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# Stock Market Simulation

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By

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## **Abstract**

In this project research on investing and investing strategies was performed using printed and digital resources. This research guided a short term stock market simulation comparing strategies. Finally an analysis of the factors influencing the results of the simulation was performed.

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# **1. Introduction**

## **1.1 Goal:**

My goal in this project is to gain a greater understanding of investing and the stock market in general, and apply this through a stock market simulation. In the course of this project I hope to gain a practical understanding of investment which I can use in the future to guide my personal investing. These two objectives of research and simulation separate this IQP into two phases. In the first phase of the project I will research the different types of investments (stocks, bonds, etc), as well as different investment strategies, and compare their relative merits. During this time I will learn what I need to know in order to choose stocks for the simulation. In the second phase I will choose a strategy for selecting stocks and begin the simulation. The simulation will last forty days.

## **1.2 What is investing?**

When we talk about investing, we talk about things one can do with saved money in order to maximize the growth of that money over time. In a broad sense this could include not only traditional investments, but also buying a house to live in with the knowledge (or at least the hope) that it will be worth more when sold, collecting antiques, etc. Within this paper we will discuss traditional investments – stocks, bonds, and mutual funds.

## **2. Background**

### **2.1 Types of Investment**

There are a great variety of investments available, with varying levels of risk, time scale, and investor involvement. This paper describes the three most common forms of investment: Stocks, Bonds, and Mutual Funds. The balances of risk and returns available in these forms of investment are acceptable for most prudent investors.

#### **2.1.1 Stocks**

Stocks are the most common form of investment. Each share of a stock represents a share in the ownership of the company; the investor who holds stock thus has a claim to the assets and profits of that company. Companies may share profit with the stock holders by paying dividends to stockholders. Dividends are paid at a rate of a certain number of cents per share, though not all companies pay dividends. As partial owners of the company, the stock holders are entitled to vote for members of the Board of Directors. Through the Board, the stockholders effect the major decisions on how company resources are spent. An example of such a decision might be whether to invest profits in growing the company or offering dividends, or who to hire for the senior management positions [1,2].

The value of stocks is determined by what investors are willing to pay for the stock. The factors that come into play include the value of a company in terms of assets, the size of any dividends offered and the company's earnings, as well as the potential for future growth of the company. Current events relating to an industry or a company also have a

great effect on stock prices. In the strategies section I will discuss how these factors might be analyzed [1,2].

Stocks are frequently categorized by their market capitalization – this is the total number of shares multiplied by the value of each share. Because market capitalization reflects the size of the company, this can help predict how the stock will behave. Small-cap and large-cap stocks are affected differently by some economic factors. Many investing strategies focus on a certain size of company [1].

Because the stock market is governed by supply and demand, sometimes drastic changes in the price of a stock can be traced to a single large financial institution deciding to buy or sell large numbers of shares, even when there is no news about the stock in question. These trades further affect the value of the share because other investors assume that the “big boys” better know what will happen in the company’s future [1,3]. There are several examples of this effect observed in the simulation

Trading stocks: Stocks are traded at stock exchanges. There are two kinds of exchanges, listed exchanges and Over-the-counter exchanges. The former is more suited to high volume stocks, while the later is better for lower volume stocks. However, for most investors it doesn’t matter what kind of exchange the stock is traded on, since personal trading is generally done through a brokerage. These brokerages charge a fee per trade, and some also charge a percentage of the transaction (the wise investor will avoid those). These fees are in addition to the fees that exchange itself will charge. Many online brokerages charge commissions as low as \$5 per trade, and offer promotional offers of free trades to new customers [1,3,4].

The largest and most well known stock exchange is the New York Stock Exchange (NYSE). In the NYSE the trading takes place face to face, and is run by specialists known as “market makers” who manage all trading for particular stocks. The specialists match up buyers and sellers for the stock they manage. The price normally discussed for a stock is the price it was last traded at, but all sales are effectively auctions. The “real” price for any stock is what someone else is willing to pay for the stock (or what someone is willing to sell it for, depending on which your perspective). This type of stock exchange, where buyers and sellers are matched directly, is called a “Listed Exchange” [1,2].

The other type of stock exchange is called an Over-the-counter exchange (the most well known of these is the NASDAQ). In this type of exchange, the specialists will purchase stock from people looking to sell it, and hold onto it until someone wants to buy it. This increases the liquidity of the market; in an OTC market, one can almost always buy or sell a stock. The downside of this is that the specialists who run the markets take a larger share [1].

There are three numbers available describing the price of the stock. The last price the stock was traded at is generally considered the “price” of the stock. “Bid” is the price that a buyer offers for a stock, “Ask” is the price which a seller wants to sell their stock at. When trades are made, the bid will be higher than the ask – this difference, the “spread”, goes to the specialists and market makers running the exchange [1,2].

A trader can set their own bid or ask price in advance. This is called an “open order” and the order will be completed if conditions allow it. Many open orders are never completed, since in these cases the investor is offering a transaction at a price more

favorable than the current market price. Specialists and market makers often use these open orders to gauge the demand for a stock, and use that information in their decisions regarding spreads [1].

Shorting: Buying stock is known as having a “long” position on the stock. This works fine when the market is performing well. In bad times investors turn to a type of trade called “shorting” In this type of trade, the investor borrows stock (from a pool that his brokerage keeps available for such a purpose) and sells it. At a later time in the future the holder of the short position must purchase the same number of shares off the market (adjusted for any splits) to replace the shares he sold. This is called “Closing” the short [1,2].

Short sales have the potential to produce a profit even when the market is falling, but if the market goes up, the losses can be much greater (if, for example, the stock price triples, the investor has lost twice as much as the original sale was worth. For obvious reasons, any brokerage will make sure that an investor always has enough money in his account to cover his short position and can force one to cover their short position [1].

Risk of Stocks: The investor owns a share of the company so if the company goes through rough times the investor will lose money. Even if the company does everything right (which is rarely the case), major national events, economic indicators (inflation, etc), and decisions (and even casual remarks) by the Federal Reserve board can effect the entire market. There is the risk that the company could go out of business entirely. In some cases, these companies increase their dividends in their closing years (by ceasing to invest in the company) so the investors get some return, but in other cases, the investors are left with a total loss.



Despite these risks, the stock market has given an average annual return of 12% over time [1]. The risks to an investor of individual stocks or industries failing can be mitigated by investing in a large number of stocks in multiple industries (diversification), so poor performance in one area will be countered by good performance in another. Mutual funds offer “instant” diversification; the extreme of diversification is simply buying an index fund to match the performance of the market as a whole. While market downturns may result in short term losses, it is virtually impossible to lose one’s entire investment with a well diversified portfolio.

### **2.2.2 Bonds**

Bonds are issued by organizations (companies or governments) as a way of borrowing money. The bond pays a fixed income, set at the time the bond is issued, over its entire life. The interest rate paid by the bond is called the coupon rate. After the bond matures, the issuer of the bond pays back the principle. The time to maturity on a bond can vary from months to decades; 30 year bonds are quite common. Depending on the type of bond, it may be possible for the issuer to “call” the bond, and pay back the principle early; whether this can be done for a given bond is specified when the bond is issued [1].

Bonds are often traded higher or lower than the par value; if a bond was issued when interest rates were high, and rates then went down, the bond would trade for more than the par value, since investors would pay a premium for a bond that would pay the higher interest rate. Such a bond would likely be called if the bond is callable. On the flipside, if interest rates go up, bondholders would be willing to sell their bonds for less than the original price, so they can buy newly issued bonds with higher interest rates.

The current interest rate compared to stock market performance affects the relative desirability of bonds. When the Federal Reserve raises rates, stocks become less desirable (since lower rates make it easier for companies to expand), and bonds become more desirable because of the higher yield.

Special types of bonds: The most important thing to consider when looking to invest in bonds is what organization is issuing the bond. This can affect the interest rates as well as the risk associated with the bond. The most common type of bond is the corporate bond. These can vary widely in terms of maturity date, and depending on the company's credit rating, in interest rate as well. Some corporate bonds set out conditions in which they could be converted into stock in the company [1].

Bonds issued by the federal treasury offer lower interest rates, but are guaranteed by the US government. Treasury bonds are exempt from state and local taxes. State and local governments can also issue bonds. These municipal bonds are exempt from federal income taxes, and some are also exempt from state and local taxes. Because of this tax advantage, municipal bonds offer lower interest rates. Tax-free municipal bonds are most advantageous to investors in high tax brackets, for whom the higher interest rates of corporate bonds are outweighed by the taxes that would be associated with it [1].

There are also numerous special kinds of bonds. A zero-coupon bond is one with a coupon rate of zero, which is sold off for a fraction of the par value. One might spend \$2000 to buy a zero-coupon bond that would pay \$10000 upon maturity some number of years later. Two such bonds financed part of my education at WPI. These bonds appreciate in value as they get closer to the maturity date.

Risks of Bonds: Bonds, like stocks, do carry some level of risk. If the issuer goes bankrupt, leaving them unable to pay the interest (nor the principle), the bondholder will be just another creditor in the bankruptcy court, and will receive little or nothing. This is analogous to a company in which one owns stock going under. However, bonds are generally safer than stocks, and certainly more predictable; unless the issuer goes bankrupt, your bond will pay exactly what it said it would when it was purchased, unlike a stock where the value would fluctuate widely.

The interest rates that investors will demand from a bond are dependant in large part on the credit rating of the issuer. There exist numerous independent agencies rate the credit of companies who issue bonds. Moody's and the Standard and Poor's Rating Service are two of the largest bond rating agencies. Poorly ranked companies have to offer higher interest rates to entice investors to buy their bonds. The lower bond ratings are commonly referred to as "junk". These junk bonds are rather infamous for their high risk. They pay very high interest, and usually have a much shorter maturity time – if the company is still around to pay the principle back. Investors usually stay away from anything except highly rated bonds – Junk bonds are the realm of speculators. Oftentimes it is a major blow to a company if their bond rating is lowered below the threshold which most serious investors and institutions are willing to invest in [1,2].

Federal, state, or municipal bonds usually give lower interest rates than corporate bonds because of low risk to the investor and tax advantages. This is not to say that there is no risk in investing in government bonds. Federal bonds may have essentially no risk, but there is a risk, albeit small that a state or municipality may be unable to pay – Orange

County California declared bankruptcy in 1994 (due to unwise speculation with county funds) [5].

### **2.2.3 Mutual Funds**

Mutual funds are collections of stocks and/or bonds, which are maintained by a mutual fund manager. Most of these funds are actively managed – the manager of the fund trades stocks and bonds within the fund, attempting to improve its performance. Not surprisingly, these managers charge a significant fee for this service. The fee is, on average, 1.5% of the fund assets for an actively managed fund. Because of the high management expenses, many actively traded mutual funds significantly under perform the market [1].

Index funds, unlike actively traded funds, just try to match the returns of the market in general. They hold a little bit of every stock in the index they are matching. Because there is no active trading, their costs are far less. The most famous index fund is the Vanguard S&P 500 Index Fund, which seeks to match the returns of the S&P 500. It charges fees of only 0.19%, and yet has outperformed 90% of mutual funds over the last 10 years [1].

Risks of Mutual Funds: Mutual funds have the same risks as investing in a diverse portfolio of stocks. It is rare for an investor to lose much money in mutual funds, especially in the long term. More likely, someone who invests in mutual funds, particularly actively managed ones, will wish they had invested it somewhere else where it could earn higher returns. In an active fund with high fees, an investor may see a large portion of his income consumed by fees. Many times, the brokerage offering the mutual

fund will use deceptive or misleading advertisements to hide the magnitude of their fees [1].

Some brokerages offer sector funds, mutual funds where all the stocks in the fund are from a particular sector. These funds may be more promising in terms of potential returns, but they have greater risks than a normal mutual fund, since a prolonged downturn in a given sector is far more likely than one for the entire stock market.

## **2.2 Investment Strategies**

### **2.2.1 Investment vs. Speculation**

In the field of investing one must be aware of the difference between investing and speculating. Speculation is investment in often very high risk areas, with the expectation of huge returns. The speculator makes assumptions about the future of his investment which usually cannot be known with much certainty – he speculates. Frequent areas of speculative investment include high risk stock, junk bonds and futures. Much of the “internet bubble” of the late 90’s was fueled by speculative investment in companies with no fundamental strength. (1,3)

While speculation frequently lures people with the possibilities of gambling-like returns, it comes with gambling-like risks as well. Derivatives (investments where the payoff is derived from some other occurrence) are a common form of speculation, where the payback can be based on just about everything (even the weather). Large scale

investment in derivatives has been responsible in large part for several spectacular bankruptcies [1,3,5].

A serious investor is looking for sustained profits from investments over time, with minimal risks. This paper and simulation is concerned with investing, not speculating.

### **2.2.2 Investing Strategies**

There are three schools of thought regarding stock selection, however in practice these are often combined. The traditional method is fundamental analysis, which is concerned with the quality of the business. This method reflects the idea that the stock is a share in a business, and so to find a good stock, the investor should look for a strong business. Fundamental analysts look for undervalued stocks (value investing) or stocks in companies with great potential for growth (growth investing), or a combination thereof. The fundamental approach includes subjective measures of the company. Research analysts will try to determine whether new products are arriving at retail channels as the company planned, interview the management, and try to determine if the company's plans will lead to success of the business. Additionally, they often look at numeric measures of the company's performance – Sales, profit margins, book value, growth rate, etc [1].

Value investors often focus mainly on the liquidation value of the business. They are concerned in large part with numbers like the Price/Earnings ratio (P/E), the book value, and sales relative to market capitalization. Growth investors are focused on the growth potential of the company which they are investing in. They typically look at the growth rate of the business and the industry in general. Growth investors typically invest in small

and mid-cap stocks, which have more room to grow, and are often interested in new companies or established companies with promising new products [1,2].

A hybrid of these approaches is referred to as “Growth at a reasonable price” (GARP). This combines attention to the value of the business with the growth prospects. The PEG ratio – the ratio of the P/E to the earnings growth rate as a percentage – is central to the GARP strategy. A rule of thumb circulated is that if everything were priced fairly, the PEG would be about 1, and thus stocks with a PEG below 1 are good investments. Oftentimes, GARP investing makes more use of quantitative techniques than traditional value or growth analysis [1,3].

Quantitative analysts look only at the numbers representing a stock’s performance. The numbers examined often reflect the underlying business, including some of the same measures that fundamental investors use; they often try to exclude any information other than the numbers, because they want to avoid subjective information. This technique is further removed from the business itself than fundamental analysis. They frequently make use of the stocks “relative strength” (performance relative to other stocks), as well as past pricing history. A frequent method for finding stocks is using a “stock screen” to select stocks with certain values in these numeric measures. There are two major criticisms leveled against quantitative analysis. First, it uses information and techniques available to everyone, and thus some say that it provides no special benefit. Secondly, it ignores potentially useful information not reflected by just numbers. Many investors use stock screening to generate ideas, but then apply fundamental analysis to decide whether to buy the stocks returned by the screen [1].

Technical analysis is probably the strangest method of stock analysis. Since fundamental and quantitative analysis use tools available to everyone, the technical analyst reasons that they will not provide any specific benefit. The technical analysts try to use stock price charts and similar information to determine the psychology surrounding a stock, and use that to predict the future of the stock price. This method focuses particularly on looking for the signature of large institutions (i.e., a large actively managed mutual fund) buying or selling shares of a stock, which often cause sudden price changes. Technical investors may use computer algorithms to guide their trades; some of these technical investing houses can account for very large volumes of trades [1]. Hard evidence in favor of this method has been lacking, and scientific studies have cast doubt over whether chart formations can predict future behavior. A number of investors use fundamental or quantitative techniques to choose stocks, and then use technical methods to time their purchase or sale. Technical analysis is very popular among day-traders and short term investors. The message boards at investing websites, which are typically populated by amateur short term investors and day traders (one might consider such persons speculators rather than investors) discuss chart analysis almost exclusively [1].



### **3. Simulation**

#### **3.1 Objective of simulation**

In this simulation I will compare actively trading stocks to a buy-and-hold method. Many investment guides I have read suggested that active traders gain little compared to those who just buy stocks and hold onto them. I will select a starting portfolio of between 6 and 12 stocks for the two simultaneous simulations; both simulations will start with the same initial portfolio. In the active trading one I will sell stocks which perform poorly as well as stocks which bad news is released relating to. Each portfolio will start with \$100,000 for investing. The simulation will run for 40 days, from June 7<sup>th</sup> to July 17.

#### **3.2 Description of strategy used**

I chose to use fundamental analysis to select stocks for the simulation. The essence of a stock is that it is part of a business, and looking at the quality of this business seems the most rational way to choose stocks. I do not believe that a purely quantitative method, even one that used the normal fundamental numbers could give a satisfactory description of the potential of a stock.

I decided to use the growth at reasonable price strategy, since it combined the two schools of thought in fundamental analysis while addressing their respective shortcomings. To narrow my search, I decided to use a screen to generate some ideas for investment. I used the free Yahoo! Finance Stock Screener to examine stocks on these criteria:

- Market Capitalization less than \$2 Billion - Small-mid cap stocks have greater potential for growth.
- PEG ratio of less than 0.50
- 5-year Earnings growth est. greater than 25%
- Debt to Equity ratio less than .5 - Avoid companies burdened with heavy debt

I also avoided the Oil Drilling and Mining industries. Stocks in the raw materials industry are generally valued on assets (i.e., reserves) rather than earnings, so the PEG ratio is not a valid indicator for these stocks.

The stock ideas generated in this way were: Parlux Fragrances (PARL), Spartan Motors (SPAR), Pixelplus Co (PXLPL), Interdigital Communications Corp (IDCC), Aspreva Pharmaceuticals (ASPV), Sigma Designs (SIGM), Real Networks (RNWK), JLG Industries (JLG), Optimal Group (OPMR), Wet Seal Inc (WTSLA). I used the Yahoo! Finance website as well as the NASDAQ website to get charts, quotes, and financial data for these companies.

### **3.3 Discussion of stocks chosen, and why**

#### **Parlux Fragrances (PARL):**

Stock Price: \$24.10

Market Cap: 186.57M

PEG Ratio: 0.39

P/E: 14.4

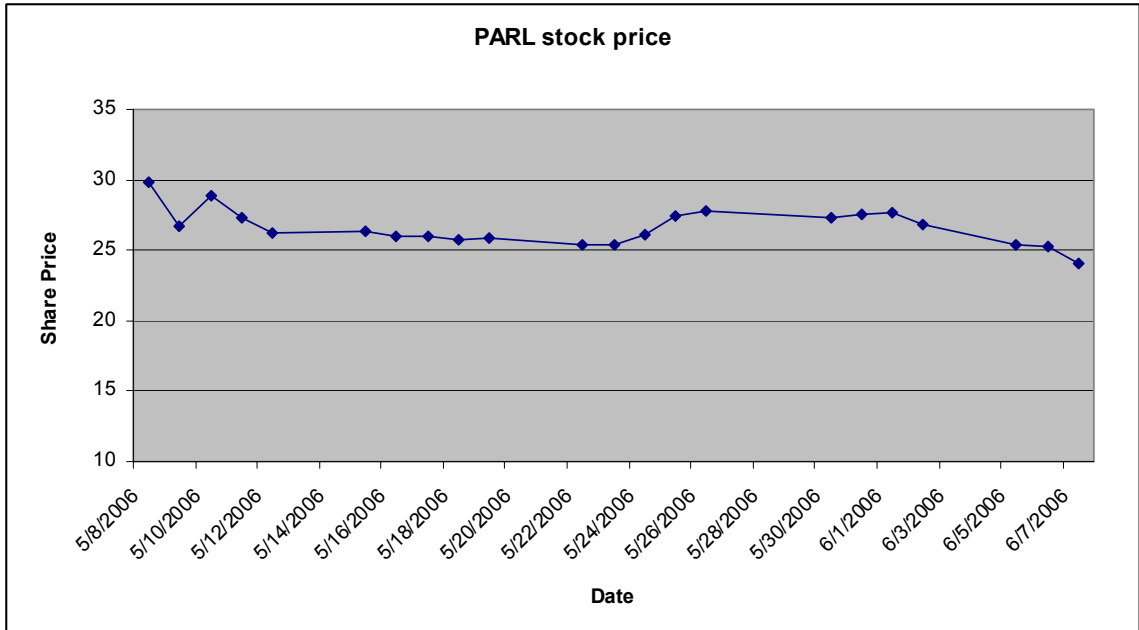


Fig. 3.1 1-month PARL Stock Chart

Parlux Fragrances is a fast growing manufacturer of perfume and other cosmetics. They distribute cosmetics under a number of well known brands, and have a licensing agreement with Paris Hilton Entertainment for the distribution of cosmetics and small leather goods under the Paris Hilton name. Parlux products are sold worldwide through department stores and specialty stores.

Expectations for future growth are high, and so are analyst expectations. There is a stock split planned on June 16. Stock splits are done during times of rapid increase in share value. I decided to include this stock in my portfolio based on the strong expectations of growth. I had heard of many of the brands mentioned, which is notable since I have no contact with this business in my daily life. The planned stock split is an additional vote of confidence for the strength of expected growth.

**Spartan Motors (SPAR):**

Stock Price: \$14.89

Market Cap: 189.02M

PEG Ratio: 0.32

P/E: 17.78

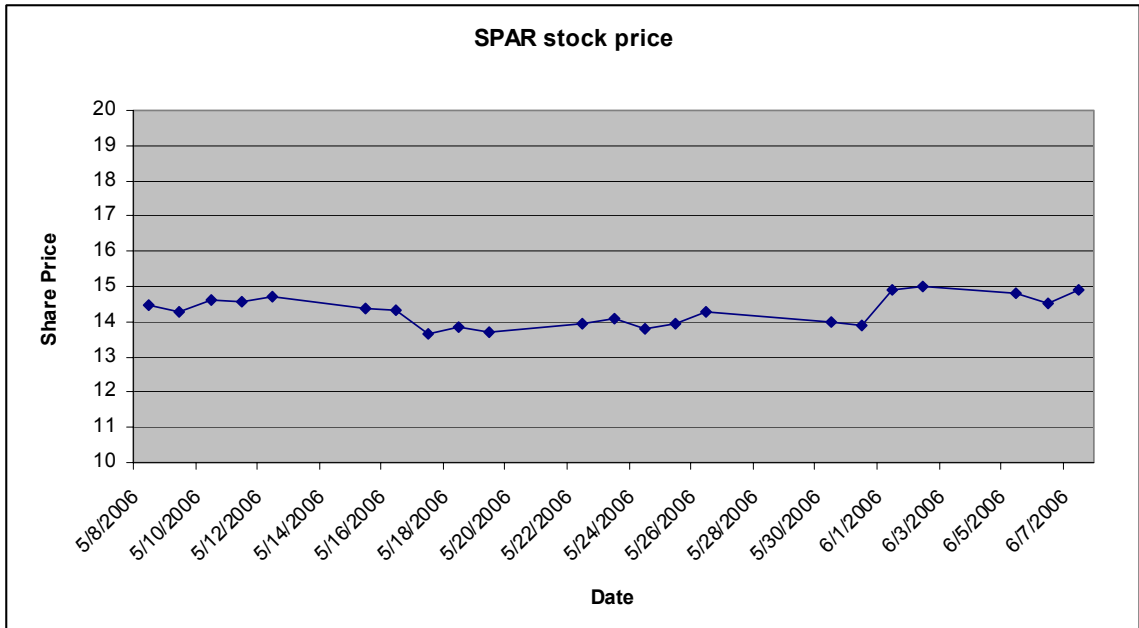


Fig. 3.2 1-month SPAR Stock Chart

Spartan Motors is a manufacturer of custom motor vehicle chassis and bodies. They specialize in recreational vehicles, fire trucks, and emergency rescue vehicles. Their brands (Spartan®, Crimson Fire®, and Road Rescue ®) are well respected within their niche market. Spartan Motors claims that their recent spectacular growth in sales results from the fact that their products have lower total cost than their competitors.

I decided to invest in Spartan Motors based on the strong performance of the business. There was no bad news or potential problem on the horizon that I could find, and analyst expectations were generally high. Also this stock is in a sector in which I have not chosen any other stocks, so this stock adds diversity to my portfolio.

**Pixelplus (PXLP):**

Stock Price: \$2.77

Market Cap: 20.82M

PEG Ratio: 0.24

P/E: 13.95

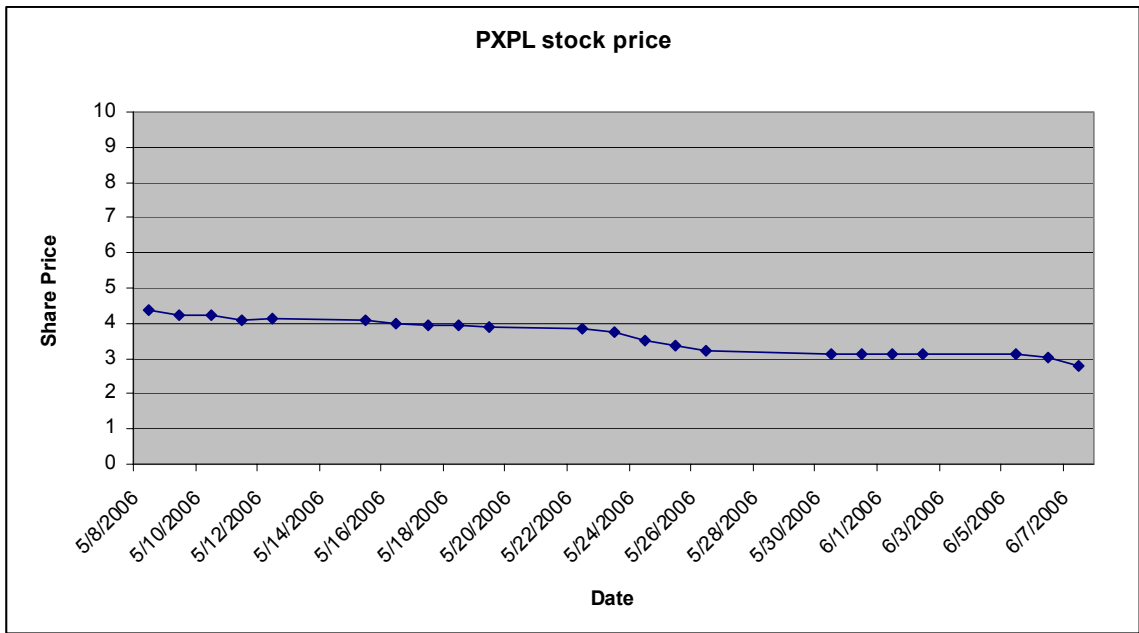


Fig. 3.3 1-month PXPL Stock Chart

Pixelplus is a small South Korean company specializing in development and marketing of digital image sensors. It is a fabless design house – the manufacturing is outsourced to other contractors, while Pixelplus focuses primarily on design. The business appears to be strong, with promising new technology in the form of compact image sensors with performance characteristics that lead the industry. The market for its products, used primarily in camera phones and similar products, is growing rapidly.

The share price has tumbled amid allegations of accounting irregularities originating in April and May of this year, and there is an ongoing audit that has delayed some of the earnings reports. The questions about the true financial condition of the company will likely be resolved within the month of June. Because the technology and market for its products are strong, there is potential that the stock may be significantly undervalued, but the current questions about the accuracy of the companies statements makes this a riskier stock to invest in. I decided to invest in this stock, but more cautiously – I will aim to invest 1/3<sup>rd</sup> to 1/2 as much in Pixelplus compared to other companies in my portfolio.

**JLG Industries (JLG):**

Stock Price: \$17.95

Market Cap: 1.94B

PEG Ratio: 0.42

P/E: 14.04

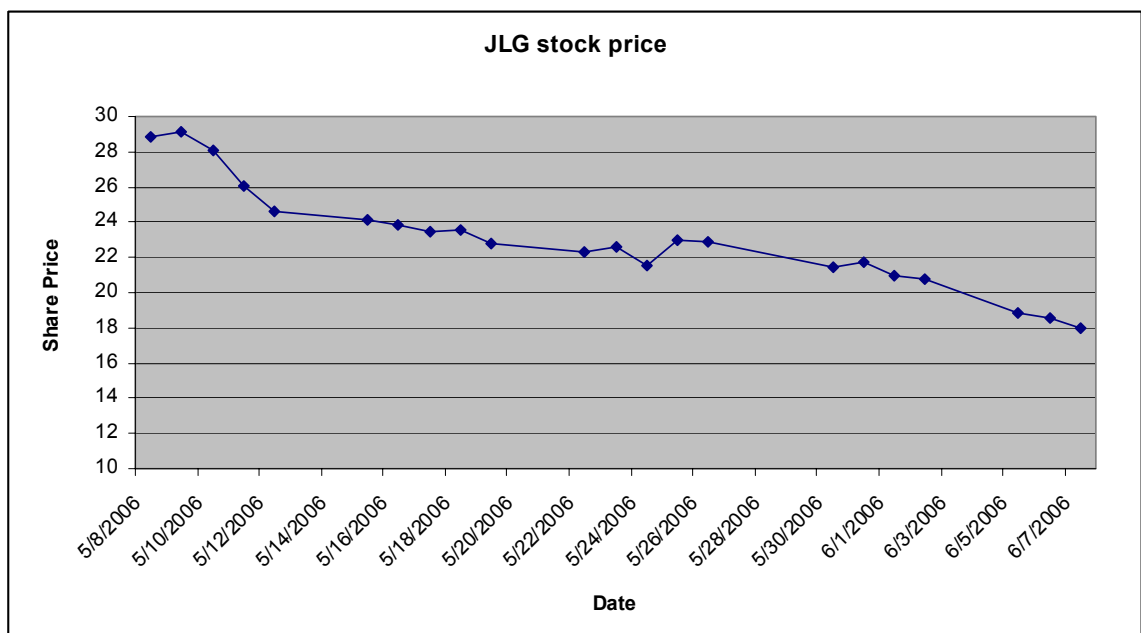


Fig. 3.4 1-month JLG Stock Chart

JLG Industries designs and manufactures aerial work platforms, hydraulic excavators, and related accessories for these products. They also offer servicing programs for such equipment, and rental arrangements through their financial solutions unit. Their products are used by a wide variety of customers worldwide, including the US Military and many private construction companies.

Despite being in what is not usually thought of as a high growth industry, their earnings and revenue growth have been very strong recently. They are outperforming their industry in many areas. The stocks performance recently has been strong as well, and there seems to be no reason not to expect continued good performance. Based on this I chose to invest in JLG Industries.

**Aspreva Pharmaceuticals (ASPV):**

Stock Price: \$32.12

Market Cap: 1.10B

PEG Ratio: 0.39

P/E: 15.66

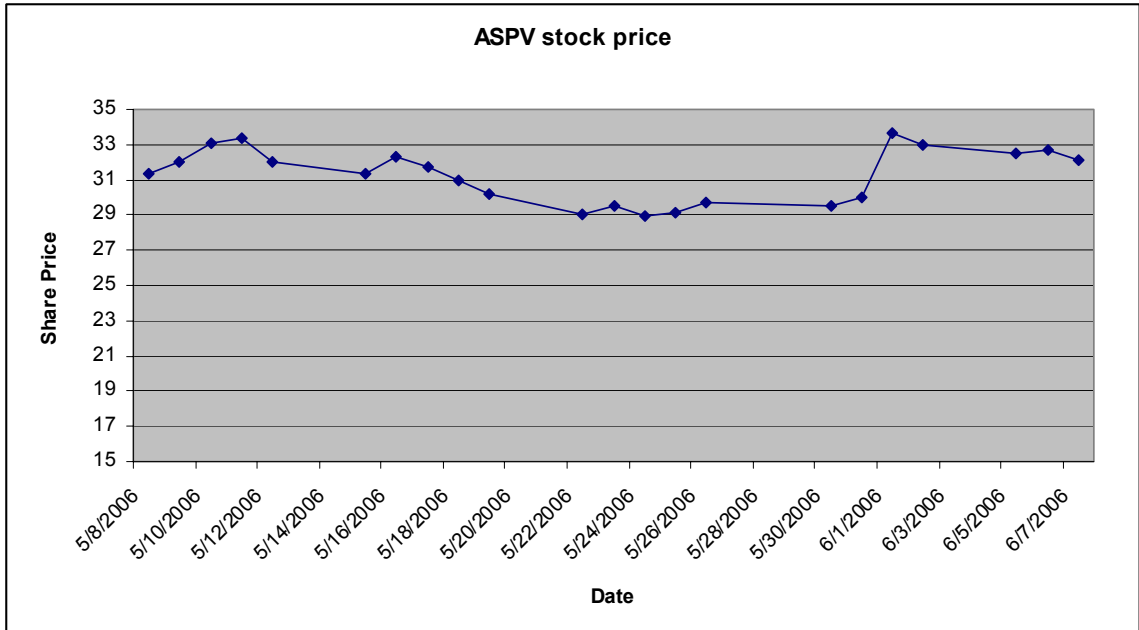


Fig. 3.5 1-month ASPV Stock Chart

Aspreva Pharmaceuticals Corporation specializes in late-stage development and commercialization of new drugs for uncommon diseases. They engage in many partnerships with smaller biopharmaceutical companies with promising drug candidates. Aspreva’s expertise is in clinical, regulatory and commercial aspects of specialty drug development

Their main product line, CellCept, is being researched and tested in treatment of a number of autoimmune diseases, and recently was granted orphan drug status for the treatment of pemphigus vulgaris, a rare chronic skin disorder. Orphan status guarantees seven years of exclusive marketing to Aspreva for CellCept for use treating pemphigus vulgaris. Trials of CellCept are expected to be completed early next year.

With the revenue from current products growing and the likely introduction of new products in the next few years, this company looks strong in both the short and long term, so I decided to invest in it.



**Sigma Designs (SIGM):**

Stock Price: \$11.50

Market Cap: 254M

PEG Ratio: 0.36

P/E: 136 (Forward P/E 13.6)

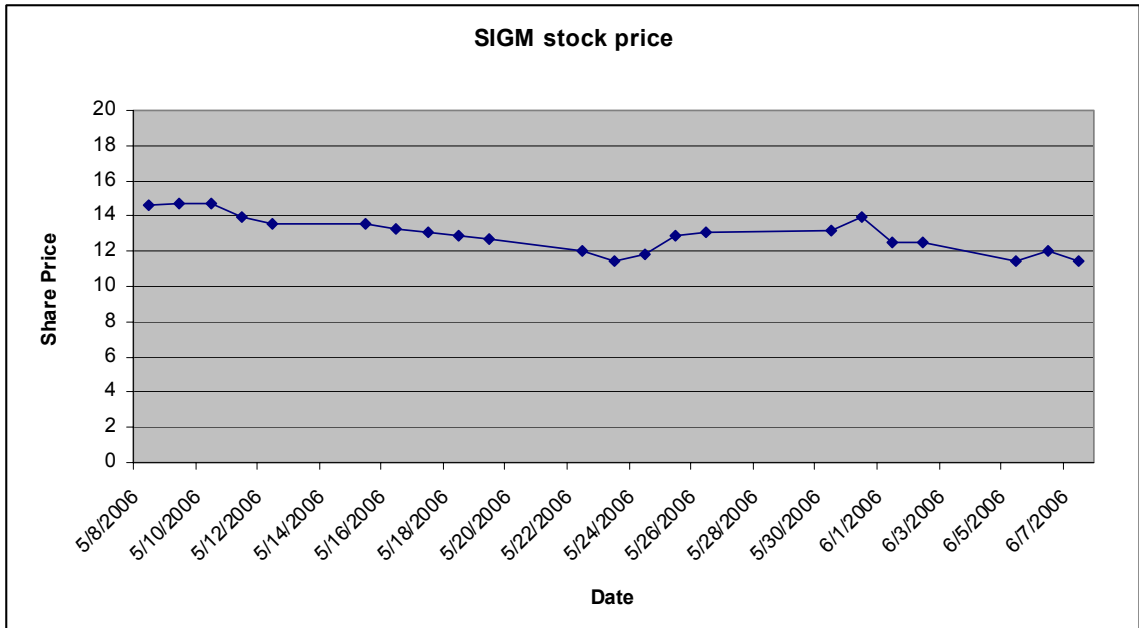


Fig. 3.6 1-month SIGM Stock Chart

Sigma Designs is a designer and producer of hardware video codec solutions. Sigma's REALmagic (no relation to Real Networks below) Video Streaming technology is used in digital media receivers, high resolution DVD players, HDTV systems and similar devices. This market has potential for significant growth as digital media technology becomes accessible the average consumer (currently, DVDs are the only commonplace use of digital video technology).

The company's earnings are expected to increase significantly (as we can see clearly from the comparison of the trailing and forward P/E). Although this company seems to

have good prospects, this company depends heavily on expected growth this year, currently it is barely turning a profit. This is a good potential investment, but the other stocks investigated appear to show better prospects. I may consider buying stock in SIGM in the active trading simulation if I am looking to reinvest proceeds from the sale of other stocks.

**Real Networks (RNWK):**

Stock Price: \$9.49

Market Cap: 1.54B

PEG Ratio: 0.40

P/E: 5.2 (the forward P/E is 25.45)

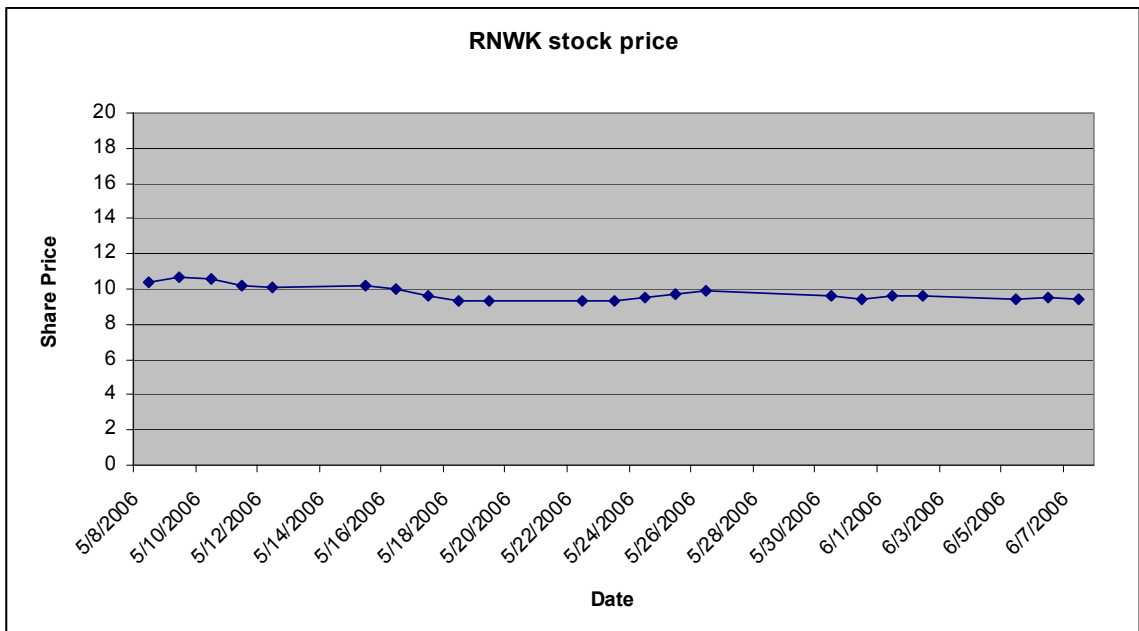


Fig. 3.7 1-month RNWK Stock Chart

Real Networks is a provider of digital media software and network delivered content. They make widely used RealPlayer application, used by many websites for distributing

digital video. They also sell many applications related to RealPlayer. They have an online game download and subscription service, and many other similar operations.

The earnings estimates for this year are uninspiring, though larger earnings growth is expected in following years. There have been questions raised about the continuing dominance of RealPlayer, and Macromedia's Flash has been taking some market share away from Real Networks. In my personal experience and that of friends, the Real Network software is annoying and frustrating to use, and many people use it only when no alternative is available. Because of these questions about their products, and the fact that most of the growth is expected to happen after the end of the simulation, I chose to avoid this stock.

**Interdigital Communications Corp. (IDCC):**

Stock Price: \$31.73

Market Cap: 1.17B

PEG Ratio: 0.29

P/E: 26.46

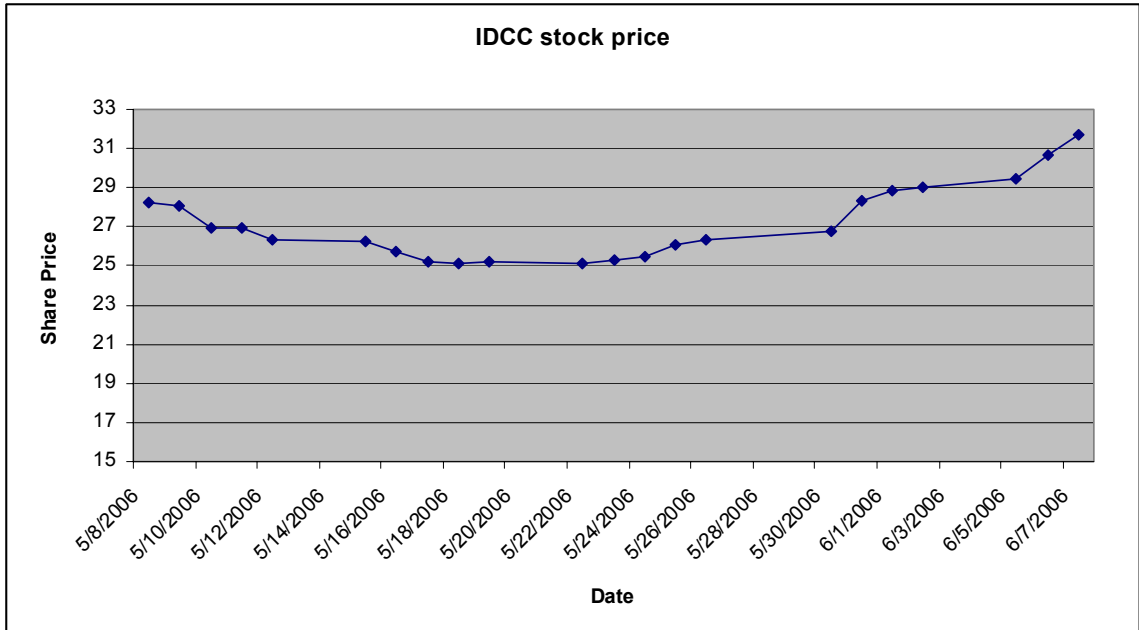


Fig. 3.8 1-month IDCC Stock Chart

Interdigital Communications is a developer of digital wireless technologies, which it licenses to semiconductor companies and other product producers. They are a leading developer of technology for 3G devices, and their technology is used in many mobile devices. They are also active in contributing to international standards for mobile devices. The mobile device industry is booming as such devices are becoming very popular worldwide. Based on the strong business prospects, I decided to invest in this stock.

**Optimal Group. (OPMR):**

Stock Price: \$13.82

Market Cap: 327.6M

PEG Ratio: 0.41

P/E: 71.88 (Forward P/E 9.02 for this year)

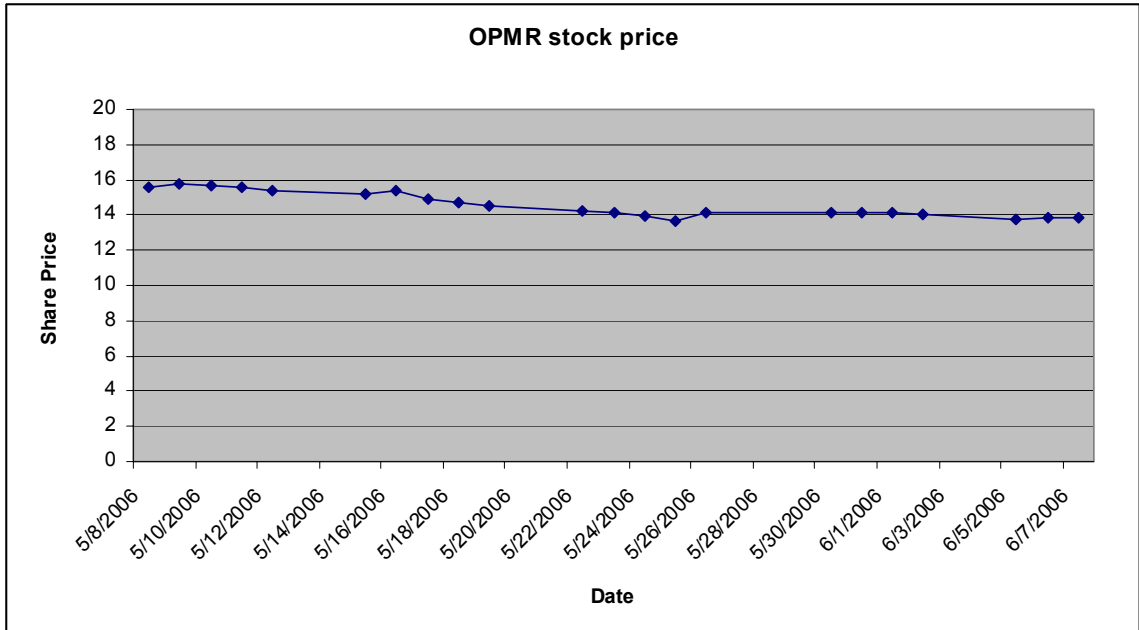


Fig. 3.9 1-month OPMR Stock Chart

Optimal Group is an online payment processing service company. They provide payment processing solutions to the online gaming industry and other online businesses. They also provide hardware maintenance services to their clients. Their Firepay online-wallet service is widely accepted in the online gaming industry (a fast growing and profitable industry). Their non-gaming division processes payments by check, credit, and debit card for internet and mail-order businesses, as well as providing point-of-sale solutions to traditional retail companies.

The company's earnings have been growing dramatically and it has recently started turning a profit. The strong earnings growth is readily apparent, and with no looming problems for the industries it services, it looks like this growth is likely to occur as predicted. Based on these considerations I chose to invest in this company.

**Wet Seal Inc. (WTSLA):**

Stock Price: \$4.73

Market Cap: 311.5M

PEG Ratio: 0.46

P/E: N/A (Forward P/E 11.56 for this year)

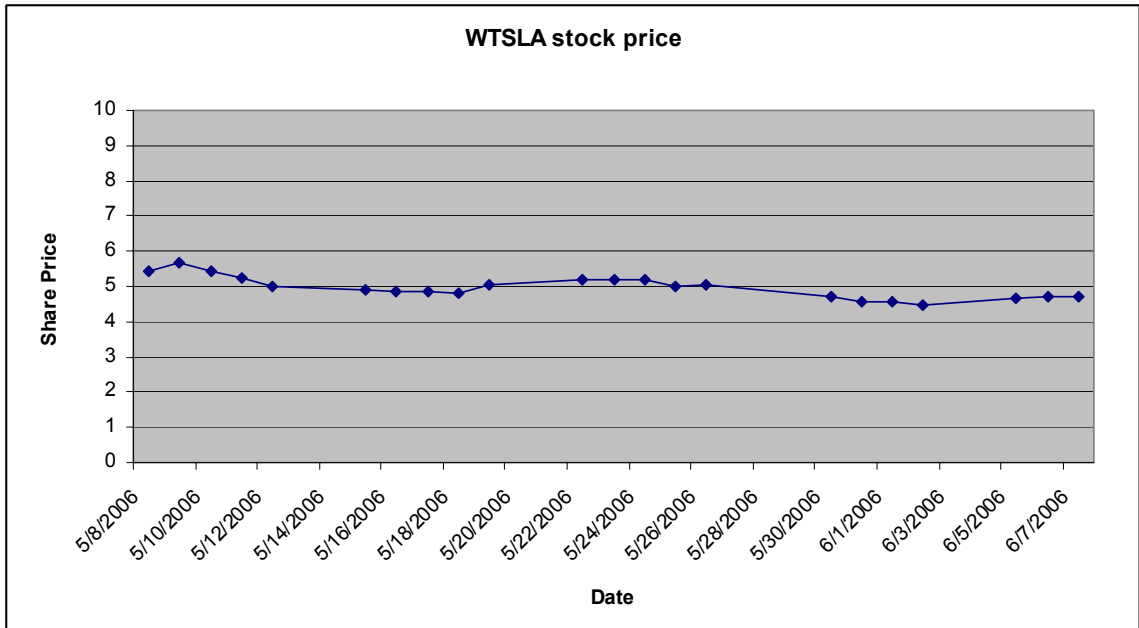


Fig. 3.10 1-month WTSLA Stock Chart

Wet Seal operates two chains of specialty stores selling women’s apparel and accessories. The product line is targeted at young fashion conscious consumers. It has stores in 46 states, and also sells its products online through its website. The company has been running at a loss, but revenue is growing, and the company expects profits this year. They have a high growth rate relative to their industry. Analyst expectations for this company are high. Based on these strong indicators and expectations, this stock seemed a clear choice for investing.

With this initial portfolio selected, I aimed to invest \$12,000 to \$16,000 in each stock except for PXLN as described above. In the active trading group, I will reconsider any stock that shows a dramatic decline in price (10% or more) from the initial purchase price, as well as any stock for which strong bad news comes out.

Date	Symbol		Initial investment		
			Shares	Price	
8-Jun	PARL	BUY	500	\$24.10	\$12,050.00
8-Jun	SPAR	BUY	900	\$14.89	\$13,401.00
8-Jun	IDCC	BUY	500	\$31.73	\$15,865.00
8-Jun	ASPV	BUY	500	\$32.12	\$16,060.00
8-Jun	OPMR	BUY	900	\$13.82	\$12,438.00
8-Jun	JLG	BUY	750	\$17.95	\$13,462.50
8-Jun	WTSLA	BUY	2600	\$4.73	\$12,298.00
8-Jun	PXLN	BUY	1500	\$2.77	\$4,155.00
Investment					\$99,729.50
Remaining Money					\$270.50

Table 3.1 Initial Investment

### 3.4 Description of trades in active group

On Thursday June 8<sup>th</sup>, just one day after the initial purchase, bad news came out regarding Parlux Fragrances. Two major analysts downgraded the stock, after their research found that the Paris Hilton product line which much of the projected earnings growth had been founded was not distributed as widely as expected. The stock tumbled 13% in the day, and I sold my holdings in this company. I decided to reinvest the money in SIGM, which had been a close contender for investment earlier. The day after this was sold, the stock fell another 12%.

One week after I sold the PARL shares, the CEO announced that he was seeking investors to buy all outstanding PARL shares and take the company private. He

complained about disruptions to the share price caused by market speculators (particularly short sellers), as well as accounting overhead due to the rigorous reporting requirements for publicly traded companies (Parlux had experienced difficulties preparing reports on time in the past). This news led to an increase in the share price, but the shares are still far short of the \$29 per share proposed by the CEO. Wall Street seems to doubt that he will be able to find investment partners, but his proposal indicates that he believes that the stock is significantly undervalued.

On June 22, prices of Aspreva (ASPV) plunged, falling 10% in the last 90 minutes of trading. No big news was released regarding this stock. The only explanation I can see is that some institutional investor decided to dump a lot of shares in ASPV from their holdings. This presents a problem for me – the underlying value of the company doesn't appear to have changed; this makes me reluctant to sell. I decided to wait to see what happened. The next day there was a partial rebound in the stock. Still no bad news came out about the company; rumors were circulated that a VC firm with a large stake in the company sold off a (relatively) small part of its stake, to raise money for a new venture. In the absence of any evidence that the fundamental business is in trouble, I could not justify selling this stock – indeed, from a fundamental perspective, it looks like a better bargain than ever.

Also on June 22, the much delayed earnings results for Pixel Plus were announced, and they weren't pretty. Due to exchange rates and a variety of other issues, they were in fact not profitable in the first quarter of this year, as earlier estimates had suggested – and worse still, their loss was greater in the first quarter of 2006 than the last quarter of 2005. This is not something I want to hear about a company, and I sold the shares on June 22.



The next day, Jefferies & Co. downgraded Pixel Plus, and a 23% plunge in the stock price followed. I decided to invest the smaller amount of cash freed up from this transaction to increase my holdings in JLG

On the week of July 4<sup>th</sup> most of the stocks in the portfolio went down significantly. A large portion of this is likely due to North Korea's missile testing. It is a fact that the market reacts very negatively to uncertainty, and the conflict with North Korea over their weapons programs has been providing much uncertainty. The fear of the U. S. getting involved in another military operation is present among some investors.

More importantly there is a general fear of instability in Asia and in general. As Asia becomes increasingly powerful economically, investors worry about the effects of a conflict there on the international market. Uncertainty about future political events and their effect tends to have a significant negative effect on the economy, as investors move their money into areas less likely to be effected by political changes. There is already a lot of this uncertainty in the market, due to US engagement in Iraq and Afghanistan, and ongoing diplomatic conflicts with Iran and North Korea.

Also this week, the saga of Parlux Fragrances continued. They have been unable to file their Form10-K with the SEC on time, due to internal accounting difficulties, and a need to “review internal control policies”. This had a negative impact on their share price for obvious reasons. On July 5<sup>th</sup> the NASDAQ notified Parlux that it may be de-listed because of this – Parlux has requested a hearing from the NASDAQ Listing Qualification Panel in the hopes of averting this. In June, difficulty in complying with SEC filing requirements was cited as one of the reasons that the CEO wanted to privatize the

company. In my opinion, it reflects very poorly on the company that they are unable to file forms in a timely manner, when almost every other company does so successfully.

On the morning of Monday July 10<sup>th</sup>, Piper Jaffrey cut its rating of Interdigital Communications (IDCC) to “under perform” and set a 1 year price target of \$25 per share, and the stock price began falling. I had seen before enough times that when an analyst says bad things about a stock the stock tends to plunge, and sold the stock at 10:00 AM (I had the good fortune to check on my stocks at that time, and saw this bad news) at \$29.20 per share – as I expected the stock continued its plunge to end the day at \$25.89 per share. Where to reinvest the money was a definite question – additional research turned up no new prospects. I looked towards Aspreva Pharmaceuticals; the fundamentals of the stock look strong, but it has still performed poorly since the beginning of the simulation. If this simulation was going to go on for longer, I would have invested more in ASPV, because the growth prospects are still quite strong. However since the growth is longer term, I decided not to invest more in this stock because the simulation would only go on for 2 more weeks. I decided to invest more in Spartan Motors (SPAR) because has been doing reasonably well recently, compared to the rest of the market. Perhaps it owes its success to the fact that it has military contracts, making it more attractive in the increasingly unstable political environment.

Throughout the week of July 10<sup>th</sup> the stock market (and all the stocks in the simulation) plunged due to the conflict between Israel and Lebanon. The conflict has led to fears about energy supply, particularly since Iran, one of the world’s largest oil producers, is a strong supporter of Lebanon. This has sent oil prices to nearly \$80 per

barrel, and the markets have fallen more than three percent in only 4 days. Much of this decline is due to investor fear regarding the effects of rising energy prices.

**Trading record:**

Buy and Hold Portfolio							
Date	Symbol		Shares	Price	Net Cost/Proceeds	Profit/Loss	Total Cash
7-Jun	PARL	BUY	500	\$24.10	\$12,050.00	0	\$87,950.00
7-Jun	SPAR	BUY	900	\$14.89	\$13,401.00	0	\$74,549.00
7-Jun	IDCC	BUY	500	\$31.73	\$15,865.00	0	\$58,684.00
7-Jun	ASPV	BUY	500	\$32.12	\$16,060.00	0	\$42,624.00
7-Jun	OPMR	BUY	900	\$13.82	\$12,438.00	0	\$30,186.00
7-Jun	JLG	BUY	750	\$17.95	\$13,462.50	0	\$16,723.50
7-Jun	WTSLA	BUY	2600	\$4.73	\$12,298.00	0	\$4,425.50
7-Jun	PXLP	BUY	1500	\$2.77	\$4,155.00	0	\$270.50

Table 3.2 Buy & Hold Trading Record

Actively Traded Portfolio:							
Date	Symbol		Shares	Price	Net Cost/Proceeds	Profit/Loss	Total Cash
7-Jun	PARL	BUY	500	\$24.10	\$12,050.00	0	\$87,950.00
7-Jun	SPAR	BUY	900	\$14.89	\$13,401.00	0	\$74,549.00
7-Jun	IDCC	BUY	500	\$31.73	\$15,865.00	0	\$58,684.00
7-Jun	ASPV	BUY	500	\$32.12	\$16,060.00	0	\$42,624.00
7-Jun	OPMR	BUY	900	\$13.82	\$12,438.00	0	\$30,186.00
7-Jun	JLG	BUY	750	\$17.95	\$13,462.50	0	\$16,723.50
7-Jun	WTSLA	BUY	2600	\$4.73	\$12,298.00	0	\$4,425.50
7-Jun	PXLP	BUY	1500	\$2.77	\$4,155.00	0	\$270.50
8-Jun	PARL	SELL	500	\$20.98	\$10,490.00	-\$1,560.00	\$10,760.50
8-Jun	SIGM	BUY	900	\$11.60	\$10,440.00	0	\$320.50
22-Jun	PXLP	SELL	1500	\$2.69	\$4,035.00	-\$120.00	\$4,355.50
22-Jun	JLG	BUY	200	\$19.09	\$3,818.00	0	\$537.50
10-Jul	IDCC	SELL	500	\$29.20	\$14,600.00	-\$1,265.00	\$15,137.50
10-Jul	SPAR	BUY	1000	\$14.97	\$14,970.00	0	\$167.50

Table 3.3 Active Trading Record

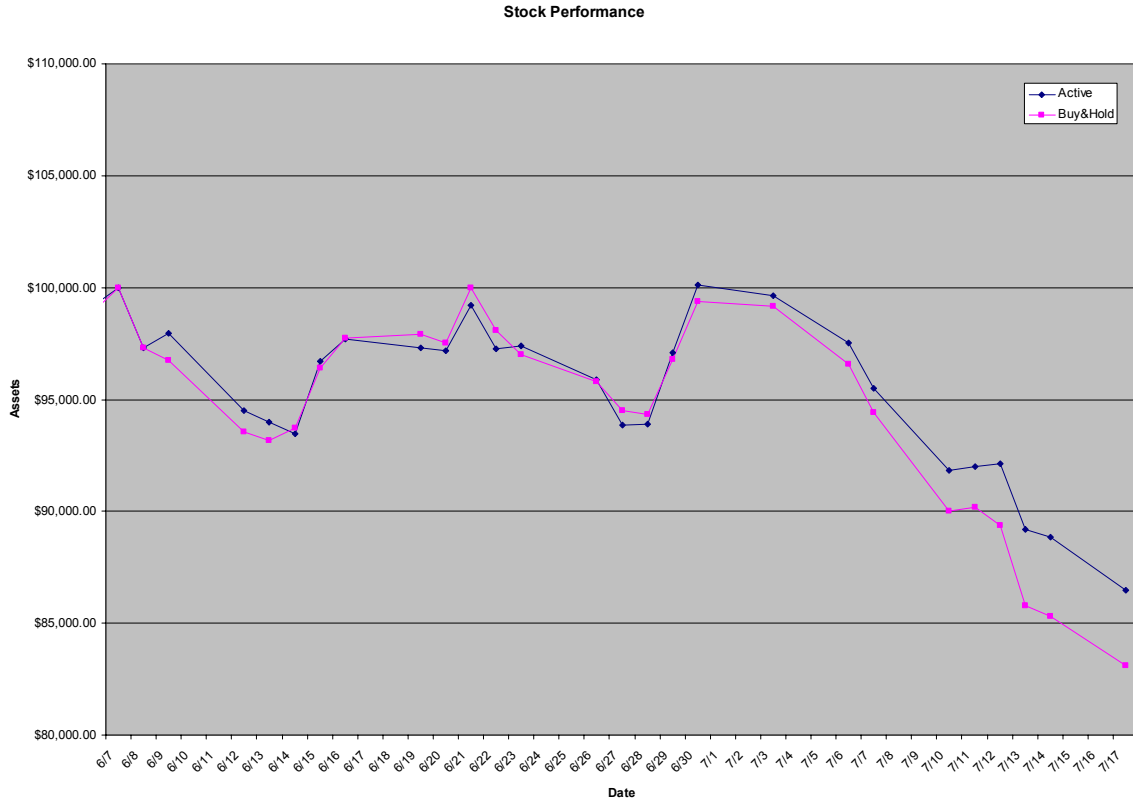


Fig 3.11 Portfolio Performance Chart

### 3.5 Simulation Results

On July 17<sup>th</sup> the simulation was concluded. At this point, the total assets (cash and stocks) in the actively traded portfolio were worth \$86,479.00. The buy and hold portfolio had assets worth \$83,109.00. During this time the NASDAQ fell about 5%, and the Dow fell about 2%. These portfolios significantly underperformed the market. In part, I think that this is due to the large degree of uncertainty about the future of the economy resulting from events during the course of the simulation. Also, many of these stocks had been doing well before the simulation began, leaving them more room to fall. I also had bad luck - three of the stocks in the simulation plunged after being downgraded by analysts. In the case of Parlux Fragrances, this happened the day after I had purchased the

stock. I wish that I had recognized that Interdigital Communications' was becoming over-valued before the analysts downgraded it. I was starting to worry about it because it suddenly started falling on the 6<sup>th</sup> and 7<sup>th</sup> of July, but I didn't sell it until right after it got downgraded on the morning of July 10<sup>th</sup>.

Comparing the two portfolios, the actively traded portfolio lost less money than the buy & hold portfolio. The actively traded portfolio allowed me to sell my holdings in Parlux, Pixelplus and Interdigital Communications, which fell significantly after I had sold them. I wish that I had sold my stock in SIGM shortly after purchasing it, or had chosen a different stock to reinvest the proceeds from the sale of PARL; the performance of SIGM was so poor that I would have done better to have kept my shares in PARL.

I don't fully understand the behavior of Aspreva Pharmaceuticals' stock price. There has been no change in the company's performance or analyst expectations, the company recently got its flagship product approved for a new use, and earnings beat analyst expectations. There doesn't seem to be any explanation for the abysmal performance of this stock. This stock dragged down my portfolio more than any other stock.

I think that had I been able to do this simulation over again I would have been more aggressive about trading. In my experience with the simulation, it seems that when a stock went down by a significant amount, it seemed to continue going down, even if the fundamentals of the company were very strong. Although in the long term these stocks would probably go up again, continuing to hold onto them in expectation of that was not a good decision in this short simulation.

**Individual stock contributions:**

Buy and Hold Portfolio:

Symbol	Shares	Buy Price	Sell/Final price	Profit/Loss
PARL	500	\$24.10	\$8.13	-\$3,920.00
SPAR	900	\$14.89	\$15.42	\$477.00
IDCC	500	\$31.73	\$25.00	-\$3,365.00
ASPV	500	\$32.12	\$20.50	-\$5,810.00
OPMR	900	\$13.82	\$12.15	-\$1,503.00
JLG	750	\$17.95	\$17.75	-\$150.00
WTSLA	2600	\$4.73	\$4.38	-\$910.00
PXLP	1500	\$2.77	\$1.63	-\$1,710.00

Table 3.4 Buy & Hold Profit/Loss by stock

Actively Traded Portfolio

Symbol	Shares	Buy Price	Sell/Final price	Profit/Loss
PARL	500	\$24.10	\$20.98	-\$1,560.00
SPAR	900	\$14.89	\$15.42	\$477.00
SPAR	1000	\$14.97	\$15.42	\$450.00
IDCC	500	\$31.73	\$29.20	-\$1,265.00
ASPV	500	\$32.12	\$20.50	-\$5,810.00
OPMR	900	\$13.82	\$12.15	-\$1,503.00
JLG	750	\$17.95	\$17.75	-\$150.00
JLG	200	\$19.09	\$17.75	-\$268.00
WTSLA	2600	\$4.73	\$4.38	-\$910.00
PXLP	1500	\$2.77	\$2.69	-\$120.00
SIGM	900	\$11.60	\$8.42	-\$2,862.00

Table 3.5 Active Trading Profit/Loss by stock

Individual Stock Performance

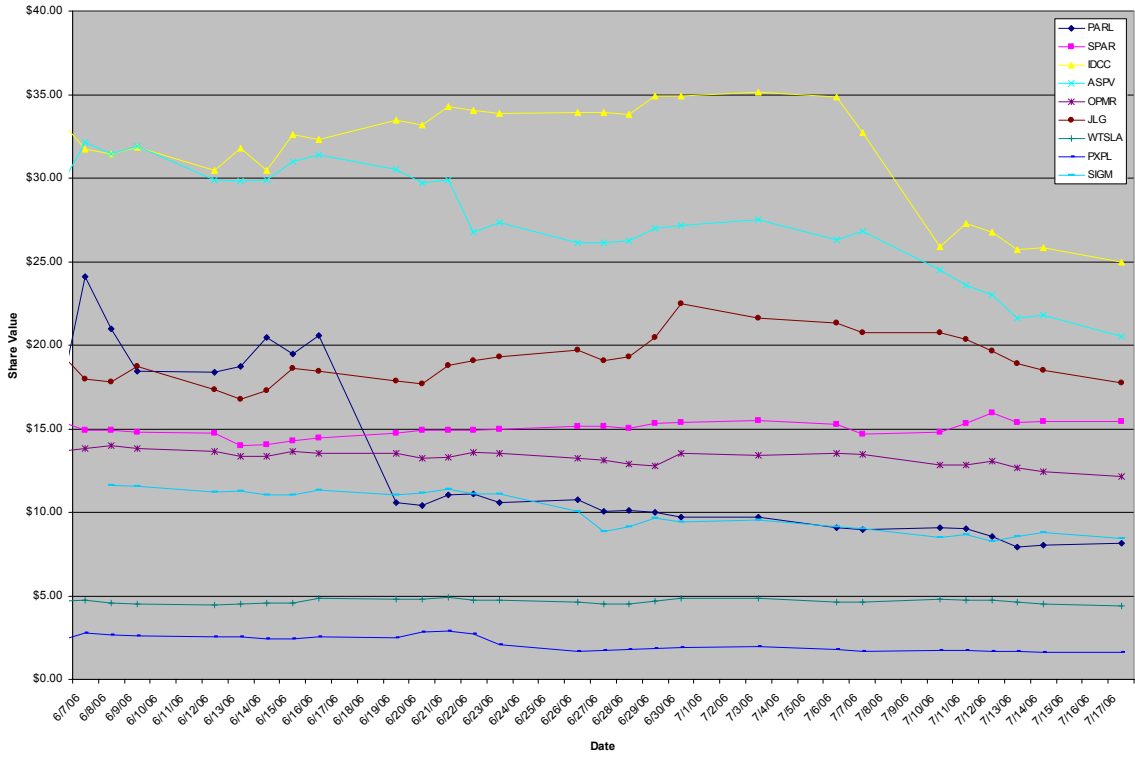


Fig 3.12 Stock Performance during Simulation

#### **4. Analysis of Simulation**

The timing of this simulation proved to be incredibly bad. Energy prices have been putting increasing pressure on the market for some time, driven up due to increasing demand from China, India, and other developing countries, and fears about supply shortages. The existing insurgency in Iraq and the conflict between the US and Iran over their nuclear program, and rising threats from various fundamentalist groups all lead to fears that oil production in the middle east could be disrupted. Most of the oil producing nations are running at or near capacity, so a disruption to any one nation could not be compensated for by other nations increasing their production. Acting on these fears, speculators have driven the price on oil futures up dramatically, and the price goes up every time bad news comes out about the Middle East.

Most recently, Israel's attack on Lebanon has led to fears that it could destabilize the entire region (which was already rather unstable). Some people fear that Iran and/or Syria will take action against Israel, and Iran is a major oil producer. Iran has made threats of doing just that. Some have also talked about the possibility that Iran might withhold oil as a sign of solidarity with Hezbollah (personally I find this unlikely, considering the amount of money which Iran makes off of oil exports, but the fundamentalist regimes do not always behave logically).

Also many people fear that there could be a war involving the entire region, which would mean prolonged disruption to oil supply, and probably increased terrorist activity. The U.S. would probably end up involved in any such conflict, because of American troops stationed in Iraq, as well as our traditional alliance with Israel – and we would be



fighting against the side with the oil. Such an entanglement would probably be very unpopular within America, considering the opposition to the current war in Iraq. The domestic political instability hurts the stock market.

There are some people suggesting that Israel's attack on Hezbollah in Lebanon may be a good thing in the long term – if it ends up crippling Hezbollah, it could lead to the Lebanese government being able to take firm control of their country after Israeli troops left, and would neutralize a terrorist group. On the other hand, the attack could strengthen support for Hezbollah in Lebanon, and end up strengthening them long term instead.

Shortly after the conclusion of the simulation, Federal Reserve chairman Ben Bernake told congress that he believed that inflation was slowing, which sent stocks higher, since it might signal the end of interest rate increases. Although this is good news, I still worry about inflation. Energy prices are still very high, and raw material prices are at their highest levels in years (metals in particular), because of increased demand from developing countries, particularly China. The prices of copper and aluminum are so high that in the mid-west, copper and aluminum items (such as copper pipes at a construction site) are being stolen to sell for scrap. Against this background of rising raw material costs, inflation seems almost inevitable.

During the course of the simulation, I was surprised at the power that the analysts had over the price of a stock. The most surprising example of this was with Pixelplus. When they released their revised report, which was, in my opinion, horrifying, the stock barely moved at all that day. The next day, when an investment house finished analyzing the new report and came to the conclusion that the company was in trouble, the stock lost

more than 40% of its value. It surprises me that so few investors read or reacted to the report, but everyone dumped their shares when the analyst downgraded the stock.

I find it worrisome that analysts, who are often looking at publicly available information, have such a great influence on the markets – it seems very open to corruption, considering the huge profits that could be reaped by knowing, say, a day ahead of time, which stock a given analyst was going to upgrade or downgrade. It is almost inevitable that some analyst would leak to a friend or family member his plans for the next few days.

## **5. Conclusion**

Although the simulation did not succeed in the sense of having turned a profit, I do stand by the investing strategies used. I still believe the companies themselves to be fundamentally strong (with the exception of PXPL), but this simulation demonstrated that a sound strategy and strong companies do not guarantee short term success. The simulation illustrated the effects of strongly negative outside effects on an investment. In this way the simulation was informative – and as a simulation rather than an investment – perhaps more successful than if it had turned a large profit.

In the course of this project I have learned a great deal about investing. Through the research I performed I gained a much greater understanding of the investments available and the strategies one should use to select one to maximize the returns. The simulation also helped me see how the market works in practice. I think that these experiences have made me vastly better prepared for actual investing over the course of my life.

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