

Basic Principles of Computerized Investment Analysis Part 2

By

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Computerized investing takes advantage of the power of modern computers to enable investors to make good investment decisions. However, the results of computerized investing are only as good as the programs that are used and the data that they analyze. Computers are useful for the following tasks:

1. keeping track of holdings, expenses, profits and losses, and other similar bookkeeping tasks
2. finding and storing information related to current and potential investments
3. predicting the future performance of your current and potential individual investments
4. portfolio optimization based on the results of expected performance of individual investments
5. making specific buy and sell decisions based on the above

Of these, task 3, predicting the future performance of an investment, is the most controversial and difficult (some would say impossible). This series of two classes will cover methods by which this problem can be approached with the aid of computers. We will also look at the results that have been achieved with these methods and to what degree they can be relied upon.

The extent to which individual investors are willing and able to take advantage of computers for these tasks depends not only on the degree of computer literacy of the individual involved, but more importantly on the personality of that investor. Therefore the necessary attitudes to adopt in order to use computerized analysis will also be discussed.

- **Investment analysis is about predicting future returns of an investment.**
- **Investment analysis is about predicting future risk in an investment.**
- **Computers can only analyze data that can be quantified.**
- **Data that cannot be quantified is often more important than data that can.**
- **Accuracy of the input data is often more important than the method used to analyze it.**
- **The main advantages of computers are to allow one to:**
 - **acquire, format and do preliminary screening of large amounts of data and**
 - **enforce unemotional adherence to a tested strategy.**

The objective of all investment analysis, computerized or not, is to predict the future returns and risks of a particular investment. In this case, an investment is defined as something that can be purchased or sold which is capable of generating positive net returns for the owner. This is a rather broad definition of the word “investment” that includes both categories of incoming-producing things: those which can produce income merely by owning them (e.g. – CD’s, stocks) and those which require additional labor or cash to produce a profit (e. g. – a milling machine, or a house with net negative cash flow).

Predicting the future is always risky, and a prediction of the future without at least some idea of the probability that the prediction is correct is absolutely useless for investment purposes. In fact, in order to be useful, the probability must be explicitly stated in a quantitative way. This is one place where computers can help.

Unfortunately for computerized analysis, many of the most important data that determine the future performance of investments are not easy to quantify. Also, it can be difficult to obtain accurate data, even when available. One of the problems with computerized screens is that sometimes data entry errors are made that can make the screen results invalid. A greater problem is that the data that is available necessarily relates to an investment’s performance in the past, not in the future – thus the universal warning to investors that “past performance does not necessarily reflect future results.” Luckily, this is true for everyone in the market, so at least the playing field is level.

Computerized investing has two main advantages:

First, computers can screen thousands of stocks in seconds, allowing individuals to find the investments that best meet their objectives without depending on their broker’s research staff. Because even large brokerage houses concentrate on a relatively small number of investments which are approved for recommendation to clients, this potentially allows individuals to do a better job than the broker in building a portfolio designed for their needs. Second, because computers are quantitative devices, they force investors to quantify both their investment goals and their assessments of specific investments. This is important because it can dramatically reduce the effects of the two most important reasons for market losses – fear and greed.

- **Technical Analysis**
 - **Analysis of price and volume trends.**
 - **This tries to predict future performance that is related to investor psychology.**
- **Fundamental Analysis**
 - **Adds analysis of news, company financial and business information such as quarterly and annual reports, economic data, etc.**
 - **This tries to predict the effect of changes in business conditions on future performance**
- **Portfolio Balancing**
 - **Given that individual investments have been analyzed, the performance of a portfolio can (within limits) be tailored to the requirements of an individual by selecting an appropriate mix of securities.**

The value and returns of investments change for two basic reasons. Short term changes in value are mostly caused by changes in investor perception of the desirability of an investment. Long-term changes are mostly caused by real changes in the earning power of the business represented by the investment. An examples of the former is the bandwagon effect as a result of panic or greed (Stocks are risky! Get out of stocks!). An example of the latter is a specific business development affecting the probable future of a company (Recent headline: “Graham Corporation Awarded \$3.7 Million U.S. Oil Refinery Order”).

Some investors prefer to use technical analysis, which tries to predict investor psychology by watching price and volume fluctuations and other indicators of past investor sentiment. They believe that certain patterns in past investor behavior are useful in predicting future behavior and thus price changes caused by investor sentiment changes. Others prefer fundamental analysis which looks at financial figures such as sales, earnings and other concrete measures of business health to predict price changes based on actual changes in the business fortunes of the company. Interestingly, until recently, most investors concentrated on one or the other of these methods, and mostly ignored the other. That has changed with the advent of computerized quant investing. “Quant” is short for “quantitative.”

Portfolio balancing is not the subject of this talk, but is mentioned for completeness. The optimum method of investing rarely if ever involves making just one investment. That is mostly because unforeseen things can happen to any one investment. Thus having at least ten investments with approximately equal dollars in each means that if something goes badly wrong with one, the loss is limited to ten percent. Portfolios are for downside protection.

- **THE HUMAN MAKES THE DECISIONS**
 - **FINAL SECURITY SELECTION AFTER SCREENING**
 - **SUBJECTIVE FACTORS (FUNDAMENTAL ANALYSIS)**
 - **SUBJECTIVE INTERPRETATION OF QUANTITATIVE FACTORS (TECHNICAL ANALYSIS)**
- **THE COMPUTER MAKES THE DECISIONS**
 - **SCREENING**
 - **“QUANT” INVESTING**
 - **AUTOMATED TRADING (NOT A GOOD IDEA IN MY OPINION!)**
- **WE WILL LOOK AT WAYS TO IMPLEMENT BOTH TYPES**

Computers can be used either to find and display information so that humans can make the decisions, or to make the decisions automatically according to specific mathematical formulas. Generally, humans are better at making the final buy/sell decisions, and computers are better at sifting through large numbers of possibilities to make preliminary decisions as to which possibilities are worth the time of the human. Think of your computer as your research staff, but the boss gives the staff their marching orders, and the boss makes the final decision.

- **THEY LET *YOU* TELL THE COMPUTER WHAT TO DO**
 - **THE DISPLAYS YOU WANT**
 - **THE DATA YOU WANT**
 - **FROM THE SOURCES YOU WANT**
 - **WHEN YOU WANT IT**

- **DIRECTLY FROM WEB PAGES**
 - ANY WEB PAGE WITH TABLES
 - TYPE IT IN YOURSELF
 - USEFUL FOR EVALUATING SPECIFIC INVESTMENT IDEAS BUT NOT FOR SCREENING
- **FREE DOWNLOADS FROM THE INTERNET**
 - YAHOO HISTORICAL QUOTES – PRICE AND VOLUME ONLY
 - EDGAR – ALL SEC SUBMISSIONS SINCE 1995
 - FRED – A COLLECTION OF ECONOMIC DATA
 - MANY OTHER SITES BOTH FREE AND FOR A FEE
- **SUBSCRIPTION DATABASES**
 - AAII STOCK INVESTOR PRO USED AS A DATABASE
 - NUMEROUS OTHERS
 - WARNING! MANY OF THESE REQUIRE YOU TO USE THEIR SOFTWARE. THE DATA IS ENCRYPTED.

This subject is directly addressed only on this slide. However, all of the above sources will be used in the example spreadsheets.



DATA SOURCES FOR THE EXAMPLE

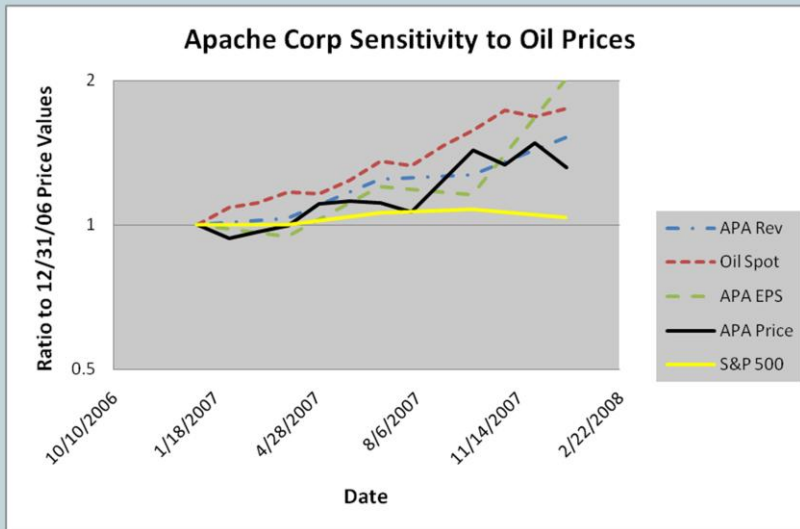


Date	APA Rev	Revenues	APA EPS	APA EPS	APA Price	APA Price	S&P 500	S&P 500
12/31/2007	1.52404616	\$2,996.29	2.012422	\$3.24	1.6291572	\$107.28	1.035296	\$1,468.36
9/30/2007	1.27089384	\$2,498.59	1.15528	\$1.86	1.3621868	\$89.70	1.076465	\$1,526.75
6/30/2007	1.2431422	\$2,444.03	1.198758	\$1.93	1.2320425	\$81.13	1.059966	\$1,503.35
3/31/2007	1.02902325	\$2,023.07	0.944099	\$1.52	1.0654518	\$70.16	1.001805	\$1,420.86
12/31/2006	1	\$1,966.01	1	\$1.61	1	\$65.85	1	\$1,418.30

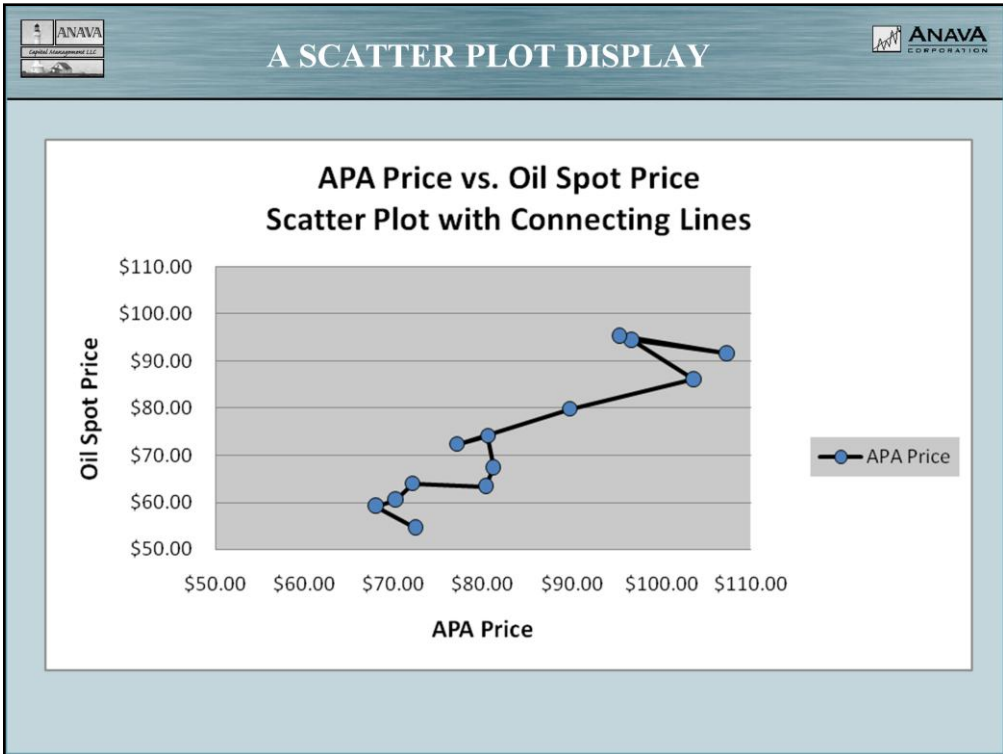
Date	Oil Spot	Oil Spot	APA Price	APA Price
2007-01-01	1	\$54.57	1	\$72.41
2007-02-01	1.08594466	\$59.26	0.93813	\$67.93
2007-03-01	1.10976727	\$60.56	0.968927	\$70.16
2007-04-01	1.17225582	\$63.97	0.995581	\$72.09
2007-05-01	1.16291002	\$63.46	1.108825	\$80.29
2007-06-01	1.23657687	\$67.48	1.120425	\$81.13
2007-07-01	1.35935496	\$74.18	1.112001	\$80.52
2007-08-01	1.32655305	\$72.39	1.064356	\$77.07
2007-09-01	1.46472421	\$79.93	1.238779	\$89.70
2007-10-01	1.5796225	\$86.20	1.430189	\$103.56
2007-11-01	1.73391974	\$94.62	1.333517	\$96.56
2007-12-01	1.68096023	\$91.73	1.481563	\$107.28
2008-01-01	1.75076216	\$95.54	1.315702	\$95.27

Data came from a Google Finance web page, FRED west Texas medium crude spot prices, and Yahoo Finance historical quotes.

This data can be easily downloaded to most any spreadsheet. We'll demonstrate the method using Microsoft Excel 2007.

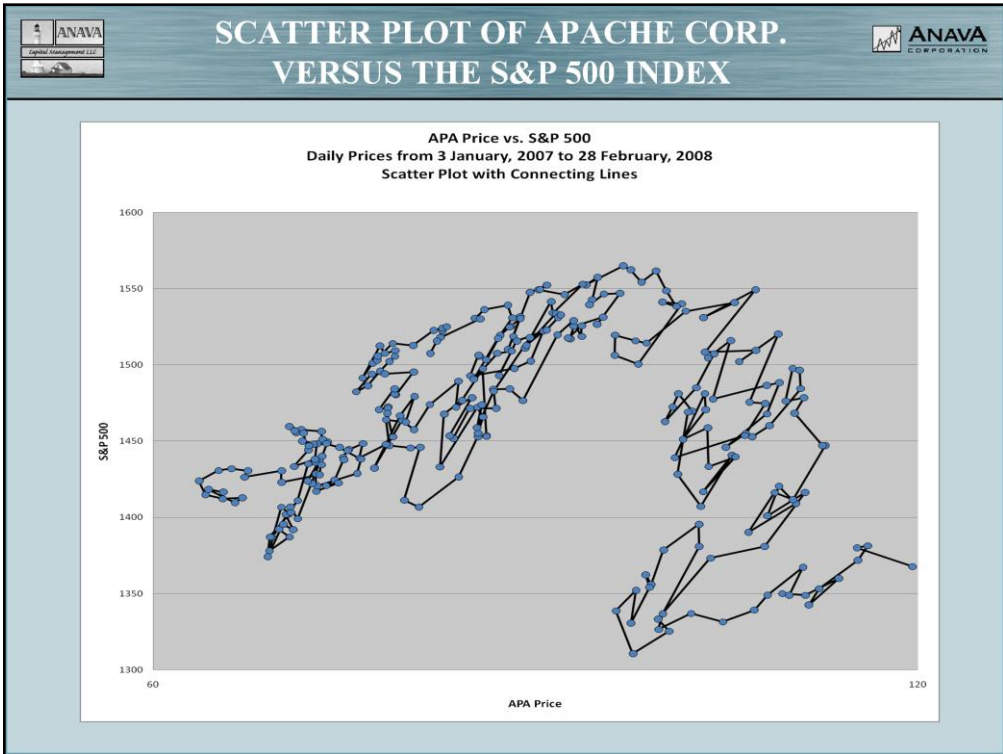


Here's a conventional graph comparing the price of the stock of a mid-sized independent oil producer with holdings in politically safe locations. It shows Apache's price over the last year compared to several other relevant parameters. As can be seen, the stock price has outperformed the S&P, but underperformed oil prices. The short-term price fluctuations seem to be greater than, and to happen before changes in the earnings per share and the revenues. The earnings track the revenues but fluctuate more, and dropped on two occasions when revenues were increasing more slowly. What are some possible explanations for these things and what do they mean for Apache as a possible future investment?



This uses 13 monthly values of west Texas crude spot prices and APA stock price per share plotted against each other. The lines connect successive values in time. Lines slanting up and to the right (or down and to the left) show prices moving together. Lines slanting up and to the left (or down and to the right) show the prices moving in opposite directions. The plot shows a long-term correlation between the two variables, but some short-term changes of 10% or so where APA and oil went in opposite directions. There is one period where oil went up about 15% while APA remained static.

Of course, the same information can be seen in a conventional graph, but it is easier to estimate the frequency and magnitude of the variations from the “normal” situation where oil company stocks follow oil prices.



Scatter plots like these can be much more useful in determining the relationship between two numbers than any statistical analysis. They contain a wealth of detailed information on actual past behavior than the calculation of any statistical numbers such as the mean and standard deviation. In cases where there are many data points, they are one of the best ways to show not only the magnitude of the returns and risks, but the times and ways in which they occur.



SCREENING WITH SPREADSHEETS



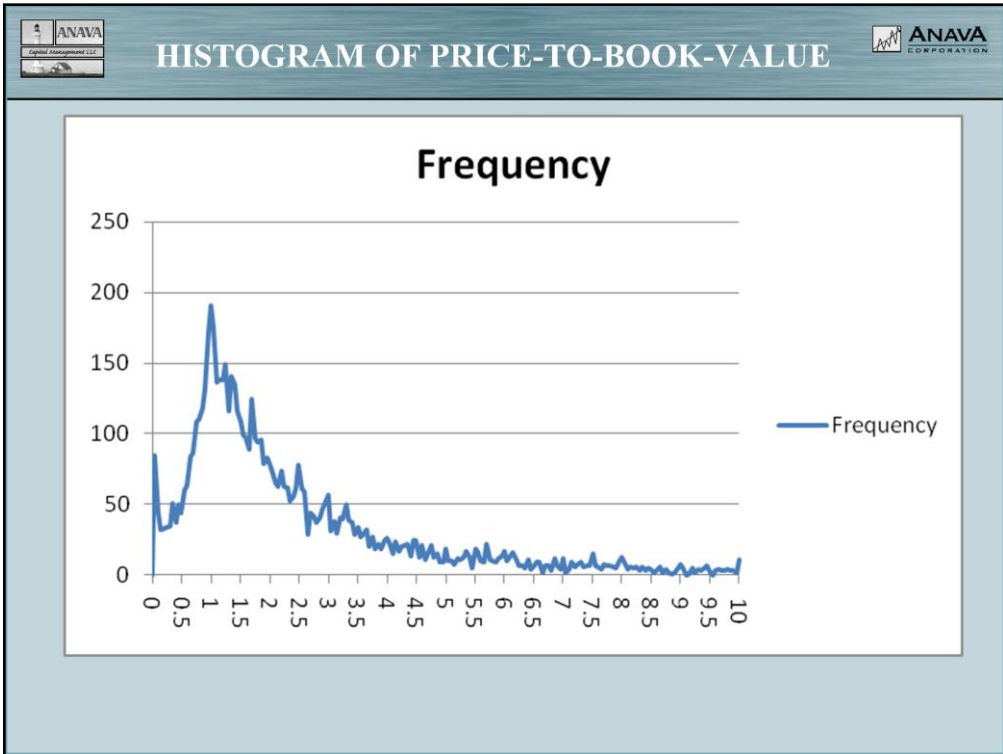
- **DATA SOURCE**
 - **SI PRO FEBRUARY 22, 2008 DATABASE**
 - **DIRECT TABLE CONNECTIONS**
- **MOTIVATION**
 - **SCREENING REQUIRES HISTORICAL DATA FOR MANY SECURITIES**
 - **WE WANT TO DO FUNDAMENTAL SCREENS**
 - **WE WANT TO DO THINGS THAT ARE DIFFICULT WITH THE SI PRO SOFTWARE**
 - **WE WANT MORE FLEXIBILITY THAN ON-LINE SCREENING PROVIDES**

The SI Pro databases are unencrypted, and are easily accessed with most any Microsoft Office product, as well as products from other manufacturers. SI Pro uses a Visual FoxPro free table format database. It is compatible with Excel.

ticker	pbvps	mktcap	eps_12m	price
ADTN	3.6	1440.5	1.09	21.71
SMLC	2.53	319.8	0.3	12.61
ATTY	0.13	0.3	-1.54	0.3
FLWS	2.76	546.8	0.29	8.68
HMSLQ		0.5	-1.44	0.03
FCEN	1.97	98.1	1.71	20.1
FCCY	1.47	58.2	1.54	15.54
FIFG	0.47	19.5	0.48	9.76
FNRG		1.2	0	0.02
SRCE	0.98	415.5	1.34	17.19
TWIC		0.1	-0.02	0
TTY.U		86	-0.01	8.19
TCHC	1.34	110.4	1.18	13.49
TCCC	0.05	0.1	-0.04	0.02
COMS	1.61	1804.5	-0.32	4.55
TDSC	3.35	347.1	-0.73	15.67
TDFXQ		12.3	-9.65	0.31
THDOQ		0	-3.34	0
THDS		0.1	-2.35	0.02
MMM	5.54	60688.7	6.1	85.09
SSRX	2.47	316.3	0.49	14.56

LET'S FIND STOCKS WITH A PRICE-TO-BOOK-VALUE THAT IS LOW, BUT NOT TOO LOW.

Here is part of a data table imported directly into Excel from the SI Pro database. It contains the book value per share, market cap, earnings per share for the preceding 12 months, and the current price for 9037 securities traded on US exchanges. This type of data allows Excel to be used as a powerful screening program.



Looks like anything below about 1 is suspicious, so a reasonable value to screen for might be between 1 and 1.5. SI Pro says there are about 1300 of these companies. You might also want to look at those between 0.25 and 0.5 (219), and those between 0 and 0.25 (172) to see what is different about them that makes them worth less than book value.

- **The lowest price group (less than 0.25) are either rapidly going out of business or bankrupt.**
- **The next lowest group (0.25 to 0.5) are mostly reasonable companies in out-of-favor industries – for example airlines, tech, and financial. Generally they are still solvent and might be good investments**
- **The highest group (1 to 1.5) tend to be solidly profitable companies in out-of-favor industries, and could include some good bargains.**
- **The use of the spreadsheet's histogram made the setting of the threshold for the screen very easy.**