not sufficiently high to reduce the returns on the net nets investment rule. This is largely because of the low frequency of trading – essentially one round-trip per stock per year.

Increasing the strictness of the filters naturally reduces the returns on the portfolios. Initially we eliminate stocks that trade for less than 1% of net asset value per share for most of this paper. Our stricter filters eliminate stocks that trade for less than $1 per share and less than $5 per share. This leads to lower monthly returns – 2.2% and 1.6% respectively. Excess returns are also lower – the low estimates are 1.4% and 0.8% per month. Nevertheless, these still are economically significant excess (net of risk factors) returns.

In sum, our results show that there is a persistent investment opportunity, the returns on which are not fully explained by risk factors or non-risk firm characteristics. It appears that stocks selling at a discount to net current asset value represent a pool of stocks for which arbitrage opportunities are limited, and thus have distorted market prices. These distorted market prices provide an opportunity for substantial gain.

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Table I: Occurrence of NCAV stocks by exchange and year.

Number of firms that meet the NCAV rule by year and index. The NCAV rule states that if the current stock price is two-thirds or less of the net current assets per share, buy the stock. Net current assets are defined as current assets less total liabilities and preferred stock.

Year	NYSE	AMEX	NDQ	Total
1984	4	3	6	13
1985	6	1	10	17
1986	6	1	12	19
1987	4	0	15	19
1988	4	5	31	40
1989	4	2	26	32
1990	4	2	34	40
1991	6	7	86	99
1992	6	7	55	68
1993	3	3	45	51
1994	5	1	22	28
1995	7	1	28	36
1996	9	1	30	40
1997	8	2	29	39
1998	10	0	32	42
1999	13	4	63	80
2000	12	5	51	68
2001	23	14	114	151
2002	22	11	119	152
2003	19	7	114	140
2004	14	1	28	43
2005	14	1	20	35
2006	12	2	22	36
2007	16	2	18	36
2008	14	2	22	38
Total	245	85	1032	1362