PICK SIX STOCKS

Team #077

Summary

The stock market has always been thought of as rather untamable, challenging enterprising individuals to turn a profit. Over the years, many different methods have been tested, each with its strengths and weaknesses. Many investors consciously omit certain factors that other investors may desire to use in determining the strength of a stock. Thus each stock needs to be examined in its own right and as part as the overall stock market to evaluate the potential for profit for each stock.

Presented with $30,000 to invest and six spots in a portfolio, the group was required to select six out of the eighteen given stocks that would turn the biggest profit over the course of a year. First approaching each individual company from a qualitative perspective using the five given factors, we categorized each corporation as either "high risk," "medium risk," or "low risk." A JAVA model was used to calculate the best pair of each risk group, as well as the amount of money to be invested in each corporation. The conclusion derived from the program was to invest in three major corporations that the program considered the best, one from each risk group, and, in case of negative market fluctuations, to invest a minor portion of the $30,000 into three corporations as a buffer.

Using the discounted cash flow would greatly improve the accuracy of the predictions and investments made, as it provides a prediction of the future, instead of more analysis of the past.

To test the model developed, the JAVA program can be made to run through many years of the past, and observations can be recorded about the accuracy of its predictions in both short- and long-term investments.

Assumptions

1. In the course of the next fiscal year, the market will be generally rising.
2. All provided data are not subject to financial fraud and therefore accurately represent the status of the company.
3. All eighteen corporations do not practice corporate manipulation, such as slush fund accounting.
4. The market will behave relatively normally, without unreasonably sharp increases or decreases.
5. Inflation will not create any exaggerated effects on the market.

Overview

Given the fluctuation of the economy, trading should only be undertaken after extensive research and serious consideration. Investors have a choice between short-term purchases or long-term investments. This portfolio of up to six stocks, a short-term purchase, will be held for only a year. The stocks for this portfolio will be chosen to maximize profit, which is based on a model that incorporates indicators of stock quality and volatility. By performing fundamental analysis, or the examination of a business's overall health, management, and competition, this portfolio will maximize profit earned during the given year.

Current Philosophies of Investing

Before developing a new portfolio, it is beneficial to study the different philosophies of investment currently used. The following describe each method of investing along with the pros and cons of utilizing it.

Value investors generally purchase stocks that are appear under-priced by fundamental analysis in hopes that they will rise eventually. Value investing is based upon the idea that these stocks have hit rock bottom and cannot lose any more value. However, there is always the possibility that a stock will not rise and the investor will take a loss. This problem is especially important because the given time span of our portfolio is only one year. Alternately, if one buys at a trough and sells at a peak, there is a potential for maximized earnings.

The "Buy and Hold" investment philosophy involves buying stocks and holding on to them as a long-term investment. Buy and hold investors believe that as time progresses, any company of any quality will eventually reach a peak because of the fluctuating nature of the stock market. More selective buy and hold investors select only businesses that they deem "good," which is determined after careful critique and fundamental analysis of businesses. Many people choose to buy and hold because of the lack of time needed to labor over a portfolio. On the other hand, because one cannot predict the market into even next week, predicting the market for years ahead is even more unreasonable. It is always possible that the bottom will drop out of the market. Many buy and hold investors only sell their stock when they need cash. However, this is

dangerous, as the market has a big chance of being low when they feel the need to sell their shares. The buy and hold method is not applicable to this portfolio, as it is a long-term investment plan.

Contrarian investors believe in a pessimistic outlook on the stock market. They believe that the market fluctuates in relation to people's outlook on the market. While widespread optimism will lead to lows in trading prices, pessimism will drive a stock to a higher price. Contrarian investors do not take the market as a whole into account, believing that a stock's success is independent of other stocks. Rather, they use fundamental analysis for individual stocks, ignoring overall trends in the market. Successful contrarian investment is difficult because weak fundamental analysis paired with ignorance of the normal market can lead to unwise decisions.

Fundamental analysis is an integral part in each investment philosophy. The following are factors that investors take into account as indicator of both stock quality and volatility.

Indicating factors

Cash flow refers to the amounts of cash received or spent by a business over a defined period of time. There are three classifications of cash flow: operational cash flow, investment cash flow, and financing cash flow. Operational cash flow includes the cash expenditures and money received due to core business activities and services rendered. Investment cash flow includes the cash expenditures and money received due to a business's investments, acquisitions, or capital expenditure. Financing cash flow includes the cash expended and received from financial activities, such as the payment or reception of loans, the issuing or repurchasing of stock, and the payment of dividends. The cash flow statement is useful for determining the short-term sustainability of a company. If cash flow is positive, a company is often deemed healthy in the short-term because this is an indication of increasing cash, which is needed for a company to remain solvent.

The price-to-earnings ratio (P/E ratio) is a number that represents how much money one pays for each dollar of earnings. It also shows how long it will take to earn back the original investment. Between 1900 and 2005, the average P/E ratio was fourteen. A higher value shows more earning growth, whereas a lower value denotes fewer earnings. An extraordinarily high P/E, one that is over one hundred, merely means that the stock is overvalued. The following is a general guideline used for considering the P/E ratio.

N/A	The ratio cannot be determined if the company doesn't have any earnings.
0-10	The stock is either undervalued or in decline
10-17	A desirable range
17-25	The stock is overvalued or earnings have decreased
25+	The company has an extraordinarily good outlook, or subject to speculation

Return on Invested Capital (ROIC) is the ratio of net income to invested capital. Net income is the money a company earns after taxes and expenses are deducted. Invested capital represents the total cash investments that debtholders and shareholders have invested in the company, and can be calculated by subtracting cash and equivalents and non-interest-bearing current liabilities (NIBCLs) from the company's total assets. ROIC is a lagging indicator, which means that it indicates how a company has done in the past, and so it does not necessarily hold any implications for the future. For a company to earn money, the ROIC must be greater than their cost of capital.

The Price-to-Sales ratio (P/S ratio) is the ratio of the price per share of stock to the revenue per share of stock. It is normally used as an alternative for the P/E ratio. When a company does not have an earning, the P/S ratio can be used because it uses the revenue of the company. Thus, the ratio is often used for unprofitable companies, while the P/E ratio is used for more lucrative enterprises. A company that has a low ratio, usually around one, is believed to be a better investment, since it reflects more sales for every dollar that is invested in the company. It normally represents a higher productivity of the company. However, high P/S ratios can also indicate rapid growth of a company. As stated before, the P/S is handy with start-ups, small cap companies, and unprofitable firms, as the P/S ratio can be used to determine how a company is faring relative to its competitors.

The beta (ß) coefficient denotes the volatility of the stock; the higher the beta coefficient, the more the stock price moves. For values where ß > 1, the stock prices moves more than the overall market, whereas for values where ß < 1, the stock prices move less than the overall market. Stocks with large ß are considered risks because even though their prices shoot up as the market rises, they have the potential of dropping drastically as well. Stocks with very small ß are usually bought only because they are very stable. However, it is difficult to earn large amounts of money. On the other hand, it is unlikely that a considerable amount of money would be lost either. The ß coefficient does not predict whether or not a stock price will rise or fall, but it only determines the deviation between a stock price and the overall market.

Even though these figures can provide a guide to predicting how a stock will behave, it is important to remember that there are many other intangible factors, and, in the stock market, nothing is completely certain. There are often underlying factors that are not considered. In addition, values for these indicators may not be what are normally associated with such a value. For example, in general, a high free cash flow is desirable. However, if a company makes long-term investments, there is a sharp decrease in its investment cash flow, resulting in a decrease in free cash flow. However, in the long run, the stock for this company may be much more valuable than expected. In the stock market, there are on guarantees, and all predictions are mathematical gambles, based on properties of probability and the indicators listed above.

While the five factors included in this fundamental analysis are evaluations of the past, it would be beneficial to include a factor that would possibly predict the future behavior of a company. The discounted cash flow (DCF), a leading indicator, is the amount of money that one would pay today for the anticipated cash flow of the future. Essentially, a DCF is the money of the future converted into the cash of the present. The discounted cash flow includes the risk premium,

which is an insurance in case that the cash disappears and there is no cash flow in the future. A factor such as the discounted cash flow is useful, as it helps to predict the future instead of only working off of the past.

The DCF is calculated in relation to the future value (FV) formula:

$$FV = PV(1+i)^n.$$

DPF, or discounted present value, is calculated as follows:

$$DPF = (FV/(1+d)^n),$$

where d is the discount rate, i is the time value of money, and n is the number of discounting periods, which is the period in which the future cash flow occurs. If the cash flow happens instantly, $n = 0$, rendering the expression as an identity $DPV = FV$.

It is important to diversify one's portfolio. In addition to simply meaning to invest in different stocks, it is important to invest in different types of stocks. Because every stock has a chance, however small, of dropping, investing in only one stock is extremely risky. The set of eighteen stocks can be split up into three different risk levels based on their beta coefficients, ROIC, and cash flow. To ensure stability of the portfolio, 50% of the total allotted money will be put in the predetermined "stable" stocks, while 35% will be put into "partially risky" stocks, and 15% into "very risky" stocks. Because of the rising nature of the stock market, the stable stocks will be expected to rise as well, earning money. The profit from these stocks should counteract any loss generated by the riskier investments. The partially risky stocks will have 35% of the capital as they contain a better possibility of exponential growth. Finally, because there is always the chance of a decline, the extremely risky stocks will contain only 15% of the invested money. These can generate either a big profit or a big loss. As investing is always a gamble, one should indulge in cautious risks. After classifying the stock options into these three categories, two stocks were purchased for each division. This span represents safe growth, faster growth, and the possibility of exponential growth or fast loss.

Risk Group	Percentage	Money Allotted
Low	50%	$15000
Medium	35%	$10500
High	15%	$4500

The model used to determine the two stocks that belong in each risk classification was implemented in a JAVA computer program that used the 2003–2004 statistics for these stocks. The margin of profit will be compared and the two most profitable stocks will be determined. The 2003–2004 year was chosen because the stock market generally rose steadily that year, which is assumed for this portfolio. The behavior of the corporations focused on during periods of steady growth is seen through this time period of 2003–2004, and a similar behavior is expected of the present.

Investment choices were based on the level of risk for each company. We looked at the 5-year graph of each company's trends. We then examined the category price per share and compared that to the company's particular cash flow. We found the net profit from 2003–2004 for each company from an online database. During this time period, the market was generally expanding. As such, these data mirror the context of the given problem. Next, we also used Return on Invested Capital (ROIC) and the P/E and P/S values. A higher risk would involve consistent fluctuations in the 5-year graphs. A low cash flow compared to a high price per share, a low ROIC and net profit, particularly negative values, and high P/E and P/S values denote high risk. Low risk would involve either a steady rise or a plateau in the graph for the stocks. A high cash flow compared to price per share, a high ROIC and net profit, and low P/E, P/S, and β values, preferable as close to one as possible. A medium risk would involve a mix of high and low risk characteristics, such as a fluctuating graph coupled with a low beta value.

To determine the level of risk, we looked at past stock trends for each:

1. ADBE
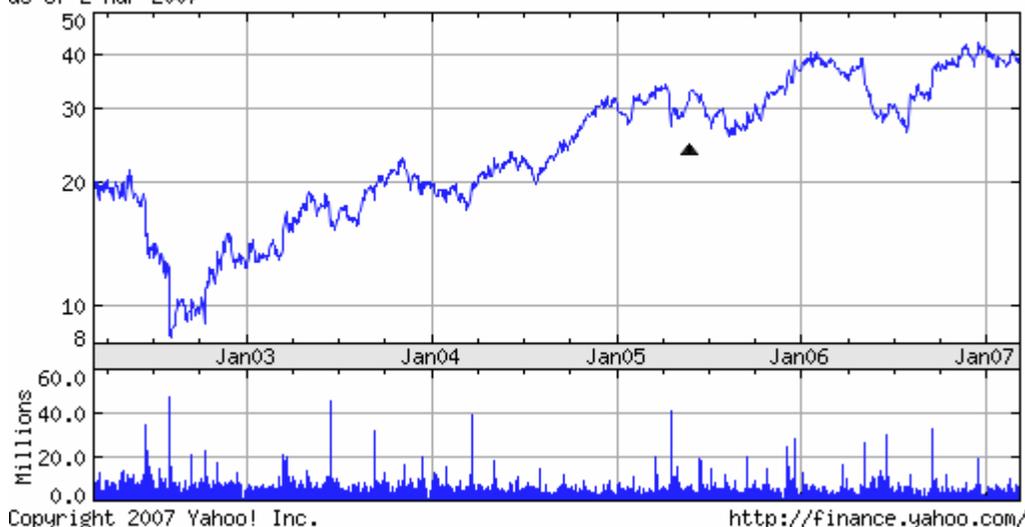
We can see that Adobe Systems Incorporated (ADBE) is on a steady rise after its peak around 2000 in this 5-year chart. ADBE is also a reliable company that we can expect to continue rising. More recently, the stock value of ADBE has stabilized. Its   value indicates that ADBE will increase with the market, but will not plummet significantly if the market falls. The free cash flow of ADBE is decently high for its share price, 1.38. At 10.16%, its ROIC is also very high, meaning we can expect a high net income for the money invested. Thus, we feel that this would be a low-risk investment option.

2. ADVS

From the graph for Advent Software Incorporated (ADVS), we can observe a recovery after its fall from the peak in 2002, with a steady rise thereafter. However, it also has a low free cash flow for its price of share, 0.87. The P/E value is much higher than those of the other companies, the highest one in fact, and its net profit was -67.8% (2003). Furthermore, since it has a relatively high   value of 2.38, we feel this security can be best classified as a medium-risk investment.

3. BMC

BMC Software Incorporated (BMC) has experienced quite a lot of fluctuating stock prices over the years, but recently, it has steadily increased without much ado. BMC has a high ROIC of 19.23% and an evenhanded P/E ratio of 22.59 so that it is fairly reliable. However, its

stock price of $29.96 is somewhat high compared to its free cash flow of $1.58, and it has a moderate   value of 1.61 which could prove risky, so we have determined it to be a medium-risk investment.

4. CAI

CACI International Incorporated (CAI) has some interesting stock characteristics. Though its shares are highly priced at $46.41 per, it has a very high (highest of these eighteen, in fact) cash flow value of $3.92/share. Also, its   value is 0.70, which makes it a low-risk investment were we to invest money in CAI. Its P/E ratio is relatively low at 18.58%, but CAI has a low ROIC of 7.48. All in all, we have categorized CAI as a low-risk investment.

5. CDNS

After its fall from the peak at 2002, Cadence Design Systems Incorporated (CDNS) has experienced gradual fluctuations, though an overall increase in stock price. CDNS has a low ROIC of 5.98% but a much higher P/E ratio of 19.06. Though its high   value of 2.25 indicates that it will rise and fall exaggeratedly with the market, its low current price of $19.65 and its relatively high free cash flow of $1.10 tell us that we will likely make a profit on investments in CDNS. Thus, we have decided to stamp CDNS a medium-risk company.

6. CTXS

After almost hitting rock bottom in 2002, Citrix Systems (CTXS) has experienced a bumpy rise, and appears to have reached a plateau. CTXS has a good cash flow, 1.37, for its price per share, 31.26. It also has a decently high ROIC of 14.16%, so we can expect a net income. Over the period of steady growth in the market from 2003–2004, CTXS has experienced a 17.8% net profit. It has a reasonable P/E ratio of 24.00, and an average value for P/S at 5.49. Its β value is altogether too high, at 2.49, leaving it at the mercy of the market. Therefore, CTXS has been demarked a high-risk option.

7. COGN

COGNOS INC   Splits:▼
as of 2-Mar-2007
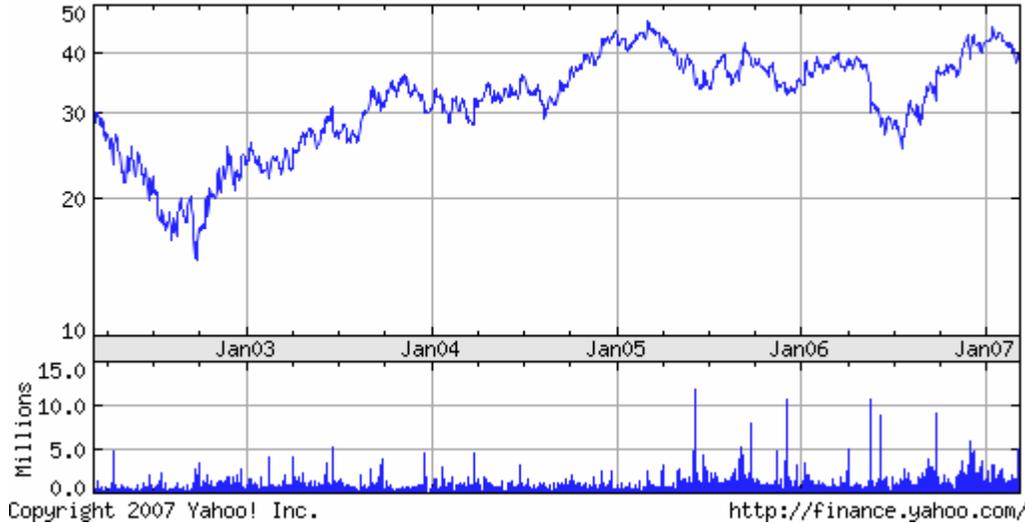
After a fallback from the peak period, from approximately 2003 on, Cognos Incorporated (COGN) has seen a steady rise in stock. Though COGN has a high price per share, it also has a high free cash flow of 2.03. Its ROIC is decently high, at 13.37%, so we can expect a net income. The P/E value is relatively low, at 21.46, and so is the P/S value, which is 3.72. During the period of steady growth from 2003–2004, COGN experienced a pretty good growth, of 13.3% net profit. The β value is also 1.59, so it will not experience too great a fall if the market drops. COGN would appear to be a low-risk investment.

8. INFY

INFOSYS TECH LTD   Splits:▼
as of 2-Mar-2007

From the graph over the 5-year growth after the peak period, Infosys Tech Ltd. (INFY) has experienced high fluctuations, almost hitting rock bottom during 2003, but rising steadily from there on. INFY has a very high price per share, 53.10, which also happens to be the highest one of the eighteen. Coupled with that, INFY also has a very low cash flow of 0.78. Its ROIC also happens to be the highest on the list, at 38.41, but its P/E and P/S are also very high, at 37.48, and 10.92 respectively. During the period of steady growth from 2003–2004, it experienced a growth as well, having a net profit of 25.9%. Thus, with its value of 1.30, it will be affected by the market, but it won't fall considerably with a drop in the market. Overall, INFY would be a high-risk investment, however.

9. MSCS

MSC SOFTWARE CORP
as of 2-Mar-2007
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After its peak, MSC Software Corp (MSCS) has seen a steady rise, but some fluctuation, and it appears to have already hit a peak, and is on a downward trend. It has too low of a free cash flow, the lowest on the whole list, at 0.10, as well as its ROIC, which is also only a 2.53%. Though its P/E is reasonable, 25.98, its P/S value is very low, 2.17. Also, during a period of steady growth overall for the market, MSCS was experiencing a net loss of 16.3%. Overall, MSCS would be a high-risk option.

10. MFE

MCAFEE   Splits:▼
as of 2-Mar-2007

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We can see from the graph for McAfee (MFE) over the 5-year period from 2002 to 2007 that there are consistent fluctuations despite a definite rise. McAfee does have a very high cash flow, 2.02, for its price per share, which is 29.98. It also has a decently high ROIC, 10.56%. Its P/E value is relatively average, 24.24; its P/S value is pretty low, 4.94. Its net profit was also relatively high during the steady growth in the market from 2003–2004, at 12.3%. However, its β value is extremely high, 2.30, so it would be affected greatly by the market, whether it rises or falls. McAfee would be a medium-risk investment.

11. MSFT

MICROSOFT CORP   Splits:▼
as of 2-Mar-2007

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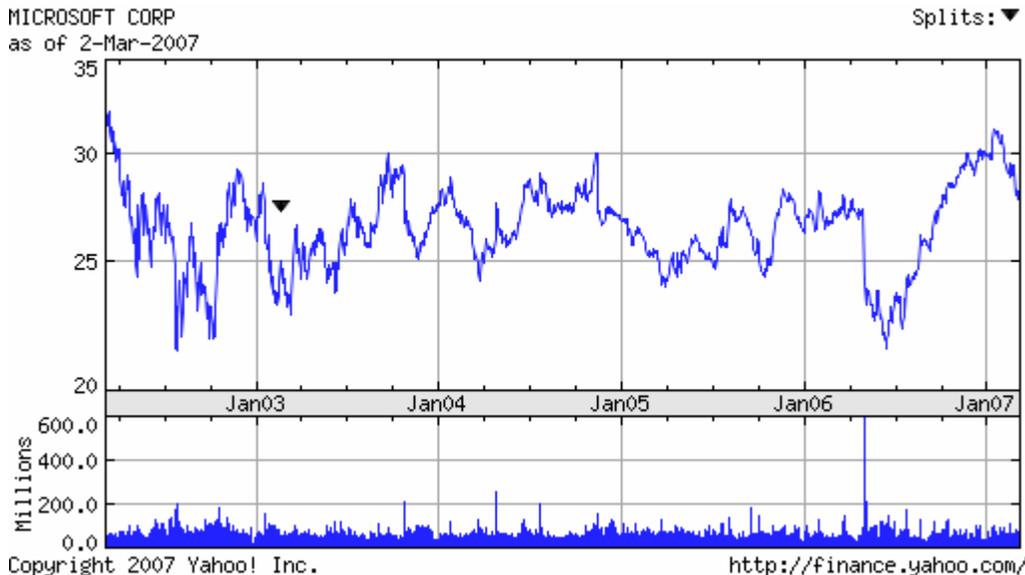
From the 5-year graph for Microsoft Corporations (MSFT), we can observe that, after hitting its peak, from 2002 onwards it seems to have hit somewhat of a plateau. MSFT has a decent enough cash flow, 1.20. It has the highest ROIC of all the companies listed, at 30.76%, and one of the highest net profits at 23.4% during the period of steady growth in the market, 2003–2004. Its P/E and P/S are also reasonable low, 19.11 and 6.06 respectively. Its   value is very close to one, 1.04, so it won't experience that much change from the market and will remain extremely stable relative to it. MSFT would seem to be a low-risk option.

12. NUAN

For Nuance Communications (NUAN), we can see a definite rise, but also consistent fluctuations over the 5-year period after the peak period, from 2002 to 2007. There is also a low free cash flow value, 0.40. It has a low net profit 5.9% during 2003–2004 period when the market was experiencing a general growth, and a low P/S. Its   value is also much too high, 3.03, so it depends greatly on the market. A fall for the market would have potentially devastating results for NUAN. Overall, the risk for NUAN is extremely high.

13. ORCL

ORACLE CORP
as of 2-Mar-2007
Splits: ▼

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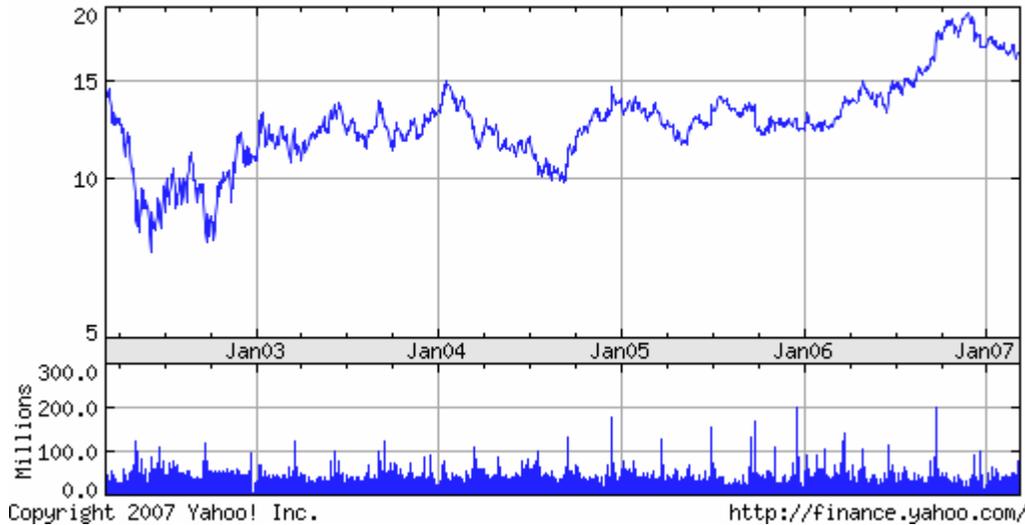
We can see a plateau for Oracle (ORCL), after a fall from the peak around 2000 on the 5-year graph. With a   value relatively close to 1, 1.27, ORCL won't be considerably affected by a drop in the market, and will be pretty much stable in that aspect. Its net profit is also very high, at 24.3%, along with an ROIC of 17.75%. It has a low P/E of 18.03. Although it does have a very low cash flow of 0.83, ORCL would be a low-risk investment.

14. QADI

QAD INC
as of 2-Mar-2007

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From the graph we are able to observe a recovery from QAD Incorporated (QADI) after the drop from its peak on 2002 on a 5-year graph. We can see the graph has a plateau already for QADI, showing stability, even though it is a relatively new company. It does have a low free

cash flow of 0.47, though, even for its price of share, which is also very low, 8.07. Its ROIC is high, at 16.88%, denoting a high net income, and it also has a low P/E, 19.55. Its P/S is also low, but this is due to a net profit of -3.4%. It may also be a little too closely connected to the market, with a   value of 2.11. Overall, QADI would be a low-risk option.

15. RHT

We can see a steady rise for Red Hat Incorporated (RHT) from 2003 on after its fall from its peak over a 5-year graph. RHT appears to be heading into another peak as well. However, it has a low free cash flow of 0.85, a net income of -7.2%, and a considerably high P/E of 61.38. Despite this, its   value of 1.80 would involve a relatively close connection with the market, but not so high as to fall significantly along with the market if it does go down. RHT would be a low-risk investment.

16. SPSS

Though we can see an overall rise for SPSS Incorporated (SPSS), its trend is far from stable, with consistent fluctuations over the whole 5-year graph, up to 2007. For its price per share of 33.50, it has a low cash flow of 1.24. It has a relatively high ROIC of 10.04%, but it has a net profit of -8.0%, which would account for its low P/S of 2.80. It does have a   value of 1.39, so it would be affected significantly by the market, although it won't drop too much with a fall in the market. SPSS has been classified as a high-risk investment.

17. SRX

Since it entered the stock market in around 2002, SRA International Incorporated (SRX) has been on a steady rise until 2007, where it appears to have peaked and started a downward

trend. It does have a decent cash flow, 1.50, for its price per share, 23.69. It also has a good ROIC of 11.76%, but it is a relatively new company, and its net profit is only 6.6%, which accounts for its low P/S value. It has a low connection to the market, having an extremely low value near zero, 0.23. Despite this, SRX is a high-risk investment.

18. SYMC
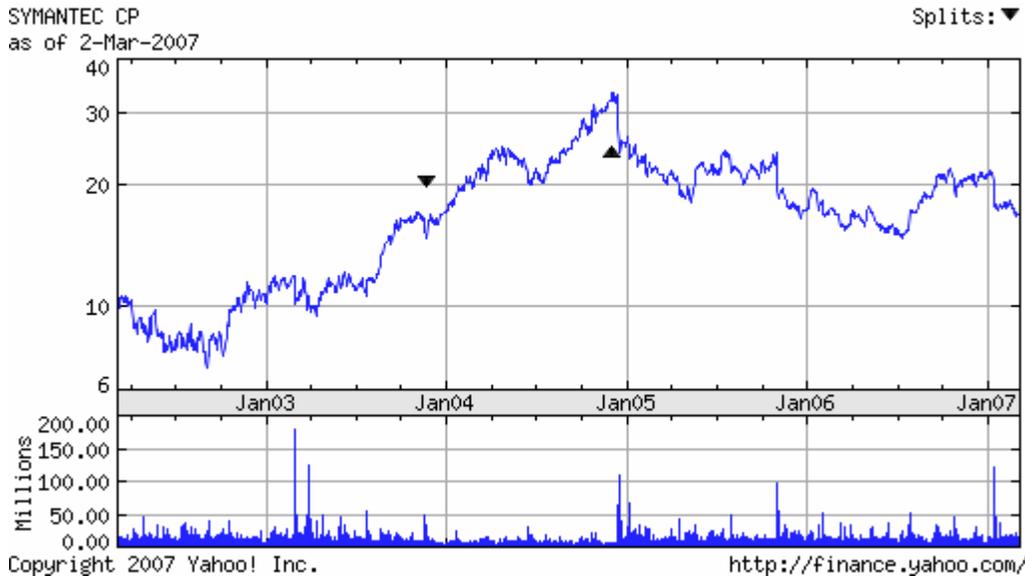
        Symantec Corporation (SYMC) has been known for its reputation as a strong security in the "tech" sector. The 5-year graph data reveals that Symantec semi-peaked towards the beginning of 2005 and has started a downward trend afterwards. It has a low share price of $16.90 and a decent cash flow value of $1.20/share, but it also has a low ROIC of 3.15%. Since the   value is only 0.56, we can be sure not to lose much should the market fall, but neither will we gain much from a rise in the market.

The JAVA application uses a brute force approach to determine the best combination of stocks for each risk group. The program selects two corporations for the risk group, and one of the two corporations is allotted $500 dollars, which is the minimum possible value of stocks for a corporation. The other corporation is given the rest of the money that the risk group is allotted. For example, in the high risk group, if corporations A and B are selected by the program, $500 of Corporation A's stock would be purchased, and $4000 of Corporation B's stock would be purchased. The program continues to calculate the profit for this purchase for the 2003–2004 year, using the net profits found on online databases. The program then increases the cash allotment of Corporation A by increments of $500, as the amount of stock purchased by Corporation B simultaneously decreases by increments of $500 because the cash allotted to each risk group remains constant. The program records which combination of cash allotments yielded the highest profit. The application repeats this for each combination of corporations in the risk groups. For example, six corporations were rated as "high-risk investments." This means that there are 15 distinct combinations of permutations, and the program runs 15 times. It finally outputs the combination that yielded the highest profit and the amount of money allotted to

purchase both. The program undergoes this process for each risk group, given the appropriate cash allotment, outputting the results through each iteration.

The output of our tests were as follows:

Stock	Amount Invested
SRX	$4000
SPSS	$500
SYMC	$10000
CDNS	$500
MSFT	$14500
ORCL	$500

Testing the Model

To test the model created, it may be beneficial to test past years and observe the data that is outputted. The result of the model can be seen through the actual statuses of the corporations afterwards.

Conclusion

From the data collected, it is clear that there are three stocks that are heavily favored, one from each risk group (SRX, SYMC, and MSFT). Knowing how the JAVA application operates, if it were possible, it would have selected only three stocks to invest in. However, the importance of spreading out investments is still present. That way, if one of our stocks experiences a decline, the others should be able to counterbalance this negative factor. The counterbalance, even if small, will still provide the buffer needed to protect against drastic losses.

After running the model, the investment method favored is investing heavily in certain corporations while maintaining buffers of reasonable size to counterbalance any loss that may occur through normal market fluctuations.

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Discounted Cash Flow

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APPENDIX A

```java
/*
This program was designed for testing how well the different stocks performed using a simulation
formula through the course of a sample year with a general steady market growth, 2003-2004.
note: Negatively profiting companies have been removed from the data
*/
import java.io.*;


public class StockEval {
  public static void main (String args[]) {
    final double[] highRiskPrices03= {12.00, 15.25/*, 9.11*/, 4.55, 10.82, 12.45};
    final double[] highRiskPrices04= {20.74, 20.69/*, 9.66*/, 5.39, 20.41, 19.24};
    final double[] medRiskPrices03= {/*14.08,*/ 18.34, 10.63, 14.85, 12.49};
    final double[] medRiskPrices04= {/*17.33,*/ 19.58, 15.63, 18.42, 21.50};
    final double[] lowRiskPrices03= {13.38, 32.88, 23.87, 23.54, 11.69/*, 3.88, 6.00*/};
    final double[] lowRiskPrices04= {18.48, 45.00, 31.24, 26.37, 13.01/*, 15.72, 18.04*/};
    final double[] highRiskBeta= {2.49, 1.3, /*1.05,*/ 3.03, 1.39, 0.26};
    final double[] medRiskBeta= {/*2.38,*/ 1.61, 2.25, 2.30, .56};
    final double[] lowRiskBeta= {1.69, 0.70, 1.59, 1.04, 1.27/*, 2.11, 1.80*/};
    final double[] highRiskCashFlow={1.37, 0.78, /*0.10,*/ 0.40, 1.24, 1.50};
    final double[] medRiskCashFlow={/*0.87,*/ 1.58, 1.10, 2.02, 1.20};
    final double[] lowRiskCashFlow={1.38, 3.92, 2.03, 1.20, 0.83/*, 0.47, 0.85*/};
    final String[] highRiskSymbol = {"CTXS","INFY",/*"MSCS",*/"NUAN","SPSS","SRX"};
    final String[] medRiskSymbol = {/*"ADVS",*/"BMC","CDNS","MFE","SYMC"};
    final String[] lowRiskSymbol = {"ADBE","CAI","COGN","MSFT","ORCL"/*,"QADI","RHT"*/};
    double maxHighRiskProfit=1, maxMedRiskProfit=1, maxLowRiskProfit=1;
    int highRisk1=0, highRisk2=0, medRisk1=0, medRisk2=0, lowRisk1=0, lowRisk2=0;
    double maxHighRiskStock1=0, maxHighRiskStock2=0;
    double maxMedRiskStock1=0, maxMedRiskStock2=0;
    double maxLowRiskStock1=0, maxLowRiskStock2=0;
    int stockCost1=0, stockCost2=0;

/*Iterates thru each permutation of pairs of High Risk Stocks calculating maximum profit for each permutation*/
    for (stockCost1=500; stockCost1<4500; stockCost1+=500){          //Iterates from $500 to 15% of $30000=$4500
      stockCost2=4500-stockCost1;
      for (int x=0; x<highRiskSymbol.length;x++){
        for (int y=0; y<highRiskSymbol.length; y++){
          if (y!=x){
            maxHighRiskProfit=profit(stockCost1, stockCost2, highRiskPrices03, highRiskPrices04, highRiskBeta, highRiskCashFlow,
x,y);
            maxHighRiskStock1=stockCost1;
            maxHighRiskStock2=stockCost2;
            highRisk1=x;
            highRisk2=y;
            System.out.println(highRiskSymbol[highRisk1]+" "+maxHighRiskStock1+"   "
                       +highRiskSymbol[highRisk2]+" "+maxHighRiskStock2+ "  \t"+maxHighRiskProfit);
          }
        }
      }
    }

    for (stockCost1=500; stockCost1<10500; stockCost1+=500){          //Iterates from $500 to 35% of $30000=$10500
      stockCost2=10500-stockCost1;
      for (int x=0; x<medRiskSymbol.length;x++){
        for (int y=0; y<medRiskSymbol.length; y++){
          if (y!=x){
            maxMedRiskProfit=profit(stockCost1, stockCost2, medRiskPrices03, medRiskPrices04, medRiskBeta, medRiskCashFlow,
x,y);
            maxMedRiskStock1=stockCost1;
            maxMedRiskStock2=stockCost2;
            medRisk1=x;
            medRisk2=y;
            System.out.println(medRiskSymbol[medRisk1]+" "+maxMedRiskStock1+"   "
                       +medRiskSymbol[medRisk2]+" "+maxMedRiskStock2+ "  \t"+maxMedRiskProfit);
          }
```

```java
      }
     }
    }

  for (stockCost1=500; stockCost1<15000; stockCost1+=500){          //Iterates from $500 to 50%  of $30000=$15000
   stockCost2=15000-stockCost1;
   for (int x=0; x<lowRiskSymbol.length;x++){
    for (int y=0; y<lowRiskSymbol.length; y++){
     if (y!=x){
       maxLowRiskProfit=profit(stockCost1, stockCost2, lowRiskPrices03, lowRiskPrices04, lowRiskBeta, lowRiskCashFlow, x,y);
       maxLowRiskStock1=stockCost1;
       maxLowRiskStock2=stockCost2;
       lowRisk1=x;
       lowRisk2=y;
       System.out.println(lowRiskSymbol[highRisk1]+" "+maxLowRiskStock1+"   "
                 +lowRiskSymbol[highRisk2]+" "+maxLowRiskStock2+ "  \t"+maxLowRiskProfit);
     }
    }
   }
  }
  System.out.println(lowRiskSymbol[lowRisk1]+" "+maxLowRiskStock1+"   "
            +lowRiskSymbol[lowRisk2]+" "+maxLowRiskStock2+'\n'
            +medRiskSymbol[medRisk1]+" "+maxMedRiskStock1+"   "
            +medRiskSymbol[medRisk2]+" "+maxMedRiskStock2+'\n'
            +highRiskSymbol[highRisk1]+" "+maxHighRiskStock1+"   "
            +highRiskSymbol[highRisk2]+" "+maxHighRiskStock2);
 }


/* Calculates "profit" margin for each stock pair provided by above loops, the profit is multiplied by cashflow and divided by beta to
give higher preference to greater stock quality and lower risk respectively.*/
  public static double profit (int stock1, int stock2, double prices03[], double prices04[], double beta[], double cashflow[], int x, int y){
    return (cashflow[x]/(beta[x]))*(stock1/prices03[x])*(prices04[x]-prices03[x])
        +(cashflow[y]/(beta[y]))*(stock2/prices03[y])*(prices04[y]-prices03[y]);
 }
}
```

Appendix B

Eighteen Computer Software/Services Corporation Stocks

Stock symbol	Price ($/share)	Cash Flow ($/share)	ROIC (%)	P / E *Forward* ($/$)	P / S ($/$)	Beta	Risk Group
ADBE	38.66	1.38	10.16	29.74	9.33	1.69	Low
ADVS	34.88	0.87	5.00	74.35	5.88	2.38	Medium
BMC	29.96	1.58	19.23	22.59	4.08	1.61	Medium
CAI	46.41	3.92	07.48	18.58	0.79	0.70	Low
CDNS	19.65	1.10	05.98	19.06	4.21	2.25	Medium
CTXS	31.26	1.37	14.16	24.00	5.49	2.49	High
COGN	39.78	2.03	13.37	21.46	3.72	1.59	Low
INFY	53.10	0.78	38.41	37.48	10.92	1.30	High
MSCS	12.54	0.10	02.53	25.98	2.17	1.05	High
MFE	29.98	2.02	10.56	24.24	4.94	2.30	Medium
MSFT	27.76	1.20	30.76	19.11	6.06	1.04	Low
NUAN	13.97	0.40	-02.07	37.08	5.35	3.03	High
ORCL	16.71	0.83	17.75	18.03	5.52	1.27	Low
QADI	8.07	0.47	16.88	19.55	1.18	2.11	Low
RHT	22.01	0.85	05.58	61.38	13.54	1.80	Low
SPSS	33.50	1.24	10.04	26.80	2.80	1.39	High
SRX	23.69	1.50	11.76	22.37	1.14	0.23	High
SYMC	16.90	1.20	3.15	20.43	3.22	0.56	Medium