Theory and Evidence…

# Small Cap Premium:

# Does Liquidity Hold Water?

by

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## I. Introduction

Great things come in small packages.  It is not only a cliché – it has actually become a principle that a lot of people live by and even invest by.  In terms of investments, smaller companies tend to be more volatile, more illiquid than larger ones and many argue they must therefore offer better returns than larger companies.  And in fact there has been a lot of research done and evidence found in the past few decades to try to prove, even on a risk-adjusted basis, this idea of a "small-cap premium."

The marketplace has been trying to use this "small-cap premium" phenomenon as a strategy to invest in smaller companies in order to take advantage of this so called "market anomaly."  Many portfolio managers believe that this premium exists and expect to see excess returns in their portfolios from small capitalization stocks just because of their size.  Even equity research analysts when valuing smaller companies add a premium onto the discount rate in their valuations to account for this so called "small firm effect." This actually translates into a discount on value for smaller companies since they are expected to earn those excess returns.  However, whether or not small capitalization stocks always offer superior returns relative to the market and outperform mid and large capitalization stocks is yet to be conclusively proven.  This "small-cap premium" or "small-firm effect" is assumed to be embedded in small market capitalization stocks, but what many investors may actually be overlooking are the hidden costs that are associated with investing in these types of stocks – mainly risk and liquidity. This risk in small stocks is the risk that is not captured in conventional measures like beta.  Therefore, just because these companies look cheap on a relative basis to large cap stocks, they might not live up to their expectations when other factors are brought into the picture.

Many people who believe in the "small-cap premium" argue that it can be explained by the fact that investors need and expect this extra return to compensate them for the lack of

information on these firms which is usually much more readily available for larger companies. In addition, many small-cap companies are not covered or have limited coverage by research analysts on the street. This however, might be related to the inherent risk of these types of stocks which on average tend to be more volatile and give off higher returns than their counterpart larger capitalization stocks. Modern Portfolio Theory argues that higher market risk is linked with higher returns. Since smaller stocks are said to carry higher risks than large cap stocks, it would therefore be logical for them to deliver higher returns. But can the inherent risk of these smaller companies be offered as justification for their returns? In fact, investors are more jittery and concerned more than usual in the last couple of years because of the market's wild swings. Small companies have a smaller margin of error than larger companies if something goes wrong.

Liquidity, or lack there of in small-cap stocks, is the ease with which an owner of an asset can sell at the current market price. Investors want to be able to get in and out of positions quickly in the event of a crisis, and that's much easier to do with blue chip stocks than small stocks. For example, selling a pair of tickets to a U2 concert is much easier than selling a pair of tickets to an off-Broadway show. Even if the tickets have the same face value, there might still be a problem trying to sell the tickets to the off-Broadway show as there are fewer buyers who know the fair price for this ticket. The U2 tickets have higher liquidity than the off-Broadway show tickets. The extent to which liquidity affects the price of an asset refers to this liquidity premium.

The liquidity premium is the difference in price between assets identical except for their liquidity. One true driver of higher returns for small stock is their illiquidity, which investors rationally trade-off for lower returns in liquid stocks. They are willing to pay for the right to liquidate quickly if need be.

The main motivation for this paper is to delve deeper into this theory of the "size effect" or "small cap premium" that is so widely assumed by the whole market, and see whether or not there really is a return advantage in owning small capitalization securities.  I would like to analyze and compare the relative annualized holding period returns or performance of small, mid and large capitalization stocks over a 10 year period in history (1995-2004) and try to figure out if there is any statistical significance between returns of these companies and their relative size based on their market capitalization as well as their liquidity based on their trading volume as a percentage of the number of shares outstanding.  This will further enable me to test whether or not liquidity, or lack there of in small cap stocks, can explain these excess returns in performance and essentially be able to hold water.

## II. Literature Review

### 1. Small Cap Premium

The idea of a small cap premium is more than two decades old.  In 1981,  Rolf Banz published "The Relationship between Return and Market Value of Common Stocks" in the *Journal of Financial Economics*.[1]  Although classical investment theory said expected returns for the security should only be based on quantifiable market risks, 25 years ago the real life evidence began to emerge for a "size effect" that was not fully explained by risk differences.  Over the period 1936-1975, he was able to show that "the common stock of small firms had, on average, higher risk adjusted returns than the common stock of larger firms."[2]  He noted that size by itself is not the likely driver of the over performance, but rather a hidden risk that is not priced.  He estimated that on average, if we constructed long-short portfolios of small versus large cap

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[1] Banz, Rolf W. (1981). "The Relationship between Return and Market Value of Common Stocks," *Journal of Financial Economics*, 9, 3-18.
[2] AXA Advisors, LLC. "Good things may come in small packages: small cap stocks." 2007, <www.axaonlinne.com/rs/axa/print/5073_print.html> (09 April 2007)

stocks, rebalanced every month, and levered so each have equal risk, small companies produce excess returns of 20% annually.  He found however, that this relationship is not linear and that this effect only affected the smallest firms in the market (~20% of the smallest firms) as the other portfolios, on a risk adjusted basis performed as expected.

This benefit of investing in small companies has since been documented in numerous studies.  From 1925 to 1997, the annual rate of return on small caps was 12.7% while large caps returned 11% annually, according to Ibbotson Associates.[3]  In the last decade, 1997-2006, small cap equities delivered a 13.5% compounded annual return, while large caps returned 8.4%, when looking at the S&P500 and Russell 2000 indexes.[4]  Ken French and Gene Fama, for the period from 1927 to 2001, were able to construct portfolios based upon the market caps of stocks for each year and hold those portfolios for one consecutive year before reconstructing them again based on their market value.   They found that the annual returns of the smallest stocks were about 20% over this period compared to 11.74% for larger companies.[5]  When they used equally weighted portfolios (as opposed to value weighted as stated above), the "small cap premium" was even higher but just as Banz discovered earlier, this effect was most visibly seen in the smallest stocks in their market universe. (***See Figure 1 on the next page***)  Regardless, these discoveries provided many investors including portfolio managers a basis for an investment strategy.

[3] Kathman, David. "Are small-cap stocks finally bouncing back?" Stock Analyst Journal. 11 December 1998, <http://news.morningstar.com/article/printArticle.asp?id=1084> (16 April 2007)
[4] Votruba, Jason J. "Disciplined Investing Delivers Lasting Returns." Viewpoint:UMB, 2006, <www.umbscoutfunds.com/docs/cmsdocs/UMB006974.pdf> (10 April 2007)
[5] Damodaran, Aswath. Investment Philosophies: Successful Strategies and the Investors who Made Them Work. (John Wiley & Sons Canada Ltd., 2003) Chap. 9, p. 1-11.

*Figure 1: Annual Returns by Market Value Class (1927-2001)*
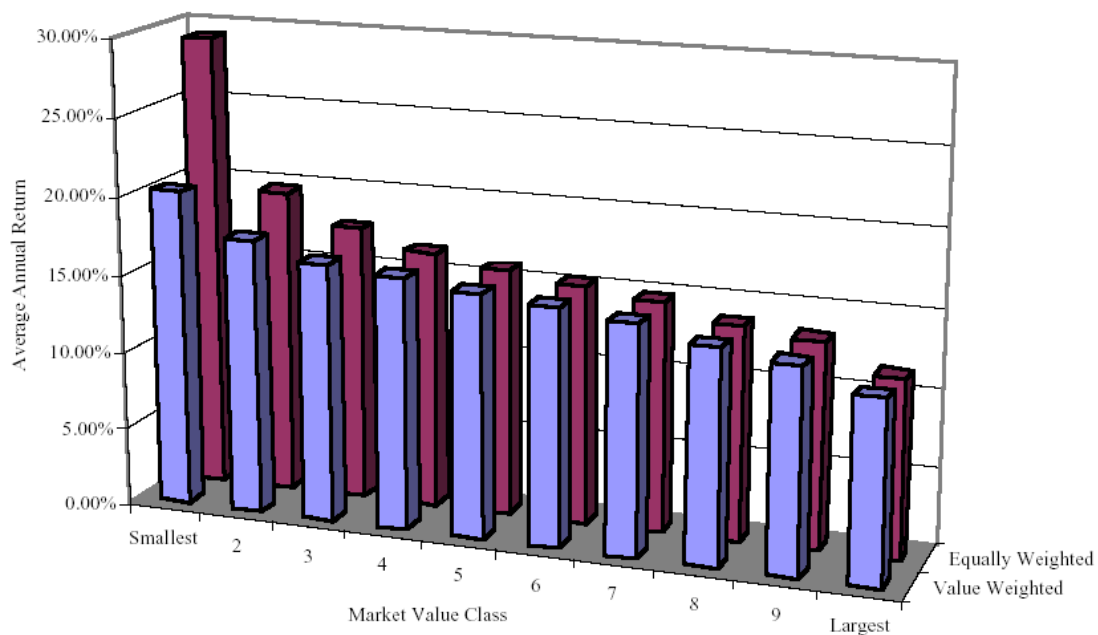


*Source: Damodaran (2003), Raw Data from French (2002)*

There have been numerous empirical studies done throughout the years that further complicate the small cap premium effect. Donald Keim in his paper "Stock Return Seasonality and the Size Effect", in 1983 shows the small firm effect mostly occurs in the month of January.[6] This phenomenon is known as the "January effect." Based on his calculations, about 50% of the average annual small stock premium comes from January. Keim argues that the small stock premium effect should be decomposed into two parts – the large premium in January and the smaller, yet on average positive risk adjusted return between February and December. He argues that this large difference is linked to informational differences in January compared to other months, as there is more uncertainty and risk in this period. Companies typically end their fiscal year in December and start reporting earnings. The impact of any information that is released has a larger effect on smaller companies. This theory sounds nice on paper but has yet to be proven.

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[6] Keim, Donald, 1983, "Stock return seasonality and the size effect," *Journal of Financial Economics* 12, p.13-32

## 2. Illiquidity Premium

Many of the studies that uncover a small cap premium measure the risk of these stocks using the market beta and the capital asset pricing model (CAPM).  The weakness of these studies is that the market beta might not be incorporating all the risk associated with smaller companies including liquidity, or lack there of in small stocks.  In addition small companies tend to change very quickly over time and their market betas are very volatile.  The small cap premium that is not explained in the market beta risk, at least partially might be explained by an illiquidity factor.

Amihud and Mendelson (1986) were one of the first researchers to offer compelling evidence to show that illiquidity is one of the primary drivers behind the small cap premium effect.[7]  They construct a model explaining why assets with lower liquidity will yield higher returns and test this model empirically.  They argue that the price of an asset already includes the present value of the transaction costs associated with selling the asset in future years.  In their model the bid-ask spread is used as a proxy for transaction costs.  The magnitude of the discount will be a function of the holding period of the investors and turnover ratios, with shorter holding periods and higher turnover leading to higher discounts.  After showing that bid-ask spread does affect pricing, Amihud and Mendelson in 1991 explicitly show a liquidity premium in the market and that investors do in fact trade higher liquidity for lower returns when trading US treasury securities.[8]  But can this liquidity premium translate into other assets such as stocks?

Acharya and Pedersen (2005) in a recent study examined how assets are priced with liquidity risk and argue that it is not just how illiquid an asset is that matters but rather when it is

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[7] Amihud, Y. and H. Mendelson , 1986, "Asset pricing and the bid ask spread," *Journal of Financial Economics* 17, p. 223-249.

[8] Amihud, Y. and H. Mendelson , 1991, "Liquidity, maturity and the yields on US Treasury securities," *Journal of Finance* 4, p. 1411-1425.

illiquid, particularly when the market is illiquid.[9]  They estimated that illiquid stocks have

annualized risk premiums about 1.1% higher than liquid stocks and that 80% of this premium

can be explained by the covariance between a stock's liquidity and overall market illiquidity.


## III. Data

I began collecting data from the Center for Research in Securities Prices (CRSP) database

for the most recent 10 year period beginning from January 1995 to the end of 2004 for all

publicly traded companies in the United States which amounted to just over 9000 companies.  I

collected the monthly holding period returns, monthly stock prices, trading volume and number

of shares outstanding.  A snapshot of the raw data can be seen in *Figure 2* below.

*Figure 2: Snapshot of Raw Data from Center for Research in Securities Prices Database*

| PERMNO | DATE | COMPANY NAME | TICKER | PRC | VOL | RETURN | SHARES OUTS | MKT CAP |
|---|---|---|---|---|---|---|---|---|
| 75730 | 19950131 | PRESSTEK INC | PRST | 43.75 | 18332 | -0.13366 | 7194 | 314737.5 |
| 75730 | 19950228 | PRESSTEK INC | PRST | 47 | 11221 | 0.07429 | 7194 | 338118 |
| 75730 | 19950331 | PRESSTEK INC | PRST | 66 | 53817 | 0.40426 | 7236 | 477576 |
| 75730 | 19950428 | PRESSTEK INC | PRST | 83 | 52255 | 0.25758 | 7236 | 600588 |
| 75730 | 19950531 | PRESSTEK INC | PRST | 58 | 89636 | 0.39759 | 14472 | 839376 |
| 75730 | 19950630 | PRESSTEK INC | PRST | 51 | 72940 | -0.12069 | 14558 | 742458 |
| 75730 | 19950731 | PRESSTEK INC | PRST | 62 | 50567 | 0.21569 | 14558 | 902596 |

Source: CRSP Database

I then sorted through the data and deleted companies that went public after January 1995

as I wanted to calculate the holding period returns for all US publicly traded companies from the

perspective of an investor making stock decisions in the beginning of 1995.  I wanted the stocks

to have comparable stock returns with one single starting date.  In addition, I deleted companies

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[9] Acharya, V. and L.H. Pedersen, 2005, "Asset Pricing with Liquidity Risk," *Journal of Financial Economics,* 77, p. 375-410

that were taken private and then put back on the public market sometime within the 10 year analysis period. This is due to the large gap in the data that would prove inconsistent with the rest of the database. These adjustments caused me to lose about 1,000 companies.

However, I did not delete companies that went out of existence during this 10 year time period due to either bankruptcy or acquisitions. This is because I did not want to subject my data to survivorship bias. Survivorship bias is the tendency for failed companies to be excluded from performance studies due to the fact that they no longer exist. It often causes the results of studies to skew higher because only companies which were successful enough to survive until the end of the period are included. This left me with 8,021 companies to use for my empirical study.

## IV. Analysis

### 1. Calculations

Once the data was sorted, I calculated each company's average market cap and trading volume % in 1995 (base year). Trading volume as a % of number of shares outstanding was used in order to provide a better metric for standardized volume as companies with fewer shares outstanding tend to have fewer shares traded. To take into account this potential bias I used the relative trading volume number. A dollar trading volume number could also have been used.

Then I calculated each company's annualized holding period return for a 1 year, 3 year, 5 year and 10 year time horizon. The Holding Period Return or HPR is the total return measured over some period of time. Holding period return is an important concept because it tells me the return on my initial invested capital, measured over the total time period I held the asset.

Because of the huge amount of data and limited amount of time available to collect and analyze it, I had to make some basic assumptions about the companies that went out of existence in the 10 year period. I assumed that companies that had their stock price drop more than 20%

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within the last 6 months of their existence on the stock exchange went into bankruptcy. In

addition any company whose last traded stock price was below $2 was also assumed to have

gone bankrupt. Their annualized holding period return for that year was therefore -100% and no

returns were reported for future time periods as the company was no longer trading. All of the

other companies that went out of existence during this time period were assumed to be acquired.

The last trading stock price was understood to be the acquisition price and therefore the last

available monthly holding period return was used to calculate the annualized holding period

return. As with the companies that went bankrupt, no returns were reported for future time

periods.

A snapshot of a portion of the final output can be seen in *Figure 3* below.

**Figure 3: Updated Dataset**

| COMPANY NAME | TICKER | VOLUME | MKT CAP | 1 YR HPR | 3 YR HPR | 5 YR HPR | 10 YR HPR |
|---|---|---|---|---|---|---|---|
| ENERGY WEST INC | EWST | 12.87% | 18,246.62 | 22.86% | 30.11% | 36.59% | 32.74% |
| BANCTRUST FINANCIAL GROUP INC | BTFG | 2.89% | 39,709.01 | 9.21% | 104.93% | 60.03% | 289.47% |
| GREAT COUNTRY BK ASONIA CT | GCBK | 1430.45% | 208,913.77 | 158.57% | | | |
| IROQUOIS BANCORP INC | IROQ | 19.36% | 27,987.51 | 65.61% | 224.68% | 93.77% | |
| CABOT MEDICAL CORP | CBOT | 103.32% | 64,652.00 | 132.90% | | | |
| A T C GROUP SERVICES INC | ATCS | 142.48% | 87,502.35 | -27.69% | -28.46% | | |
| D P A C TECHNOLOGIES CORP | DPAC | 242.84% | 56,616.51 | 191.67% | 105.55% | 256.93% | -54.22% |
| SCOTT TECHNOLOGIES INC | SCTT | 130.38% | 136,369.37 | 69.39% | 114.29% | 208.18% | |
| DELTA COMPUTEC INC | DCIS | 3.47% | 3,385.29 | -91.75% | | | |
| I F R SYSTEMS INC | IFRS | 57.58% | 58,600.48 | -2.63% | 145.63% | 59.46% | -100.00% |

*2. Regressions*

Once my dataset was completed I ran regressions to check if the companies' returns could

statistically be explained by either their size, through the market cap, or possibly by their

liquidity, through trading volume % or even both. Because of the large sample and huge range

of numbers I took the log normal (LN) of the market capitalizations and trading volumes before I

ran the sets of regressions to try to reduce the number of outliers and randomness of the data.

*Figure 4* below presents a summary of my results.  Full regression outputs can be seen in

*Appendix A*.

*Figure 4: Initial Regression Output*

**Regression Analysis: 1 Year Return versus LN of Volume, LN (Avg Mkt Cap)**
The regression equation is:
1 Year Return = 0.130 + 0.137 LN of Volume + 0.0316 LN (Avg Mkt Cap)

| Predictor | Coef | SE Coef | T | P |
|---|---|---|---|---|
| Constant | 0.13002 | 0.09327 | 1.39 | 0.163 |
| LN of Volume | 0.13690 | 0.01304 | 10.50 | 0.000 |
| LN (Avg Mkt Cap) | 0.031598 | 0.007863 | 4.02 | 0.000 |

S = 1.28516  **R-Sq = 1.7%**  R-Sq(adj) = 1.7%

**Regression Analysis: 3 Year Return versus LN(Volume), LN(Avg. Mkt Cap)**
The regression equation is:
3 Year Return = 0.230 - 0.0611 LN(Volume) + 0.0574 LN(Avg. Mkt Cap)

| Predictor | Coef | SE Coef | T | P |
|---|---|---|---|---|
| Constant | 0.2296 | 0.1517 | 1.51 | 0.130 |
| LN(Volume) | -0.06109 | 0.02110 | -2.89 | 0.004 |
| LN(Avg. Mkt Cap) | 0.05745 | 0.01272 | 4.52 | 0.000 |

S = 1.93181  **R-Sq = 0.4%**  R-Sq(adj) = 0.3%

**Regression Analysis: 5 Year Return versus LN(Volume), LN(Avg. Mkt Cap)**
The regression equation is:
5 Year Return = 0.844 + 0.526 LN(Volume) + 0.0806 LN(Avg. Mkt Cap)

| Predictor | Coef | SE Coef | T | P |
|---|---|---|---|---|
| Constant | 0.8443 | 0.6860 | 1.23 | 0.218 |
| LN(Volume) | 0.52585 | 0.09651 | 5.45 | 0.000 |
| LN(Avg. Mkt Cap) | 0.08056 | 0.05707 | 1.41 | 0.158 |

S = 8.02980  **R-Sq = 0.6%**  R-Sq(adj) = 0.6%

**Regression Analysis: 10 Year Return versus LN(Avg. Mkt Cap), LN(Volume)**
The regression equation is:
10 Year Return = 1.97 + 0.0534 LN(Avg. Mkt Cap) - 0.0504 LN(Volume)

| Predictor | Coef | SE Coef | T | P |
|---|---|---|---|---|
| Constant | 1.9711 | 0.6982 | 2.82 | 0.005 |
| LN(Avg. Mkt Cap) | 0.05338 | 0.05731 | 0.93 | 0.352 |
| LN(Volume) | -0.05045 | 0.09950 | -0.51 | 0.612 |

S = 6.78157  **R-Sq = 0.0%**  R-Sq(adj) = 0.0%

The above regressions proved to be statistically insignificant.  None of the T values were

high enough to be significant and the R-Squared values in all of the regressions were very low

ranging from 1.7% to 0%.  This signifies that the data was only able to explain about 1.7% to 0%

of the companies' returns.  This indicated that both size and liquidity could not explain returns during this 10 year time horizon – 1995-2004.  Even if you look at the line chart of all the data in *Figure 5* below, you can see that the data seems to be scattered all over the place and there don't seem to be any visible trend lines.

*Figure 5: Annualized Holding Period Returns*
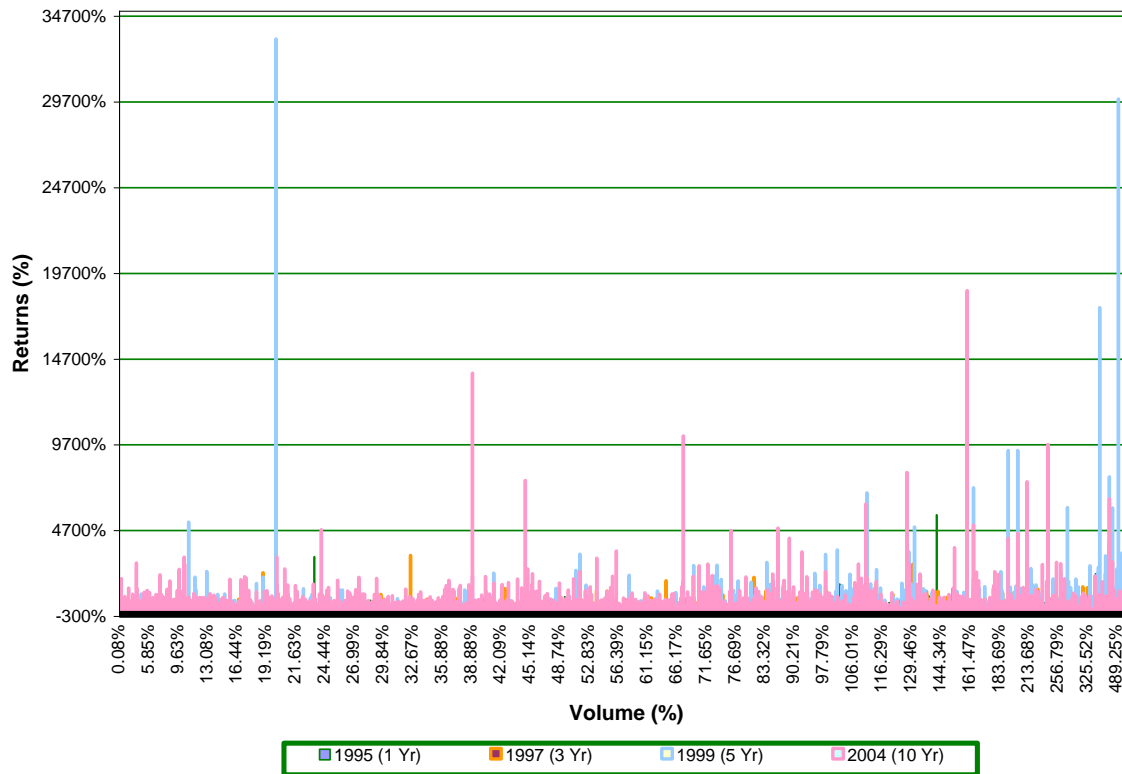


### 3. Portfolios

Due to the noise in the data I decided to sort the dataset into 40 portfolios with about 200 companies in each portfolio and track their returns in this way.  This would enable me to get rid of huge outliers and average out the data into 40 different classes based on size and liquidity.  I first sorted the data based on market capitalization (a proxy for size) and took the average returns, volume % and market cap for each individual portfolio.  I ran the regressions again

based on this updated data, which can be seen in *Appendix B,* and my results can be seen in

*Appendix C* and also summarized below in *Figure 6*.

*Figure 6: Portfolio Regressions (based on sort by market cap)*

**Regression Analysis: 1995 (1 Yr) versus Volume, 1995 Avg Mkt Cap**
The regression equation is:
1995 (1 Yr) = - 0.0440 + 0.465 Volume + 0.000000 1995 Avg Mkt Cap

| Predictor | Coef | SE Coef | T | P |
|---|---|---|---|---|
| Constant | -0.04396 | 0.08009 | -0.55 | 0.586 |
| Volume | 0.46548 | 0.08084 | 5.76 | 0.000 |
| 1995 Avg Mkt Cap | 0.00000001 | 0.00000001 | 2.36 | 0.023 |

S = 0.0851282   **R-Sq = 48.6%**   R-Sq(adj) = 45.9%

**Regression Analysis: 1997 (3 Yr) versus Volume, 1995 Avg Mkt Cap**
The regression equation is:
1997 (3 Yr) = 0.471 + 0.460 Volume + 0.000000 1995 Avg Mkt Cap

| Predictor | Coef | SE Coef | T | P |
|---|---|---|---|---|
| Constant | 0.4707 | 0.1778 | 2.65 | 0.012 |
| Volume | 0.4605 | 0.1795 | 2.57 | 0.014 |
| 1995 Avg Mkt Cap | 0.00000003 | 0.00000001 | 2.66 | 0.011 |

S = 0.189002   **R-Sq = 23.9%**   R-Sq(adj) = 19.8%

**Regression Analysis: 1999 (5 Yr) versus 1995 Avg Mkt Cap, Volume**
The regression equation is:
1999 (5 Yr) = 0.505 + 0.000000 1995 Avg Mkt Cap + 0.897 Volume

| Predictor | Coef | SE Coef | T | P |
|---|---|---|---|---|
| Constant | 0.5050 | 0.5972 | 0.85 | 0.403 |
| 1995 Avg Mkt Cap | 0.00000008 | 0.00000004 | 2.02 | 0.051 |
| Volume | 0.8967 | 0.6028 | 1.49 | 0.145 |

S = 0.634769   **R-Sq = 12.7%**   R-Sq(adj) = 8.0%

**Regression Analysis: 2004 (10 Yr) versus 1995 Avg Mkt Cap, Volume**
The regression equation is:
2004 (10 Yr) = 1.37 + 0.000000 1995 Avg Mkt Cap + 1.28 Volume

| Predictor | Coef | SE Coef | T | P |
|---|---|---|---|---|
| Constant | 1.3732 | 0.5118 | 2.68 | 0.011 |
| 1995 Avg Mkt Cap | 0.00000002 | 0.00000003 | 0.45 | 0.657 |
| Volume | 1.2758 | 0.5166 | 2.47 | 0.018 |

S = 0.544011   **R-Sq = 14.2%**   R-Sq(adj) = 9.5%

My results were mixed with some statistical significance in the 1 year regression with an

R-squared of 48.6% and a T value for volume of 5.76.  The rest of the regressions, as before,

continued to have very low T values and R-squares.  The regressions still seemed to show that

the size or market cap of a company had little or almost no predictive power when it came to explaining returns in this time period. The coefficient of the market cap variable in the regressions consistently was very low and many times close to 0. This would indicate that possibly volume, or liquidity, more than market cap has some explanatory power when it comes to explaining returns. *Figure 7* below highlights the results I found in the regressions based on the 40 portfolios I sorted based on market capitalization. There doesn't seem to be any visible trend below than can explain returns.

*Figure 7: Annualized Holding Period Returns of Portfolios sorted by Market Cap*
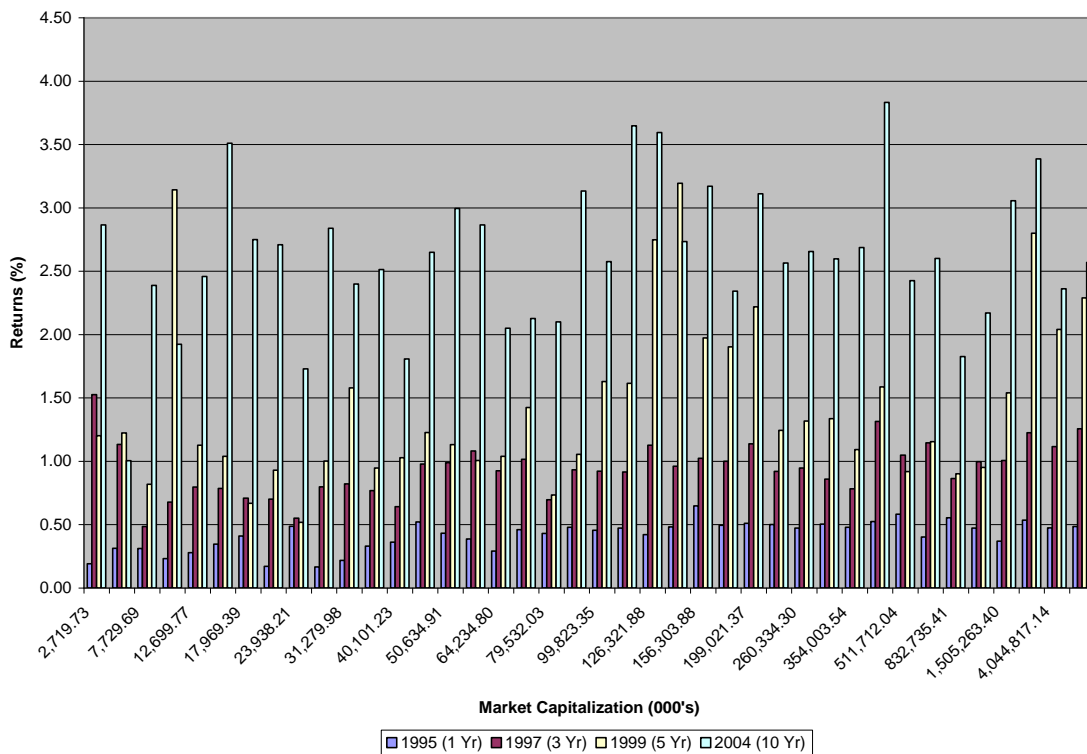


As was seen in the previous regressions, there was no real statistical significance in explaining returns for these companies when both size and liquidity factors were taken into account. Liquidity, if anything however, seemed to indicate through it's slightly higher T value that there might be some sort of relationship between trading volume % and returns. Therefore I decided to sort my data once again, this time creating 40 portfolios based on trading volume % as

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can been seen in *Appendix D*.  Full regression output can be found in *Appendix E* while a brief

summary is located in *Figure 8* below.

*Figure 8: Portfolio Regressions (based on sort by volume %)*

<div align="center">

**Regression Analysis: 1995 (1 Yr) versus Volume, Avg Mkt Cap**

The regression equation is: 1995 (1 Yr) = 0.302 + 0.157 Volume - 0.000000 Avg Mkt Cap

</div>

| Predictor | Coef | SE Coef | T | P |
|---|---|---|---|---|
| Constant | 0.30162 | 0.03594 | 8.39 | 0.000 |
| Volume | 0.15694 | 0.01183 | 13.27 | 0.000 |
| Avg Mkt Cap | -0.00000005 | 0.00000004 | -1.26 | 0.217 |

$S = 0.0837883$   **R-Sq = 84.2%**   R-Sq(adj) = 83.3%

<div align="center">

**Regression Analysis: 1997 (3 Yr) versus Avg Mkt Cap, Volume**

The regression equation is: 1997 (3 Yr) = 0.972 - 0.000000 Avg Mkt Cap - 0.0408 Volume

</div>

| Predictor | Coef | SE Coef | T | P |
|---|---|---|---|---|
| Constant | 0.97212 | 0.07388 | 13.16 | 0.000 |
| Avg Mkt Cap | -0.00000000 | 0.00000008 | -0.00 | 0.997 |
| Volume | -0.04079 | 0.02431 | -1.68 | 0.102 |

$S = 0.172233$   **R-Sq = 7.5%**   R-Sq(adj) = 2.5%

<div align="center">

**Regression Analysis: 1999 (5 Yr) versus Avg Mkt Cap, Volume**

The regression equation is: 1999 (5 Yr) = 0.730 - 0.000000 Avg Mkt Cap + 0.798 Volume

</div>

| Predictor | Coef | SE Coef | T | P |
|---|---|---|---|---|
| Constant | 0.7301 | 0.2792 | 2.62 | 0.013 |
| Avg Mkt Cap | -0.00000004 | 0.00000029 | -0.12 | 0.904 |
| Volume | 0.79760 | 0.09187 | 8.68 | 0.000 |

$S = 0.650804$   **R-Sq = 68.5%**   R-Sq(adj) = 66.8%

<div align="center">

**Regression Analysis: 2004 (10 Yr) versus Avg Mkt Cap, Volume**

The regression equation is: 2004 (10 Yr) = 2.58 + 0.000000 Avg Mkt Cap + 0.044 Volume

</div>

| Predictor | Coef | SE Coef | T | P |
|---|---|---|---|---|
| Constant | 2.5772 | 0.3401 | 7.58 | 0.000 |
| Avg Mkt Cap | 0.00000001 | 0.00000036 | 0.02 | 0.985 |
| Volume | 0.0438 | 0.1119 | 0.39 | 0.698 |

$S = 0.792960$   **R-Sq = 0.4%**   R-Sq(adj) = 0.0%

The 1 year and 5 year regressions show statistical significance in explaining a possible

liquidity premium effect with high T values for volume % and higher R-squares.  However, once

again it is not seen conclusively in all of the regressions.  In addition the coefficients for the high

R-squared regressions are very small. This, however, interestingly points that if there is anything

that we should be focusing on when trying to explain stock returns it should be their liquidity not their market cap or size.

*Figure 9: Annualized Holding Period Returns of Portfolios sorted by Volume %*
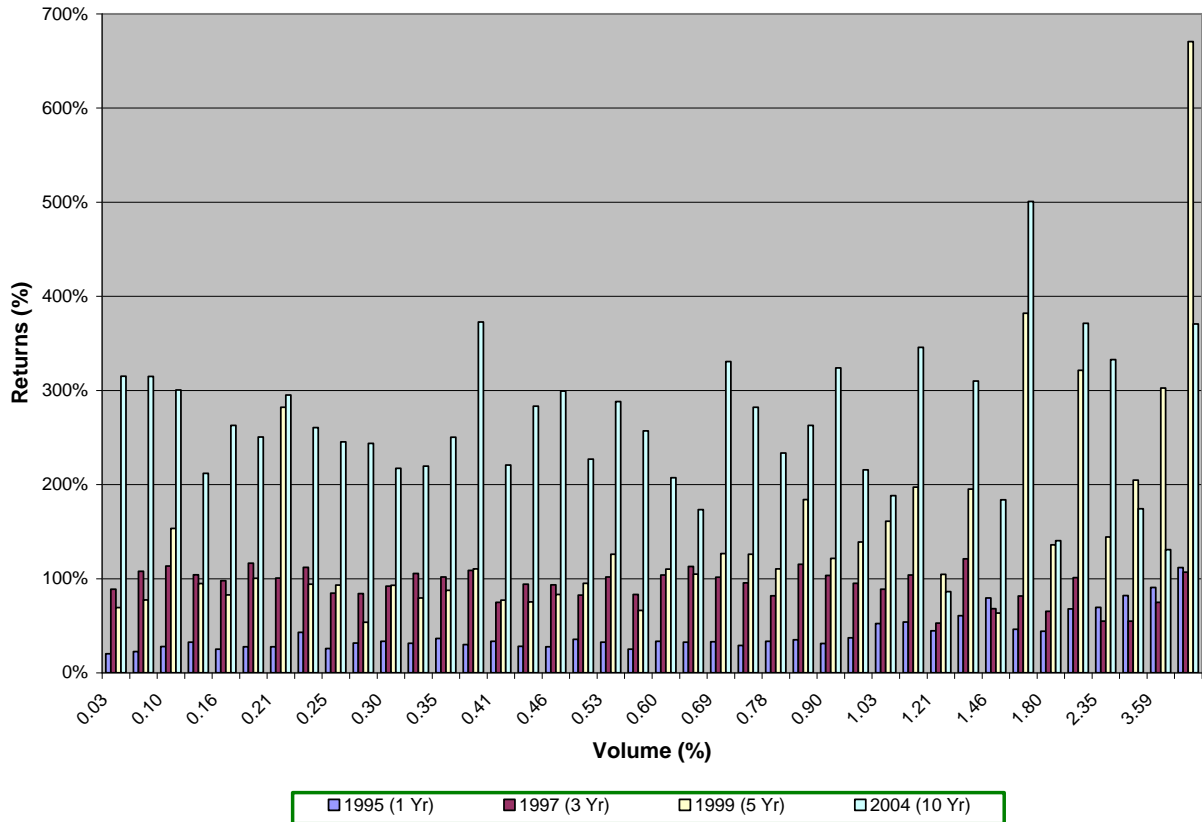


I plotted the data in *Figure 9* above and just as in the regressions I ran earlier, this chart was not able to conclusively show that any real pattern or trend occurred during this 10 year time period in relation to volume % and returns.

## V. Conclusions

On average, as I mentioned earlier, studies show small cap stocks outperform large cap stocks, however on a year by year basis this might not be necessarily true and as my research was able to show it is both naïve and primitive for investors to assume that just by investing in small cap stocks they will automatically earn excess returns. Although this may be true for

longer time horizons, holding smaller stocks for shorter periods may lead many investors to see the true realities of the riskiness and volatility of these types of investments. While small cap stocks have done better than larger stocks in more periods than not, there have been times where they have actually underperformed. In fact, Aswath Damodaran summarizes and dissects Fama and French's earlier research data in his book "Investment Philosophies: Successful Strategies and the Investors who Made them Work," to illustrate this point - that although these small firm premiums average out to be very high over time, they actually change a lot throughout the same time period they were analyzing – 1927-2001, and under-perform large cap stocks in many of the years as demonstrated in *Figure 10* (below) by their negative small firm premiums.[10]

*Figure 10: Small Firm Premium from 1927-2001*
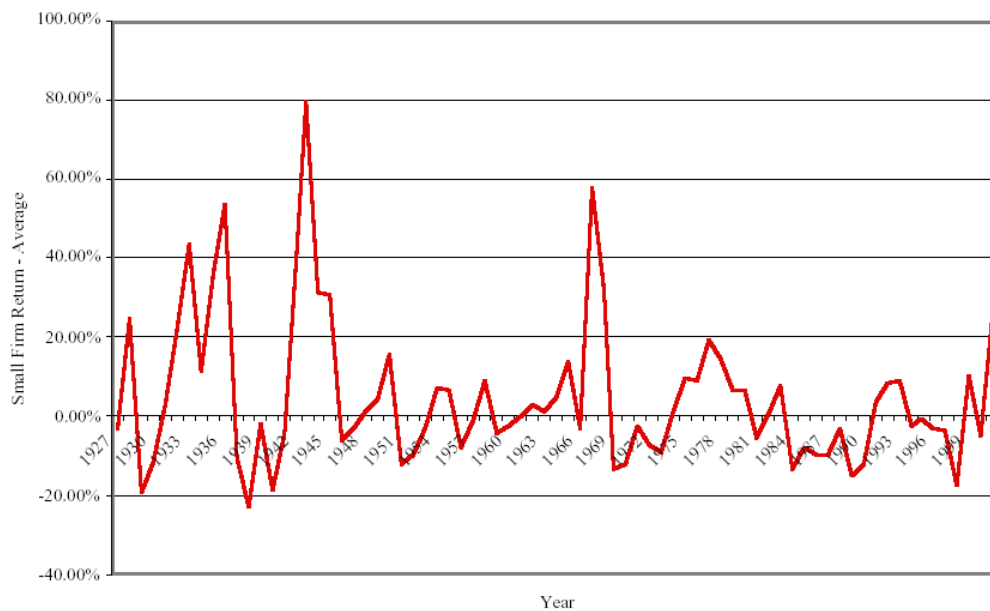


*Source: Damodaran(2003), Raw data from French*

What I was able to find from my exploratory research was that great things actually don't always come in small packages. Sometimes, as in the 10 year historical period that I analyzed – 1995 -2004 the small cap premium as well as the liquidity premium were not always clearly

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[10] Damodaran, Aswath. Investment Philosophies: Successful Strategies and the Investors who Made Them Work. (John Wiley & Sons Canada Ltd., 2003) Chap. 9, p. 1-11.

visible. My research however, does not disprove previous work done in this area that argues that a small cap premium exists throughout longer time horizons; it just enables us to realize that it should not always be taken for granted as given.

My study showed that market capitalization, as a proxy for size, did not have a lot of predictive power when it came to measuring returns of companies during the late 1990s and early 2000s and therefore the size of the company should not be the only factor we need to focus on. In fact, volume %, as a proxy for liquidity, seemed to show more predictive power in my analysis; therefore if there is anything that we should be focusing on in terms of trying to explain returns it should be liquidity. It seems to have better explanatory power during this 10 year period of analysis. This creates a good reason to caution investors and portfolio managers that they should not blindly invest in small cap stocks just because of their size and expect excess returns. There are many other factors that are involved in explaining returns and as seen through my research both size and liquidity from 1995 to 2004 were not able to really hold water.

# Appendix A: Initial Regression Output

**Regression Analysis: 1 Year Return versus LN (Volume %), LN (Avg Mkt Cap)**

```
The regression equation is
1 Year Return = 0.130 + 0.137 LN of Volume + 0.0316 LN (Avg Mkt Cap)


Predictor             Coef   SE Coef      T      P
Constant           0.13002   0.09327   1.39  0.163
LN of Volume       0.13690   0.01304  10.50  0.000
LN (Avg Mkt Cap)  0.031598  0.007863   4.02  0.000


S = 1.28516   R-Sq = 1.7%   R-Sq(adj) = 1.7%
```

***Analysis of Variance***

```
Source             DF        SS      MS      F      P
Regression          2    227.18  113.59  68.77  0.000
Residual Error   8018  13242.78    1.65
Total            8020  13469.96


Source             DF  Seq SS
LN of Volume        1  200.51
LN (Avg Mkt Cap)    1   26.67
```

***Unusual Observations***

```
        LN of   1 Year
 Obs   Volume   Return       Fit  SE Fit  Residual  St Resid
   3     2.66   1.5900    0.8813  0.0444    0.7087    0.55 X
   9    -3.36  -0.9200   -0.0733  0.0451   -0.8467   -0.66 X
  14    -3.57  -0.4400   -0.0715  0.0440   -0.3685   -0.29 X
  42     0.13   4.6100    0.4900  0.0184    4.1200    3.21R
  48     0.54   0.4400    0.7641  0.0509   -0.3241   -0.25 X
 115     0.55   6.3800    0.5029  0.0276    5.8771    4.57R
 161     0.33   5.0000    0.5075  0.0210    4.4925    3.50R
 168    -1.03   0.3200    0.5672  0.0558   -0.2472   -0.19 X
 178     0.11   5.4400    0.4410  0.0251    4.9990    3.89R
 236    -0.47   3.5700    0.3732  0.0206    3.1968    2.49R
 245    -0.78   0.1400    0.5502  0.0431   -0.4102   -0.32 X
 260     0.26   4.0000    0.5139  0.0188    3.4861    2.71R
 270     0.13   7.5300    0.4861  0.0189    7.0439    5.48R
 271    -4.12   0.1600   -0.1424  0.0498    0.3024    0.24 X
 290    -4.08   0.1100   -0.0851  0.0475    0.1951    0.15 X
 291    -0.26   3.6000    0.5151  0.0200    3.0849    2.40R
 353     0.23   3.3500    0.5367  0.0178    2.8133    2.19R
 432     0.66   9.6500    0.6197  0.0225    9.0303    7.03R
 442     1.01  -0.5100    0.4960  0.0443   -1.0060   -0.78 X
 496     0.30   0.1700    0.6987  0.0431   -0.5287   -0.41 X
 511    -1.35   0.4600    0.5208  0.0561   -0.0608   -0.05 X
 546     2.18   2.6300    0.7165  0.0452    1.9135    1.49 X
 555     1.16   3.5800    0.6573  0.0268    2.9227    2.27R
 566     1.29   4.6500    0.6062  0.0341    4.0438    3.15R
 669     0.81   4.6700    0.5419  0.0295    4.1281    3.21R
 674    -0.74   0.2900    0.5801  0.0485   -0.2901   -0.23 X
 681     1.48   4.4700    0.7428  0.0314    3.7272    2.90R
 695    -0.51   0.4400    0.5920  0.0435   -0.1520   -0.12 X
 718     1.70   4.1300    0.7314  0.0330    3.3986    2.65R
 727    -1.55   0.3900    0.4957  0.0575   -0.1057   -0.08 X
 767    -3.84  -0.0500   -0.0801  0.0452    0.0301    0.02 X
 803    -4.81   0.2700   -0.1194  0.0592    0.3894    0.30 X
 807    -1.38   0.4500    0.5240  0.0578   -0.0740   -0.06 X
 816    -0.44   0.2800    0.6182  0.0475   -0.3382   -0.26 X
 845    -4.94  -0.1900   -0.2835  0.0614    0.0935    0.07 X
 846    -2.59   3.8100    0.0586  0.0345    3.7514    2.92R
 866     1.10   8.4700    0.5289  0.0409    7.9411    6.18R
 888     0.12   0.2600    0.7085  0.0508   -0.4485   -0.35 X
 922    -0.76   1.1300    0.5760  0.0485    0.5540    0.43 X
 923    -0.73   0.6400    0.5973  0.0525    0.0427    0.03 X
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 928    0.64    3.7700    0.5195    0.0276    3.2505      2.53R
 943   -1.19    0.2200    0.5127    0.0485   -0.2927     -0.23 X
 946    1.67    1.0800    0.8564    0.0439    0.2236      0.17 X
 979   -0.97    0.6100    0.5349    0.0460    0.0751      0.06 X
 985   -4.69   -0.5000   -0.1840    0.0552   -0.3160     -0.25 X
 988   -0.97    0.3800    0.5495    0.0493   -0.1695     -0.13 X
 996   -5.99    0.9900   -0.3540    0.0716    1.3440      1.05 X
 997   -0.98    0.9800    0.5267    0.0443    0.4533      0.35 X
1037   -3.46    0.5700    0.2016    0.0630    0.3684      0.29 X
1060   -1.32    0.3700    0.5103    0.0524   -0.1403     -0.11 X
1070   -1.39    0.3000    0.4616    0.0437   -0.1616     -0.13 X
1083    2.77    0.2600    0.9119    0.0460   -0.6519     -0.51 X
1105   -0.91    0.5300    0.5553    0.0485   -0.0253     -0.02 X
1109   -1.11    0.2500    0.5244    0.0484   -0.2744     -0.21 X
1110   -0.35    0.7000    0.6142    0.0438    0.0858      0.07 X
1150   -1.05    0.3000    0.5313    0.0480   -0.2313     -0.18 X
1158   -0.39    0.0900    0.6067    0.0431   -0.5167     -0.40 X
1172   -1.23    0.5200    0.5107    0.0496    0.0093      0.01 X
1201   -0.71    0.6700    0.5777    0.0471    0.0923      0.07 X
1211   -1.16    0.3400    0.4959    0.0434   -0.1559     -0.12 X
1212   -1.09    0.5900    0.5376    0.0509    0.0524      0.04 X
1229   -0.96    0.2800    0.5360    0.0459   -0.2560     -0.20 X
1235   -0.82    0.7600    0.5844    0.0526    0.1756      0.14 X
1237    0.22   -0.0100    0.7108    0.0483   -0.7208     -0.56 X
1329    0.03    5.0000    0.4903    0.0167    4.5097      3.51R
1366   -0.53    0.3700    0.5970    0.0455   -0.2270     -0.18 X
1370   -1.65    0.3900    0.4198    0.0438   -0.0298     -0.02 X
1386   -0.35    0.0800    0.6242    0.0461   -0.5442     -0.42 X
1402    0.66    3.2200    0.6060    0.0218    2.6140      2.03R
1411   -0.62    0.2900    0.5878    0.0465   -0.2978     -0.23 X
1437   -1.35    0.9600    0.4669    0.0436    0.4931      0.38 X
1478   -0.32    1.2300    0.6367    0.0480    0.5933      0.46 X
1502   -1.67    0.2500    0.4330    0.0476   -0.1830     -0.14 X
1521   -3.88    0.9200   -0.0167    0.0461    0.9367      0.73 X
1523   -4.00    0.5600    0.0280    0.0527    0.5320      0.41 X
1548   -2.14    0.1400    0.3462    0.0453   -0.2062     -0.16 X
1549    0.34    3.8400    0.5360    0.0188    3.3040      2.57R
1552   -3.76    0.2900    0.0607    0.0501    0.2293      0.18 X
1557   -4.16    0.2400   -0.0032    0.0538    0.2432      0.19 X
1563   -5.08   -0.0800   -0.1763    0.0614    0.0963      0.08 X
1581   -4.61    0.1700   -0.0527    0.0603    0.2227      0.17 X
1624   -6.20    0.5600   -0.2825    0.0785    0.8425      0.66 X
1643   -2.84   -0.5500   -0.0358    0.0458   -0.5142     -0.40 X
1660   -2.28    0.1400    0.3155    0.0441   -0.1755     -0.14 X
1682    0.39    5.3500    0.5641    0.0192    4.7859      3.72R
1705   -2.38   -0.6700   -0.0520    0.0594   -0.6180     -0.48 X
1748   -3.70   -0.1100   -0.0804    0.0447   -0.0296     -0.02 X
1756   -5.67    0.0100   -0.2099    0.0719    0.2199      0.17 X
1764   -3.71    0.3800   -0.0491    0.0433    0.4291      0.33 X
1792   -5.31    0.0000   -0.3094    0.0642    0.3094      0.24 X
1850   -4.07    0.5900    0.0079    0.0526    0.5821      0.45 X
1886   -0.91    7.0000    0.3444    0.0162    6.6556      5.18R
1955    1.93   -0.3300    0.5932    0.0576   -0.9232     -0.72 X
2003   -0.78    0.5500    0.5628    0.0461   -0.0128     -0.01 X
2004    1.51   11.1800    0.6745    0.0322   10.5055      8.18R
2032   -0.89    8.2800    0.2849    0.0263    7.9951      6.22R
2075   -0.63    4.1500    0.4158    0.0144    3.7342      2.91R
2087   -3.89    1.1800    0.0281    0.0499    1.1519      0.90 X
2088   -4.27    0.1100   -0.1939    0.0540    0.3039      0.24 X
2103    0.46    3.8600    0.5451    0.0203    3.3149      2.58R
2109    1.55    3.6400    0.7293    0.0312    2.9107      2.27R
2120    2.45   13.9600    0.8731    0.0422   13.0869     10.19R
2130   -3.77    0.6300   -0.0713    0.0444    0.7013      0.55 X
2145    0.01    3.6800    0.5430    0.0193    3.1370      2.44R
2172   -3.21   -0.6300   -0.0715    0.0463   -0.5585     -0.43 X
2181    0.09    0.6600    0.6789    0.0446   -0.0189     -0.01 X
2194   -6.44   -0.0100   -0.3838    0.0778    0.3738      0.29 X
2200   -7.08    0.0900   -0.4652    0.0863    0.5552      0.43 X
2204   -2.57    0.7500    0.2698    0.0452    0.4802      0.37 X
2277    0.01    3.6700    0.4503    0.0204    3.2197      2.51R
2348   -0.81    0.7700    0.5554    0.0453    0.2146      0.17 X
2352    1.47    6.4300    0.6926    0.0305    5.7374      4.47R
2356   -0.36    0.7500    0.6196    0.0453    0.1304      0.10 X
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2399   -4.58    0.1000   -0.1433   0.0539    0.2433     0.19 X
2427    0.78    4.3200    0.6254   0.0231    3.6946     2.88R
2475    1.69    1.1300    0.8723   0.0464    0.2577     0.20 X
2493   -4.82   -0.2600   -0.1183   0.0594   -0.1417    -0.11 X
2496   -3.59    0.9200   -0.0616   0.0432    0.9816     0.76 X
2497   -3.74   -0.6300   -0.1394   0.0506   -0.4906    -0.38 X
2514   -3.56    0.2900    0.0497   0.0438    0.2403     0.19 X
2518   -3.71    0.9400   -0.0745   0.0444    1.0145     0.79 X
2528    0.41   12.9600    0.5065   0.0231   12.4535     9.69R
2548   -4.26    0.0300   -0.0695   0.0507    0.0995     0.08 X
2574   -1.24    0.0600    0.5246   0.0529   -0.4646    -0.36 X
2591   -4.66    0.2300   -0.0971   0.0573    0.3271     0.25 X
2595   -2.03   10.3900    0.0857   0.0388   10.3043     8.02R
2631   -2.58    1.2300    0.0040   0.0432    1.2260     0.95 X
2717   -0.35    0.7000    0.6138   0.0435    0.0862     0.07 X
2737    1.00    0.7800    0.8239   0.0518   -0.0439    -0.03 X
2785    0.73    9.5800    0.5649   0.0243    9.0151     7.02R
2818   -3.71   -0.1600   -0.0382   0.0431   -0.1218    -0.09 X
2835   -4.15    0.0100    0.0130   0.0553   -0.0030    -0.00 X
2840   -4.12    0.5200   -0.0861   0.0481    0.6061     0.47 X
2863   -1.49    0.0000    0.0160   0.0697   -0.0160    -0.01 X
2907    0.02   15.7800    0.3938   0.0315   15.3862    11.98R
2926    0.17    5.0500    0.5019   0.0182    4.5481     3.54R
2971   -2.32   -0.9000    0.0297   0.0435   -0.9297    -0.72 X
2975   -0.13    4.1900    0.4817   0.0155    3.7083     2.89R
3012   -1.26    3.2000    0.2394   0.0260    2.9606     2.30R
3027   -4.24    0.9700   -0.1720   0.0522    1.1420     0.89 X
3046    0.86    7.9200    0.5892   0.0250    7.3308     5.71R
3056    0.10    4.9200    0.4751   0.0193    4.4449     3.46R
3110   -1.61    0.5200    0.4502   0.0491    0.0698     0.05 X
3111   -1.49    0.4100    0.4643   0.0481   -0.0543    -0.04 X
3112   -1.66    0.6800    0.4503   0.0510    0.2297     0.18 X
3120   -1.25    0.5300    0.4880   0.0449    0.0420     0.03 X
3127   -1.53    0.4700    0.4639   0.0494    0.0061     0.00 X
3129   -0.91    0.7200    0.5350   0.0439    0.1850     0.14 X
3134   -0.22    0.0400    0.6311   0.0433   -0.5911    -0.46 X
3169   -1.14    0.4200    0.5248   0.0495   -0.1048    -0.08 X
3177   -0.95    0.3700    0.5286   0.0437   -0.1586    -0.12 X
3245   -1.95    4.5000    0.2355   0.0230    4.2645     3.32R
3258   -1.93    5.0600    0.2230   0.0226    4.8370     3.76R
3271   -5.19    0.0700   -0.1248   0.0679    0.1948     0.15 X
3338    1.60    4.0000    0.7076   0.0320    3.2924     2.56R
3343   -0.28    7.0000    0.3787   0.0249    6.6213     5.15R
3426   -3.78    1.0100   -0.0972   0.0461    1.1072     0.86 X
3500    0.90    3.1400    0.5557   0.0300    2.5843     2.01R
3517   -5.07    0.2200   -0.1096   0.0665    0.3296     0.26 X
3559   -2.63    0.1700    0.2536   0.0443   -0.0836    -0.07 X
3563    0.21    3.6200    0.5056   0.0186    3.1144     2.42R
3658   -3.04   -0.1100    0.1929   0.0472   -0.3029    -0.24 X
3704   -4.57   -0.4400   -0.2117   0.0556   -0.2283    -0.18 X
3749   -0.69    3.8300    0.4701   0.0226    3.3599     2.61R
3834    2.25    0.7600    0.8959   0.0436   -0.1359    -0.11 X
3882   -3.72   -0.7700   -0.1530   0.0526   -0.6170    -0.48 X
3903    0.64    3.6000    0.4752   0.0357    3.1248     2.43R
3962   -2.64    1.2700   -0.0009   0.0431    1.2709     0.99 X
3982   -2.78   -0.8100   -0.0144   0.0431   -0.7956    -0.62 X
3989   -3.53    0.1400    0.1570   0.0574   -0.0170    -0.01 X
3996   -4.80   -0.1600   -0.1468   0.0574   -0.0132    -0.01 X
4072    1.20    1.1200    0.8173   0.0454    0.3027     0.24 X
4088    2.62    1.7300    0.9134   0.0450    0.8166     0.64 X
4141   -0.60    0.3900    0.5776   0.0434   -0.1876    -0.15 X
4197    0.52    4.2000    0.5361   0.0223    3.6639     2.85R
4220    0.81    9.7300    0.6689   0.0267    9.0611     7.05R
4230   -5.69    0.1800   -0.3092   0.0678    0.4892     0.38 X
4242    2.49   -0.8100    0.7182   0.0544   -1.5282    -1.19 X
4263    0.27    4.2300    0.5733   0.0202    3.6567     2.85R
4274    1.28   21.8200    0.5914   0.0359   21.2286    16.52R
4278   -3.16    0.8800   -0.0496   0.0437    0.9296     0.72 X
4330    1.12   -0.2200    0.4941   0.0489   -0.7141    -0.56 X
4372    0.31    3.6400    0.4349   0.0328    3.2051     2.49R
4373    0.35   56.1900    0.4506   0.0308   55.7394    43.38R
4400    0.75    3.2500    0.6174   0.0226    2.6326     2.05R
4410    1.60    3.9400    0.7580   0.0326    3.1820     2.48R
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4422   -3.49    0.7900    0.0962   0.0467    0.6938      0.54 X
4433    3.33    0.0200    1.0075   0.0533   -0.9875     -0.77 X
4434    0.69    4.7100    0.6060   0.0220    4.1040      3.19R
4455   -4.58   -0.1200   -0.0951   0.0559   -0.0249     -0.02 X
4468    2.25    7.8000    0.8411   0.0398    6.9589      5.42R
4469    0.17    3.1100    0.5108   0.0177    2.5992      2.02R
4489    0.62    3.2200    0.5776   0.0213    2.6424      2.06R
4493    0.19    4.8300    0.4375   0.0281    4.3925      3.42R
4513    0.20    5.4400    0.5352   0.0177    4.9048      3.82R
4533   -0.42    3.7900    0.4274   0.0148    3.3626      2.62R
4578    0.47    8.1800    0.5616   0.0198    7.6184      5.93R
4582    0.97    3.4500    0.6617   0.0254    2.7883      2.17R
4604   -5.15    0.3400   -0.2383   0.0609    0.5783      0.45 X
4608   -3.68    0.0800    0.0365   0.0455    0.0435      0.03 X
4623   -0.70    8.4100    0.3221   0.0239    8.0879      6.29R
4626    0.15    5.6700    0.4254   0.0291    5.2446      4.08R
4627   -5.87    0.2200   -0.2300   0.0751    0.4500      0.35 X
4676    1.07   13.2200    0.5619   0.0343   12.6581      9.85R
4734   -0.44    3.6000    0.3991   0.0171    3.2009      2.49R
4749    0.87    7.1300    0.5811   0.0259    6.5489      5.10R
4822    1.39   21.8800    0.7340   0.0307   21.1460     16.46R
4832   -0.53    3.0900    0.3300   0.0272    2.7600      2.15R
4833    1.63   -1.0000    0.5713   0.0512   -1.5713     -1.22 X
4983    1.19    3.6200    0.5955   0.0326    3.0245      2.35R
5034    0.32    9.0800    0.6158   0.0256    8.4642      6.59R
5040   -3.90   -0.5600   -0.0873   0.0459   -0.4727     -0.37 X
5062    0.30    3.1000    0.4637   0.0267    2.6363      2.05R
5304    0.85    5.0000    0.6019   0.0240    4.3981      3.42R
5354    0.57    5.0000    0.5321   0.0239    4.4679      3.48R
5430    0.22    3.7300    0.5121   0.0182    3.2179      2.50R
5459    0.99    9.7500    0.6407   0.0250    9.1093      7.09R
5490    1.53    4.4200    0.7060   0.0310    3.7140      2.89R
5507   -0.01    3.1500    0.4907   0.0163    2.6593      2.07R
5570   -3.75    0.1400   -0.1207   0.0483    0.2607      0.20 X
5577   -3.92   -0.2000   -0.0889   0.0461   -0.1111     -0.09 X
5579    0.75   14.3300    0.5369   0.0283   13.7931     10.74R
5580    2.14   11.3600    0.8241   0.0384   10.5359      8.20R
5587   -6.33   -0.3100   -0.5026   0.0797    0.1926      0.15 X
5596   -6.09    0.0000   -0.3499   0.0731    0.3499      0.27 X
5620   -4.93   -0.2900   -0.1878   0.0583   -0.1022     -0.08 X
5638   -4.68    0.0000   -0.2285   0.0570    0.2285      0.18 X
5639   -1.15    4.7500    0.2962   0.0187    4.4538      3.47R
5640    0.08   -0.5600    0.3454   0.0445   -0.9054     -0.70 X
5644    1.48    3.6800    0.7337   0.0309    2.9463      2.29R
5648   -5.58    0.2200   -0.2197   0.0691    0.4397      0.34 X
5715    2.04    1.1000    0.6182   0.0567    0.4818      0.38 X
5743    0.00    8.3500    0.4914   0.0163    7.8586      6.12R
5752    1.36   -0.5600    0.4953   0.0572   -1.0553     -0.82 X
5769   -3.35    0.0200   -0.0574   0.0433    0.0774      0.06 X
5845    0.38    5.4300    0.4609   0.0299    4.9691      3.87R
5914   -4.19    0.3500   -0.1004   0.0489    0.4504      0.35 X
5924    3.19    0.3200    0.9824   0.0514   -0.6624     -0.52 X
5943   -4.28    0.9400   -0.0600   0.0517    1.0000      0.78 X
5976    0.27    9.0000    0.4544   0.0275    8.5456      6.65R
5989   -4.75    0.0300   -0.2061   0.0563    0.2361      0.18 X
6005   -3.25    1.1700    0.1284   0.0441    1.0416      0.81 X
6056    2.35   -0.7300    0.7747   0.0432   -1.5047     -1.17 X
6130    0.13    4.4700    0.4925   0.0183    3.9775      3.10R
6230    1.32    3.6900    0.6620   0.0293    3.0280      2.36R
6298    1.52   33.1100    0.6466   0.0353   32.4634     25.27R
6361   -1.42    3.5300    0.3132   0.0185    3.2168      2.50R
6362    0.19    3.9700    0.5712   0.0208    3.3988      2.65R
6368   -4.08   -0.0500   -0.0655   0.0477    0.0155      0.01 X
6398    1.03   10.7400    0.6553   0.0254   10.0847      7.85R
6480   -4.52   -0.0100   -0.1029   0.0541    0.0929      0.07 X
6570   -0.31   -0.9100    0.2741   0.0472   -1.1841     -0.92 X
6638   -5.05    1.0600   -0.1883   0.0603    1.2483      0.97 X
6652   -5.37   -0.1000   -0.2795   0.0638    0.1795      0.14 X
6696    0.77    3.1800    0.5868   0.0233    2.5932      2.02R
6714   -1.46   31.8300    0.2504   0.0208   31.5796     24.58R
6724    0.24    3.9800    0.5259   0.0180    3.4541      2.69R
6725    0.47    3.3400    0.5794   0.0200    2.7606      2.15R
6734   -4.37   -0.0700   -0.0578   0.0538   -0.0122     -0.01 X
```

```
6735   -5.48    0.4400   -0.1692   0.0709     0.6092      0.47 X
6763   -3.38    0.0400   -0.0632   0.0438     0.1032      0.08 X
6770   -0.02    3.0600    0.4724   0.0172     2.5876      2.01R
6776    1.62    4.9900    0.7264   0.0320     4.2636      3.32R
6818   -4.45   -0.1200   -0.2060   0.0550     0.0860      0.07 X
6824   -4.21   -0.1800   -0.1946   0.0543     0.0146      0.01 X
6897    1.35    8.9300    0.6919   0.0289     8.2381      6.41R
6899    0.80    3.6500    0.6034   0.0231     3.0466      2.37R
6919   -3.71   -0.3100   -0.1001   0.0463    -0.2099     -0.16 X
6934   -6.45   -0.3400   -0.3738   0.0783     0.0338      0.03 X
6945   -0.01    8.3600    0.5182   0.0170     7.8418      6.10R
7065    1.64    5.5800    0.7812   0.0343     4.7988      3.74R
7093    1.01   13.3000    0.6467   0.0251    12.6533      9.85R
7110   -4.84    0.4900   -0.1221   0.0596     0.6121      0.48 X
7123    1.30    6.9600    0.7646   0.0346     6.1954      4.82R
7149    0.61    3.3000    0.5227   0.0265     2.7773      2.16R
7162   -1.25    6.3800    0.3268   0.0168     6.0532      4.71R
7171   -1.26    3.6000    0.2957   0.0178     3.3043      2.57R
7179    0.79    4.3900    0.6390   0.0238     3.7510      2.92R
7183    1.64    5.2900    0.7303   0.0322     4.5597      3.55R
7195   -1.07    3.2900    0.3203   0.0170     2.9697      2.31R
7238    1.43   -0.5000    0.5742   0.0437    -1.0742     -0.84 X
7258    1.42    3.6300    0.6330   0.0343     2.9970      2.33R
7267    1.35    3.6600    0.7479   0.0320     2.9121      2.27R
7271   -0.19    4.9800    0.3644   0.0307     4.6156      3.59R
7294   -0.20    5.6800    0.5251   0.0203     5.1549      4.01R
7303   -4.42   -0.1200   -0.0736   0.0539    -0.0464     -0.04 X
7382    1.19    5.4000    0.6750   0.0272     4.7250      3.68R
7568   -5.10   -0.1500   -0.2403   0.0604     0.0903      0.07 X
7635    1.94   -0.3700    0.6654   0.0450    -1.0354     -0.81 X
7639    0.90   -0.9500    0.4230   0.0564    -1.3730     -1.07 X
7647   -0.40    5.5900    0.4860   0.0181     5.1040      3.97R
7661    0.94    3.2300    0.6210   0.0245     2.6090      2.03R
7706   -4.32    0.0500   -0.1372   0.0507     0.1872      0.15 X
7713    1.12    7.6800    0.6230   0.0277     7.0570      5.49R
7714    2.61   -0.4000    0.7309   0.0562    -1.1309     -0.88 X
7772    1.27    5.0000    0.6636   0.0283     4.3364      3.38R
7773    0.96    4.3800    0.6183   0.0250     3.7617      2.93R
7775   -4.50   -0.0900   -0.1358   0.0528     0.0458      0.04 X
7791   -4.21    0.9600   -0.1337   0.0498     1.0937      0.85 X
7827    1.60   11.1100    0.7258   0.0317    10.3842      8.08R
7842    0.68    3.2200    0.5754   0.0224     2.6446      2.06R
7870   -1.77    4.6200    0.1049   0.0411     4.5151      3.52R
7918   -4.88    0.4000   -0.2288   0.0580     0.6288      0.49 X
7950   -0.13    3.9800    0.4172   0.0220     3.5628      2.77R
7962   -0.59    5.1800    0.3582   0.0201     4.8218      3.75R
7996   -3.52   -0.4400   -0.0868   0.0457    -0.3532     -0.27 X
```

R denotes an observation with a large standardized residual.
X denotes an observation whose X value gives it large influence.

## Regression Analysis: 3 Year Return versus LN(Volume), LN(Avg. Mkt Cap)

**The regression equation is**
**3 Year Return = 0.230 - 0.0611 LN(Volume) + 0.0574 LN(Avg. Mkt Cap)**

```
Predictor              Coef   SE Coef       T      P
Constant             0.2296    0.1517    1.51  0.130
LN(Volume)          -0.06109   0.02110  -2.89  0.004
LN(Avg. Mkt Cap)     0.05745   0.01272   4.52  0.000


S = 1.93181   R-Sq = 0.4%   R-Sq(adj) = 0.3%
```

*Analysis of Variance*

```
Source              DF          SS       MS      F      P
Regression           2      98.344   49.172  13.18  0.000
Residual Error    7051   26313.457    3.732
Total             7053   26411.801
```

```
Source             DF   Seq SS
LN(Volume)          1   22.246
LN(Avg. Mkt Cap)    1   76.099
```

**Unusual Observations**

| Obs | LN(Volume) | 3 Year Return | Fit | SE Fit | Residual | St Resid |
|-----|-----------|--------|--------|--------|----------|----------|
| 11   | -3.57 | 0.2200  | 0.9706 | 0.0713 | -0.7506  | -0.39 X |
| 35   | -0.51 | 5.7000  | 0.8897 | 0.0248 | 4.8103   | 2.49R |
| 38   | 0.54  | 3.2300  | 1.2134 | 0.0817 | 2.0166   | 1.04 X |
| 48   | -0.27 | 8.1000  | 0.6933 | 0.0553 | 7.4067   | 3.84R |
| 96   | 0.55  | 7.0000  | 0.7381 | 0.0453 | 6.2619   | 3.24R |
| 142  | -1.03 | 0.8900  | 1.3443 | 0.0892 | -0.4543  | -0.24 X |
| 146  | 0.05  | 12.1600 | 0.9027 | 0.0268 | 11.2573  | 5.83R |
| 152  | 0.11  | 6.3300  | 0.7593 | 0.0413 | 5.5707   | 2.88R |
| 186  | -0.18 | 11.9500 | 0.7800 | 0.0385 | 11.1700  | 5.78R |
| 221  | 0.26  | 14.1600 | 0.8473 | 0.0308 | 13.3127  | 6.89R |
| 246  | -0.26 | 8.1900  | 1.0112 | 0.0317 | 7.1788   | 3.72R |
| 300  | 0.31  | 9.5400  | 0.7775 | 0.0387 | 8.7625   | 4.54R |
| 305  | -0.12 | 7.6600  | 0.8023 | 0.0347 | 6.8577   | 3.55R |
| 357  | 1.89  | 15.3900 | 0.9686 | 0.0673 | 14.4214  | 7.47R |
| 377  | -1.13 | 32.5000 | 0.7224 | 0.0589 | 31.7776  | 16.46R |
| 379  | -1.79 | 6.9300  | 0.8520 | 0.0466 | 6.0780   | 3.15R |
| 406  | 0.30  | 0.6400  | 1.1709 | 0.0692 | -0.5309  | -0.27 X |
| 412  | -0.09 | 8.1000  | 0.8685 | 0.0269 | 7.2315   | 3.74R |
| 421  | -1.35 | 1.6800  | 1.3582 | 0.0896 | 0.3218   | 0.17 X |
| 454  | 2.18  | 0.6000  | 0.6190 | 0.0736 | -0.0190  | -0.01 X |
| 474  | 1.29  | 5.0400  | 0.6950 | 0.0558 | 4.3450   | 2.25R |
| 526  | -0.21 | 19.7100 | 0.7327 | 0.0472 | 18.9773  | 9.83R |
| 537  | 0.64  | 8.0400  | 0.8095 | 0.0374 | 7.2305   | 3.74R |
| 572  | -0.74 | 1.3200  | 1.2760 | 0.0775 | 0.0440   | 0.02 X |
| 589  | 1.26  | 5.1000  | 0.7838 | 0.0470 | 4.3162   | 2.23R |
| 590  | -0.51 | 0.3600  | 1.2263 | 0.0695 | -0.8663  | -0.45 X |
| 619  | -1.55 | 1.2400  | 1.3755 | 0.0919 | -0.1355  | -0.07 X |
| 656  | -3.84 | -0.3000 | 1.0376 | 0.0731 | -1.3376  | -0.69 X |
| 668  | -0.39 | 7.4900  | 0.8804 | 0.0254 | 6.6096   | 3.42R |
| 675  | 0.39  | 8.1200  | 0.8992 | 0.0312 | 7.2208   | 3.74R |
| 676  | -0.35 | 7.6200  | 0.8707 | 0.0262 | 6.7493   | 3.49R |
| 684  | -0.29 | 9.5000  | 0.9348 | 0.0242 | 8.5652   | 4.43R |
| 686  | -4.81 | 2.3700  | 1.2682 | 0.0949 | 1.1018   | 0.57 X |
| 688  | -1.38 | 2.0700  | 1.3723 | 0.0924 | 0.6977   | 0.36 X |
| 697  | -0.44 | 0.6700  | 1.2538 | 0.0760 | -0.5838  | -0.30 X |
| 719  | -0.36 | 4.8000  | 0.8596 | 0.0274 | 3.9404   | 2.04R |
| 723  | -4.94 | 0.5500  | 1.0103 | 0.0995 | -0.4603  | -0.24 X |
| 759  | 0.12  | 1.9300  | 1.2441 | 0.0814 | 0.6859   | 0.36 X |
| 793  | -0.76 | 1.2600  | 1.2769 | 0.0774 | -0.0169  | -0.01 X |
| 794  | -0.73 | 1.6900  | 1.3059 | 0.0839 | 0.3841   | 0.20 X |
| 803  | -0.31 | 5.3500  | 0.8224 | 0.0322 | 4.5276   | 2.34R |
| 813  | -1.19 | 0.9200  | 1.2939 | 0.0773 | -0.3739  | -0.19 X |
| 816  | 1.67  | 1.8500  | 1.0325 | 0.0710 | 0.8175   | 0.42 X |
| 848  | -0.97 | 1.6700  | 1.2668 | 0.0734 | 0.4032   | 0.21 X |
| 851  | -0.38 | 7.0600  | 0.9215 | 0.0235 | 6.1385   | 3.18R |
| 854  | -4.69 | -1.0000 | 1.1111 | 0.0890 | -2.1111  | -1.09 X |
| 856  | -0.97 | 0.9000  | 1.2920 | 0.0787 | -0.3920  | -0.20 X |
| 864  | -5.99 | 0.8000  | 1.2075 | 0.1155 | -0.4075  | -0.21 X |
| 865  | -0.98 | 1.7800  | 1.2542 | 0.0707 | 0.5258   | 0.27 X |
| 878  | -2.32 | 11.6700 | 0.8173 | 0.0625 | 10.8527  | 5.62R |
| 883  | 0.07  | 5.3900  | 0.7377 | 0.0451 | 4.6523   | 2.41R |
| 900  | -3.46 | 1.2500  | 1.4310 | 0.1005 | -0.1810  | -0.09 X |
| 921  | -1.32 | 1.7100  | 1.3286 | 0.0836 | 0.3814   | 0.20 X |
| 930  | -1.39 | 0.5300  | 1.2620 | 0.0695 | -0.7320  | -0.38 X |
| 941  | 2.77  | 4.9000  | 0.7910 | 0.0748 | 4.1090   | 2.13RX |
| 960  | -0.91 | 2.5800  | 1.2837 | 0.0775 | 1.2963   | 0.67 X |
| 963  | -1.11 | 0.6000  | 1.2906 | 0.0772 | -0.6906  | -0.36 X |
| 964  | -0.35 | 1.1700  | 1.2198 | 0.0699 | -0.0498  | -0.03 X |
| 1003 | -1.05 | 1.1300  | 1.2852 | 0.0766 | -0.1552  | -0.08 X |
| 1023 | -1.23 | 0.9700  | 1.3037 | 0.0790 | -0.3337  | -0.17 X |
| 1026 | -0.20 | 5.0000  | 0.8941 | 0.0249 | 4.1059   | 2.13R |
| 1051 | -0.71 | 3.0600  | 1.2643 | 0.0753 | 1.7957   | 0.93 X |
| 1061 | -1.16 | 0.9400  | 1.2529 | 0.0691 | -0.3129  | -0.16 X |
| 1062 | -1.09 | 1.5200  | 1.3090 | 0.0812 | 0.2110   | 0.11 X |
| 1079 | -0.96 | 0.7300  | 1.2656 | 0.0732 | -0.5356  | -0.28 X |

| | | | | | | |
|---|---|---|---|---|---|---|
| 1084 | -0.82 | 1.9600 | 1.3114 | 0.0841 | 0.6486 | 0.34 X |
| 1086 | 0.22 | 0.0100 | 1.2185 | 0.0775 | -1.2085 | -0.63 X |
| 1143 | -0.98 | 5.2600 | 1.0919 | 0.0389 | 4.1681 | 2.16R |
| 1205 | -0.53 | 1.2400 | 1.2431 | 0.0727 | -0.0031 | -0.00 X |
| 1209 | -1.65 | 1.8000 | 1.2689 | 0.0697 | 0.5311 | 0.28 X |
| 1224 | -0.35 | 0.9900 | 1.2378 | 0.0737 | -0.2478 | -0.13 X |
| 1231 | 0.61 | 5.7000 | 0.8820 | 0.0343 | 4.8180 | 2.49R |
| 1235 | -1.07 | 7.1300 | 0.9765 | 0.0253 | 6.1535 | 3.19R |
| 1239 | 0.66 | 10.3800 | 0.8888 | 0.0354 | 9.4912 | 4.91R |
| 1246 | -0.62 | 1.1900 | 1.2552 | 0.0743 | -0.0652 | -0.03 X |
| 1268 | -1.35 | 0.8300 | 1.2605 | 0.0694 | -0.4305 | -0.22 X |
| 1305 | -0.32 | 1.5700 | 1.2509 | 0.0768 | 0.3191 | 0.17 X |
| 1315 | -2.24 | -0.2300 | 0.7655 | 0.0698 | -0.9955 | -0.52 X |
| 1316 | -1.79 | 5.1100 | 0.8690 | 0.0440 | 4.2410 | 2.20R |
| 1327 | -1.67 | 1.3300 | 1.2997 | 0.0757 | 0.0303 | 0.02 X |
| 1341 | 1.18 | 13.7100 | 0.9205 | 0.0471 | 12.7895 | 6.62R |
| 1344 | -3.88 | 0.0800 | 1.1655 | 0.0738 | -1.0855 | -0.56 X |
| 1345 | -4.00 | 1.1800 | 1.2827 | 0.0841 | -0.1027 | -0.05 X |
| 1361 | -1.03 | 5.6300 | 0.9216 | 0.0259 | 4.7084 | 2.44R |
| 1368 | -2.14 | 1.4100 | 1.2857 | 0.0720 | 0.1243 | 0.06 X |
| 1372 | -3.76 | 1.2500 | 1.2703 | 0.0800 | -0.0203 | -0.01 X |
| 1376 | -4.16 | 0.8400 | 1.2784 | 0.0859 | -0.4384 | -0.23 X |
| 1382 | -5.08 | 0.2600 | 1.2488 | 0.0986 | -0.9888 | -0.51 X |
| 1397 | -4.61 | -0.1100 | 1.3268 | 0.0965 | -1.4368 | -0.74 X |
| 1455 | -0.98 | 9.3800 | 0.8946 | 0.0277 | 8.4854 | 4.39R |
| 1457 | -0.90 | 7.5400 | 1.0028 | 0.0265 | 6.5372 | 3.38R |
| 1469 | -2.28 | 1.1600 | 1.2739 | 0.0700 | -0.1139 | -0.06 X |
| 1473 | 1.85 | -1.0000 | 0.6266 | 0.0694 | -1.6266 | -0.84 X |
| 1510 | -2.38 | -0.8900 | 0.6349 | 0.0970 | -1.5249 | -0.79 X |
| 1543 | -3.12 | 0.3900 | 0.8897 | 0.0695 | -0.4997 | -0.26 X |
| 1549 | -3.70 | -0.0800 | 0.9936 | 0.0724 | -1.0736 | -0.56 X |
| 1555 | -5.67 | -0.0100 | 1.3686 | 0.1154 | -1.3786 | -0.71 X |
| 1561 | -3.71 | 1.7400 | 1.0555 | 0.0698 | 0.6845 | 0.35 X |
| 1586 | -5.31 | 1.3800 | 1.0772 | 0.1038 | 0.3028 | 0.16 X |
| 1638 | -4.07 | 1.6500 | 1.2705 | 0.0840 | 0.3795 | 0.20 X |
| 1678 | -1.35 | 5.3400 | 0.9527 | 0.0282 | 4.3873 | 2.27R |
| 1730 | 1.93 | -0.7500 | 0.4728 | 0.0937 | -1.2228 | -0.63 X |
| 1774 | -0.78 | 0.6700 | 1.2593 | 0.0735 | -0.5893 | -0.31 X |
| 1775 | 1.51 | 27.6400 | 0.7525 | 0.0525 | 26.8875 | 13.92R |
| 1788 | -0.11 | 6.3100 | 0.9540 | 0.0270 | 5.3560 | 2.77R |
| 1850 | -3.89 | 0.3900 | 1.2511 | 0.0798 | -0.8611 | -0.45 X |
| 1851 | -4.27 | 0.2400 | 0.9646 | 0.0877 | -0.7246 | -0.38 X |
| 1860 | 0.20 | 5.7800 | 1.0086 | 0.0381 | 4.7714 | 2.47R |
| 1881 | 2.45 | 44.9300 | 0.8220 | 0.0687 | 44.1080 | 22.85R |
| 1890 | -3.77 | 2.5100 | 1.0308 | 0.0718 | 1.4792 | 0.77 X |
| 1896 | 0.50 | 5.9800 | 0.9641 | 0.0377 | 5.0159 | 2.60R |
| 1904 | 0.01 | 6.0600 | 0.9760 | 0.0309 | 5.0840 | 2.63R |
| 1928 | -3.21 | -0.4700 | 0.8585 | 0.0755 | -1.3285 | -0.69 X |
| 1934 | -0.29 | 6.5400 | 0.9449 | 0.0246 | 5.5951 | 2.90R |
| 1936 | 0.09 | 2.2500 | 1.1981 | 0.0715 | 1.0519 | 0.54 X |
| 1939 | -0.47 | 8.3300 | 0.9603 | 0.0242 | 7.3697 | 3.82R |
| 1945 | -0.65 | 5.8400 | 0.9998 | 0.0268 | 4.8402 | 2.51R |
| 1949 | -6.44 | 0.1400 | 1.2917 | 0.1253 | -1.1517 | -0.60 X |
| 1954 | -7.08 | 0.4000 | 1.3431 | 0.1390 | -0.9431 | -0.49 X |
| 1957 | -2.57 | 0.9700 | 1.2799 | 0.0718 | -0.3099 | -0.16 X |
| 2079 | -2.28 | 6.1000 | 1.0450 | 0.0424 | 5.0550 | 2.62R |
| 2083 | -0.81 | 3.5500 | 1.2545 | 0.0722 | 2.2955 | 1.19 X |
| 2087 | 1.47 | 13.9000 | 0.7967 | 0.0497 | 13.1033 | 6.79R |
| 2091 | -0.36 | 2.3700 | 1.2323 | 0.0724 | 1.1377 | 0.59 X |
| 2112 | -2.04 | 7.9000 | 0.9272 | 0.0420 | 6.9728 | 3.61R |
| 2126 | -0.99 | 5.3600 | 0.8648 | 0.0316 | 4.4952 | 2.33R |
| 2134 | -4.58 | 0.1400 | 1.1530 | 0.0867 | -1.0130 | -0.52 X |
| 2175 | 0.28 | 8.6000 | 0.8583 | 0.0304 | 8.0017 | 4.14R |
| 2202 | 1.69 | 0.1800 | 1.0554 | 0.0749 | -0.8754 | -0.45 X |
| 2219 | -4.82 | -0.3300 | 1.2714 | 0.0952 | -1.6014 | -0.83 X |
| 2221 | -3.59 | 0.7500 | 0.9951 | 0.0700 | -0.2451 | -0.13 X |
| 2239 | -3.71 | -0.2700 | 1.0073 | 0.0718 | -1.2773 | -0.66 X |
| 2266 | -4.26 | 0.8100 | 1.1864 | 0.0813 | -0.3764 | -0.20 X |
| 2290 | -1.24 | 0.9000 | 1.3297 | 0.0845 | -0.4297 | -0.22 X |
| 2307 | -4.66 | 0.4900 | 1.2602 | 0.0919 | -0.7702 | -0.40 X |
| 2333 | 0.34 | 5.1400 | 0.8737 | 0.0304 | 4.2663 | 2.21R |
| 2418 | -0.35 | 3.0000 | 1.2173 | 0.0695 | 1.7827 | 0.92 X |
| 2438 | 1.00 | 3.4300 | 1.1815 | 0.0833 | 2.2485 | 1.17 X |

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| | | | | | |
|---|---|---|---|---|---|
| 2441 | -0.49 | 5.1900 | 1.0066 | 0.0287 | 4.1834 | 2.17R |
| 2474 | -1.90 | 5.8600 | 0.8390 | 0.0507 | 5.0210 | 2.60R |
| 2513 | -3.71 | 0.4200 | 1.0745 | 0.0693 | -0.6545 | -0.34 X |
| 2528 | -4.15 | -0.0700 | 1.3044 | 0.0883 | -1.3744 | -0.71 X |
| 2532 | -4.12 | 0.4100 | 1.1150 | 0.0774 | -0.7050 | -0.37 X |
| 2538 | 0.05 | 5.3400 | 0.8987 | 0.0268 | 4.4413 | 2.30R |
| 2552 | -1.49 | -0.2900 | 0.4854 | 0.1137 | -0.7754 | -0.40 X |
| 2565 | -3.06 | 5.9200 | 0.9682 | 0.0602 | 4.9518 | 2.56R |
| 2604 | -1.49 | 5.8400 | 0.8887 | 0.0360 | 4.9513 | 2.56R |
| 2616 | -0.37 | 5.8600 | 0.9719 | 0.0259 | 4.8881 | 2.53R |
| 2622 | -0.72 | 5.9900 | 0.8768 | 0.0272 | 5.1132 | 2.65R |
| 2638 | -2.75 | 6.2500 | 0.9906 | 0.0521 | 5.2594 | 2.72R |
| 2648 | -0.13 | 16.0900 | 0.9092 | 0.0251 | 15.1808 | 7.86R |
| 2695 | -4.24 | 0.1800 | 0.9939 | 0.0845 | -0.8139 | -0.42 X |
| 2707 | -0.41 | 8.0300 | 0.8040 | 0.0356 | 7.2260 | 3.74R |
| 2753 | -0.07 | 5.0600 | 0.8828 | 0.0262 | 4.1772 | 2.16R |
| 2770 | -1.61 | 1.2300 | 1.3104 | 0.0782 | -0.0804 | -0.04 X |
| 2771 | -1.49 | 1.0900 | 1.3003 | 0.0767 | -0.2103 | -0.11 X |
| 2772 | -1.66 | 1.3200 | 1.3268 | 0.0813 | -0.0068 | -0.00 X |
| 2778 | -1.25 | 0.8600 | 1.2677 | 0.0715 | -0.4077 | -0.21 X |
| 2784 | -1.53 | 1.0000 | 1.3113 | 0.0787 | -0.3113 | -0.16 X |
| 2786 | -0.91 | 1.4600 | 1.2484 | 0.0701 | 0.2116 | 0.11 X |
| 2790 | -0.22 | 0.9400 | 1.2084 | 0.0693 | -0.2684 | -0.14 X |
| 2800 | 0.27 | 10.5800 | 0.7993 | 0.0357 | 9.7807 | 5.06R |
| 2813 | -1.57 | 10.0500 | 0.8621 | 0.0410 | 9.1879 | 4.76R |
| 2821 | -1.14 | 1.5200 | 1.3004 | 0.0790 | 0.2196 | 0.11 X |
| 2896 | -1.93 | 6.5700 | 0.9955 | 0.0361 | 5.5745 | 2.89R |
| 2906 | -5.19 | 0.3700 | 1.3741 | 0.1088 | -1.0041 | -0.52 X |
| 3039 | -0.98 | 6.3300 | 0.7908 | 0.0436 | 5.5392 | 2.87R |
| 3040 | -3.19 | 7.8100 | 1.0613 | 0.0590 | 6.7487 | 3.50R |
| 3044 | -3.78 | 0.2300 | 0.9886 | 0.0746 | -0.7586 | -0.39 X |
| 3064 | -2.17 | 5.8200 | 0.8767 | 0.0507 | 4.9433 | 2.56R |
| 3109 | 0.31 | 11.5400 | 0.7348 | 0.0453 | 10.8052 | 5.59R |
| 3126 | -5.07 | 0.8200 | 1.3660 | 0.1064 | -0.5460 | -0.28 X |
| 3164 | -2.63 | 0.2500 | 1.2701 | 0.0704 | -1.0201 | -0.53 X |
| 3258 | -3.04 | 0.1300 | 1.2857 | 0.0751 | -1.1557 | -0.60 X |
| 3294 | -0.99 | 7.5600 | 0.9683 | 0.0246 | 6.5917 | 3.41R |
| 3300 | -4.57 | 0.2500 | 1.0259 | 0.0900 | -0.7759 | -0.40 X |
| 3407 | -1.65 | 6.5800 | 0.9513 | 0.0329 | 5.6287 | 2.91R |
| 3413 | 2.25 | -0.0600 | 0.9232 | 0.0708 | -0.9832 | -0.51 X |
| 3451 | -0.20 | 5.9200 | 0.9332 | 0.0249 | 4.9868 | 2.58R |
| 3460 | 0.68 | 6.4500 | 0.7987 | 0.0387 | 5.6513 | 2.93R |
| 3531 | -2.64 | 9.8900 | 0.8098 | 0.0703 | 9.0802 | 4.70RX |
| 3555 | -3.53 | 0.0600 | 1.3732 | 0.0915 | -1.3132 | -0.68 X |
| 3562 | -4.80 | -0.6000 | 1.2152 | 0.0922 | -1.8152 | -0.94 X |
| 3624 | 1.20 | 3.7600 | 1.1058 | 0.0732 | 2.6542 | 1.37 X |
| 3639 | 2.62 | 1.7600 | 0.8408 | 0.0732 | 0.9192 | 0.48 X |
| 3686 | -0.60 | 0.2300 | 1.2302 | 0.0693 | -1.0002 | -0.52 X |
| 3707 | 0.65 | 4.7000 | 0.7518 | 0.0438 | 3.9482 | 2.04R |
| 3708 | -0.17 | 5.7400 | 0.8183 | 0.0324 | 4.9217 | 2.55R |
| 3717 | -0.85 | 13.1800 | 0.7784 | 0.0444 | 12.4016 | 6.42R |
| 3753 | 0.81 | 12.8500 | 0.9582 | 0.0431 | 11.8918 | 6.16R |
| 3769 | -1.34 | 6.1700 | 0.8324 | 0.0416 | 5.3376 | 2.76R |
| 3793 | -0.15 | 22.9000 | 0.8291 | 0.0309 | 22.0709 | 11.43R |
| 3801 | -3.16 | 2.0600 | 0.8834 | 0.0711 | 1.1766 | 0.61 X |
| 3803 | -1.29 | 10.5900 | 0.7773 | 0.0507 | 9.8127 | 5.08R |
| 3818 | 1.34 | 9.8200 | 0.8491 | 0.0469 | 8.9709 | 4.65R |
| 3844 | 1.12 | 0.4900 | 0.5433 | 0.0797 | -0.0533 | -0.03 X |
| 3859 | -2.14 | 12.7700 | 0.8838 | 0.0491 | 11.8862 | 6.15R |
| 3916 | -3.49 | 1.9100 | 1.2490 | 0.0745 | 0.6610 | 0.34 X |
| 3922 | 3.33 | 0.4100 | 0.7923 | 0.0867 | -0.3823 | -0.20 X |
| 3923 | 0.69 | 11.2500 | 0.8799 | 0.0357 | 10.3701 | 5.37R |
| 3940 | -4.58 | -0.1900 | 1.2413 | 0.0896 | -1.4313 | -0.74 X |
| 3962 | -0.42 | 5.2300 | 0.8671 | 0.0267 | 4.3629 | 2.26R |
| 3971 | 0.62 | 8.0000 | 0.8525 | 0.0347 | 7.1475 | 3.70R |
| 3979 | -0.04 | 8.3500 | 0.8758 | 0.0267 | 7.4742 | 3.87R |
| 4005 | -1.10 | 8.5800 | 0.9245 | 0.0265 | 7.6555 | 3.96R |
| 4009 | -0.42 | 7.5700 | 0.8998 | 0.0240 | 6.6702 | 3.45R |
| 4031 | -1.98 | 7.8400 | 0.8516 | 0.0503 | 6.9884 | 3.62R |
| 4049 | 0.47 | 15.1800 | 0.8690 | 0.0323 | 14.3110 | 7.41R |
| 4053 | 0.97 | 8.7100 | 0.8967 | 0.0412 | 7.8133 | 4.05R |
| 4054 | 0.58 | 6.6600 | 0.8639 | 0.0340 | 5.7961 | 3.00R |
| 4072 | -0.35 | 4.8300 | 0.9526 | 0.0246 | 3.8774 | 2.01R |

| 4074 | -3.68 | 0.9300 | 1.2010 | 0.0727 | -0.2710 | -0.14 X |
|------|-------|--------|--------|--------|---------|---------|
| 4088 | -5.87 | 1.6100 | 1.3946 | 0.1205 | 0.2154 | 0.11 X |
| 4095 | -1.31 | 7.7300 | 0.7668 | 0.0530 | 6.9632 | 3.61R |
| 4131 | -2.62 | 4.9000 | 0.9371 | 0.0532 | 3.9629 | 2.05R |
| 4161 | 1.44 | 11.7400 | 0.9880 | 0.0598 | 10.7520 | 5.57R |
| 4187 | -0.44 | 17.7100 | 0.8556 | 0.0281 | 16.8544 | 8.73R |
| 4200 | 0.87 | 7.6700 | 0.7802 | 0.0424 | 6.8898 | 3.57R |
| 4243 | 1.01 | 10.0500 | 0.8455 | 0.0410 | 9.2045 | 4.77R |
| 4246 | 1.16 | 7.2700 | 0.9216 | 0.0468 | 6.3484 | 3.29R |
| 4267 | -0.53 | 9.7900 | 0.7587 | 0.0447 | 9.0313 | 4.68R |
| 4294 | 0.22 | 5.2000 | 0.7778 | 0.0384 | 4.4222 | 2.29R |
| 4315 | -0.60 | 11.7200 | 0.7143 | 0.0540 | 11.0057 | 5.70R |
| 4316 | 1.60 | 6.7700 | 0.8743 | 0.0530 | 5.8957 | 3.05R |
| 4343 | 0.99 | 5.3300 | 0.8865 | 0.0413 | 4.4435 | 2.30R |
| 4387 | 0.26 | 27.5000 | 0.7107 | 0.0495 | 26.7893 | 13.87R |
| 4402 | 1.79 | 5.4600 | 0.9544 | 0.0635 | 4.5056 | 2.33R |
| 4446 | -3.90 | -0.5900 | 1.0430 | 0.0742 | -1.6330 | -0.85 X |
| 4482 | 0.20 | 5.7900 | 0.8940 | 0.0286 | 4.8960 | 2.53R |
| 4505 | -0.26 | 6.1900 | 0.8074 | 0.0343 | 5.3826 | 2.79R |
| 4511 | -1.64 | 5.3700 | 0.9966 | 0.0318 | 4.3734 | 2.26R |
| 4536 | 0.11 | 6.9600 | 0.9137 | 0.0276 | 6.0463 | 3.13R |
| 4600 | -0.12 | 7.3300 | 0.8029 | 0.0346 | 6.5271 | 3.38R |
| 4636 | 0.92 | 5.3600 | 0.7644 | 0.0444 | 4.5956 | 2.38R |
| 4754 | 1.28 | 7.8100 | 0.9040 | 0.0480 | 6.9060 | 3.58R |
| 4767 | 1.43 | 6.0600 | 0.6702 | 0.0602 | 5.3898 | 2.79R |
| 4794 | 0.22 | 6.5000 | 0.8573 | 0.0298 | 5.6427 | 2.92R |
| 4815 | 0.45 | 6.6000 | 0.8445 | 0.0329 | 5.7555 | 2.98R |
| 4831 | 1.01 | 7.2600 | 0.9863 | 0.0505 | 6.2737 | 3.25R |
| 4856 | 0.25 | 6.0000 | 0.8331 | 0.0319 | 5.1669 | 2.68R |
| 4864 | -0.03 | 8.5000 | 0.7065 | 0.0512 | 7.7935 | 4.04R |
| 4880 | 1.58 | 4.9100 | 0.7990 | 0.0515 | 4.1110 | 2.13R |
| 4890 | -0.05 | 6.6100 | 0.7835 | 0.0376 | 5.8265 | 3.02R |
| 4917 | -3.92 | 0.4000 | 1.0457 | 0.0744 | -0.6457 | -0.33 X |
| 4919 | 0.75 | 17.6700 | 0.7369 | 0.0464 | 16.9331 | 8.77R |
| 4934 | -6.09 | -0.5500 | 1.2459 | 0.1177 | -1.7959 | -0.93 X |
| 4955 | -4.93 | -0.4800 | 1.1804 | 0.0939 | -1.6604 | -0.86 X |
| 4973 | -4.68 | 1.7900 | 1.0288 | 0.0923 | 0.7612 | 0.39 X |
| 4976 | -0.16 | 8.2300 | 0.8915 | 0.0252 | 7.3385 | 3.80R |
| 4979 | -5.58 | 1.3000 | 1.3236 | 0.1110 | -0.0236 | -0.01 X |
| 4986 | 0.52 | 6.4100 | 0.7981 | 0.0373 | 5.6119 | 2.91R |
| 4999 | -0.99 | 8.2900 | 0.9226 | 0.0255 | 7.3674 | 3.81R |
| 5032 | 2.04 | 1.7500 | 0.4837 | 0.0922 | 1.2663 | 0.66 X |
| 5055 | -0.11 | 4.9500 | 0.9459 | 0.0264 | 4.0041 | 2.07R |
| 5074 | 0.06 | 5.5900 | 0.8667 | 0.0279 | 4.7233 | 2.45R |
| 5078 | -3.35 | 0.1400 | 0.9266 | 0.0703 | -0.7866 | -0.41 X |
| 5157 | -0.32 | 7.7700 | 0.7311 | 0.0482 | 7.0389 | 3.64R |
| 5180 | 1.14 | 14.1500 | 0.7871 | 0.0451 | 13.3629 | 6.92R |
| 5198 | 0.50 | 18.8800 | 0.8875 | 0.0326 | 17.9925 | 9.32R |
| 5209 | -4.19 | 1.1900 | 1.1091 | 0.0787 | 0.0809 | 0.04 X |
| 5217 | 3.19 | 1.1200 | 0.7901 | 0.0836 | 0.3299 | 0.17 X |
| 5218 | 0.71 | 9.3500 | 0.8768 | 0.0360 | 8.4732 | 4.39R |
| 5236 | -4.28 | 0.3000 | 1.2114 | 0.0829 | -0.9114 | -0.47 X |
| 5251 | 1.29 | 5.4000 | 0.8789 | 0.0467 | 4.5211 | 2.34R |
| 5259 | -0.48 | 6.4700 | 0.7657 | 0.0429 | 5.7043 | 2.95R |
| 5265 | 0.27 | 15.0000 | 0.7363 | 0.0451 | 14.2637 | 7.39R |
| 5270 | -0.14 | 6.1400 | 0.8239 | 0.0316 | 5.3161 | 2.75R |
| 5278 | -4.75 | 0.7100 | 1.0920 | 0.0910 | -0.3820 | -0.20 X |
| 5323 | -0.05 | 5.2800 | 0.9558 | 0.0279 | 4.3242 | 2.24R |
| 5327 | 0.04 | 5.7100 | 0.7596 | 0.0413 | 4.9504 | 2.56R |
| 5340 | 2.35 | -1.0000 | 0.6744 | 0.0704 | -1.6744 | -0.87 X |
| 5359 | 0.13 | 5.8300 | 0.9156 | 0.0280 | 4.9144 | 2.54R |
| 5361 | 0.07 | 8.2900 | 0.9438 | 0.0286 | 7.3462 | 3.80R |
| 5406 | 0.13 | 15.9300 | 0.8467 | 0.0299 | 15.0833 | 7.81R |
| 5433 | 0.87 | 4.7900 | 0.8543 | 0.0385 | 3.9357 | 2.04R |
| 5505 | 0.04 | 10.1600 | 0.9079 | 0.0266 | 9.2521 | 4.79R |
| 5578 | -0.49 | 5.5200 | 0.8476 | 0.0294 | 4.6724 | 2.42R |
| 5600 | -1.42 | 9.3200 | 1.0032 | 0.0293 | 8.3168 | 4.31R |
| 5601 | 0.19 | 9.4100 | 0.9739 | 0.0333 | 8.4361 | 4.37R |
| 5606 | -0.95 | 7.0000 | 0.8727 | 0.0300 | 6.1273 | 3.17R |
| 5634 | -0.55 | 6.8900 | 0.9077 | 0.0237 | 5.9823 | 3.10R |
| 5677 | -0.30 | 5.8200 | 0.9057 | 0.0241 | 4.9143 | 2.54R |
| 5742 | -0.01 | 11.0000 | 0.8670 | 0.0275 | 10.1330 | 5.25R |
| 5750 | 0.36 | 11.6400 | 0.8499 | 0.0316 | 10.7901 | 5.59R |

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5766      0.60  10.1500  0.7833  0.0396    9.3667    4.85R
5777      0.36   6.9600  0.9061  0.0309    6.0539    3.13R
5782      1.31  10.4200  0.8233  0.0464    9.5967    4.97R
5788     -0.10   7.4900  0.8516  0.0284    6.6384    3.44R
5805     -0.35   5.4900  0.9331  0.0237    4.5569    2.36R
5841     -5.05   2.8400  1.2172  0.0969    1.6228    0.84 X
5851     -5.37   0.6600  1.1511  0.1030   -0.4911   -0.25 X
5894     -0.48   7.7600  0.8953  0.0243    6.8647    3.55R
5909      0.47  12.1100  0.9022  0.0325   11.2078    5.80R
5916     -4.37  -0.9100  1.2419  0.0861   -2.1519   -1.12 X
5917     -5.48   2.2300  1.3833  0.1137    0.8467    0.44 X
5943     -3.38   3.2900  0.9252  0.0711    2.3648    1.22 X
5947     -1.67  22.4400  0.8840  0.0398   21.5560   11.16R
5950     -0.02   5.1700  0.8573  0.0282    4.3127    2.23R
5972     -2.04   7.3500  0.9189  0.0428    6.4311    3.33R
5996     -4.21   2.6500  0.9454  0.0882    1.7046    0.88 X
5997     -3.20  11.5100  0.9190  0.0677   10.5910    5.49R
6061      0.80   6.2400  0.8419  0.0377    5.3981    2.79R
6065      0.77   6.0200  0.8146  0.0385    5.2054    2.70R
6079     -3.71  -0.8600  0.9625  0.0752   -1.8225   -0.94 X
6092     -6.45  -0.2900  1.3118  0.1259   -1.6018   -0.83 X
6101     -0.01  13.2000  0.9399  0.0272   12.2601    6.35R
6105      0.62  10.6000  0.8650  0.0345    9.7350    5.04R
6154     -0.64   4.9200  0.8580  0.0289    4.0620    2.10R
6208      0.12   6.5900  0.8650  0.0285    5.7250    2.96R
6209      0.32   4.8100  0.8165  0.0340    3.9935    2.07R
6221     -0.41   4.9500  0.9050  0.0238    4.0450    2.09R
6242     -4.84   3.0700  1.2714  0.0956    1.7986    0.93 X
6330     -2.09   6.6400  0.9301  0.0428    5.7099    2.96R
6337      0.33   7.2900  0.8668  0.0305    6.4232    3.33R
6343      0.66   4.7500  0.8086  0.0377    3.9414    2.04R
6349      1.43  -0.4900  0.5950  0.0713   -1.0850   -0.56 X
6404     -4.42   0.2900  1.2308  0.0863   -0.9408   -0.49 X
6431     -0.01   5.7600  0.8707  0.0272    4.8893    2.53R
6439      0.22   8.3500  0.8753  0.0290    7.4747    3.87R
6441      0.43   5.6700  0.6855  0.0538    4.9845    2.58R
6450     -0.04   5.1600  0.8195  0.0322    4.3405    2.25R
6474      1.19   9.0400  0.8501  0.0442    8.1899    4.24R
6475     -0.62  11.8900  0.8312  0.0327   11.0588    5.73R
6540     -0.54   7.3400  0.8600  0.0280    6.4800    3.35R
6641     -0.95   4.7800  0.9092  0.0260    3.8708    2.00R
6646     -5.10  -0.6800  1.1385  0.0974   -1.8185   -0.94 X
6710      1.94   1.5800  0.6030  0.0733    0.9770    0.51 X
6711     -0.16   6.8200  1.0692  0.0426    5.7508    2.98R
6721     -0.40  16.9100  0.9995  0.0287   15.9105    8.24R
6743      0.97   5.6400  0.7084  0.0517    4.9316    2.55R
6753      0.78   6.6800  0.9075  0.0381    5.7725    2.99R
6777     -4.32   1.1800  1.0821  0.0819    0.0979    0.05 X
6784      1.12   4.9200  0.7798  0.0453    4.1402    2.14R
6785      2.61  -1.0000  0.5118  0.0915   -1.5118   -0.78 X
6839      0.96   7.0400  0.8188  0.0409    6.2212    3.22R
6841     -4.50  -0.2200  1.1404  0.0849   -1.3604   -0.70 X
6854     -4.21  -0.2300  1.0549  0.0804   -1.2849   -0.67 X
6915     -1.22   9.7700  0.7885  0.0474    8.9815    4.65R
6967     -4.88   0.2100  1.0887  0.0937   -0.8787   -0.46 X
6991      0.25  13.5600  0.8237  0.0328   12.7363    6.59R
7017      0.70   5.6700  0.9173  0.0374    4.7527    2.46R
7052     -1.43   8.7100  0.9490  0.0295    7.7610    4.02R
```

R denotes an observation with a large standardized residual.
X denotes an observation whose X value gives it large influence.

## Regression Analysis: 5 Year Return versus LN(Volume), LN(Avg. Mkt Cap)

**The regression equation is**
**5 Year Return = 0.844 + 0.526 LN(Volume) + 0.0806 LN(Avg. Mkt Cap)**

```
Predictor            Coef  SE Coef      T      P
Constant           0.8443   0.6860   1.23  0.218
LN(Volume)         0.52585  0.09651   5.45  0.000
LN(Avg. Mkt Cap)   0.08056  0.05707   1.41  0.158
```

S = 8.02980   R-Sq = 0.6%   R-Sq(adj) = 0.6%

**Analysis of Variance**

| Source | DF | SS | MS | F | P |
|---|---|---|---|---|---|
| Regression | 2 | 2197.7 | 1098.9 | 17.04 | 0.000 |
| Residual Error | 5786 | 373067.5 | 64.5 | | |
| Total | 5788 | 375265.2 | | | |

| Source | DF | Seq SS |
|---|---|---|
| LN(Volume) | 1 | 2069.3 |
| LN(Avg. Mkt Cap) | 1 | 128.5 |

**Unusual Observations**

| Obs | LN(Volume) | 5 Year Return | Fit | SE Fit | Residual | St Resid |
|---|---|---|---|---|---|---|
| 9 | -3.57 | 1.670 | -0.301 | 0.321 | 1.971 | 0.25 X |
| 23 | 1.70 | 33.900 | 2.985 | 0.310 | 30.915 | 3.85R |
| 28 | -0.88 | 22.170 | 1.122 | 0.176 | 21.048 | 2.62R |
| 31 | 0.54 | 14.280 | 2.557 | 0.364 | 11.723 | 1.46 X |
| 47 | 0.91 | 18.860 | 2.547 | 0.257 | 16.313 | 2.03R |
| 66 | -0.37 | 26.670 | 1.343 | 0.210 | 25.327 | 3.16R |
| 99 | -2.22 | 52.000 | 0.378 | 0.239 | 51.622 | 6.43R |
| 115 | -1.03 | 1.450 | 1.777 | 0.398 | -0.327 | -0.04 X |
| 118 | 0.05 | 21.560 | 1.819 | 0.125 | 19.741 | 2.46R |
| 278 | 1.89 | 78.610 | 3.033 | 0.304 | 75.577 | 9.42R |
| 329 | -1.35 | 1.380 | 1.602 | 0.401 | -0.222 | -0.03 X |
| 352 | 2.18 | 10.260 | 2.726 | 0.343 | 7.534 | 0.94 X |
| 371 | 1.29 | 22.090 | 2.287 | 0.260 | 19.803 | 2.47R |
| 452 | -0.74 | 1.660 | 1.862 | 0.345 | -0.202 | -0.03 X |
| 491 | -1.55 | 2.090 | 1.502 | 0.411 | 0.588 | 0.07 X |
| 520 | -3.84 | -0.820 | -0.370 | 0.329 | -0.450 | -0.06 X |
| 538 | -0.35 | 25.440 | 1.527 | 0.122 | 23.913 | 2.98R |
| 546 | -1.38 | 5.650 | 1.605 | 0.413 | 4.045 | 0.50 X |
| 555 | -0.44 | 1.520 | 2.011 | 0.338 | -0.491 | -0.06 X |
| 578 | -4.94 | -1.000 | -1.084 | 0.448 | 0.084 | 0.01 X |
| 597 | 1.08 | 18.710 | 2.412 | 0.197 | 16.298 | 2.03R |
| 607 | 0.12 | 5.120 | 2.341 | 0.362 | 2.779 | 0.35 X |
| 635 | -0.76 | 1.260 | 1.846 | 0.345 | -0.586 | -0.07 X |
| 636 | -0.73 | 0.500 | 1.906 | 0.374 | -1.406 | -0.18 X |
| 645 | -0.31 | 20.650 | 1.487 | 0.150 | 19.163 | 2.39R |
| 654 | -1.19 | 1.290 | 1.610 | 0.345 | -0.320 | -0.04 X |
| 657 | 1.67 | 10.990 | 2.992 | 0.319 | 7.998 | 1.00 X |
| 687 | -0.97 | 1.840 | 1.705 | 0.327 | 0.135 | 0.02 X |
| 693 | -0.97 | 1.950 | 1.743 | 0.351 | 0.207 | 0.03 X |
| 700 | -5.99 | 0.710 | -1.449 | 0.523 | 2.159 | 0.27 X |
| 733 | -3.46 | 1.750 | 0.416 | 0.454 | 1.334 | 0.17 X |
| 751 | -1.32 | 2.820 | 1.581 | 0.374 | 1.239 | 0.15 X |
| 784 | -0.91 | 3.970 | 1.768 | 0.346 | 2.202 | 0.27 X |
| 822 | -1.05 | 1.430 | 1.682 | 0.342 | -0.252 | -0.03 X |
| 839 | -1.23 | 1.830 | 1.597 | 0.353 | 0.233 | 0.03 X |
| 866 | -0.71 | 4.380 | 1.860 | 0.335 | 2.520 | 0.31 X |
| 874 | -1.09 | 2.660 | 1.690 | 0.362 | 0.970 | 0.12 X |
| 889 | -0.96 | 1.180 | 1.709 | 0.326 | -0.529 | -0.07 X |
| 894 | -0.82 | 2.870 | 1.857 | 0.375 | 1.013 | 0.13 X |
| 896 | 0.22 | 1.630 | 2.363 | 0.345 | -0.733 | -0.09 X |
| 1002 | -0.53 | 1.660 | 1.941 | 0.324 | -0.281 | -0.04 X |
| 1016 | -0.35 | 2.560 | 2.042 | 0.328 | 0.518 | 0.06 X |
| 1036 | -0.62 | 0.970 | 1.901 | 0.331 | -0.931 | -0.12 X |
| 1088 | -0.32 | 3.770 | 2.079 | 0.342 | 1.691 | 0.21 X |
| 1106 | -1.67 | 1.110 | 1.321 | 0.339 | -0.211 | -0.03 X |
| 1119 | -3.88 | 1.330 | -0.216 | 0.334 | 1.546 | 0.19 X |
| 1137 | -2.14 | 5.810 | 1.017 | 0.323 | 4.793 | 0.60 X |
| 1144 | -4.16 | 0.960 | -0.232 | 0.390 | 1.192 | 0.15 X |
| 1149 | -5.08 | 0.270 | -0.836 | 0.447 | 1.106 | 0.14 X |
| 1164 | -4.61 | 0.260 | -0.437 | 0.438 | 0.697 | 0.09 X |
| 1208 | 1.41 | 32.330 | 2.516 | 0.226 | 29.814 | 3.71R |
| 1225 | -0.68 | 23.790 | 1.384 | 0.111 | 22.406 | 2.79R |
| 1256 | -2.38 | -0.290 | -0.040 | 0.435 | -0.250 | -0.03 X |
| 1288 | -3.70 | 0.830 | -0.346 | 0.326 | 1.176 | 0.15 X |

| 1293 | -5.67 | -0.120 | -1.025 | 0.525 | 0.905 | 0.11 X |
|------|-------|--------|--------|-------|-------|--------|
| 1368 | -4.07 | 1.180 | -0.187 | 0.381 | 1.367 | 0.17 X |
| 1445 | 1.93 | -0.450 | 2.367 | 0.432 | -2.817 | -0.35 X |
| 1484 | -0.78 | 1.840 | 1.809 | 0.327 | 0.031 | 0.00 X |
| 1488 | -0.18 | 28.440 | 1.820 | 0.142 | 26.620 | 3.32R |
| 1545 | -3.89 | 0.600 | -0.104 | 0.361 | 0.704 | 0.09 X |
| 1578 | -3.77 | 1.480 | -0.335 | 0.323 | 1.815 | 0.23 X |
| 1591 | 0.01 | 35.680 | 1.900 | 0.140 | 33.780 | 4.21R |
| 1611 | -3.21 | 0.300 | -0.237 | 0.338 | 0.537 | 0.07 X |
| 1618 | 0.09 | -1.000 | 2.260 | 0.318 | -3.260 | -0.41 X |
| 1629 | -6.44 | 0.080 | -1.604 | 0.569 | 1.684 | 0.21 X |
| 1634 | -7.08 | -0.160 | -1.926 | 0.632 | 1.766 | 0.22 X |
| 1637 | -2.57 | 0.800 | 0.747 | 0.323 | 0.053 | 0.01 X |
| 1749 | -0.81 | 3.450 | 1.785 | 0.322 | 1.665 | 0.21 X |
| 1752 | 1.47 | 78.430 | 2.539 | 0.232 | 75.891 | 9.46R |
| 1754 | -0.36 | 2.800 | 2.028 | 0.322 | 0.772 | 0.10 X |
| 1771 | -2.04 | 23.130 | 0.575 | 0.189 | 22.555 | 2.81R |
| 1845 | 1.69 | 2.540 | 3.035 | 0.336 | -0.495 | -0.06 X |
| 1862 | -4.82 | -0.390 | -0.640 | 0.432 | 0.250 | 0.03 X |
| 1881 | -3.71 | 0.270 | -0.333 | 0.323 | 0.603 | 0.08 X |
| 1906 | -4.26 | 1.000 | -0.417 | 0.368 | 1.417 | 0.18 X |
| 1928 | -1.24 | 5.730 | 1.632 | 0.377 | 4.098 | 0.51 X |
| 2064 | 1.00 | 9.410 | 2.790 | 0.371 | 6.620 | 0.83 X |
| 2083 | 0.27 | 49.070 | 1.912 | 0.139 | 47.158 | 5.87R |
| 2135 | -4.15 | 0.510 | -0.188 | 0.400 | 0.698 | 0.09 X |
| 2138 | -4.12 | 0.260 | -0.436 | 0.350 | 0.696 | 0.09 X |
| 2156 | -1.49 | -1.000 | 0.289 | 0.512 | -1.289 | -0.16 X |
| 2279 | -4.24 | -0.090 | -0.675 | 0.380 | 0.585 | 0.07 X |
| 2343 | -1.61 | 3.130 | 1.376 | 0.350 | 1.754 | 0.22 X |
| 2344 | -1.49 | 2.000 | 1.433 | 0.343 | 0.567 | 0.07 X |
| 2345 | -1.66 | 3.010 | 1.367 | 0.364 | 1.643 | 0.20 X |
| 2353 | -1.53 | 1.770 | 1.425 | 0.352 | 0.345 | 0.04 X |
| 2386 | -1.14 | 3.730 | 1.649 | 0.353 | 2.081 | 0.26 X |
| 2457 | -5.19 | 0.910 | -0.722 | 0.494 | 1.632 | 0.20 X |
| 2474 | -0.66 | 33.280 | 1.400 | 0.109 | 31.880 | 3.97R |
| 2500 | -1.60 | 333.800 | 0.741 | 0.192 | 333.059 | 41.49R |
| 2575 | -3.78 | -0.150 | -0.403 | 0.336 | 0.253 | 0.03 X |
| 2644 | -5.07 | 4.920 | -0.663 | 0.484 | 5.583 | 0.70 X |
| 2788 | -4.57 | 0.070 | -0.835 | 0.405 | 0.905 | 0.11 X |
| 2879 | 2.25 | 0.180 | 3.195 | 0.322 | -3.015 | -0.38 X |
| 2917 | 0.10 | 69.070 | 1.661 | 0.186 | 67.409 | 8.40R |
| 2925 | -0.30 | 18.480 | 1.410 | 0.195 | 17.070 | 2.13R |
| 2997 | -4.80 | -0.580 | -0.711 | 0.418 | 0.131 | 0.02 X |
| 3049 | 1.20 | 26.450 | 2.809 | 0.327 | 23.641 | 2.95RX |
| 3062 | 2.62 | -0.230 | 3.305 | 0.335 | -3.535 | -0.44 X |
| 3192 | -0.15 | 28.840 | 1.593 | 0.144 | 27.247 | 3.39R |
| 3200 | -3.16 | 2.060 | -0.173 | 0.319 | 2.233 | 0.28 X |
| 3233 | 1.12 | 2.020 | 1.971 | 0.367 | 0.049 | 0.01 X |
| 3283 | 2.01 | 41.050 | 2.939 | 0.278 | 38.111 | 4.75R |
| 3290 | -3.49 | 1.890 | 0.142 | 0.337 | 1.748 | 0.22 X |
| 3296 | 3.33 | 1.410 | 3.670 | 0.398 | -2.260 | -0.28 X |
| 3297 | 0.69 | 93.790 | 2.181 | 0.166 | 91.609 | 11.41R |
| 3342 | -0.04 | 22.120 | 1.723 | 0.125 | 20.397 | 2.54R |
| 3395 | 0.47 | 91.470 | 2.027 | 0.151 | 89.443 | 11.14R |
| 3399 | 0.97 | 23.050 | 2.371 | 0.190 | 20.679 | 2.58R |
| 3408 | 1.30 | -1.000 | 2.168 | 0.318 | -3.168 | -0.39 X |
| 3417 | -3.68 | 1.130 | -0.045 | 0.329 | 1.175 | 0.15 X |
| 3430 | -5.87 | 1.530 | -1.112 | 0.548 | 2.642 | 0.33 X |
| 3520 | 0.87 | 41.270 | 2.148 | 0.198 | 39.122 | 4.87R |
| 3556 | 1.01 | 60.390 | 2.326 | 0.191 | 58.064 | 7.23R |
| 3558 | 1.52 | 60.150 | 2.815 | 0.270 | 57.335 | 7.14R |
| 3680 | 1.79 | 86.700 | 2.955 | 0.288 | 83.745 | 10.44R |
| 3722 | -3.90 | -1.000 | -0.399 | 0.334 | -0.601 | -0.07 X |
| 4044 | -0.27 | 18.490 | 1.579 | 0.122 | 16.911 | 2.11R |
| 4089 | -3.92 | -1.000 | -0.406 | 0.336 | -0.594 | -0.07 X |
| 4101 | -6.09 | -1.000 | -1.457 | 0.534 | 0.457 | 0.06 X |
| 4116 | -4.93 | -0.280 | -0.838 | 0.425 | 0.558 | 0.07 X |
| 4118 | -2.15 | 19.880 | 0.659 | 0.180 | 19.221 | 2.39R |
| 4133 | -4.68 | -1.000 | -0.898 | 0.416 | -0.102 | -0.01 X |
| 4136 | -5.58 | 0.800 | -1.034 | 0.504 | 1.834 | 0.23 X |
| 4180 | 2.04 | 4.300 | 2.450 | 0.426 | 1.850 | 0.23 X |
| 4195 | 1.46 | 40.400 | 2.575 | 0.227 | 37.825 | 4.71R |
| 4321 | 0.50 | 72.000 | 2.070 | 0.152 | 69.930 | 8.71R |

```
4330      -4.19    0.730  -0.484   0.356     1.214      0.15 X
4354      -4.28    0.250  -0.397   0.376     0.647      0.08 X
4390      -4.75    1.310  -0.853   0.411     2.163      0.27 X
4501       0.13   24.330   1.792   0.140    22.538      2.81R
4788       1.31  177.010   2.481   0.216   174.529     21.74R
4834      -5.05   -0.160  -0.861   0.440     0.701      0.09 X
4843      -5.37    0.130  -1.150   0.466     1.280      0.16 X
4871       0.77   24.890   2.145   0.178    22.745      2.83R
4892       1.59   24.680   2.614   0.240    22.066      2.75R
4894       0.47  164.640   2.072   0.150   162.568     20.25R
4899      -4.37   -1.000  -0.407   0.390    -0.593     -0.07 X
4900      -5.48    3.060  -0.887   0.517     3.947      0.49 X
4922      -3.38    1.000  -0.246   0.319     1.246      0.16 X
4926      -1.67   19.890   0.741   0.179    19.149      2.39R
4933       1.62  298.750   2.652   0.242   296.098     36.89R
4962      -4.21    2.310  -0.728   0.396     3.038      0.38 X
5015       0.64   93.740   2.019   0.185    91.721     11.43R
5020      -3.71   -1.000  -0.399   0.338    -0.601     -0.07 X
5031      -6.45   -0.360  -1.580   0.572     1.220      0.15 X
5037      -0.01   33.090   1.831   0.125    31.259      3.89R
5145      -4.84    3.110  -0.654   0.434     3.764      0.47 X
5151      -0.30   26.920   1.644   0.111    25.276      3.15R
5155       1.30   25.690   2.692   0.252    22.998      2.87R
5171       0.61   23.060   1.954   0.203    21.106      2.63R
5185      -0.26   17.610   1.529   0.144    16.081      2.00R
5231       1.43   -0.620   2.229   0.330    -2.849     -0.36 X
5275      -4.42    0.320  -0.457   0.391     0.777      0.10 X
5380      -0.54   20.910   1.398   0.130    19.512      2.43R
5390       1.40   -1.000   2.237   0.317    -3.237     -0.40 X
5458      -5.10   -1.000  -1.002   0.441     0.002      0.00 X
5511       1.94    0.460   2.552   0.341    -2.092     -0.26 X
5567      -4.32    2.980  -0.600   0.370     3.580      0.45 X
5620      -4.50   -0.280  -0.629   0.384     0.349      0.04 X
5628      -4.21    0.630  -0.572   0.363     1.202      0.15 X
5724      -4.88    0.010  -0.933   0.423     0.943      0.12 X
5743       0.25   34.780   1.828   0.154    32.952      4.10R
```

R denotes an observation with a large standardized residual.
X denotes an observation whose X value gives it large influence.

## Regression Analysis: 10 Year Return versus LN(Avg. Mkt Cap), LN(Volume)

**The regression equation is**
**10 Year Return = 1.97 + 0.0534 LN(Avg. Mkt Cap) - 0.0504 LN(Volume)**

```
Predictor              Coef  SE Coef       T      P
Constant             1.9711   0.6982    2.82  0.005
LN(Avg. Mkt Cap)    0.05338  0.05731    0.93  0.352
LN(Volume)         -0.05045  0.09950   -0.51  0.612
```

S = 6.78157   R-Sq = 0.0%   R-Sq(adj) = 0.0%

### *Analysis of Variance*

```
Source            DF         SS      MS      F      P
Regression         2      47.10   23.55   0.51  0.599
Residual Error  4004  184142.57   45.99
Total           4006  184189.66
```

```
Source            DF  Seq SS
LN(Avg. Mkt Cap)   1   35.27
LN(Volume)         1   11.82
```

### *Unusual Observations*
```
       LN(Avg.
         Mkt  10 Year
 Obs     Cap)  Return    Fit  SE Fit  Residual  St Resid
   7      9.1   0.250  2.637   0.333    -2.387     -0.35 X
```

```
19       9.2    16.400   2.507   0.185   13.893    2.05R
22      17.7     6.890   2.889   0.358    4.001    0.59 X
30      11.3    27.510   2.572   0.134   24.938    3.68R
75       9.7    20.810   2.506   0.169   18.304    2.70R
82      18.3    -0.320   3.000   0.392   -3.320   -0.49 X
93      10.6    19.380   2.624   0.164   16.756    2.47R
161     11.4    16.460   2.619   0.110   13.841    2.04R
185     12.5    18.000   2.707   0.137   15.293    2.26R
193     14.9    64.780   2.670   0.306   62.110    9.17R
202      9.7    18.630   2.582   0.195   16.048    2.37R
224     18.2     0.860   3.011   0.395   -2.151   -0.32 X
241      9.1    -0.960   2.347   0.355   -3.307   -0.49 X
275     11.1    27.290   2.522   0.190   24.768    3.65R
277     12.8    18.750   2.698   0.124   16.052    2.37R
313     17.4     1.320   2.939   0.338   -1.619   -0.24 X
322     11.0    20.580   2.494   0.227   18.086    2.67R
345     18.3     3.430   3.026   0.405    0.404    0.06 X
364     10.0    -1.000   2.698   0.341   -3.698   -0.55 X
374     10.8    26.470   2.565   0.128   23.905    3.53R
376     11.2    19.160   2.630   0.126   16.530    2.44R
380     18.4     4.230   3.024   0.407    1.206    0.18 X
389     17.4     0.710   2.920   0.331   -2.210   -0.33 X
399     11.6    47.040   2.604   0.114   44.436    6.55R
424     17.8     4.780   2.915   0.356    1.865    0.28 X
429     14.4    27.440   2.755   0.179   24.685    3.64R
446     17.4     2.590   2.939   0.338   -0.349   -0.05 X
447     18.0     4.320   2.967   0.367    1.353    0.20 X
464     17.3     2.280   2.953   0.339   -0.673   -0.10 X
498     10.6     2.070   2.842   0.540   -0.772   -0.11 X
522     17.2     3.310   3.066   0.455    0.244    0.04 X
533     17.7     3.260   2.984   0.368    0.276    0.04 X
554     17.4     1.460   2.945   0.339   -1.485   -0.22 X
582     17.3     2.680   2.945   0.335   -0.265   -0.04 X
613     17.3     3.810   2.928   0.328    0.882    0.13 X
619     17.6     4.390   2.967   0.356    1.423    0.21 X
624     10.3    35.130   2.550   0.140   32.580    4.81R
634     18.0     1.240   2.971   0.368   -1.731   -0.26 X
636     17.4     0.080   2.891   0.338   -2.811   -0.42 X
738      8.9    34.630   2.450   0.214   32.180    4.75R
743     17.2     0.970   2.920   0.324   -1.950   -0.29 X
781     17.4     1.360   2.918   0.335   -1.558   -0.23 X
794     16.8     1.950   2.955   0.334   -1.005   -0.15 X
805     12.2     1.980   2.816   0.343   -0.836   -0.12 X
824     13.8     3.070   2.919   0.397    0.151    0.02 X
836      7.9    27.090   2.509   0.282   24.581    3.63R
856     12.6    18.930   2.679   0.116   16.251    2.40R
891      9.8    17.590   2.618   0.230   14.972    2.21R
930      8.2     1.830   2.565   0.324   -0.735   -0.11 X
934      9.4     0.660   2.658   0.338   -1.998   -0.29 X
939     10.4     2.980   2.715   0.326    0.265    0.04 X
990     13.8     2.580   2.913   0.388   -0.333   -0.05 X
1007     9.8    18.430   2.529   0.158   15.901    2.35R
1009     9.0    24.410   2.571   0.244   21.839    3.22R
1046     6.3     0.670   2.209   0.445   -1.539   -0.23 X
1115    13.6     1.710   2.896   0.368   -1.186   -0.18 X
1137    12.9     6.800   2.537   0.323    4.263    0.63 X
1142     9.9     6.850   2.692   0.335    4.158    0.61 X
1161     7.5    28.080   2.535   0.351   25.545    3.77RX
1178    11.6     0.370   2.917   0.586   -2.547   -0.38 X
1183    11.9    -1.000   2.961   0.651   -3.961   -0.59 X
1186    15.6     0.380   2.931   0.322   -2.551   -0.38 X
1267    11.4    65.560   2.507   0.239   63.053    9.30R
1306    13.1    19.970   2.684   0.133   17.286    2.55R
1333    16.2     0.130   2.749   0.335   -2.619   -0.39 X
1342     9.5     1.000   2.660   0.327   -1.660   -0.25 X
1343     9.6    20.300   2.511   0.170   17.789    2.62R
1356     9.6    13.440   2.670   0.335   10.770    1.59 X
1392    17.8     4.310   2.986   0.371    1.324    0.20 X
1494    17.6     5.020   2.862   0.366    2.158    0.32 X
1535    10.8     0.000   2.733   0.323   -2.733   -0.40 X
1547    11.0     5.240   2.768   0.361    2.472    0.37 X
1577     9.5    31.480   2.559   0.189   28.921    4.27R
1582    12.3    16.700   2.673   0.113   14.027    2.07R
```

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```
1622    11.7    18.030    2.602    0.119    15.428    2.28R
1651     8.8     0.900    2.655    0.394    -1.755   -0.26 X
1659    10.8    17.400    2.504    0.199    14.896    2.20R
1670    11.4    17.430    2.620    0.110    14.810    2.18R
1684    11.3    20.150    2.578    0.127    17.572    2.59R
1696    17.1     1.340    2.957    0.337    -1.617   -0.24 X
1697    17.3     1.720    2.980    0.358    -1.260   -0.19 X
1705    17.2     0.770    2.967    0.347    -2.197   -0.32 X
1710    11.7    24.680    2.638    0.109    22.042    3.25R
1712    15.1    19.230    2.773    0.219    16.457    2.43R
1723     9.3    24.660    2.549    0.194    22.111    3.26R
1730    17.4     3.370    2.959    0.346     0.411    0.06 X
1792    11.2    23.060    2.603    0.113    20.457    3.02R
1865     9.2    -0.270    2.653    0.348    -2.923   -0.43 X
2021     9.6    76.250    2.526    0.166    73.724   10.87R
2051    11.8    16.690    2.600    0.128    14.090    2.08R
2098    14.5    -0.510    2.630    0.325    -3.140   -0.46 X
2127     9.5    19.680    2.471    0.195    17.209    2.54R
2165     7.3    21.220    2.494    0.327    18.726    2.76RX
2181    12.0    -1.000    2.857    0.430    -3.857   -0.57 X
2213    16.5     8.900    2.793    0.324     6.107    0.90 X
2223    13.4     2.660    2.556    0.343     0.104    0.02 X
2314    10.3    48.500    2.527    0.152    45.973    6.78R
2319     8.0    -1.000    2.559    0.331    -3.559   -0.53 X
2320     8.2    19.800    2.472    0.239    17.328    2.56R
2380    14.0     3.390    2.896    0.341     0.494    0.07 X
2385    13.3     1.120    2.515    0.407    -1.395   -0.21 X
2386    12.1    45.480    2.580    0.169    42.900    6.33R
2432    11.5    37.110    2.564    0.153    34.546    5.10R
2449    11.6   187.070    2.568    0.155   184.502   27.21R
2451    12.6    27.790    2.597    0.192    25.193    3.72R
2461    13.0     4.780    2.851    0.336     1.929    0.28 X
2467    14.0     6.520    3.017    0.561     3.503    0.52 X
2531    10.5    97.300    2.488    0.206    94.812   13.99R
2565    14.5    28.800    2.671    0.270    26.129    3.86R
2599    12.9    28.460    2.613    0.192    25.847    3.81R
2604    12.1    17.750    2.592    0.156    15.158    2.24R
2632    10.8    21.650    2.531    0.159    19.119    2.82R
2640    14.5    21.480    2.656    0.289    18.824    2.78R
2670     9.1    42.660    2.462    0.203    40.198    5.93R
2745    12.3    20.260    2.676    0.115    17.584    2.59R
2766    14.0    17.140    2.649    0.243    14.491    2.14R
2921    11.7    18.870    2.548    0.194    16.322    2.41R
2939     9.6    75.580    2.447    0.226    73.133   10.79R
2974    13.1     3.800    2.952    0.517     0.848    0.13 X
3000     6.6    -1.000    2.220    0.439    -3.220   -0.48 X
3011    12.0    37.870    2.536    0.233    35.334    5.21R
3028     8.6     0.300    2.598    0.328    -2.298   -0.34 X
3046    10.7    80.970    2.529    0.158    78.441   11.57R
3096    12.0    50.170    2.586    0.155    47.584    7.02R
3115    12.5     3.820    2.856    0.385     0.964    0.14 X
3137    10.0     4.720    2.742    0.425     1.978    0.29 X
3142    12.5    20.560    2.685    0.118    17.875    2.64R
3187    10.0    21.770    2.512    0.163    19.258    2.84R
3327     8.2    17.980    2.384    0.271    15.596    2.30R
3365    11.7   138.880    2.644    0.112   136.236   20.09R
3391    10.3    21.510    2.489    0.194    19.021    2.81R
3392    12.3    17.340    2.620    0.132    14.720    2.17R
3432    11.8    -1.000    2.857    0.453    -3.857   -0.57 X
3437    10.3    18.960    2.793    0.481    16.167    2.39RX
3452     9.0    20.490    2.434    0.227    18.056    2.66R
3470    12.2    48.580    2.599    0.153    45.981    6.78R
3472    14.3    13.290    3.009    0.528    10.281    1.52 X
3485     8.5     0.750    2.596    0.331    -1.846   -0.27 X
3504     8.0     2.550    2.610    0.410    -0.060   -0.01 X
3530    10.1    17.960    2.560    0.149    15.400    2.27R
3542    10.4    42.530    2.493    0.193    40.037    5.91R
3554    12.3    23.040    2.631    0.125    20.409    3.01R
3602    11.9    23.060    2.575    0.162    20.485    3.02R
3644    10.9    54.890    2.510    0.196    52.380    7.73R
3668     7.9    -1.000    2.320    0.342    -3.320   -0.49 X
3717     9.8    30.930    2.526    0.159    28.404    4.19R
3823     8.6     2.010    2.330    0.353    -0.320   -0.05 X
```

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```
3824   14.4    17.330   2.750   0.184    14.580      2.15R
3826   12.2    20.130   2.713   0.158    17.417      2.57R
3831   13.0   102.220   2.684   0.126    99.536     14.68R
3860   10.2     8.510   2.736   0.382     5.774      0.85 X
3891   11.1    -1.000   2.789   0.396    -3.789     -0.56 X
3898    9.9     0.930   2.711   0.376    -1.781     -0.26 X
3934    9.7    62.540   2.486   0.183    60.054      8.86R
3937   12.6    20.360   2.660   0.116    17.700      2.61R
3942    9.4    18.420   2.563   0.201    15.857      2.34R
3949   11.2    22.810   2.545   0.163    20.265      2.99R
3966    9.8     0.020   2.739   0.438    -2.719     -0.40 X
3976    9.3    31.550   2.580   0.232    28.970      4.27R
3977   10.6    27.660   2.525   0.161    25.135      3.71R
3984   11.6    21.820   2.632   0.109    19.188      2.83R
3993   12.7    21.130   2.615   0.173    18.515      2.73R
4007   11.0    47.520   2.631   0.139    44.889      6.62R
```

R denotes an observation with a large standardized residual.
X denotes an observation whose X value gives it large influence.

## Appendix B: Portfolio Data Sorted by Market Capitalization

| Portfolio | Volume | Market Cap | 1 Yr HPR | 3 Yr HPR | 5 Yr HPR | 10 Yr HPR |
|---|---|---|---|---|---|---|
| Average 1 | 0.84 | 2,719.73 | 0.19 | 1.52 | 1.20 | 2.87 |
| Average 2 | 0.68 | 5,362.53 | 0.31 | 1.13 | 1.22 | 1.00 |
| Average 3 | 0.72 | 7,729.69 | 0.31 | 0.48 | 0.82 | 2.39 |
| Average 4 | 0.71 | 10,032.70 | 0.23 | 0.68 | 3.14 | 1.92 |
| Average 5 | 0.78 | 12,699.77 | 0.28 | 0.80 | 1.13 | 2.46 |
| Average 6 | 0.88 | 15,354.64 | 0.35 | 0.79 | 1.04 | 3.51 |
| Average 7 | 0.79 | 17,969.39 | 0.41 | 0.71 | 0.67 | 2.75 |
| Average 8 | 0.76 | 20,612.99 | 0.17 | 0.70 | 0.93 | 2.71 |
| Average 9 | 0.80 | 23,938.21 | 0.49 | 0.55 | 0.52 | 1.73 |
| Average 10 | 0.85 | 27,422.92 | 0.17 | 0.80 | 1.00 | 2.84 |
| Average 11 | 0.82 | 31,279.98 | 0.22 | 0.82 | 1.58 | 2.40 |
| Average 12 | 0.90 | 35,641.90 | 0.33 | 0.77 | 0.95 | 2.51 |
| Average 13 | 0.92 | 40,101.23 | 0.36 | 0.64 | 1.03 | 1.81 |
| Average 14 | 0.91 | 45,181.04 | 0.52 | 0.98 | 1.23 | 2.65 |
| Average 15 | 0.83 | 50,634.91 | 0.43 | 0.99 | 1.13 | 2.99 |
| Average 16 | 0.91 | 57,429.98 | 0.39 | 1.08 | 1.01 | 2.86 |
| Average 17 | 0.83 | 64,234.80 | 0.29 | 0.93 | 1.04 | 2.05 |
| Average 18 | 1.03 | 71,221.54 | 0.46 | 1.01 | 1.42 | 2.13 |
| Average 19 | 1.03 | 79,532.03 | 0.43 | 0.70 | 0.73 | 2.10 |
| Average 20 | 0.92 | 88,813.69 | 0.48 | 0.93 | 1.05 | 3.13 |
| Average 21 | 0.92 | 99,823.35 | 0.45 | 0.92 | 1.63 | 2.58 |
| Average 22 | 1.25 | 112,717.66 | 0.47 | 0.91 | 1.61 | 3.65 |
| Average 23 | 1.02 | 126,321.88 | 0.42 | 1.13 | 2.75 | 3.59 |
| Average 24 | 1.13 | 139,793.69 | 0.48 | 0.96 | 3.19 | 2.73 |
| Average 25 | 1.19 | 156,303.88 | 0.65 | 1.02 | 1.97 | 3.17 |
| Average 26 | 0.99 | 176,043.47 | 0.49 | 1.00 | 1.90 | 2.34 |
| Average 27 | 1.26 | 199,021.37 | 0.51 | 1.14 | 2.22 | 3.11 |
| Average 28 | 1.15 | 226,444.00 | 0.50 | 0.92 | 1.24 | 2.56 |
| Average 29 | 1.01 | 260,334.30 | 0.47 | 0.95 | 1.32 | 2.66 |
| Average 30 | 1.10 | 302,244.94 | 0.50 | 0.86 | 1.34 | 2.60 |
| Average 31 | 1.12 | 354,003.54 | 0.48 | 0.78 | 1.09 | 2.69 |
| Average 32 | 1.08 | 426,657.71 | 0.52 | 1.31 | 1.59 | 3.83 |
| Average 33 | 1.16 | 511,712.04 | 0.58 | 1.05 | 0.92 | 2.42 |
| Average 34 | 1.33 | 643,289.89 | 0.40 | 1.15 | 1.15 | 2.60 |
| Average 35 | 1.09 | 832,735.41 | 0.55 | 0.86 | 0.90 | 1.83 |
| Average 36 | 1.18 | 1,095,203.35 | 0.47 | 1.00 | 0.95 | 2.17 |
| Average 37 | 1.00 | 1,505,263.40 | 0.37 | 1.01 | 1.54 | 3.06 |
| Average 38 | 1.16 | 2,196,930.69 | 0.54 | 1.22 | 2.80 | 3.39 |
| Average 39 | 0.92 | 4,044,817.14 | 0.47 | 1.12 | 2.04 | 2.36 |
| Average 40 | 0.70 | 16,370,287.47 | 0.48 | 1.26 | 2.29 | 2.57 |

# Appendix C: Regression Output for Portfolio Sort by Market Capitalization

### Regression Analysis: 1995 (1 Yr) versus Volume, 1995 Avg Mkt Cap

**The regression equation is**
**1995 (1 Yr) = - 0.0440 + 0.465 Volume + 0.000000 1995 Avg Mkt Cap**

```
Predictor                   Coef      SE Coef        T       P
Constant                 -0.04396      0.08009    -0.55   0.586
Volume                    0.46548      0.08084     5.76   0.000
1995 Avg Mkt Cap  0.00000001   0.00000001     2.36   0.023

S = 0.0851282    R-Sq = 48.6%    R-Sq(adj) = 45.9%
```

***Analysis of Variance***

```
Source            DF        SS        MS       F       P
Regression         2   0.25386   0.12693   17.52   0.000
Residual Error    37   0.26813   0.00725
Total             39   0.52199

Source            DF   Seq SS
Volume             1   0.21338
1995 Avg Mkt Cap   1   0.04048
```

***Unusual Observations***

```
              1995
Obs  Volume  (1 Yr)     Fit  SE Fit  Residual  St Resid
 10    0.85  0.1700  0.3520  0.0173   -0.1820     -2.18R
 34    1.33  0.4000  0.5831  0.0322   -0.1831     -2.32R
 40    0.70  0.4800  0.4850  0.0821   -0.0050     -0.22 X
```

```
R denotes an observation with a large standardized residual.
X denotes an observation whose X value gives it large influence.
```

### Regression Analysis: 1997 (3 Yr) versus Volume, 1995 Avg Mkt Cap

**The regression equation is**
**1997 (3 Yr) = 0.471 + 0.460 Volume + 0.000000 1995 Avg Mkt Cap**

```
Predictor                   Coef      SE Coef       T       P
Constant                  0.4707       0.1778    2.65   0.012
Volume                    0.4605       0.1795    2.57   0.014
1995 Avg Mkt Cap  0.00000003   0.00000001    2.66   0.011

S = 0.189002    R-Sq = 23.9%    R-Sq(adj) = 19.8%
```

***Analysis of Variance***

```
Source            DF        SS        MS      F       P
Regression         2   0.41549   0.20774   5.82   0.006
Residual Error    37   1.32170   0.03572
Total             39   1.73719

Source            DF   Seq SS
Volume             1   0.16186
1995 Avg Mkt Cap   1   0.25363
```

***Unusual Observations***
```
              1997
Obs  Volume  (3 Yr)     Fit  SE Fit  Residual  St Resid
  1    0.84  1.5200  0.8576  0.0395    0.6624      3.58R
 40    0.70  1.2600  1.3014  0.1822   -0.0414     -0.82 X
```

```
R denotes an observation with a large standardized residual.
```

X denotes an observation whose X value gives it large influence.

## Regression Analysis: 1999 (5 Yr) versus 1995 Avg Mkt Cap, Volume

**The regression equation is**
**1999 (5 Yr) = 0.505 + 0.000000 1995 Avg Mkt Cap + 0.897 Volume**

```
Predictor                 Coef     SE Coef      T      P
Constant                0.5050      0.5972   0.85  0.403
1995 Avg Mkt Cap  0.00000008  0.00000004   2.02  0.051
Volume                  0.8967      0.6028   1.49  0.145
```

S = 0.634769   R-Sq = 12.7%   R-Sq(adj) = 8.0%

*Analysis of Variance*

```
Source          DF       SS      MS      F      P
Regression       2   2.1702  1.0851   2.69  0.081
Residual Error  37  14.9085  0.4029
Total           39  17.0786
```

```
Source            DF  Seq SS
1995 Avg Mkt Cap   1  1.2784
Volume             1  0.8917
```

*Unusual Observations*

```
              1999
      1995 Avg   (5
Obs   Mkt Cap    Yr)     Fit  SE Fit  Residual  St Resid
  4     10033  3.140   1.142   0.191     1.998     3.30R
 23    126322  2.750   1.430   0.107     1.320     2.11R
 24    139794  3.190   1.529   0.140     1.661     2.68R
 40  16370287  2.290   2.424   0.612    -0.134    -0.80 X
```

R denotes an observation with a large standardized residual.
X denotes an observation whose X value gives it large influence.

## Regression Analysis: 2004 (10 Yr) versus 1995 Avg Mkt Cap, Volume

**The regression equation is**
**2004 (10 Yr) = 1.37 + 0.000000 1995 Avg Mkt Cap + 1.28 Volume**

```
Predictor                 Coef     SE Coef      T      P
Constant                1.3732      0.5118   2.68  0.011
1995 Avg Mkt Cap  0.00000002  0.00000003   0.45  0.657
Volume                  1.2758      0.5166   2.47  0.018
```

S = 0.544011   R-Sq = 14.2%   R-Sq(adj) = 9.5%

*Analysis of Variance*

```
Source          DF       SS      MS      F      P
Regression       2   1.8050  0.9025   3.05  0.059
Residual Error  37  10.9501  0.2959
Total           39  12.7550
```

```
Source            DF  Seq SS
1995 Avg Mkt Cap   1  0.0000
Volume             1  1.8049
```

*Unusual Observations*

```
              2004
      1995 Avg   (10
Obs   Mkt Cap    Yr)     Fit  SE Fit  Residual  St Resid
  2      5363  1.0000  2.2408  0.1770   -1.2408    -2.41R
 32    426658  3.8300  2.7574  0.1035    1.0726     2.01R
```

```
40   16370287  2.5700  2.5118  0.5244    0.0582      0.40 X
```

R denotes an observation with a large standardized residual.
X denotes an observation whose X value gives it large influence

# Appendix D: Portfolio Data Sorted by Volume %

| Portfolio | Volume | Market Cap | 1 Yr HPR | 3 Yr HPR | 5 Yr HPR | 10 Yr HPR |
|---|---|---|---|---|---|---|
| Average 1 | 0.03 | 409,706.83 | 20.16% | 88.74% | 69.27% | 315.04% |
| Average 2 | 0.07 | 173,736.38 | 22.51% | 107.76% | 77.38% | 314.79% |
| Average 3 | 0.10 | 220,248.74 | 27.80% | 113.39% | 153.34% | 300.41% |
| Average 4 | 0.13 | 307,555.74 | 32.59% | 104.06% | 94.68% | 211.84% |
| Average 5 | 0.16 | 200,283.90 | 25.03% | 97.73% | 82.76% | 262.72% |
| Average 6 | 0.19 | 652,278.61 | 27.72% | 116.41% | 100.43% | 250.54% |
| Average 7 | 0.21 | 980,665.63 | 27.61% | 100.61% | 282.07% | 294.97% |
| Average 8 | 0.23 | 419,048.80 | 43.08% | 111.96% | 94.17% | 260.55% |
| Average 9 | 0.25 | 1,397,008.29 | 25.71% | 84.57% | 93.15% | 245.25% |
| Average 10 | 0.28 | 760,725.55 | 31.58% | 84.09% | 53.59% | 243.62% |
| Average 11 | 0.30 | 1,041,564.67 | 33.56% | 92.09% | 92.92% | 217.18% |
| Average 12 | 0.33 | 1,200,927.16 | 31.30% | 105.56% | 79.45% | 219.44% |
| Average 13 | 0.35 | 1,204,145.87 | 36.55% | 101.68% | 87.57% | 250.28% |
| Average 14 | 0.38 | 1,500,635.47 | 29.88% | 108.68% | 110.26% | 372.71% |
| Average 15 | 0.41 | 1,116,546.86 | 33.55% | 74.84% | 77.22% | 220.68% |
| Average 16 | 0.43 | 1,223,963.49 | 28.08% | 94.10% | 75.18% | 283.24% |
| Average 17 | 0.46 | 1,299,657.87 | 27.61% | 93.39% | 83.12% | 299.25% |
| Average 18 | 0.49 | 1,349,310.18 | 35.59% | 82.44% | 95.03% | 227.09% |
| Average 19 | 0.53 | 1,190,915.71 | 32.53% | 101.86% | 126.01% | 288.16% |
| Average 20 | 0.56 | 963,320.19 | 24.98% | 83.07% | 66.12% | 256.89% |
| Average 21 | 0.60 | 923,017.07 | 33.49% | 103.91% | 110.14% | 207.29% |
| Average 22 | 0.64 | 876,186.65 | 32.46% | 112.99% | 104.89% | 173.20% |
| Average 23 | 0.69 | 1,127,280.44 | 33.07% | 101.44% | 126.63% | 330.66% |
| Average 24 | 0.73 | 748,571.08 | 28.94% | 95.50% | 125.97% | 281.95% |
| Average 25 | 0.78 | 603,858.74 | 33.36% | 81.67% | 110.33% | 233.41% |
| Average 26 | 0.84 | 749,060.16 | 35.18% | 115.28% | 183.93% | 262.65% |
| Average 27 | 0.90 | 536,090.46 | 31.17% | 103.45% | 121.46% | 323.76% |
| Average 28 | 0.96 | 589,059.83 | 37.25% | 95.03% | 139.02% | 215.63% |
| Average 29 | 1.03 | 659,374.03 | 52.19% | 88.66% | 160.97% | 188.24% |
| Average 30 | 1.11 | 949,352.35 | 53.88% | 103.81% | 197.19% | 345.74% |
| Average 31 | 1.21 | 668,435.09 | 44.72% | 52.82% | 104.49% | 86.12% |
| Average 32 | 1.33 | 538,200.80 | 60.75% | 121.08% | 195.20% | 309.86% |
| Average 33 | 1.46 | 310,915.94 | 79.40% | 68.12% | 63.38% | 183.89% |
| Average 34 | 1.61 | 417,607.88 | 46.27% | 81.47% | 382.06% | 500.61% |
| Average 35 | 1.80 | 523,479.57 | 44.09% | 65.22% | 135.93% | 140.39% |
| Average 36 | 2.03 | 395,132.76 | 67.87% | 101.10% | 321.20% | 371.31% |
| Average 37 | 2.35 | 434,642.55 | 69.56% | 54.87% | 144.21% | 332.75% |
| Average 38 | 2.82 | 689,732.90 | 81.90% | 54.92% | 204.58% | 174.28% |
| Average 39 | 3.59 | 432,609.36 | 90.54% | 74.70% | 302.56% | 130.79% |
| Average 40 | 6.30 | 619,792.85 | 111.73% | 106.91% | 670.51% | 370.66% |

# Appendix E: Regression Output for Portfolio Sort by Volume %

### Regression Analysis: 1995 (1 Yr) versus Volume, Avg Mkt Cap

**The regression equation is**
**1995 (1 Yr) = 0.302 + 0.157 Volume - 0.000000 Avg Mkt Cap**

```
Predictor          Coef     SE Coef        T       P
Constant        0.30162     0.03594     8.39   0.000
Volume          0.15694     0.01183    13.27   0.000
Avg Mkt Cap  -0.00000005  0.00000004   -1.26   0.217
```

```
S = 0.0837883   R-Sq = 84.2%   R-Sq(adj) = 83.3%
```

*Analysis of Variance*

```
Source           DF       SS       MS       F      P
Regression        2  1.38464  0.69232   98.61  0.000
Residual Error   37  0.25976  0.00702
Total            39  1.64440
```

```
Source        DF   Seq SS
Volume         1  1.37357
Avg Mkt Cap    1  0.01107
```

*Unusual Observations*

```
               1995
Obs  Volume  (1 Yr)    Fit  SE Fit  Residual  St Resid
 33    1.46  0.7900  0.5160  0.0212    0.2740     3.38R
 40    6.30  1.1200  1.2609  0.0634   -0.1409    -2.57RX
```

```
R denotes an observation with a large standardized residual.
X denotes an observation whose X value gives it large influence.
```

### Regression Analysis: 1997 (3 Yr) versus Avg Mkt Cap, Volume

**The regression equation is**
**1997 (3 Yr) = 0.972 - 0.000000 Avg Mkt Cap - 0.0408 Volume**

```
Predictor          Coef     SE Coef        T       P
Constant        0.97212     0.07388    13.16   0.000
Avg Mkt Cap  -0.00000000  0.00000008   -0.00   0.997
Volume         -0.04079     0.02431    -1.68   0.102
```

```
S = 0.172233   R-Sq = 7.5%   R-Sq(adj) = 2.5%
```

*Analysis of Variance*

```
Source           DF       SS       MS      F      P
Regression        2  0.08858  0.04429   1.49  0.238
Residual Error   37  1.09757  0.02966
Total            39  1.18615
```

```
Source        DF   Seq SS
Avg Mkt Cap    1  0.00511
Volume         1  0.08347
```

*Unusual Observations*

```
      Avg
      Mkt    1997
Obs    Cap  (3 Yr)    Fit  SE Fit  Residual  St Resid
 31  668435  0.5300  0.9226  0.0284   -0.3926    -2.31R
 40  619793  1.0700  0.7150  0.1303    0.3550     3.15RX
```

R denotes an observation with a large standardized residual.
X denotes an observation whose X value gives it large influence.

## Regression Analysis: 1999 (5 Yr) versus Avg Mkt Cap, Volume

**The regression equation is**
**1999 (5 Yr) = 0.730 - 0.000000 Avg Mkt Cap + 0.798 Volume**

```
Predictor          Coef     SE Coef      T      P
Constant         0.7301      0.2792   2.62  0.013
Avg Mkt Cap  -0.00000004  0.00000029  -0.12  0.904
Volume          0.79760     0.09187   8.68  0.000
```

S = 0.650804   R-Sq = 68.5%   R-Sq(adj) = 66.8%

*Analysis of Variance*

```
Source          DF      SS      MS      F      P
Regression       2  34.145  17.072  40.31  0.000
Residual Error  37  15.671   0.424
Total           39  49.816
```

```
Source        DF  Seq SS
Avg Mkt Cap    1   2.221
Volume         1  31.924
```

*Unusual Observations*
```
        Avg   1999
        Mkt    (5
Obs     Cap    Yr)     Fit  SE Fit  Residual  St Resid
  7  980666  2.820   0.863   0.132     1.957      3.07R
 34  417608  3.820   1.999   0.146     1.821      2.87R
 40  619793  6.710   5.733   0.493     0.977      2.30RX
```

R denotes an observation with a large standardized residual.
X denotes an observation whose X value gives it large influence.

## Regression Analysis: 2004 (10 Yr) versus Avg Mkt Cap, Volume

**The regression equation is**
**2004 (10 Yr) = 2.58 + 0.000000 Avg Mkt Cap + 0.044 Volume**

```
Predictor          Coef     SE Coef      T      P
Constant         2.5772      0.3401   7.58  0.000
Avg Mkt Cap  0.00000001  0.00000036   0.02  0.985
Volume          0.0438      0.1119   0.39  0.698
```

S = 0.792960   R-Sq = 0.4%   R-Sq(adj) = 0.0%

*Analysis of Variance*

```
Source          DF      SS      MS      F      P
Regression       2   0.1001  0.0501   0.08  0.924
Residual Error  37  23.2651  0.6288
Total           39  23.3652
```

```
Source        DF  Seq SS
Avg Mkt Cap    1  0.0038
Volume         1  0.0963
```

*Unusual Observations*
```
        Avg   2004
        Mkt   (10
Obs     Cap    Yr)     Fit  SE Fit  Residual  St Resid
 31  668435  0.860   2.635   0.131    -1.775     -2.27R
```

```
 34  417608  5.010  2.651    0.178      2.359      3.05R
 40  619793  3.710  2.857    0.600      0.853      1.64 X
```

R denotes an observation with a large standardized residual.
X denotes an observation whose X value gives it large influence.

# Bibliography

Acharya, V. and L.H. Pedersen, 2005, "Asset Pricing with Liquidity Risk," *Journal of Financial Economics,* 77, p. 375-410

Amihud, Y. and H. Mendelson , 1986, "Asset pricing and the bid ask spread," *Journal of Financial Economics* 17, p. 223-249.

Amihud, Y. and H. Mendelson , 1991, "Liquidity, maturity and the yields on US Treasury securities," *Journal of Finance* 4, p. 1411-1425.

AXA Advisors, LLC. "Good things may come in small packages: small cap stocks." 2007, <www.axaonlinne.com/rs/axa/print/5073_print.html> (09 April 2007)

Banz, Rolf W. (1981). "The Relationship between Return and Market Value of Common Stocks," Journal of Financial Economics, 9, 3-18.

Blaustein, Peter, "The time varying liquidity premium: spectator hesitation in liquidity shocks." 2004, <www-econ.stanford.edu/academics/Honors_Theses/Theses_2004/Blaustein.pdf> (10 April 2007)

Damodaran, Aswath. Investment Philosophies: Successful Strategies and the Investors who Made Them Work. (John Wiley & Sons Canada Ltd., 2003) Chap. 9, p. 1-11.

Damodaran, Aswath. "Marketability and Value: Measuring the Illiquidity Discount," Stern School of Business, July 2005, <www.stern.nyu.edu/~adamodar/pdfiles/papers/liquidity.pdf> (05 March 2007)

Kathman, David. "Are small-cap stocks finally bouncing back?" Stock Analyst Journal. 11 December 1998, <http://news.morningstar.com/article/printArticle.asp?id=1084> (16 April 2007)

Keim, Donald, 1983, "Stock return seasonality and the size effect," *Journal of Financial Economics* 12, p.13-32

Votruba, Jason J. "Disciplined Investing Delivers Lasting Returns." Viewpoint:UMB, 2006, <www.umbscoutfunds.com/docs/cmsdocs/UMB006974.pdf> (10 April 2007)