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Stock Market Simulation

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by


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1. Introduction

1.1. What is the Stock Market?

In the stock market, securities are bought and sold in an auction style market where buyers and sellers compete for the best available price. Most stocks are traded on regulated stock exchanges like the New York Stock Exchange (NYSE), the NASDAQ, or the American Stock Exchange (AMEX). There are also many smaller regional exchanges such as in Boston, Chicago, Cincinnati, Philadelphia, and Los Angeles. The stock prices are determined by the laws of supply and demand. Today, virtually all transactions are done electronically, but stockbrokers on trading floors can still handle specific orders.

Businesses sell stock or ownership of their company to raise capital. Many companies have different business strategies and typically designate to use the capital for continual expansion and growth, but some companies will choose to pay dividends to the shareholders based on their profitability. The latter would produce an income for the shareholder, and thus stocks of this type are referred to as income stocks.

Before stock of a company can be traded, it must raise funds in an Initial Public Offering or IPO. The funds are mostly raised from specialized investing firms, but in many cases private investors can initially own a fraction of the company as well. An initial share price and share quantity is specified. After the IPO a company must meet and maintain the requirements of the exchange in which the stock will be traded.

Shareholders of a company have the right to vote on management issues and individual influence is based on the percentage of company ownership. Company executives work for the shareholders and are represented by an elected board of directors. By law, the goal of

management is to increase the value of the corporation's equity. If the executives fail to increase the value of the company's equity, shareholders can vote to have management removed.

1.2. How Stocks are Traded

On the exchange the stock is now available to the public and its share price will fluctuate based on the pressures of the interested buyers and sellers. Generally, if more shareholders don't want to sell the stock because they believe it to be valuable, and at the same time buying interest exists, the price of the stock will rise. It will continue to rise until a current holder decides the price is right to sell to a new buyer. Conversely, if more shareholders feel the stock will lose value and in turn want to sell their securities, the stock price will decrease until new buyers accumulate who believe the stock is a good value. The lowest price that a seller is offering is called the Ask price and the highest price that a buyer is willing to pay is called the Bid price. A trade is executed when the buyer and seller prices match.

The following is an example of how a trade works:

1. John Doe of Chicago decides to invest in the stock market.
2. John consults with his broker and decides what company's stock he wants to buy and how much he would like to invest.
3. The broker accesses electronic data to determine current price quotes.
4. John then tells the broker how many shares he would like to buy based on the current price quotes (i.e. 100 shares).
5. The order is entered either by the broker or through the broker's website by John on his personal computer to buy 100 shares of company XYZ.

6. At the same time, Joan of Seattle wishes to sell 100 shares of XYZ at the same price and enters the order electronically.
7. The orders are sent to the trading floor on the exchange and will be executed electronically or by brokers on the floor (based on special request). Floor brokers make sure all orders are handled fairly and in an orderly manner.
8. Since the orders match, the orders are executed and the shares exchange hands.
9. The completed orders are sent to John and Joan's brokers so that a written record of the transaction can be made.
10. The transaction is reported by computer and appears within seconds to a tape display that is available across the country and to the world.
11. John's account is debited with the cost of the purchase while Joan's account is credited with the sale. Each may also be charged commission fees from their broker for the trade.

Companies that trade on the major exchanges tend to have significant liquidity. This means that there is a considerable amount of buying and selling interest at any given moment. This allows most market transactions to take place incredibly fast, typically within seconds of order entry.

1.2.1 Types of Orders Available

A normal Market Order is guaranteed to be executed at the best available price. However, special orders exist that allow traders to set the price at which a transaction will be made. These orders are known as Limit Orders. With a limit order, a buyer is choosing to

purchase the stock less than or equal to the specified price. A seller using a limit order is choosing to sell the stock higher or equal to the specified price. Since the specified prices can be any value, they may differ significantly from the current market bid and ask prices. In that case they will not necessarily be executed immediately. Rather, the order will remain open until the current market bid or ask price matches the specified limit price. Most traders use limits order to avoid the danger of adverse unexpected price changes.

A Stop Order is an order that will remain open until a specified price is reached, either above on a buy or below on a sell order. A stop order differs from a limit order because the price trigger is determined by the last price the stock actually traded instead of the bid and ask price.

Stop orders can be used as stop-market or stop-limit orders. A stop-market order becomes a market order once the stop price is reached. A stop-limit order becomes a limit order once the stop price is reached. Stop orders are typically used as a “stop-loss” or protection meaning that a trader sets the minimum price that he will allow the stock to fall before selling. For example, if a stock price has risen considerably since it was initially purchased, the profits could be protected by setting up a stop order above the purchase price but below the current price. This way if the price begins to fall, the stock will be sold before the shareholder loses money.

Making money in the stock market is not limited to buying and selling stocks that have rising share prices. Money can also be made when stock prices fall. If an investor believes a stock price will fall, he can do what is known as Selling Short. Short selling is the selling of stock that is not actually owned. If an investor thinks the price of a stock is going to fall, the investor could borrow the stock from a broker and sell it. Eventually, the investor must buy the stock back on the open market. If the investor buys the stock at a lower price than he sold it, he

will make money on the difference. Buying back borrowed stock is known as buying to close because the position is being closed out.

In order to short positions in the stock market, an investor must have permission from their broker to trade on a margin account. Short selling can be very risky because there is no limit to the price that a stock can climb. It is much like taking out a loan, so brokers accept margin account requests similar to the way a bank would accept loan requests.

1.3. Deciding Upon an Investment Strategy

When it comes to investing in the stock market, initially an investor should invest based on personal expectations and desired outcomes; the first decision being planned investment length, i.e. short-term or long-term investments. Investments are typically considered long-term if the securities are held for more than six months, but more so for investments that are held for one year or more. Short-term investing typically includes trades occurring in intervals less than six months, with very short-term trading (i.e. day-to-day) being known as day trading.

Those who plan to commit more of their time to market research may choose to trade on a short-term basis, attempting to maximize profits over shorter market moves. Casual investors typically invest in the stock market long-term with a simple desire to beat the current rate of return of a standard bank account. Therefore, the day-to-day movement of the stock market isn't as important as the long-term result. Those who invest in securities long-term typically invest in markets that are fairly secure.

All investors should education themselves before jumping into the stock market. Data resources concerning the stock market are numerous and free to the public. Lack of research in

investments can be very costly, but thorough research will enable an investor to establish a personal strategy.

The two analyses in this study will be similar in that they will attempt to evaluate the overall market on a short to long-term basis, and invest relative to the prediction. They will differ because the Technical Pattern Trading Theory will always invest in stocks for the short term, taking existing profits early despite a possible long-term market prediction. The Hybrid Analysis will attempt to hold stocks for as long as the macroeconomic data indicates it necessary to sell.

2. Hybrid Analysis: Macroeconomic Analysis Combined with Dow Theory

There are probably hundreds, if not thousands, of different techniques that are used to analyze the performance of stocks, but as a way of broadly classifying the analysis techniques, there are 2 main schools of thought. Most techniques can be classified as belonging to either one or the other of these two main schools of thought. One theory of analysis is called Fundamental Analysis. The other is Technical Analysis. They are two totally different ways of analyzing stock performance. Each method has strengths and weaknesses to it. I believe that the only way to get the most accurate possible picture of stock market performance is to intelligently apply elements from each theory. A person relying on solely on one theory or the other will not get a complete picture of the stock market.

The purpose of this section of the report is to develop and apply what I call Hybrid Analysis. A Hybrid Analysis uses certain elements of Fundamental Analysis and Technical Analysis at appropriate points in the stock market environment to get a more accurate picture than could be achieved by using either method independently.

Macroeconomic Analysis uses large-scale trends in the national business environment to predict stock market performance. Macroeconomic data is data such as unemployment rate, interest rates, new factory orders, energy prices, etc. Macroeconomic analysis is a form of Fundamental Analysis

2.1. Macroeconomic Analysis of Economic Data

The idea at the core of Fundamental analysis is that the performance of a stock for a particular company is driven by the underlying financial performance of the company. Some of the statistics that people practicing Fundamental Analysis use includes, but is not limited to:

cash flow, amount of debt, amount of cash in the bank, profit margins, sales, etc. Normally, a successful company will demonstrate good financial performance statistics, such as: high cash flow, low debt, large cash reserves, high profit margins, increasing sales. An unsuccessful company will normally demonstrate just the opposite: low cash flow, high debt, small cash reserves, low profit margins, and static or decreasing sales numbers.

The benefit to Fundamental Analysis is that the result of the analysis *usually* does give an accurate picture of the health of the company. If the data given by the company is accurate, and the person looking at the financial fundamentals is skilled, the analysis will be usually be able to differentiate the good companies from the bad.

However, there are also some disadvantages to Fundamental Analysis.

- 1) It takes a lot of time to get the fundamental financial data. Especially if you are analyzing anything more than 2 or 3 stocks, obtaining, recording, and interpreting the economic fundamentals of the companies will take a lot of time.
- 2) The economic data is not always accurate. Sometimes, companies pad their numbers or even outright lie about their true financial performance. Everything can look good by the numbers, but the company in reality is not doing well. Think about Enron and WorldCom.
- 3) The financial data has to be interpreted correctly. Start up companies usually will not have good fundamental economic numbers. In the beginning of its life a company will have a lot of debt, low sales, and low cash reserves. Eventually, if the company is run well, and the product is good, the company will go on to have high profits and a high stock price. So if the decision whether to buy the stock is based solely on economic numbers, a good opportunity will have been missed.
- 4) Stock market prices are often highly driven by the emotional factors, not by fundamental economic performance. A company can have great numbers, but will be caught in an emotionally driven stock sell-off. Or just the opposite: a company can have absolutely horrible

financial numbers, but market hype can drive the stock price to levels totally beyond those justified by the company's economic performance.

In this report I am looking at Macroeconomic Analysis, which is a form of fundamental analysis. Macroeconomic data is large-scale data concerning the state of the overall national economy. The macroeconomic data that I will be looking at in this report is unemployment rate, the prime interest rate, new factory orders for durable goods, and oil prices.

I created an excel spreadsheet which is combined chart of the Dow Jones Industrial Average, Unemployment Rate, Prime Interest Rate, Consumer Price Index (known as the CPI), Oil Prices (West Texas Intermediate Crude), and New Factory Orders for Durable Goods. The time interval is from January 1993 to the present. The frequency of the data is every month. I picked a frequency of once per month to keep the amount of data to a manageable level.

As a way of determining the amount of correlation between the Dow Jones and any other parameter I used the CORREL function in Excel. The CORREL function operates on any 2 sets of data and returns a coefficient ranging from +1.0 to -1.0. A correlation coefficient of 1.0 represents a perfect correlation between two sets of data. A correlation coefficient of 0 means that the 2 sets of data have no correlation whatsoever. A correlation coefficient of -1.0 means that the 2 sets of data have a perfect inverse relationship, that is, when one is high the other is low, and vice versa.

2.1.1. Unemployment Rate

This data is the national unemployment rate for all workers 16 years and older, adjusted for seasonal factors. The unemployment rate shows a relatively strong inverse correlation with the Dow Jones Industrial Average (DJIA). The Correlation Coefficient of the Unemployment Rate (UR) with the DJIA is -.669. Looking back on the past 12 years, you can see that the in the

periods of a strong economy (such as from 1998 thru 2000) the unemployment rate was low. And in the period from 2001-2003 when the economy was weak and the DJIA was falling, the UR was relatively high.

2.1.2. Interest Rates

Historically interest rates have always had a strong positive correlation with the strength of the economy. When the economy is strong and expanding, the Federal Reserve starts increasing interest rates in order to fight the tendency for inflation. Alternatively, when the economy is weak, the Federal Reserve will reduce interest rates in an attempt to stimulate demand. Also, independent of what the Federal Reserve does, a strong economy implies a strong demand for money for business investment, so interest rates go up. So although it is correlated to the DJIA, it is somewhat of a lagging indicator when compared to the DJIA. In other words, when interest rates start going up, the DJIA will already have been increasing for several months, and also when interest rates are headed down, the DJIA will have been already going down for several months. So although the interest rate can be used to confirm a trend in the stock market, it is not good as a predictor of future stock market performance.

2.1.3. Consumer Orders for Durable Goods

I picked this economic indicator because for several different reasons. It is a leading indicator because factories normally won't produce goods until they have customer orders for them. So in the condition of an economy which is improving after a period of a weakness, a factory will start receiving new orders before the company will sell the goods. Therefore the factory new orders statistic will respond sooner than the statistics for the company's sales. Also,

since consumer durable goods are expensive, consumers tend to buy them when the economy is good, and not buy them when the economy is weak. So it should be strongly correlated to the DJIA. And in fact the correlation coefficient between New Orders, Consumer Durable Goods and the DJIA is .882 (very high).

2.1.4. Oil Prices

Oil is a critical component to the US economy. In addition to its obvious use as fuel for transportation and heating purposes, it is used in many other ways which are important to the US economy. It is used to make plastics and asphalt products. It used to make fertilizer for growing crops. The machinery that farms use to grow crops use much fuel oil. Since the US imports much of its oil from overseas sources, any increase in oil prices tends to suck wealth out of the US economy. Historically, spikes in oil prices have been followed by economic recession in the US. After the Arab Oil Embargo of 1974 the economy went into recession for several years. When the Iran-Iraq war caused oil prices to spike in 1980, the economy went into recession from 1980-1982. Currently, oil prices have hit a fairly high local peak. If the previous historical trends continue, a period of recession should follow this oil price spike.

2.1.5 Consumer Price Index (CPI)

The Consumer Price Index (CPI) is an index that the US Bureau of Labor Statistics has created as a way of measuring consumer prices in the United States. It is a way of measuring the rate of inflation in the US economy. It is calculated by taking a group of commonly purchased consumer commodities and summing up the prices for these items on a monthly basis. The types of items included in the index remains relatively constant over time, so the price index shows

how much inflation or deflation exists in the economy. The CPI consists of over 200 items grouped into 8 groups. The groups are as follows: (the list comes from the www.bls.gov website)

FOOD AND BEVERAGES (breakfast cereal, milk, coffee, chicken, wine, service meals and snacks)

HOUSING (rent of primary residence, owners' equivalent rent, fuel oil, bedroom furniture)

APPAREL (men's shirts and sweaters, women's dresses, jewelry)

TRANSPORTATION (new vehicles, airline fares, gasoline, motor vehicle insurance)

MEDICAL CARE (prescription drugs and medical supplies, physicians' services, eyeglasses and eye care, hospital services)

RECREATION (televisions, pets and pet products, sports equipment, admissions);

EDUCATION AND COMMUNICATION (college tuition, postage, telephone services, computer software and accessories);

OTHER GOODS AND SERVICES (tobacco and smoking products, haircuts and other personal services, funeral expenses).

The government has selected various people throughout the nation to keep a diary of what they spend for the items that make up the CPI.

According to most economic theory, a steady or slightly rising CPI is good for the stock market. However, a CPI which is rising too quickly is a sign of economic instability, and is therefore bad for the stock market. For the period that we looked at (1993-2005), the CPI was always low and stable. The CPI is normally moves up very steadily in an upward direction, and does not have a lot of up and down movement. The DJIA tends to move up and down very

erratically. Therefore we conclude that The CPI is not a great predictor of stock market performance.

2.1.6. Macroeconomic Data Conclusions

However since Fundamental Analysis many times IS NOT a good predictor of stock price movement (especially in the short term) for the reasons discussed in Section 2.1, we will now turn to the other stock analysis technique: Dow Theory, which is one most popular forms of Technical Analysis

2.2. Technical Analysis: Dow Theory

Dow Theory was first published by Charles Dow in the late 1800's. Charles Dow and Edward Jones founded the Dow Jones Company in 1882. Dow Theory has several basic tenets. Fundamental to the Dow Theory is the idea of a trend, either in the upward or downward direction. Once a trend is established, either in the upward or downward direction it will continue until broken. The other principles of the Dow Theory are as follows:

The stock market has absorbed all of the information regarding the markets that there is to absorb. Because the market is available to all, everyone with information regarding the stock will trade the stock and therefore the stock price performance already reflects everything there is to know about that particular stock.

The market has 3 trends: Major, intermediate, and short term. Charles Dow made an analogy between the stock market and the ocean. The major trend is like the tide. The intermediate trend is like the waves, and the short-term trend is like ripples on the wave.

The trend has 3 phases: accumulation, public participation, and distribution.

The volume must confirm the trend.

The trend remains in effect unless definite signs are given that the trend has been broken.

The idea of market trending is probably the most critical point of the Dow Theory. The definition of what is major, intermediate, and short term requires some further explanation, because the terms are not absolute, and can change according to the type of market which is being analyzed. For the purposes of this report I will define major as being 6 months to 1 year, intermediate as being 1 to 2 months, and short term as being a few days to 1 or 2 weeks.

Now in the movement of the stock market, the prices never move in a straight line, but are continually advancing and retreating. So in a major trend upwards with duration of one year, there might be several intermediate counter trends lasting from 1 to 2 months going in the opposite direction of the major upward trend.



Figure 2.1 - Dow Jones Index, 2 yrs, from April 2003 to April 2005.
Major trend downward, with intermediate upward countertrend.

As an example you can see in Figure 1 there was a major trend down from Feb 2004 until the end of 2004. Although the major trend was down for most of the year, at points A, B, and C, there was an intermediate counter-trend upwards. Then at points 1, 2, and 3, the downward trend resumed.

2.2.1. Support and Resistance

Another idea which is critical to Dow Theory is the idea of **support and resistance**. Previously I was talking about how the market does not move in a straight line, but moves in a series of peaks and valleys. These peaks are called **resistance** and the valleys are called **support**. The support areas are prices at which the stock becomes such a good deal that buying pressure overcomes the dominant selling trend. Resistance areas are prices at which the stock is overbought, and the desire to make a profit on a previously taken long position overcomes the

dominant buying trend. John Murphy gives an excellent example of the psychology of a support area in his book:

..let's divide the market participants into three categories -- the longs, the shorts, and the uncommitted. The longs are the traders who have already purchased contracts; the shorts are those who have already committed themselves to the sell side; the uncommitted are those who have either gotten out of the market or remain undecided as to which side to enter.

Let's assume that a market starts to move higher from a support area where prices have been fluctuating for some time. The longs (who bought near the support area) are delighted, but regret not having bought more. If the market would dip back near that support area again, they could add to their long positions. The shorts now realize (or strongly suspect) that they are on the wrongs side of the market. (How far the market has moved away from that support area will greatly influence their decisions, but we'll come back to that point a bit later.) The shorts are hoping (and praying) for a dip back to that area where they went short so they can get out of the market where they got in (their break even point).

Those sitting on the sidelines can be divided into two groups -- those who never had a position and those who, for one reason or another, liquidated previously held long positions in the support area. The latter group is, of course, mad at themselves for liquidating their longs prematurely and are hoping for another chance to reinstate those longs near where they sold them.

The final group, the undecided, now realizes that prices are going higher and resolve to enter the market on the long side on the next good buying opportunity. All four groups are resolved to "buy the next dip". They all have a "vested interest" in that support area under the

market. Naturally, if prices do decline near that support, renewed buying by all four groups will materialize to push prices up.

This explains the market psychology which underlies the concept of support.

According to technical analysis theory, after the penetration of a support level, the support becomes resistance. And the opposite statement is true also, which is that after penetration of resistance, it becomes a support level. Look at the following figure:



Figure 2.2 - Dow From May 2004 to May 2005

From March to April the Dow dropped to around 10,400, where a support level started to form. Around mid-April the Dow penetrated the support level of 10,400 and fell all the way to 10,000. According to Dow Theory the 10,400 level is a case of penetrated support, and now will be form resistance to buying pressure to move above 10,400.

2.2.2. Technical Analysis Conclusions

The study of technical analysis goes much further than I have discussed in this section. There are other charting techniques which go into minute detail about how to read various stock price charts. These patterns have names such as reversal and continuation patterns, head and shoulder patterns, double bottoms, flags, and pennants. However, for the purpose of simplicity I will not further discuss these more complicated patterns. The concepts of major trend, intermediate trend, short-term trend, resistance, and support are enough to do most stock market analysis.

2.3. Using Technical Analysis and Fundamental Analysis

In this section I will discuss the idea of using Fundamental Analysis (or Macroeconomic Analysis) and Technical Analysis together to predict stock market movement.

The problem with using only Technical Analysis is that it is difficult to tell the difference between a short term counter-trend and the reversal of a major trend. Looking at Figure 2.1, the major trend for most of 2004 was down. However, at points A, B, and C, using the benefit of hindsight, one can see that there was an intermediate counter-trend upward. In making trading decisions in real-time (as opposed to looking at the trading action afterwards), it would be difficult to tell if they were a reversal of the major trend or just an intermediate counter-trend. If these points are interpreted as a reversal of the major trend, it would be a time to take a buy position. However, if the trader believes that these are just an intermediate counter-trend, the trader should sell into the rally, believing that at a later date the stock will go even lower. So what position is the trader going to take?

2.3.1. The Business Cycle and Hybrid Analysis

This is the time to implement the Hybrid Analysis using both technical indicators and fundamental analysis. Looking at historical data of the DJIA, Unemployment Rate, Prime Interest Rate, Consumer Price Index (known as the CPI), Oil Prices(West Texas Intermediate Crude), and New Factory Orders for Durable Goods, one can see that there is some correlation. And in fact, in economics there is the idea of a Business Cycle in which the economy fluctuates between growth phase and recession phase in a cyclical fashion. The macroeconomic indicators move in a more or less predictable pattern in relation to the business cycle. In the following section I will describe the recession phase and growth phase of the business cycle and how the macroeconomic indicators are behaving during the growth and recession phases.

2.3.2. Characteristics of the Recession Phase of the Business Cycle

During a recession, businesses experience a lessened demand for their products. Since they are not selling much of their product they produce less. Because they are producing less, they can make due with fewer employees, so the businesses either layoff employees or allow employment to drop through attrition (not replacing workers who leave or retire). This leads to higher unemployment. Since demand for their products is low, the law of supply and demand dictates that the prices they charge with drops or at least remains the same, leading to a lowered CPI. New Orders for Durable Goods are reduced for the same reasons. Since factories are running at a reduced rate, and oil is a crucial component of most products, demand for oil is less, leading to lower oil prices. And finally, in a recession, since businesses are experiencing low demand for their product, they are definitely not investing money to build more factories or increase production capacity. Since banks are seeing low demand for capital, interest rates drop.

These are the characteristics of macroeconomic indicator behavior in the recession phase of the business cycle.

2.3.3. Characteristics of the Growth Phase of the Business Cycle

In the growth phase of the business cycle all of the previous sections relationships are reversed. Businesses experience increased demand for their product, and hence increase production of their product. Higher production necessitates the hiring of more employees, (usually) so the unemployment rate drops. Businesses are experiencing increasing demand for their products, so they have the leverage to increase prices, leading to higher CPI. There will be increasing New Orders for Durable Goods for the same reasons. Increasing factory production leads to more demand for oil, and therefore higher oil prices. And lastly, since businesses will be investing to add to their productive capacity in a growth phase, there will be higher demand for capital to invest in new factories, more equipment, more research and development activity, and so forth. The increasing demand for capital leads to a higher prime rate.

2.3.4. Putting It All Together

So in using the Hybrid Analysis I am using the previous discussed Business Cycle Indicators in addition to Technical Analysis in deciding what position to take in an ambiguous trading situation. In the situation as discussed in 2.3 where it is not clear whether there is a major trend reversal or just an intermediate counter trend, I will also try to look to the Macroeconomic Indicators as additional information. If the Macroeconomic Indicators are signaling the existence of either a recession phase or the imminent start of a recession phase, a trader should assume that the DJIA will go down; therefore a short position should be taken. If

the Macroeconomic Indicators are signaling the existence of either growth phase or the imminent start of a growth phase, a trader should assume the DJIA will go up, and a long position in stocks should be taken.

2.4. Trading Simulation for the Hybrid Strategy

For my trading simulation I will start with a simulated \$100,000. For the money that is not invested into the stock market, I will assume to be resting in an interest bearing account similar to a money market account. For my personal money market account at Digital Federal Credit Union, the current interest rate is 1.00% APR. So I will assume that the money not invested in stocks will receive 1.00% APR.

Also, since I am using Macroeconomic data which measures the economic health of the country at a national level, I did not want to trade individual stocks because of the uncertainty associated with them. Regarding the stocks of individual corporations, events can happen which will effect the stock price of the company contrary to the direction of the trend of the overall economy. Events such as accounting scandals, fires, personnel changes, the success or failure of obtaining government contracts will affect the stock price and are impossible for the typical individual investor to forecast.

To avoid having to deal with these uncertainties, I decided to do all of my trading using a Dow Industrial Index ETF (Exchange Traded Fund). The one I traded is the DIAMONDS Trust 1 ETF (ticker: DIA) ETF's are similar to Mutual Funds in that they represent a basket of several individual stocks. ETF's differ in that they can be traded continuously throughout the day. Mutual Fund price changes get posted only once per day. ETFs can be short sold, and ETF options trading (with puts and calls) are also possible. Another note: The DIA ETF value is

always the DJIA, but with 2 zeros removed. Thus, if the DJIA is at 10,500, the DIA ETF will be 105. Therefore it is easy to track the DIA just by knowing where the DJIA is.

2.4.1. Initial Conditions

Our trading started on April 1, 2005. As mentioned earlier, I started with a simulated sum of \$100,000. Money not invested in stocks is receiving a simulated 1.00% APR interest.

2.4.2. Results

Listed below is my trading log with final percentage gain along with the percentage gain of the Dow Jones Industrial Average (DJIA) for the same period:

Table 2.1 – Hybrid Strategy Final Results

| SMIQP Stock Purchase Log for John Barre | | | | | | Starting Balance | \$100000 | | | |
|---|--------|--------|------------|-------------|-----------------|-------------------------------|-------------|----------|--------------|---------------------|
| Hybrid Trading Strategy | | | | | | Annual Interest Rate for Cash | 1.0% | | | |
| Initial DJIA on 4/1/05: 10404 | | | | | | Daily Interest Rate for Cash | .00274% | | | |
| Final DJIA of 6/15/05: 10566 | | | | | | | | | | |
| Stock Activity | | | | | | Cash Activity | | | | |
| Date | Ticker | Action | Num Shares | Total Price | Price per share | Date | Cash Action | Interest | Cash Balance | Note |
| 4/7 | DIA | BUY | 476 | 49980 | 105 | 4/1 | 100000 | | 100000 | cash in |
| 4/14 | DIA | SELL | 476 | 49147 | 103.25 | 4/7 | | 16.44 | 100016.44 | int from 4/1-4/6 |
| 4/26 | DIA | BUY | 487 | 49898 | 102.46 | 4/7 | -49980 | | 50036.44 | buy 476 shrs |
| 5/9 | DIA | SELL | 487 | 50648 | 103.85 | 4/14 | 49147 | | 99183.44 | sell 476 shrs |
| | | | | | | 4/14 | | 9.6 | 99193.04 | int from 4/7-4/13 |
| | | | | | | 4/26 | -49898 | | 49295.04 | buy 487 shrs |
| | | | | | | 4/26 | | 29.9 | 49324.94 | int from 4/14- 4/26 |
| | | | | | | 5/9 | 50648 | | 99972.94 | sell 487 shrs |
| | | | | | | 5/9 | | 17.57 | 99990.51 | int from 4/27 - 5/9 |
| | | | | | | 6/15 | | 95.94 | 100086.45 | int from 5/10-6/15 |

| | |
|-----------------------|--------|
| Final Results | |
| starting cash balance | 100000 |
| final cash balance | 100086 |
| % gain/loss | 0.086 |

and the DJIA comparison:

| Date | Dow | % Gain/Loss |
|---------|-------|-------------|
| 4/1/05 | 10404 | |
| 6/15/05 | 10566 | 1.56 |

So in the period from 4/1/05 to 6/15/05 the DJIA went up 1.56%. My stock trading system netted a gain of 0.086%.

A debriefing of my stock trading system:

Below is a chart of the DJIA during the period of this report.



Figure 2.3 – Dow Jones Industrial Average During Simulation Period

In early April the DJIA appeared to me to be forming a support level at around 10,400. The Dow had been dropping very steadily from early March from a high of 10,900. By early April the Dow had hit 10,400 and appeared unwilling to go below this for several weeks. I

assumed that this was a support level and bought shares of the DIA at 4/7 at 105 (equivalent to DJIA of 10,500). However, I was wrong in my guess that this was a support level. Quickly thereafter the Dow dropped to around 10,000. Fortunately, I sold out at 10,325, thus limiting my losses.

DJIA at 10,000 did turn out to be a local bottom. I bought back in at 10,246. According to Dow Theory, a support level, once penetrated, becomes a resistance level. Since the support at 10,400 had been broken, I was assuming that this would become a resistance level, and that the DJIA would bounce of this level and go down.

Additionally, in looking at the Macroeconomic Indicators, several of these were negative as far as the business cycle was concerned. Oil prices were hitting historic highs. The Prime Rate although relatively low, was increasing. During the period of our trading the Prime Rate was 5.75% coming off of a low of 4.0% in early 2004. So I sold out at 10,385, assuming that this was near a resistance level (referencing Dow Theory). However, once again I was wrong as the DJIA has continued to rally up to the present to a level of 10,566 (as of June 15, 2005). This rally has surprised me because it seems to be in contradiction to Dow Theory. So the current rally seems to be in opposition to both Dow Theory and also Fundamental Macroeconomic Analysis.

2.4.3. Conclusions

I was somewhat disappointed in the results for the Hybrid Strategy stock trading system. Although the DJIA gained only 1.56% in the trading period, my results were even less than that, a .086% gain. The DJIA seemed to behave in a way which contradicts both Dow Theory and

Macroeconomic Analysis. I think that it is probably very difficult to predict the movement of the stock market in the short term (from 1 to 6 months).

3. Technical Analysis Pattern Trading

3.1. Understanding Technical Analysis

Technical analysis is the examination of past price movements to forecast future price movements. Traditional stock trading strategies rely on fundamentals that can be found in company income statements and balance sheets. Technical analysts on the other hand, who are sometimes referred to as chartists, rely solely on patterns and trends that can be depicted from price charts. There are a wide range of trading strategies used in technical analysis relating values such as price and trading volume, moving averages, to oversold-overbought signals.

The forces of supply and demand are behind all technical analysis. For those who trade using technical analysis, it is believed that price movements in stocks (or any traded security) are not entirely random. There are typically at a minimum a several periods in which a stock will be trending in any given year.

Technical analysis can be used to determine short-term and long-term trends in stocks – the choice being based on the trader's preference. In many cases the approach is broken down into the following:

1. Broad market analysis using major indices such as the DJIA, S&P500, NASDAQ and NYSE composite to identify major market trends.
2. Sector analysis to identify the strongest and weakest groups within the broader market.
3. Individual stock analysis to identify the strongest and weakest stocks with a selected group and to determine optimal trading times.

The technical analysis used in this section of the project will bypass the sector analysis and focus on individual stocks with highlight to the overall market trend.

3.1.1. Introduction to RSI, MACD, DMI, Williams %R, and Stochastic Indicators

The **Relative Strength Index (RSI)** is a popular oscillator developed by Welles Wilder, Jr. and described in his self-published 1978 book "New Concepts in Technical Trading Systems". RSI is plotted on a vertical scale from 0 to 100. Values above 70 are considered overbought and values below 30, oversold. When prices are over 70 or below 30 and diverge from price action, a warning is given of a possible trend reversal. This is demonstrated in Figure 3.1.



Figure 3.1 – Relative Strength Index

The formula for RSI is as follows:

$$RSI = 100 - \frac{100}{1 + RS}$$

$$\begin{aligned} \text{Average Gain} &= \frac{\text{Total Gains}/n}{n} \\ \text{Average Loss} &= \frac{\text{Total Losses}/n}{n} \end{aligned}$$

$$\text{First RS} = \frac{\text{Average Gain}}{\text{Average Loss}}$$

$$\text{Smoothed RS} = \frac{[(\text{previous Average Gain}) \times 13 + \text{Current Gain}]/14}{[(\text{previous Average Loss}) \times 13 + \text{Current Loss}]/14}$$

n = number of RSI periods

The **MACD (Moving Average Convergence/Divergence)** is an indicator developed by Gerald Appel that is calculated by subtracting the 26-period exponential moving average of a given security from its 12-period exponential moving average. By comparing moving averages, MACD displays trend following characteristics, and by plotting the difference of the moving averages as an oscillator, MACD displays momentum characteristics. In most cases, the MACD is compared to its own 9-day exponential moving average and usually the difference between the two is displayed as a histogram. This is displayed in Figure 3.2.

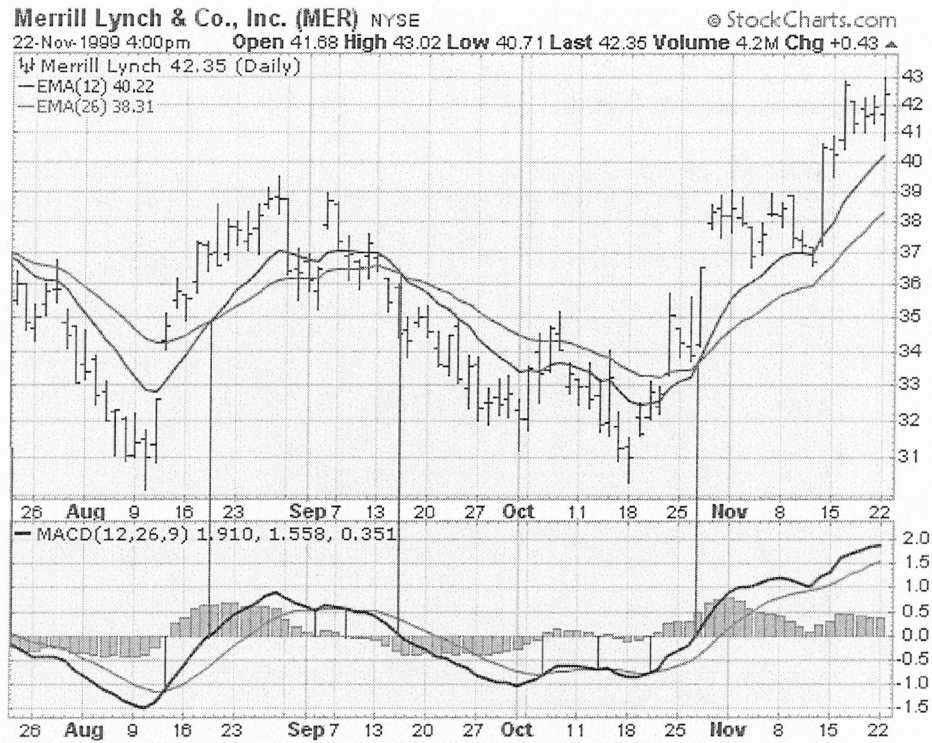


Figure 3.2 – Moving Average Convergence/Divergence

Exponential moving averages are calculated using the following equation:

$$\text{EMA}(\text{current}) = ((\text{Price}(\text{current}) - \text{EMA}(\text{prev})) \times \text{Multiplier}) + \text{EMA}(\text{prev})$$

Where the multiplier is determined by the following equation using as an example a period of 10 days:

$$\frac{2}{(\text{Time periods} + 1)} = \frac{2}{(10 + 1)} = .1818 \quad (18.18\%)$$

The **Directional Movement Indicator (DMI)** is an indicator that plots a positive +DI line measuring buying pressure and a negative -DI line measuring selling pressure. The DMI pattern is bullish as long as the +DI line is above the -DI line. The Average Directional Index

line or **ADX** is derived from this system and is based on the spread between the +DI and -DI lines. This is demonstrated in Figure 3.3.



Figure 3.3 – Directional Movement Indicator/Average Directional Index

Developed by Larry Williams, **Williams %R** is a momentum indicator and is especially popular for measuring overbought and oversold levels. The scale ranges from 0 to -100 with readings from 0 to -20 considered overbought, and readings from -80 to -100 considered oversold. Typically, Williams %R is calculated using 14 periods and can be used on intraday, daily, weekly or monthly data. Its use is displayed in Figure 3.4.



Figure 3.4 – Williams %R

The Williams %R indicator is calculated using the following equation:

$$\%R = \frac{\text{Highest high over } x \text{ periods} - \text{close}}{\text{highest high over } x \text{ periods} - \text{Lowest low over } x \text{ periods}} \times -100$$

The **Stochastic Oscillator** is a momentum indicator developed by George Lane that measures the price of a security relative to the high/low range over a set period of time. The indicator oscillates between 0 and 100, with readings below 20 considered oversold and readings above 80 considered overbought. A 14-period Stochastic Oscillator reading of 30 would indicate that the current price was 30% above the lowest low of the last 14 days and 70% below the highest high. The Stochastic Oscillator can be used like any other oscillator by looking for

overbought/oversold readings, positive/negative divergences and centerline crossovers. Its usage is displayed in Figure 3.5.

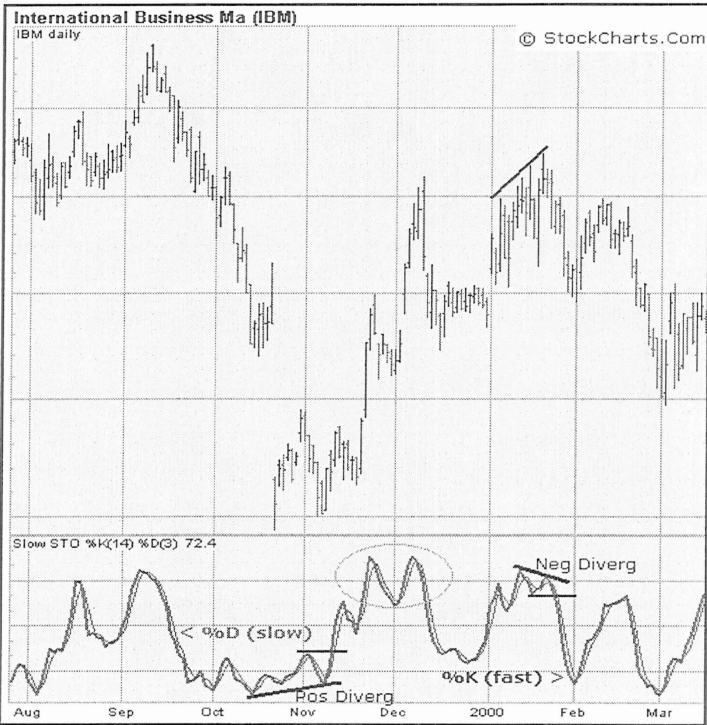


Figure 3.5 – Stochastic Oscillator

There are two oscillators used – a slow (%D) and fast (%K) oscillator. The equations are as follows:

| | | | |
|------|---------------------------------------|---|---|
| %K = | 100 × (| $\frac{\text{Recent Close} - \text{Lowest Low (n)}}{\text{Highest High(n)} - \text{Lowest Low(n)}}$ |) |
| %D = | 3-period moving average of %K | | |
| (n)= | Number of periods used in calculation | | |

3.1.2. Analyzing Patterns in Technical Indicators

In an attempt to determine key buying opportunities in the stock market using technical analysis, the following question may be posed – Does a repetitive pattern exist in technical indicators that will suggest and pinpoint quality buying opportunities? This section will be devoted to finding that pattern.

The basic principle of stock trading is to buy low and then sell high. We know already from the introduction of some technical indicators, that various conditions of a stock can be observed. Oversold conditions may then perhaps be the most critical in determining buying opportunities, but momentum oscillators are just as commonly used.

In looking at various stock charts, the Relative Strength Index, or RSI, appears to be a very good leading indicator of oversold conditions. It clearly shows when a stock price has been oversold in the short term, with values below 30 considered oversold. In many cases this correlates directly to a turnaround in the stock price shortly thereafter. It can give false signals however of a price turnaround because some stocks that appear oversold in the short term, may still be heading for a ditch. Figure 3.6, a 1 year charts of Lucent Technologies (LU), illustrates how the RSI indicator can work very well in some cases, but disastrous in others.

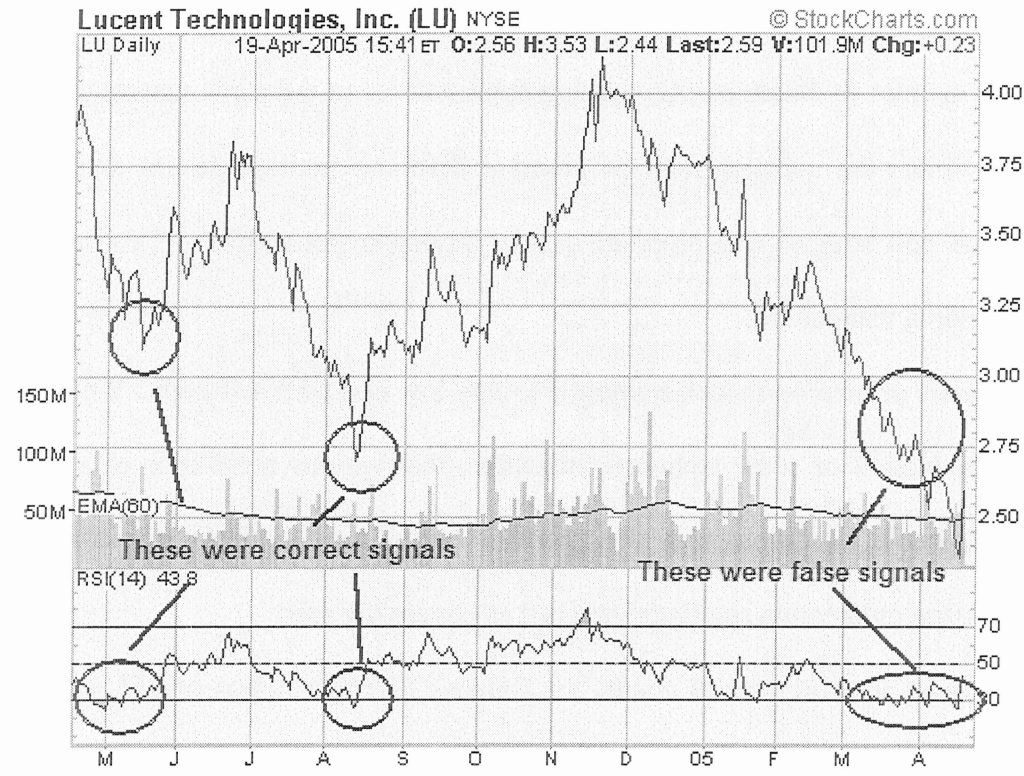


Figure 3.6 – The Unreliability of RSI Oversold Signals

Figure 8 suggests that the RSI can't be relied on alone, and should more appropriately be used in conjunction with one or more technical indicators that can dictate whether or not the buy signals are valid.

Let's examine the same 1 year chart of Lucent Technologies, but this time including a Moving Average Convergence/Divergence, or MACD, technical indicator. In review, the MACD is an oscillator showing momentum characteristics based on the difference between the 12- and 26-day exponential moving averages. Generally, when the MACD has a positive slope, the stock price momentum is bullish, or on the upside, while a negative slope indicates that the momentum is bearish, or on the downside. The MACD is typically compared to its own 9-day

exponential moving average to show the strength of the trend as well as transition points. Figure 3.7 illustrates the way the MACD can be used to confirm the RSI signals.

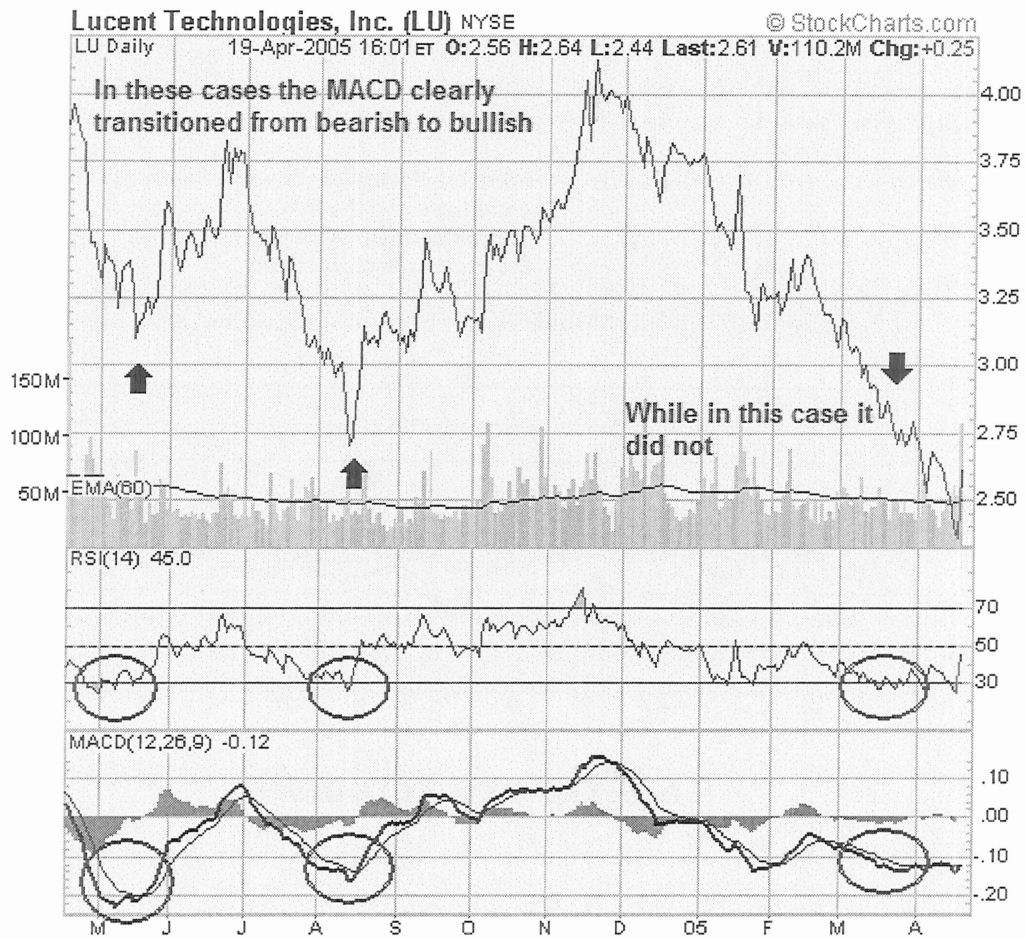


Figure 3.74 – Using the MACD to Confirm the RSI signals

As expected, this system is not fool proof either. An example of how the RSI and MACD don't always tend to give the expected results is shown in Figure 3.8. The chart is a 1 year chart of General Motors Corporation (GPM).

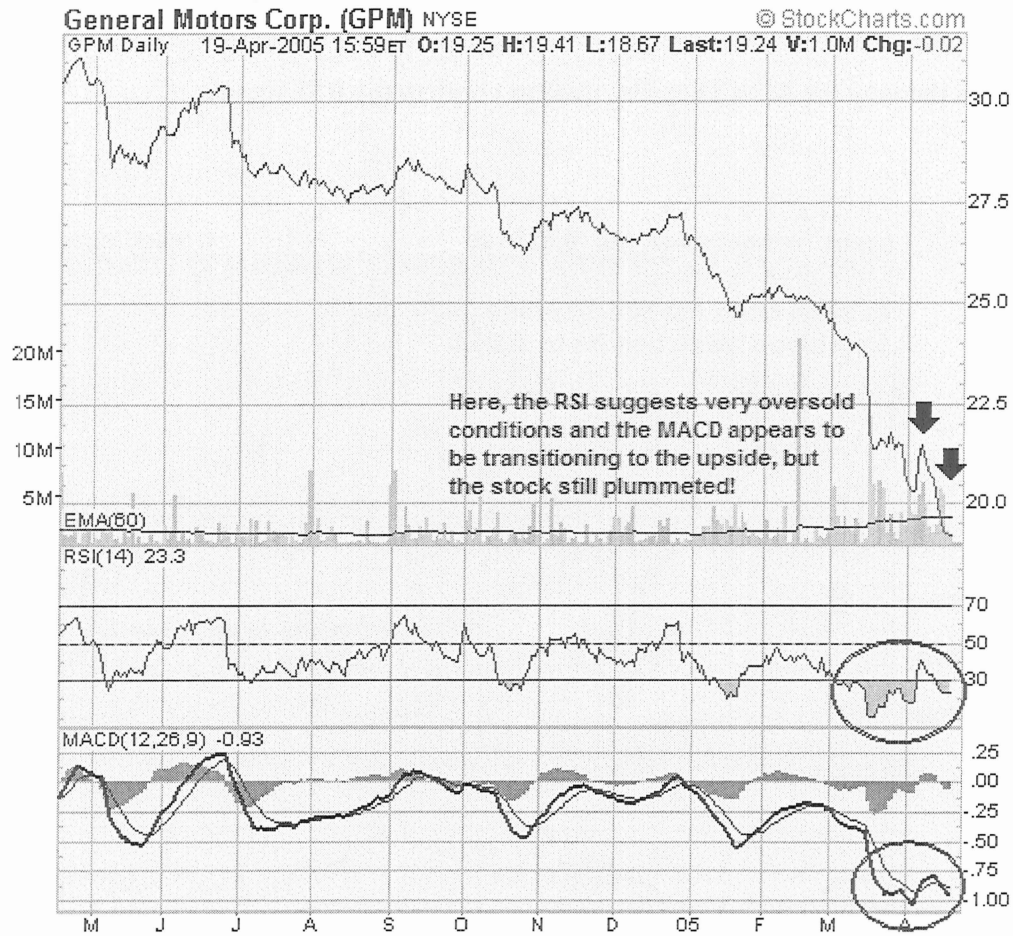


Figure 3.85 – RSI/MACD Unreliability

Another indicator to incorporate is the Directional Movement Indicator, or DMI which includes the Average Directional Index, or ADX. A DMI indicator has two lines: the DI+ measuring buying pressure, and the DI- measuring selling pressure. Also included is the Average Directional Index which is a function of the two DMI lines. Generally, the indicator is read by noticing that the ADX line rises as the current trend strengthens, but then changes direction when the trend starts to weaken. A good sign would look something like a mountain peak. Let's integrate this indicator into the Lucent Technologies chart previously examined, and

see if anything new can be discovered. Figure 3.9 shows the same 1 year chart with the DMI/ADX indicator.

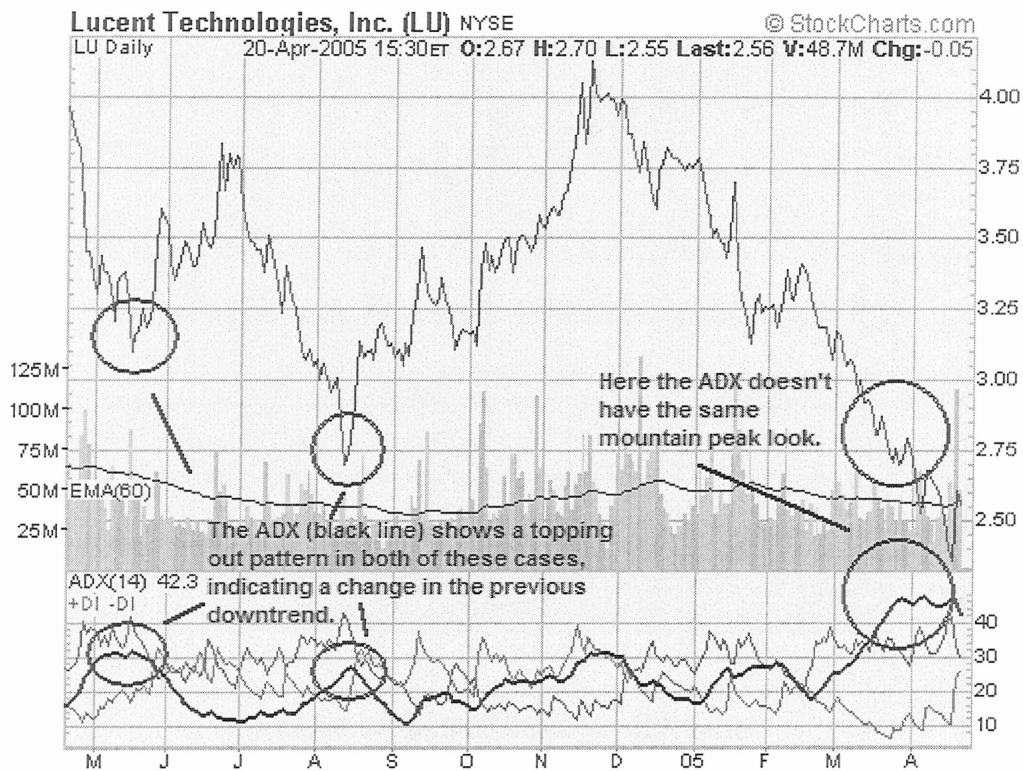


Figure 3.96 – Incorporating DMI/ADX

An example of how this technique fails can be seen in Figure 3.10. The 1 year chart of Anchor Glass Container Corp. (AGCC) has positive signals from the RSI, MACD (not shown), and ADX indicators, but the stock never rallied.

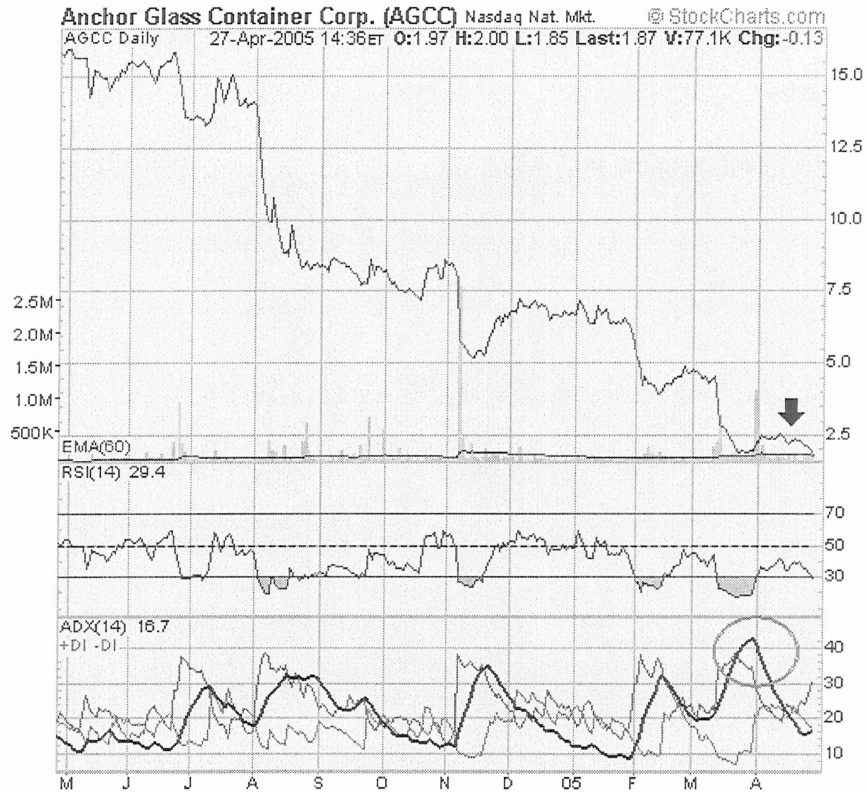


Figure 3.10 – Example of ADX Unreliability

The other two indicators that can also be used in conjunction with the RSI, MACD, and ADX indicators, is the Williams %R momentum indicator and the Slow Stochastic Oscillator. These indicators can appear quite similar depending on the time scale chosen, and are very popular for determining oversold levels. Figure 3.11 shows the 1 year LU chart again including the Williams %R on a 10-day timescale and the Slow Stochastic Oscillator on a 5-day timescale.

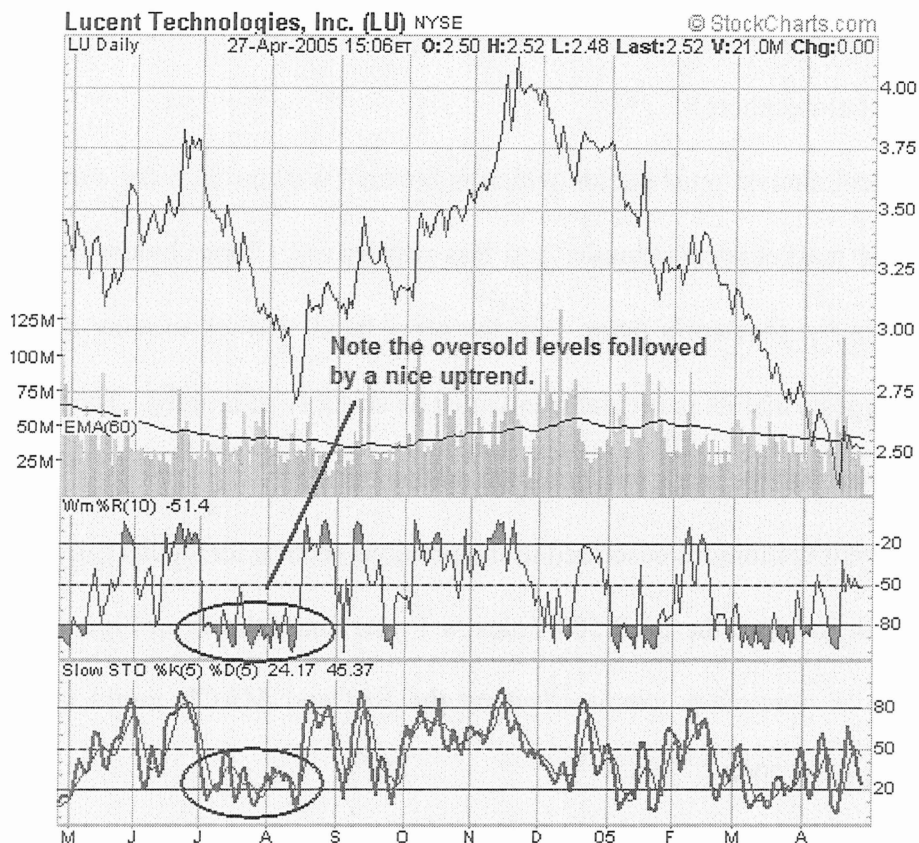


Figure 3.117 – Williams %R and Stochastic

Unfortunately, due to the randomness of the stock market, no method is guaranteed to be successful. However, by analyzing stock charts using many indicators, an investor can increase the probability of finding good stocks, and therefore increase his chances of success.

3.1.3. Relation to Overall Market Trends

Understanding how the overall market is behaving prior to making an investment is extremely wise. An important thing to note when analyzing stocks for trends is that *poor stocks* can behave positively in a bull market. More specifically, companies that are not performing well for whatever reason may still have a strong stock performance during a market uptrend due

to market influences. Likewise, *great stocks* can behave negatively in a bear market due to the overall downbeat atmosphere.

A technical analyst must decide which is better: To swim with the current or against it? Trading with the market seems simpler and less restrictive. Poor choices may even be more likely to move in the investor's favor. On the other hand, a stock moving against the overall market trend suggests that its particular trend must be strongly reinforced. Therefore, there could be a greater chance that the stock will continue on that trend.

The analysis techniques described in the previous section for stocks can also be applied to indices. Take for instance the S&P 500 Index, a 1 year chart shown in Figure 3.12. The same exact technique as previously examined using the RSI and MACD could have pinpointed a turnaround in April of 2004.

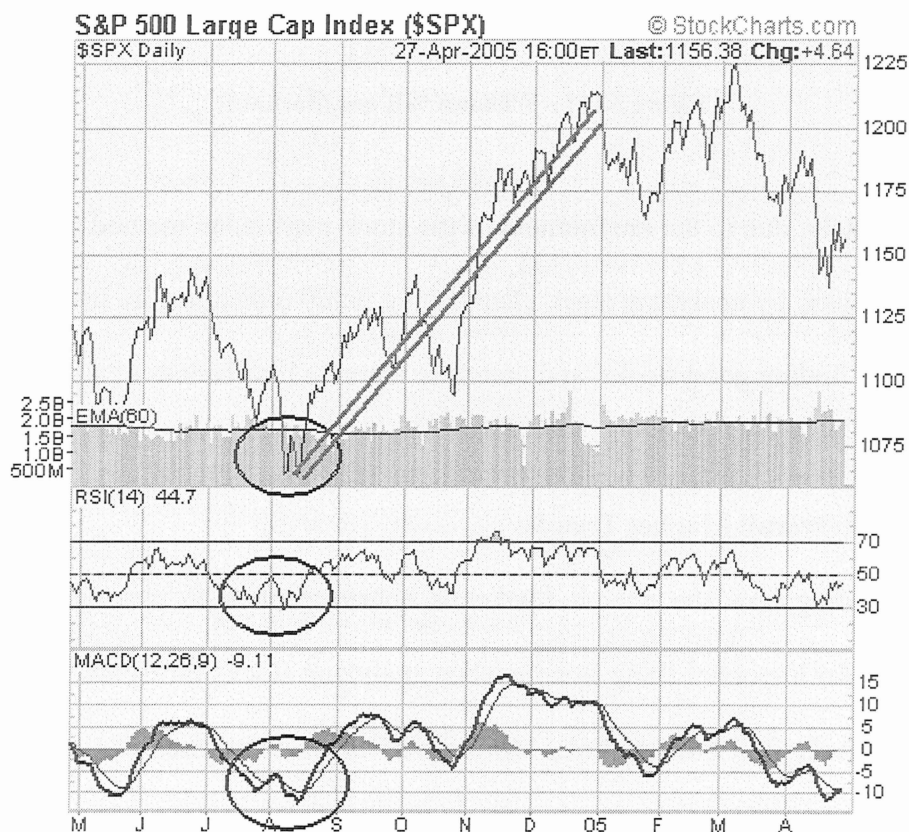


Figure 3.12 – 1 Year Chart of S&P 500 Index

It is a popular approach to apply technical analysis to major market indices before diving into individual stock analysis. To improve upon this method again, many investors also break the market down into the strongest and weakest sectors. For example, energy related stocks, automotive stocks, or semiconductor stocks. There are many sector indexes available to which technical analysis can be applied.

3.2. Trading Simulation

The trading simulation for Technical Analysis Pattern Trading will assume a preliminary investment of \$100,000. Simulated trades will be made between the standard market hours of 9:30 am to 4:00 pm. For simplicity, all market positions will be long (buy orders). Stock picks and trades will be reviewed and updated daily as needed while trades will be made when the trading theory indicates the timing is optimal.

While brokerage fees can vary widely depending upon application, this simulation will use the average trading fee for a discount online broker of \$10.99 per trade. All actions and results will be recorded in tabular form.

3.2.1. Initial Conditions

The goal in this trading simulation is to find success in trading stocks based on the analysis of technical indicators. The trading theory developed will initially search for stocks that meet the following technical criteria:

- RSI(14) that is below 35 and has been increasing for 2 days
- ADX(14,14) that is above 30 and has been decreasing for 1 day
- MACD Histogram(12,26) less than 0.005, but greater than -0.05
- MACD Histogram(12,26) has been increasing over the last 2 days
- Slow Stochastic(5,5) Slow %D is less than 60

Some deviation from the criteria may exist depending upon judgment.

3.2.2. Initial Results

Company profiles in this section are provided by Yahoo!® Finance (*finance.yahoo.com*)

The resulting trades from the first phase of the simulation can be seen in Table 3.1 below.

| Trading History | | | Price | Shares | Total | Cash Balance | Invest Balance | Asset Balance |
|-----------------|------|------|--------|--------|----------|--------------|----------------|---------------|
| 4/6/05 | BUY | ARM | 15.690 | 750 | 11778.49 | \$88,221.51 | \$11,778.49 | \$100,000.00 |
| 4/8/05 | BUY | TGEN | 0.670 | 10000 | 6710.99 | \$81,510.52 | \$18,489.48 | \$100,000.00 |
| 4/11/05 | SELL | ARM | 15.150 | 750 | 11351.51 | \$92,862.03 | \$6,710.99 | \$99,573.02 |
| 4/12/05 | SELL | TGEN | 0.820 | 10000 | 8189.01 | \$101,051.04 | \$0.00 | \$101,051.04 |
| 4/21/05 | BUY | SCSC | 44.640 | 200 | 8938.99 | \$92,112.05 | \$8,938.99 | \$101,051.04 |
| 4/27/05 | BUY | MSBK | 23.980 | 400 | 9602.99 | \$82,509.06 | \$18,541.98 | \$101,051.04 |
| 5/3/05 | BUY | WOR | 16.430 | 700 | 11511.99 | \$70,997.07 | \$30,053.97 | \$101,051.04 |
| 5/3/05 | BUY | JDAS | 10.520 | 1000 | 10530.99 | \$60,466.08 | \$40,584.96 | \$101,051.04 |
| 5/12/05 | SELL | WOR | 15.700 | 700 | 10979.01 | \$71,445.09 | \$29,072.97 | \$100,518.06 |
| 5/13/05 | SELL | JDAS | 11.150 | 1000 | 11139.01 | \$82,584.10 | \$18,541.98 | \$101,126.08 |

Table 3.1 – Trading History for First Phase of Simulation

The first stock purchased, ArvinMeritor Inc. (ticker: ARM) is a global supplier of a range of integrated systems, modules and components serving light vehicle, commercial truck, trailer and specialty original equipment manufacturers (OEMs) and certain aftermarkets. The Company also provides coil-coating applications to the transportation, appliance, construction, heating, ventilation and air conditioning, and doors industries. ArvinMeritor serves OEM customers worldwide, including truck OEMs, light vehicle OEMs, trailer producers and specialty vehicle manufacturers and certain aftermarkets. In November 2004, the Company sold its Roll Coater, Inc., a wholly owned subsidiary to an affiliate of Willis Stein & Partners. In December 2004, the Company sold its Light Vehicle Systems (LVS) automotive stampings and components manufacturing operation to privately owned Columbus Components Group (CCG), LLC.

Prior to the purchase of this stock, the RSI suggested oversold conditions while the MACD appeared to be crossing in the bullish direction, as seen in Figure 3.13. The ADX curve

and Williams %R oscillator, seen in Figure 3.14, also suggested a good buying opportunity.

ARM resulted in a net loss of \$426.98.

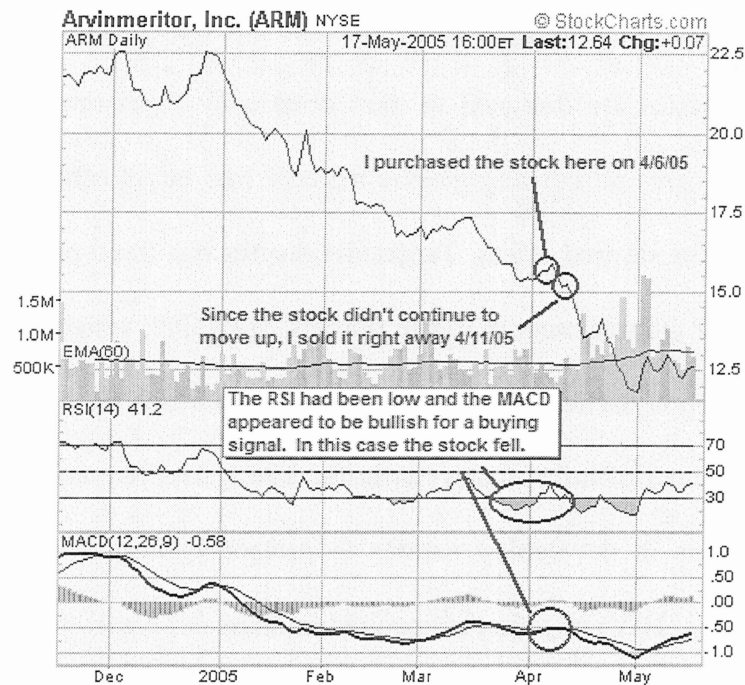


Figure 3.138 – ArvinMeritor Purchase

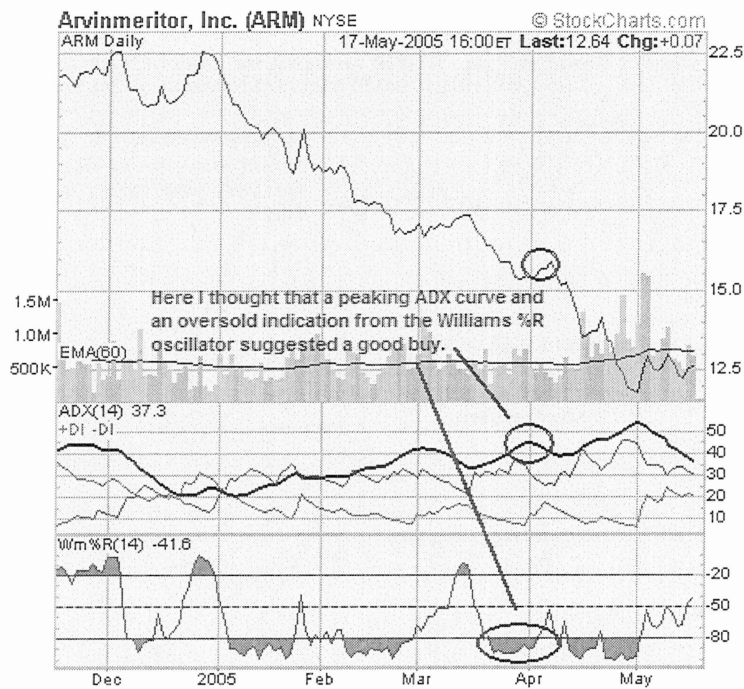


Figure 3.14 – ARM ADX and Will %R Indicators

On the other hand, Targeted Genetics Corporation (ticker: TGEN), turned out to be a very good purchase. Targeted Genetics Corporation (Targeted Genetics) develops gene therapy products and technologies for treating both acquired and inherited diseases. The Company's gene therapy product candidates are designed to treat disease by regulating cellular function at a genetic level. This involves introducing genetic material into target cells and expressing it in a manner that provides the desired effect. Targeted Genetics has three product candidates in its pipeline: tgAAVCF for the treatment of cystic fibrosis, tgAAC09, which is an adeno-associated virus (AAV)-based prophylactic vaccine, and tgAAC94, which is an AAV-based product candidate for the treatment of inflammatory arthritis. The tgAAC09 vaccine is intended for use in high-risk populations in developing nations to protect against the progression of human immunodeficiency virus (HIV) infection to acquired immune deficiency syndrome (AIDS).

Figures 3.15 and 3.16 show how a great buying opportunity was picked using the various technical indicators. TGEN resulted in a net profit of \$1478.02, a 22% gain.

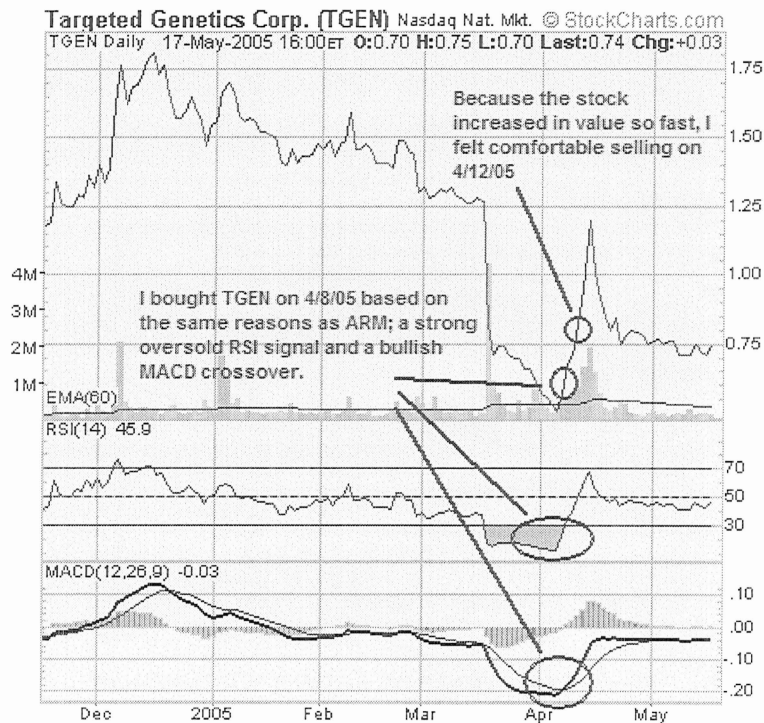


Figure 3.15 – TGEN Purchase

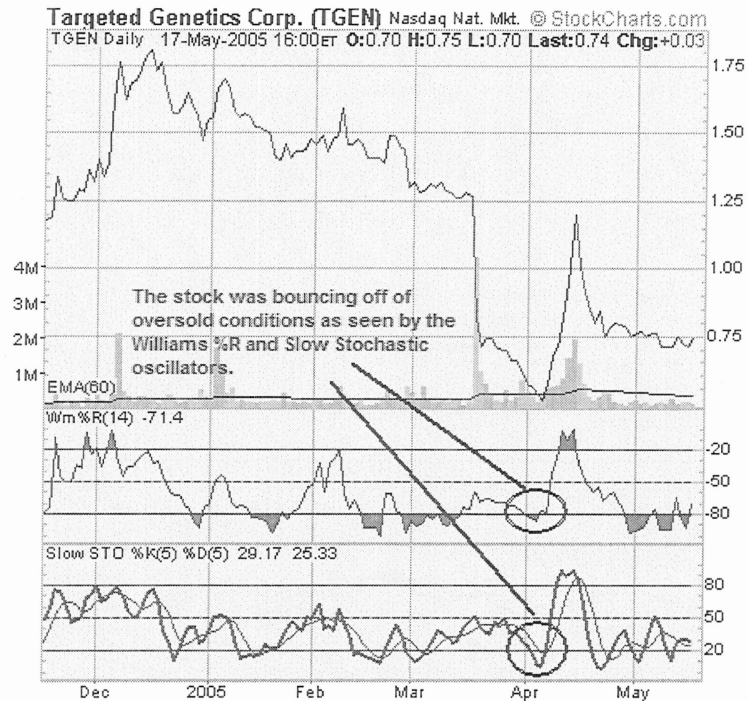


Figure 3.16 – TGEN’s Oversold Condition

ScanSource Inc. (ticker: SCSC) is a wholesale distributor of specialty technology products, providing both value-added distribution sales to technology resellers and e-logistics services to specialty technology markets. The business consists of two operating segments: North American Distribution and International Distribution. The North American Distribution segment markets automatic identification and data capture (AIDC) and point-of-sale (POS) products through its ScanSource sales unit; voice, data and converged communications equipment through its CatalystTelecom sales unit, and converged communications products through its Paracon sales unit. The International Distribution segment markets AIDC and POS products in Latin America (including Mexico) and Europe.

I purchased SCSC on 4/21/05 and it has since been steadily climbing. Very strong RSI and MACD indicators, shown in Figure 3.17, were the biggest reason I picked this stock. I will continue to hold his stock until negative signs become visible.

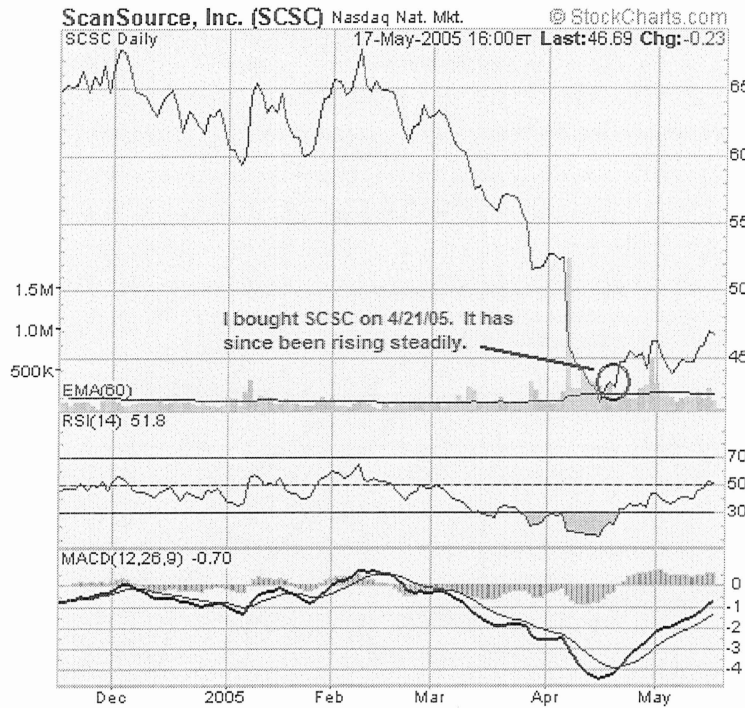


Figure 3.17 – SCSC Purchase

On 4/27/05 I purchased Main Street Banks Inc. (ticker: MSBK). Main Street Banks, Inc. is a financial holding company that engages through its subsidiaries, Main Street Bank (the Bank) Main Street Insurance Services, Inc. (MSII), Piedmont Settlement Services, Inc. (Piedmont) and MSB Payroll Solutions, LLC, in providing a range of banking, mortgage banking, investment and insurance services to its retail and commercial customers located primarily in Barrow, Clarke, Cobb, DeKalb, Forsyth, Fulton, Gwinnett, Newton, Rockdale and Walton counties in Georgia. The Bank provides traditional deposit, lending, mortgage and securities brokerage services. Main Street Bank conducts a general banking business at 23 bank offices in Georgia. The Company provides a range of traditional banking, mortgage banking, investment, and insurance services to individual and corporate customers.

MSBK has been rising slowly since the purchase date as seen in Figure 3.18, so I will continue hold it.



Figure 3.18 – MSBK Purchase

When I purchased Worthington Industries Inc. on 5/3/05, I thought that there was a clear trend reversal. Unfortunately the uptrend didn't last, and out of fear of further declines I sold the stock on 5/12/05. Worthington Industries, Inc. is a diversified metal processing company that focuses on steel processing and manufactured metal products, such as metal framing, pressure cylinders and automotive part stampings. The Company through its joint ventures processes and manufactures metal ceiling grid systems and laser welded blanks. Worthington operates 44 manufacturing facilities worldwide and holds equity positions in eight joint ventures, which operate an additional 17 manufacturing facilities worldwide. The Company's three principal business segments are Processed Steel Products, Metal Framing and Pressure Cylinders. The Processed Steel Products segment includes The Worthington Steel Company business unit (Worthington Steel) and The Gerstenslager Company business unit (Gerstenslager). The stock chart can be seen in Figure 3.19. The trade resulted in a net loss of \$532.98.

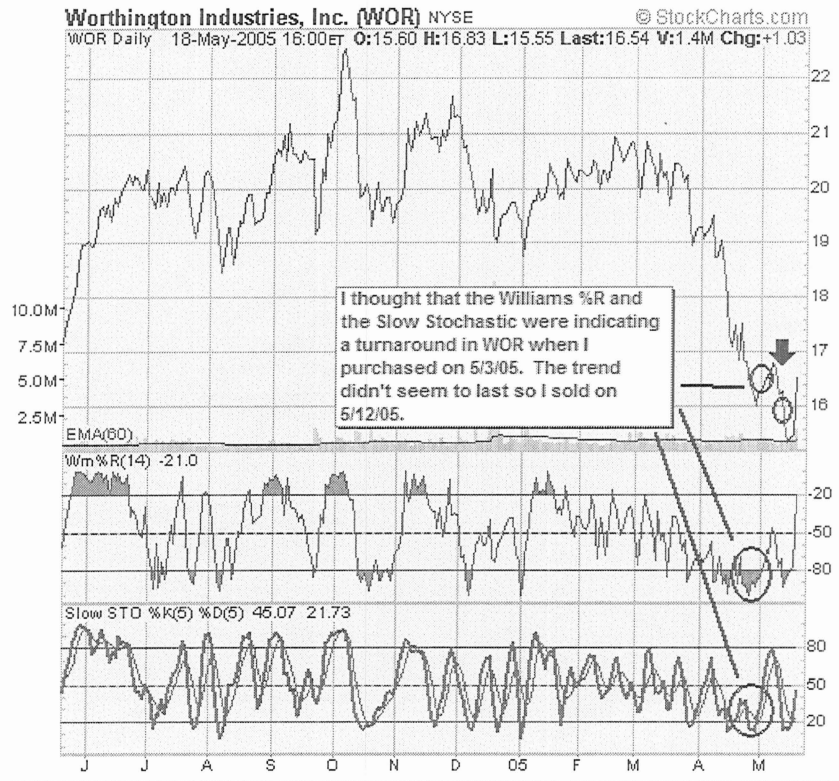


Figure 3.19 – Worthington Industries Inc. (WOR)

My purchase of JDA Software Group Inc. (ticker: JDAS) on 5/3/05 was a textbook example of solid trading based on technical analysis. Figure 3.20 is a chart showing the MACD and ADX curves during the buying cycle. The RSI (not shown) was well below the oversold value of 30. When the price seemed to be stabilizing and flattening, I decided to sell to protect profits. The purchase resulted in a net profit of \$608.02.

JDA Software Group, Inc. (JDA Software Group) is a provider of software solutions designed specifically to address the demand and supply chain management, business process, decision support, e-commerce, inventory optimization, collaborative planning and forecasting, and store operations requirements of the retail industry and its suppliers. The Company operates in three business segments: Retail Enterprise Systems, In-Store Systems and Collaborative Solutions. JDA Software Group's solutions enable customers to manage and optimize their

inventory flows throughout the demand chain to the consumer, and provide optimized labor scheduling for retail store operations. In addition, the Company offers Portfolio Customer Support services that include product maintenance, online support and access to its Solution Centers via telephone and Web interfaces. During the year ended December 31, 2004, JDA Software Group was able to begin the process of transition to its new product offering.

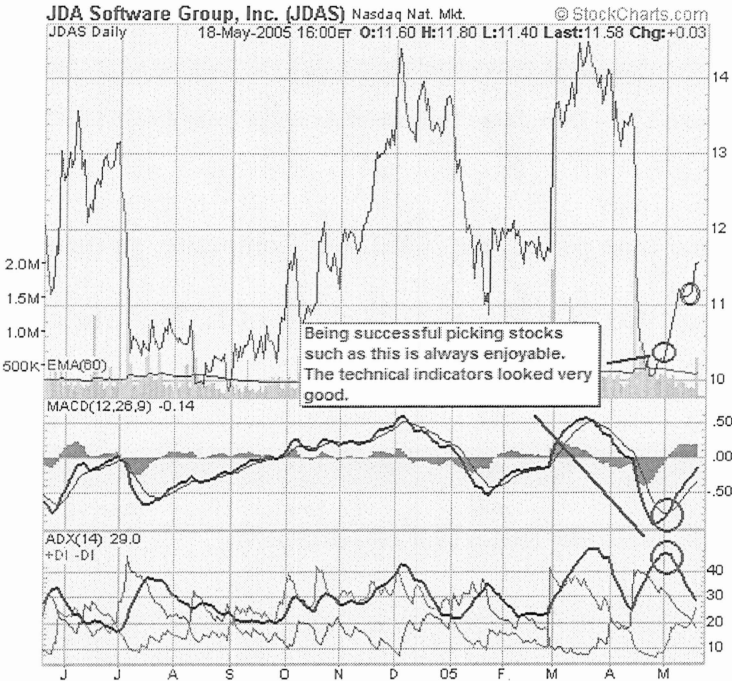


Figure 3.20 – JDS Software Inc.

3.2.2.1. Overall Market Behavior

During the first initial phase of trading, the overall market trended downward. From 4/6/05 to 5/13/05, the Dow Jones moved from 10,486.02 to 10140.12, a loss of 345.90 points or 3.30%. The chart can be seen in Figure 3.21.



Figure 3.21 – Dow Jones Industrial Average from 4/6/05 to 5/13/05

During this same time period, the NASDAQ Composite, an index heavy in tech stocks, moved from 2004.25 to 1976.78, a loss of 27.47 points of 1.37%. The chart is shown in Figure 3.22.



Figure 3.22 – NASDAQ Composite from 4/6/05 to 5/13/05

The S&P 500 lost 30.19 points or 2.55% during this time period as the index struggled and moved from 1184.24 to 1154.05. The chart is shown in Figure 3.23.



Figure 3.23 – S&P 500 Index from 4/6/05 to 5/13/05

Comparatively, during this time period, my trades resulted in a net gain of \$1126.08 or 1.13%. Considering that the overall market lost ground, I consider this gain to be very good. Hence, at this point I will not revise the trading model.

3.2.3. Final Results

I bought Security First Technologies Corp. (ticker: SONE) on 5/16/05. This trade resulted in a net gain of \$1071.98 or 5.00%. The chart can be seen in Figure 3.24.

S1 Corporation provides enterprise software solutions for banks, credit unions, investment firms, and insurance companies. It operates in two segments, Financial Institutions and Edify. The Financial Institutions segment develops, markets, and implements integrated, transactional, and brandable enterprise applications available as in-house or hosted solutions. The Edify segment provides various voice and speech recognition applications, which help companies automate their customer service facilities. Its voice and speech solutions combine speech recognition, speaker verification, text-to-speech, fax, and touch-tone automation. The segment sells its products in various markets, including financial services, travel, retail, and

telecommunications. The company's principal product groups include banking solutions, insurance solutions, customer relationship management solutions, Web site solutions, financial reporting solutions, and account aggregation. In addition, it offers hosting services; and professional services, such as project management, custom software development, technical services, educational services, and Web design services. The company offers its solutions to small, mid-sized, and large financial organizations in the Americas region; and the International region, consisting of Europe, Middle East, Africa, Asia-Pacific, and Japan. S1 Corporation was founded in 1996 and is headquartered in Atlanta, Georgia.

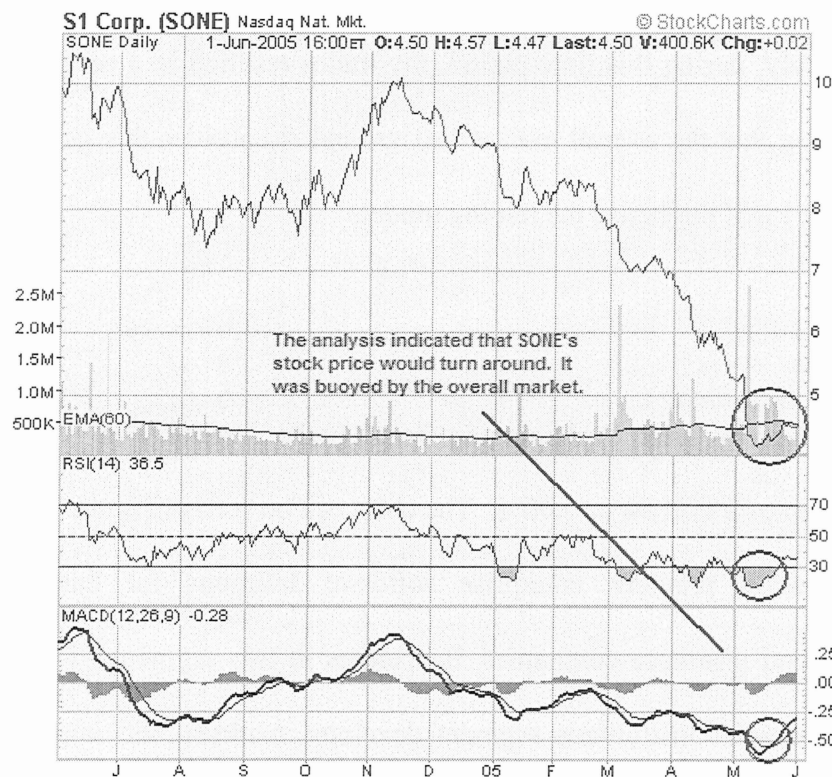


Figure 3.24 – S1 Corp.

Gray Television Inc (ticker: GTN) was purchased on 5/18/05 and resulted in a net loss of \$598.02 or 4.83%. The chart is shown in Figure 3.25. Gray Television, Inc., a communication company, provides news and entertainment services. It engages in broadcasting, publishing, and

paging operations in the United States. The company operates wireless messaging and paging business in Georgia, Florida and Alabama. As of December 31, 2004, Gray Television operated 31 television stations, comprising 16 CBS-affiliated television stations, 8 NBC-affiliated television stations, and 7 ABC-affiliated television stations serving 27 television markets. As of the same date, it owned and operated five daily newspapers, of which four were located in Georgia and one in Goshen, Indiana. The company is headquartered in Atlanta, Georgia.

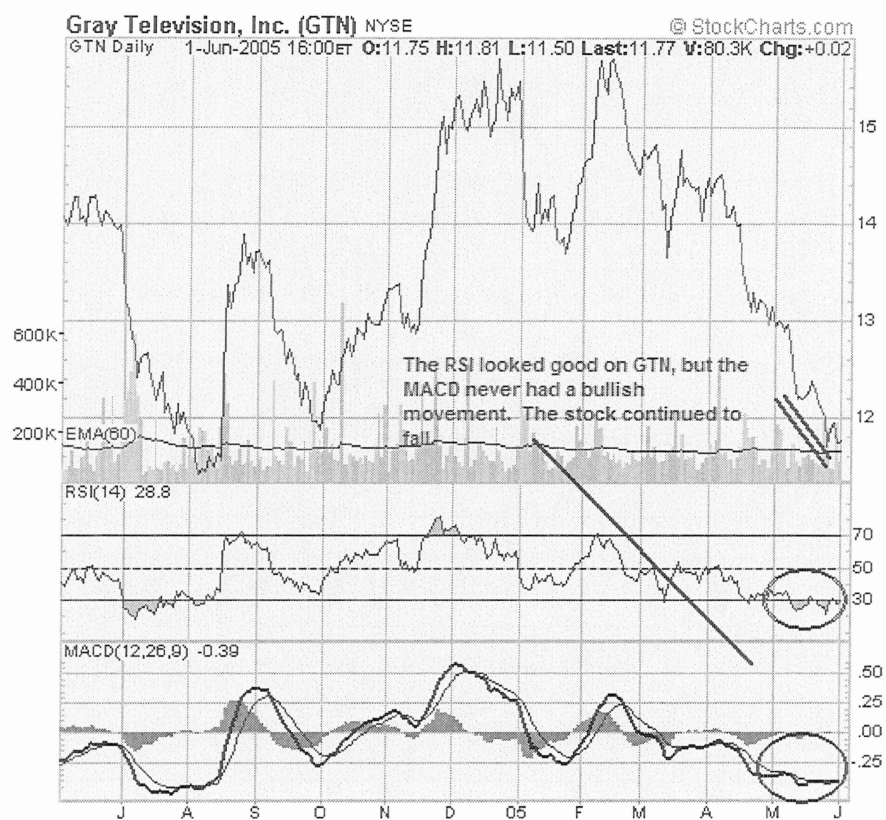


Figure 3.25 – Gray Television Inc.

Placer Dome Inc (ticker: PDG) was also purchased on 5/18/05. This trade resulted in a net gain of \$1191.98 or 9.41% and is shown in Figure 3.26. Placer Dome, Inc. engages in the exploration, acquisition, development, and operation of mineral properties. It principally produces gold, as well as silver and copper metals. The company has mining operations in

Canada, the United States, Australia, Papua New Guinea, South Africa, Tanzania, and Chile; and has exploration work in these countries, as well as other parts of the world. As of August 12, 2004, Placer Dome had interests in 17 mines in 7 countries worldwide. The company was formed in 1987 pursuant to the amalgamation of Placer Development Limited, Dome Mines Limited, and Campbell Red Lake Mines Limited. Placer Dome is headquartered in Vancouver, Canada.



Figure 3.26 – Placer Dome Inc.

Deciding to maintain the same trading approach turned about to be a favorable option. From 5/13/05 to 6/1/05, the Dow Jones Industrial Average gained 409.75 points or 4.04%, the NASDAQ gained 111.08 or 5.62%, while the S&P 500 gained 48.17 points or 4.17%. This was a very good time to buy into the stock market. The final trading results are shown in Table 3.2.

Trading History

| Date | Action | Stock | Price | Shares | Total | Cash Balance | Invest Balance | Asset Balance |
|---------|--------|-------|--------|--------|----------|--------------|----------------|---------------|
| 4/6/05 | BUY | ARM | 15.690 | 750 | 11778.49 | \$88,221.51 | \$11,778.49 | \$100,000.00 |
| 4/8/05 | BUY | TGEN | 0.670 | 10000 | 6710.99 | \$81,510.52 | \$18,489.48 | \$100,000.00 |
| 4/11/05 | SELL | ARM | 15.150 | 750 | 11351.51 | \$92,862.03 | \$6,710.99 | \$99,573.02 |
| 4/12/05 | SELL | TGEN | 0.820 | 10000 | 8189.01 | \$101,051.04 | \$0.00 | \$101,051.04 |
| 4/21/05 | BUY | SCSC | 44.640 | 200 | 8938.99 | \$92,112.05 | \$8,938.99 | \$101,051.04 |
| 4/27/05 | BUY | MSBK | 23.980 | 400 | 9602.99 | \$82,509.06 | \$18,541.98 | \$101,051.04 |
| 5/3/05 | BUY | WOR | 16.430 | 700 | 11511.99 | \$70,997.07 | \$30,053.97 | \$101,051.04 |
| 5/3/05 | BUY | JDAS | 10.520 | 1000 | 10530.99 | \$60,466.08 | \$40,584.96 | \$101,051.04 |
| 5/12/05 | SELL | WOR | 15.700 | 700 | 10979.01 | \$71,445.09 | \$29,072.97 | \$100,518.06 |
| 5/13/05 | SELL | JDAS | 11.150 | 1000 | 11139.01 | \$82,584.10 | \$18,541.98 | \$101,126.08 |
| 5/16/05 | BUY | SONE | 4.290 | 5000 | 21439.01 | \$61,145.09 | \$39,980.99 | \$101,126.08 |
| 5/18/05 | BUY | GTN | 12.390 | 1000 | 12379.01 | \$48,766.08 | \$52,360.00 | \$101,126.08 |
| 5/18/05 | BUY | PDG | 12.680 | 1000 | 12669.01 | \$36,097.07 | \$65,029.01 | \$101,126.08 |
| 6/1/05 | SELL | MSBK | 25.900 | 400 | 10370.99 | \$46,468.06 | \$55,426.02 | \$101,894.08 |
| 6/1/05 | SELL | SCSC | 49.520 | 200 | 9914.99 | \$56,383.05 | \$46,487.03 | \$102,870.08 |
| 6/1/05 | SELL | SONE | 4.500 | 5000 | 22510.99 | \$78,894.04 | \$25,048.02 | \$103,942.06 |
| 6/1/05 | SELL | GTN | 11.770 | 1000 | 11780.99 | \$90,675.03 | \$12,669.01 | \$103,344.04 |
| 6/1/05 | SELL | PDG | 13.850 | 1000 | 13860.99 | \$104,536.02 | \$0.00 | \$104,536.02 |

Table 3.2 – Final Trading Results

The overall trading simulation resulted in a net gain of \$4,536.02 or a 4.54% increase over a period of 41 working days. 18 trades were completed (buy and sell) and included were brokerage fees totaling \$197.82.

3.3. Conclusions

Technical analysis trend trading is unlike the traditional approaches to stock trading. It pays no attention to common company fundamentals such as revenue, profitability, the price to earnings ratio, or the debt to equity ratio. Instead, it relies solely upon patterns that can be depicted from price charts. This difference may be too significant for the novice or average investor to feel comfortable trading with, and hence they will choose to continue using traditional techniques.

I am confident that this technique can work well when applied under the right circumstances. The market should never be entered blindly. It is crucial that an investor get a good understanding of how the overall market is behaving prior to making decisions.

A huge advantage of using this type of technical analysis is that it allows an investor to use the same exact analytical techniques for both the major market indices and individual stocks. During the first phase of this simulation, the overall stock market performed poorly and the simulated trades resulted in mediocre success. During the final phase of the simulation, the profitability was greater due to the positive performance of the overall market. Though not an exact science, technical analysis can enable an investor to increase the probability of success over time.

4. Segment Comparison

When choosing a stock trading strategy, there is a great deal more to consider than simply performance results. Results can vary greatly over time, while short term simulations like these provide only a limited statistical sample. However, from a comparison of these two strategies, it may be possible for the reader to draw useful conclusions.

The Hybrid Strategy, relying heavily upon reported fundamental macroeconomic data, is particularly conservative in its approach, but does include some technical analysis. This approach appears to work better over a long-term period since it lacks somewhat in its ability to predict immediate market movements. An advantage to this strategy is that it can help to maintain a moderately low risk portfolio. The simulation based on this strategy failed to outperform the overall market.

At the other end of the spectrum is the Technical Analysis Pattern Trading Strategy. It literally ignores fundamental economic data, as it relies solely upon chart analysis. This non-traditional approach increases the risk-factor when trading. However, it can simplify things greatly when an investor doesn't have to digest an abundance of economic data. The strategy seems to work the best when buoyed by the overall market. The simulation based on this strategy outperformed the overall market.

5. Conclusions

The problem of stock market trading can be approached several different ways. One way is the long-term approach. The market is assumed to be ever increasing, and an investor can put his money into the market with the same attitude as a person putting their money into a bank account. The money is assumed to be relatively safe, and not much attention is paid to the day-to-day or even monthly fluctuations in the value of the invested money. The investment is assumed to be healthy on a year-to-year basis. This approach has the advantage of not requiring much time on the part of the investor, and over the long term the stock market indeed does seem to be on a strong upwards trend. Although this is an entirely valid approach, neither of us considered this approach because of the 10-week time limitation of the simulation period for this report.

At the opposite end of the spectrum is the day trader approach, in which stock trades are made on a daily, or at most a 1 to 2 week time horizon. This approach was examined in Section 3 of this report and was successful, outperforming the market during our simulation time. This approach gave excellent results. However, downsides to this approach are that it involves much time on the part of the investor in tracking the various indicators for every stock traded, and also time taken to set up and execute trades. It is a good approach, but is viable only for someone who has the time to devote to studying the stock market.

The Hybrid Analysis approach falls somewhere in between the buy-and-hold and day trade approach. This approach was not as successful, and in fact underperformed the market during the time span of our simulation. I believe that it is very difficult to trade stocks in the intermediate time range of trading on a weekly or monthly range. It seems to have the dual disadvantage of requiring a medium of level of time commitment for market research (more than

the buy-and-hold), while simultaneously not giving the advantages of long term growth as realized in the buy-and-hold strategy.

It seems like either the long-term buy-and-hold, or short term, purely technical approach, as analyzed in Section 3, are the best ways to invest in the stock market. It seems like it is virtually impossible to predict the stock market activity in the short term based on fundamental analysis only. Possibly, fundamental or Hybrid Analysis could work on a long-term basis (2 to 3 years, at a minimum).

6. References

1. US Bureau of Labor Statistics. US Department of Labor. <<http://data.bls.gov>>.
2. Economagic: Economic Time Series Page. <<http://economagic.com>>.
3. St Louis Fed: Economic Research. Federal Reserve Bank of St Louis. <<http://research.stlouisfed.org>>.
4. US Census Bureau. <<http://census.gov>>.
5. Yahoo! Finance. <<http://finance.yahoo.com>>.
6. MSN Money. <<http://moneycentral.msn.com>>.
7. Big Charts: Stock Charts. <<http://www.bigcharts.com>>.
8. StockCharts.com: Simply the Web's Best Financial Charts. <<http://www.stockcharts.com>>.
9. Murphy, John J. Technical Analysis of the Financial Markets: A Comprehensive Guide to Trading Methods and Applications. New York: Prentice Hall P, 1999.

7. Appendix

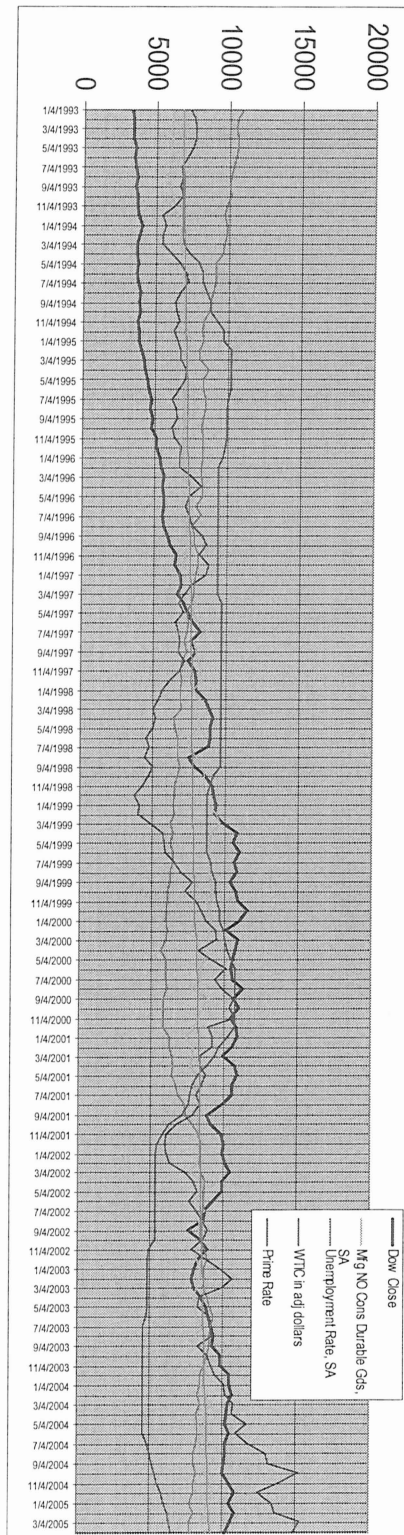


Figure 7.1 – Economic Time Series Data