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THE RISE AND FALL OF THE DOTCOMS

An Interactive Qualifying Project Report
submitted to the Faculty of
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by

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1. Acknowledgments

Our appreciation goes to the technical support personnel from Thomson Analytics and especially Annafabia Bax whose cooperation helped make this project successful. We would also like to thank Professor Wilkens for her patience and giving us the opportunity to work with her on the dotcom era that affected the U.S. economy after the millennium.

2. Abstract

This project compares and contrasts two popular approaches to investing in stocks and analyzes various factors that contribute to stock price performance in the dotcom industry. By segmenting our data into pre and post 2000 periods, we find a comparison of the number of average returns for two different Wall Street Guru strategies. We utilize hypothesis testing to affirm the results of our data analysis to see if the two indices and two strategies were statistically different from each other.

3. Introduction

The purpose of this project is to understand some major trends of the dotcom industry, especially in the stock market and its impact on society. The High-tech industry has become one of the fastest growing industries in the world and has had one of the greatest impacts on society. In the 21st century in broad terms, we will look at facets of the high-tech revolution ranging from interdependent global issues and international relations to adverse social, political and economic impacts.

From the times of J. Pierpont Morgan (1837-1913), an American financier and industrial organizer of the stock market, to the current times of Bill Gates, founder and CEO of Microsoft Corporation, and Larry Ellison, co-founder and CEO of Oracle Corporation, the stock market has seen major valuation swings. It has been plagued by bear markets and buoyed by bull markets over the years. We examined factors that led to the rise in the 1990's and fall from grace in 2000 of the high-tech industry. We also developed suggestive strategies for sound investing in this volatile dotcom industry by looking at the past performance and predicting the market trends using available data. We simulated the performance of different industry portfolios comprised of new economy stocks and old economy stocks using different strategies discussed in the literature review. The goal of our analysis is to analyze and contrast the two guru strategies used to invest in the stock market. We also need to deduce if it would be feasible to invest in the dotcom using the same strategies in the present.

A dotcom is a company whose operations are entirely or primarily Internet-based, or more specifically a company whose business model would not be possible if the Internet did not exist. The Internet, often hailed as the Industrial Revolution of the

Information Age, has emerged as a force in the stock market since early 1990s. American Online, the grandfather of Internet stocks, went public in March 1992. In the following years, we witnessed an increasing number of Internet Initial Public Offerings (IPO's), including well-known companies such as Yahoo, Amazon, and e-bay. "The year 1999 was the roaring year for Internet companies. In that year alone, 245 Internet companies jumped on to the public stage, bringing the total number of listed companies to more than 300."[1] This dramatic increase in Internet IPO's in such a short time period was fueled by an amazing rise in the share values of these public companies. Most of these Internet companies were also called e-commerce companies because they did buying and selling of products and services by businesses and consumers over the Internet. E-commerce companies are subdivided into three categories: business to business or B2B (e.g. Cisco), business to consumer or B2C (e.g. Amazon), and consumer-to-consumer or C2C (e.g. eBay). These are all examples of dotcom companies.

From 1998-1999, the Internet economy grew by 68%. As the 20th century came to a close, the dotcoms had revolutionized the way America did business. One of the questions we have to ask is how did the dotcom phenomena start and spread so quickly? Originally conceived in the 1960s, what is now called the Internet grew out of a number of efforts, mostly by government and academic organizations, to build an infrastructure that allowed computers to reliably pass information between them. Something did happen in the mid-1990s, however, that changed the global economic and social landscape forever. The Internet gained a critical mass of users, and the whole became vastly greater than the sum of its parts. The Net Effect had been realized.

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[1] Qiao Liu and Fran Song, http://www.econ.hku.hk/~qliu/internet.PDF

From December 1998, to March 2000, the dotcom stocks seemed to defy all odds. Prices were increasing at a record pace, and there seemed to be no stopping them. Yet, in April 2000, Internet stock prices began to fall. The other question we have to answer is what factors led to the decline of the dotcom. The NASDAQ 100 index comprises most of the Internet stocks in comparison with other major indices. Figure 1 illustrates the stock price trends for NASDAQ. Figure 2 shows the distribution of Internet stocks conducting IPO's obtained from two sources: www.internet.com and www.topinternetstocks.com.

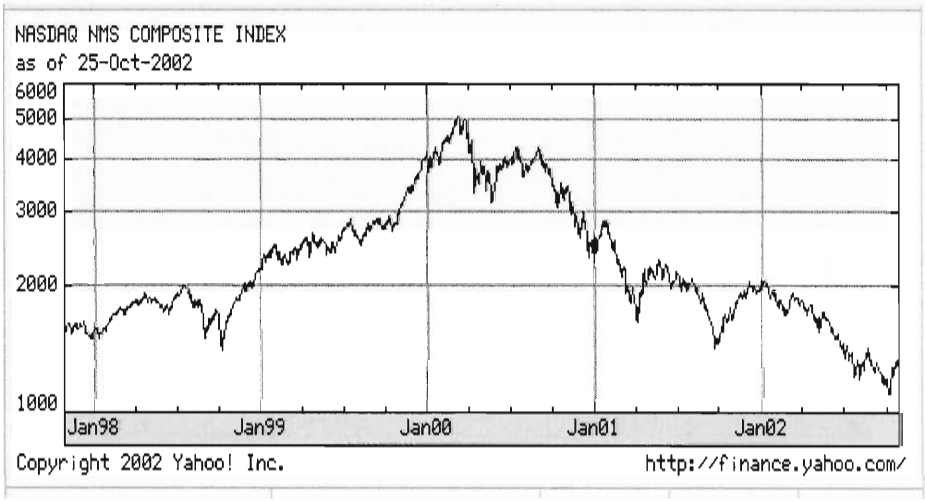

Figure 1: Pre & Post 2000 Stock Prices

Panel A: Distribution of Internet firms conducting IPOs

Year	Number of IPOs	Nasdaq price index (year-end or month-end)
Before 1996	41	1052.13
1996	20	1291.03
1997	18	1570.35
1998	18	2192.69
1999	245	4069.31
Jan – Feb 2000	27	4696.69
Total	369	

Figure 2: Distribution of Internet firms conducting IPO's

The third question we have to ask is how could have this decline been avoided? This might have been because three basic principles came into play. These are skewed risk-reward trade-off, interest rate hike, and lack of cash flow.[2]

Skewed risk-reward trade-off tends to identify how much risk an individual is willing to take for a given yield. It is the investment principle that an investment must offer higher potential returns as compensation for the likelihood of increased volatility. Investors normally accept higher risk on long-term investments, where the effects of price volatility usually diminish over time; they generally seek lower risk on short-term investments, where accessibility and preservation of principal override the need for maximum return.[3] Venture capitalists poured funding into the dotcoms, and when the time came for the company to go public, the owners only sold a fraction of their stock at the opening price. Since the supply of IPO stock was so small and demand was so high, the price in the secondary market for these new shares skyrocketed. When shareholders sold their stock, they made quite a profit.

Interest rate hikes affected consumers who had taken out loans to buy stock and other goods. They thought they could pay the loans in the future but instead would be deeply indebted or even bankrupt when their investments did not pay off. This caused future spending to be seriously depressed. Figure 2 displays the change in interest rate from 1996 to 2001.

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[2] McCombs School of Business of the University of Texas at Austin, , http://misbridge.bus.utexas.edu/knowledge/topics/dotcom/default.asp

[3] Investopedia, http://www.investopedia.com

Figure 3: Interest Rate Hike

Cash flow affected the dotcoms since venture capitalists were the main source of capital for them. As stock prices fell, venture capitalists pulled out, leading to less funding for start-up dotcoms and also pulled funding for existing dotcoms. When initial investment money ran out, there were no cash inflows to replace it. Without capital, no business can survive.

The fourth question is what is the dotcom impact on society, and where is it headed in the future. Current trends in the stocks would have to be analyzed to be able to forecast such events. The best way to understand why many dotcoms failed and how others managed to survive is to look at examples of a few cases of some dotcom companies. For example, Cisco faced a problem last year that resulted in a $2.2 billion inventory write-down. Only a few months before the write-down, Cisco wasn't able to get its products to customers quickly enough. Quoting a supplier to Cisco interviewed in CIO Magazine, "People see a shortage and intuitively they forecast higher. Salespeople don't

want to be caught without supply, so they make sure they have supply by forecasting more sales than they expect."[4]

Another example was a startup company called Govworks.com. Two years ago, with the dotcom mania in bloom, company founder Kaleil Tuzman and four of his buddies invested $200,000 to set up Govworks.com. The idea was to build out technology that would enable routine payments to local governments via the Internet and save the headaches of dealing with a bureaucracy. Govworks would pull in revenues from bill payment fees, charging government agencies for job postings and from the commission for auctioned items from its flagship Web site. Convinced that the market for this was worth $450 billion, Govworks began to hire aggressively in July 1999, growing to 50 by October. Investors began to show interest. Tuzman landed $19 million in a Series B round led by Kohlberg Kravis Roberts and the Mayfield Fund.

Soon after, with new offices in the Alley, the company teamed up with Cotesa Holding, Ltd. to develop a joint venture to tap into the burgeoning Latin American market. Govworks continued to expand at an amazing pace, gobbling up Jobs-in-Government, an auction site and two other companies.

By late spring, Govworks had 250 employees on payroll. Like many Internet companies, Govworks fell prey to the growth-at-all-cost craze. The tide had already turned in the markets and the company had to cut back. Layoffs ensued with more than 60 employees receiving pink slips at the end of April 2000. Then the company all fell apart.

The fifth question is what strategy could be implemented at present to earn profit in the stock market dealing with dotcoms. In order to develop such a strategy, we

[4] Forio Corporation, www.forio.com

reviewed literature by experienced economists on market efficiency and trading strategies.

4. Literature Review

To understand what went behind the phenomena of the dotcoms, one must research the time that the "computer" and "Internet" were brought into the world. These two most important factors were what led to the dotcom "boom". Access to computers and the Internet and the ability to effectively use this technology were increasingly important for full participation in America's economic, political and social life. People use the Internet to find lower prices for goods and services, work from home or start their own business, acquire new skills using distance learning, and make better-informed decisions with the use of the Internet.

The 1980s and early 1990s were characterized by the development of the microprocessor and the evolution of increasingly smaller but more powerful computers, such as the personal computer and Personal Digital Assistant. In 1995, only 1 out of 4 households had a computer, and only 9% of the population had access to the Internet. Most people used the computer for word processing or spreadsheet work, but a few people saw the opportunities that the Internet offered. By 1998, when 80 million Americans, nearly 30% of the population, were online, those who had recognized the potential of the Internet early on used this new tool to create new business models. The entrepreneurial spirit exhibited by the Internet pioneers was a second major factor in the rise of the dotcoms.[5]

The Internet's pace of growth in the early 1990s was spectacular, almost ferocious. Why did and do people still want to be "on the Internet?" One of the main reasons is simple freedom. The Internet is a rare example of a true, modern, functional

[5] McCombs School of Business of the University of Texas at Austin, http://misbridge.bus.utexas.edu, U.S. Department of Labor Bureau of Labor Statistics, http://www.bls.gov

anarchy. There is no "Internet Inc." There are no official censors, no bosses, no board of directors, and no stockholders. The future of the Internet proved to be bigger and exponentially faster. Commercialization of the Internet was a very hot topic, with every manner of wild new commercial information-service promised. Gradually, as more and more people went online, the Internet and dotcoms gained popularity. The demand for Internet stocks skyrocketed, and from December 1998 to March of 2000, they grew by about 500% as shown in Figure 1.

The National Association of Securities Dealers Automated Quotations (NASDAQ) began trading on February 8, 1971, and it became the largest stock market in the U.S. by volume in 1999. It is unique because it is not limited to one location. Trading is executed through NASDAQ's sophisticated computer and telecommunication network that transmits real-time quote and trade data to more than 1.3 million users in 83 countries. As the world's first electronic stock market, it is made up of the NASDAQ National Market and the NASDAQ SmallCap Market. NASDAQ allows multiple market participants to trade through its electronic communication networks structure, thus increasing competition. In the late 1990s, the NASDAQ hit a record high of over 5000; and the United States' GDP grew by 5 % to $9.963 trillion. Everyone was reaping the benefits of this growing economy rooted in the growth of the dotcoms. [6]

Overnight successes many dreamed of were a reality. Internet startups from portals sites, specialty content providers, consumer retail, and auctions sites were all the rage. For a brief period, appreciation in their stock price was the fuel for these companies.

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[6]Museum of American Financial History, www.financialhistory.org
NASDAQ Stock Market, www.nasdaq.com

The investing public behaved as if no price was too high for these promising "leaders of the new economy." Anything and everything Internet would command a hefty valuation, and a mysterious prestige. For some, the "Internet boom" was a mania. But all of this changed in 2000.

By the earlier summer of 2001, many of these dotcom companies met their horrible end. Many once highflying dotcom companies were announcing layoffs, restructurings, and bankruptcies. Many blamed shaky and flawed business models, poor execution, over funding, legal issues, and lack of consumer interest as the reason for their failures.

The strategies that we used to simulate our portfolios are based on investment strategies of Peter Lynch and Martin Zweig. In the next section, we will explain 9 different types of "guru strategies" that are implemented in the NASDAQ Stock Market.

a. Guru Analysis

Kenneth Fisher based on his book *"Super Stocks"* pays more emphasis on prices that are well known and easily accepted as valid. Annual sales of a company are also well known and easily accepted as valid, and when combined with prices are an excellent comparative measure of a stock's value. The higher the price-to-sales ratio, the higher the valuation that investors have placed on the stock's future, and also the higher the risk of failure. Lower PSRs suggest lower value placed on a stock's future. Their advantage is that "a small improvement in profit margins can bring a lot to the bottom line, improving the firm's future P/E. Low PSR stocks are held in low regard by Wall Street. Those with improving profit margins usually catch the Street by surprise. PSRs also include stocks with no earnings (and therefore no P/E).

David Dreman based on his book *"Contrarian Investment Strategies: The Next Generation"* is a strategy oriented to selecting out-of-favor stocks based upon purely technical assumptions that what has gone down must go up. The investors try to identify stocks that are going down which is very risky in the short-term, even if resulting in high returns in the long-term.

James P. O'Shaughnessy based on his book *"What Works on Wall Street"* has the first requirement of the Cornerstone Growth Strategy that the company should have a market capitalization of at least $150 million. This will screen out the companies that are too illiquid for most investors, but still include a small growth company. The Cornerstone Growth methodology looks for companies that show persistent earnings growth without regard to magnitude. To fulfill this requirement, a company's earnings must increase each year for a five-year period. The Price/Sales ratio should be below 1.5. This value

criterion, coupled with the growth criterion, identify growth stocks that are still cheap to buy. The final criterion for the Cornerstone Growth Strategy requires that the Relative Strength of the company be among the top 50 of the stocks screened using the previous criterion. This gives you the opportunity to buy the growth stocks you are searching for just as the market is embracing them.

Modigliani strategy based on the strategy by *Franco Modigliani and Leah Modigliani* is more of applying a measure than a strategy similar to Graham Harvey 2 to a sample of mutual funds. However, they do not allow for curvature in the efficient frontier. That is, they assume that the cash return has zero variance and zero covariance with other assets. Indeed, their measure is a simple transformation of the famous Sharpe ratio. Applying the M-squared measure to evaluate mutual funds gives the exact same ordering as the Sharpe measure."[7]

However, the assumption that M-square makes about the zero correlation of the interest return and the asset being evaluated is only true if the maturity of the cash instrument exactly coincides with the evaluation period. Indeed, it is reasonably well known that there is a negative correlation between the interest rate changes and both stock and bond returns. Further relative to GH2, the assumption could result in misleading inference about the performance of low volatility funds where substantial leverage is needed to achieve the S&P 500 volatility. In a sample of well-diversified funds, this is not an issue. However, in applying GH2 to a broader class of asset returns, certain issues arise. For example, substantial leverage would have to be employed to lever a money market fund to achieve the volatility of the S&P 500.

[7] Campbell R. Harvey, http://www.duke.edu/~charvey/performance_eval/lettab1.htm

Peter Lynch (PE Growth Guru) is the vice chairman of Fidelity Management & Research Company, the investment advisor arm of Fidelity Investments and a member of the board of trustees of the fidelity funds, had the best performing fund in the world under his leadership. (Peter Lynch on Investing in Turbulent Markets, a Fidelity Investments Video Presentation-video[8])

Peter Lynch advocates a variety of strategies that individual investors can use to duplicate his success. These strategies are Fast growers, Slow growers and Stalwarts[9].

Fast growers: These companies have little debt, are growing earnings at 20% to 50% a year, and have a stock price-to-earnings ratio below the company's earnings growth rate.

Slow growers: These are companies with high dividend payouts. While investing in these types of companies, Lynch advocates that these companies should have sales in excess of $1 billion, sales that generally are growing faster than inventories, a low yield-adjusted price/earnings-to-growth ratio, and a reasonable debt-to-equity ratio.

"Stalwarts: Stalwarts have only moderate earnings growth but hold the potential for 30%-to-50% stock price gains over a two-year period if they can be purchased at attractive prices. Characteristics include positive earnings; a debt to equity ratio of .33 or less; sales rates that generally are increasing in line with, or ahead of, inventories; and a low yield-adjusted price/earnings-to-growth ratio."

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[8] Peter Lynch, http://www.mysavingsatwork.com/mysavingsatwork/989960447259/1031668513989.htm

[9] NASDAQ Stock Market, http://www.nasdaq.com/validea/stocks/gurubios.asp?ticker=INFY&guru=lynch

Benjamin Graham (Value Investor) argued for investing in stocks that were significantly undervalued relative to their intrinsic worth, which he measured principally by their future earnings potential. He recommended buying stocks of large, prominent and conservatively financed companies with a long record of continuous dividend payments[10].

Martin Zweig (Conservative Growth Investor) searches for stocks that meet a long host of earnings criteria. These include quarterly earnings, annual earnings and sales should be growing as fast as or faster than earnings[11]. Other Zweig's investing Criteria include:

PE ratio (where he has set a limit to greater than 5 and not more than three times current market's PE, with an absolute limit of PE of 43, no matter what the market PE is) quarterly earnings one year ago and growth in the past several quarters (growth rate in the past four quarters should be at least half of the long-term EPS growth rate)

Compare EPS growth in the current quarter with the prior three quarters and current quarter with historical growth (the current quarter earnings compared with a year ago must be greater than the prior three quarters and must be greater or equal to the historical growth rate. With this, it passes Martin's test). Earnings persistence: Earnings must increase each year for five years. Long-term EPS growth: Long-term earnings must be greater than 15% per year, with anything over 30% exceptional.

Validea Technology Strategy (Momentum-Oriented Internet Investing) is a growth and momentum strategy that searches out companies that have strong current

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[10] NASDAQ Stock Market, http://www.nasdaq.com/validea/stocks/gurubios.asp?ticker=INFY&guru=graham

[11] NASDAQ, http://www.nasdaq.com/validea/stocks/gurubios.asp?ticker=INFY&guru=zweig

revenue growth and strong future earnings potential, operate in leading industries, and have significant levels of insider and institutional ownership[12]. This strategy also favors companies whose stock price has exhibited strength relative to the overall stock market.

The Motley Fool[13] (http://www.fool.com) (Small-Cap Growth Investor) specializes in searching out stocks of small, fast-growing companies with solid fundamentals (healthy profit margins, little debt, sample cash flow, respectable R&D budgets and tight inventory controls)[14].

[12] NASDAQ Stock Market, http://www.nasdaq.com/validea/stocks/gurubios.asp?ticker=INFY&guru=olympic

[13] The Motley Fool, http://www.fool.com

[14] NASDAQ Stock Market, http://www.nasdaq.com/validea/stocks/gurubios.asp?ticker=INFY&guru=fool

5. Data and Methods

In our report, we had two stock indexes we used to compare – NASDAQ 100 and DOW JONES INDUSTRIAL. The NASDAQ 100 is an imperfect proxy for the Internet performance. The Dow Jones Industrial Index is a good proxy for non-Internet stocks. The descriptions below support these statements.

a. Company Indices

i. NASDAQ 100

The NASDAQ-100 Index includes 100 of the largest domestic and international non-financial companies listed on The NASDAQ Stock Market based on market capitalization. The Index reflects companies across major industry groups including computer hardware and software, telecommunications, retail/wholesale trade and biotechnology. It does not contain financial companies including investment companies. The NASDAQ-100 Index is calculated under a modified capitalization-weighted methodology.

On January 31, 1985, the NASDAQ-100 Index began with a base of 250.00. On January 1, 1994, the NASDAQ-100 base was reset by division of a factor of 2.00 to 125.00.

NASDAQ 100

Company Name	Symbol
Apple Computer, Inc. *	AAPL
Adobe Systems Incorporated *	ADBE
ADC Telecommunications, Inc. *	ADCT
Altera Corporation *	ALTR
Applied Materials, Inc. *	AMAT
Amgen Inc.	AMGN
Amazon.com, Inc. *	AMZN
American Power Conversion Corporation	APCC
Apollo Group, Inc. *	APOL
Bed Bath & Beyond Inc.	BBBY
BEA Systems, Inc. *	BEAS
Biogen, Inc.	BGEN
Biomet, Inc.	BMET
Brocade Communications Systems, Inc. *	BRCD
Broadcom Corporation *	BRCM
CDW Computer Centers, Inc. *	CDWC
Cephalon, Inc.	CEPH
Chiron Corporation	CHIR
Check Point Software Technologies Ltd. *	CHKP
C.H. Robinson Worldwide, Inc.	CHRW
CIENA Corporation *	CIEN
Comcast Corporation *	CMCSA
Comverse Technology, Inc. *	CMVT
Costco Wholesale Corporation	COST
Compuware Corporation *	CPWR
Cisco Systems, Inc. *	CSCO
Cintas Corporation	CTAS
Citrix Systems, Inc. *	CTXS
Dell Computer Corporation *	DELL
EchoStar Communications Corporation *	DISH
Dollar Tree Stores, Inc. *	DLTR
eBay Inc. *	EBAY
LM Ericsson Telephone Company *	ERICY
Electronic Arts Inc. *	ERTS
Express Scripts, Inc.	ESRX
Expeditors International of Washington, Inc.	EXPD
Fastenal Company	FAST
First Health Group Corp.	FHCC
Fiserv, Inc.	FISV
Flextronics International Ltd. *	FLEX
Genzyme Corporation	GENZ
Gilead Sciences, Inc.	GILD
Gentex Corporation	GNTX
Human Genome Sciences, Inc.	HGSI
Henry Schein, Inc.	HSIC
ICOS Corporation	ICOS
IDEC Pharmaceuticals Corporation	IDPH
Intel Corporation *	INTC
Intuit Inc. *	INTU
Invitrogen Corporation	IVGN
JDS Uniphase Corporation *	JDSU
Juniper Networks, Inc. *	JNPR
KLA-Tencor Corporation *	KLAC
Lamar Advertising Company	LAMR
Linear Technology Corporation *	LLTC
Lincare Holdings Inc.	LNCR
Microchip Technology Incorporated *	MCHP
MedImmune, Inc.	MEDI
Mercury Interactive Corporation *	MERQ

Millennium Pharmaceuticals, Inc.	MLNM
Molex Incorporated *	MOLX
Microsoft Corporation *	MSFT
Maxim Integrated Products, Inc. *	MXIM
Network Appliance, Inc. *	NTAP
NVIDIA Corporation *	NVDA
Novellus Systems, Inc. *	NVLS
Nextel Communications, Inc. *	NXTL
Oracle Corporation *	ORCL
Paychex, Inc.	PAYX
PACCAR Inc.	PCAR
Patterson Dental Company	PDCO
PETsMART, Inc. *	PETM
Pixar	PIXR
PeopleSoft, Inc. *	PSFT
Patterson-UTI Energy, Inc.	PTEN
QUALCOMM Incorporated *	QCOM
QLogic Corporation *	QLGC
RF Micro Devices, Inc. *	RFMD
Ross Stores, Inc. *	ROST
Ryanair Holdings plc	RYAAY
Sanmina-SCI Corporation *	SANM
Starbucks Corporation	SBUX
Siebel Systems, Inc. *	SEBL
Sigma-Aldrich Corporation	SIAL
Synopsys, Inc. *	SNPS
Staples, Inc. *	SPLS
PanAmSat Corporation *	SPOT
Smurfit-Stone Container Corporation	SSCC
Sun Microsystems, Inc. *	SUNW
Symantec Corporation *	SYMC
Teva Pharmaceutical Industries Limited	TEVA
Tellabs, Inc. *	TLAB
TMP Worldwide Inc.	TMPW
USA Interactive *	USAI
VeriSign, Inc. *	VRSN
VERITAS Software Corporation *	VRTS
Whole Foods Market, Inc. *	WFMI
Xilinx, Inc. *	XLNX
DENTSPLY International Inc.	XRAY
Yahoo! Inc. *	YHOO

Table 1: NASDAQ 100

* - Internet Companies

ii. DOW JONES INDUSTRIAL

Prepared and published by Dow Jones & Co., this index is one of the oldest and most widely quoted of all the market indicators. The Dow Jones Industrial Average is comprised of 30 stocks that are major factors in their industries, and widely held by individuals and institutional investors represents areas of public interest. These 30 stocks represent about a fifth of the $8 trillion-plus market value of all U.S. stocks and about a fourth of the value of stocks listed on the New York Stock Exchange.

DOW JONES INDUSTRIAL

Company	Ticker / Sedol
3M Co.	MMM
Alcoa Inc.	AA
Altria Group Inc.	MO
American Express Co.	AXP
AT&T Corp.	T
Boeing Co.	BA
Caterpillar Inc.	CAT
Citigroup Inc.	C
Coca-Cola Co.	KO
E.I. DuPont de Nemours & Co.	DD
Eastman Kodak Co.	EK
Exxon Mobil Corp.	XOM
General Electric Co.	GE
General Motors Corp.	GM
Hewlett-Packard Co.	HPQ
Home Depot Inc.	HD
Honeywell International Inc.	HON
Intel Corp.	INTC
International Business Machines Corp.	IBM
International Paper Co.	IP
J.P. Morgan Chase & Co.	JPM
Johnson & Johnson	JNJ
McDonald's Corp.	MCD
Merck & Co. Inc.	MRK
Microsoft Corp.	MSFT
Procter & Gamble Co.	PG
SBC Communications Inc.	SBC
United Technologies Corp.	UTX
Wal-Mart Stores Inc.	WMT
Walt Disney Co.	DIS

Table 2: DOW Jones Industrials

b. Implementation of Guru Strategy and Hypothesis Testing

We simulated some strategies investment in the dotcom stocks and analyzed them using hypothesis testing. The reason for analyzing only some of the strategies is because

it would be very difficult and close to impossible to analyze all of the strategies in our time frame for this study. "*Hypothesis testing* is nothing else but a systematic approach to assessing beliefs about reality: it is confronting a belief (such as a tentative idea about the value of a statistic computed from a random sample taken from the population in question) and then deciding, in light of this evidence, whether the initial belief (or hypothesis) can be maintained as reasonable or must be discarded as untenable."[15] In our case, we are going to invest in two strategies namely Peter Lynch strategy and Martin Zweig strategy. These strategies are explained in detail in pages twenty-two and twenty-three.

In order to develop a comprehensive market investment strategy, literature review on market efficiency and trading strategies have to be conducted. These will be preceded by implementing, testing, and comparing various types of trading strategies to arrive with the most successful strategy based on our results.

The first step in creating a market forecast is defining the market efficiency where the stock prices provide an unbiased estimate of the true value of an enterprise. Stock prices reflect a present value estimate of the firm's expected cash flows, evaluated at an appropriate rate of return (Contemporary Financial Management, 52). There are various

[15] Heinz Kohler, *Statistics for Business and Economics*

degrees of market efficiency – weak-form efficiency[16], semistrong-form efficiency[17] and strong-form efficiency[18].

There are other different types of trading strategies that are already out there promising humongous rates of returns and some already proven from the information. They disseminate to their clients and the underlying performance in the market using this very same information. The most common trading strategies are:

~ Day trader: a person whose goal is to make his or her profits from a security in the shortest amount of time (preferably a single day)[19].

~ Short-Term Investing: Short-Term investing describes a position trade which may last any where from several days to several weeks, even as long as a month or more[20].

~ Short-Sale: Borrowing security from a broker and selling it, with the understanding that it must later be bought back and returned to the broker[21].

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[16] Weak-form efficiency: With weak-form market efficiency, no investor can expect to earn excess returns based on an investment strategy using such information as historical price or return information. All stock market information is reflected on the current price of a stock.

[17] Semistrong-Form Efficiency: No investor can expect to earn excess returns based on an investment strategy using publicly available information.

[18] Strong-Form Efficiency: with Strong-Form market efficiency, security prices fully reflect all information, both public and private. No individual should be able to consistently earn above normal profits, including insiders possessing information about economic prospects of a firm.

[19] DayTraders.com, http://www.daytraders.com/trade.html

[20] DayTraders.com, http://www.daytraders.com/investing.html

[21] DayTraders.com, http://www.daytraders.com/glossary.html

~ Swing Trading: swing traders make trades that can last minutes to days. They have slightly longer time horizon than day traders as the perceived imperfections in price may last for several days[22].

~ Position Trading: Trades can last from intraday to weeks, even months. A change in investor psychology towards the stock is what is perceived. Position traders maintain their stock positions between that of a swing trader and a long-term hold. This position is taken because they feel that the stock is breaking out and they are looking for 1 to several point moves.[23].

~ Buy and Hold: A strategy, in which the stock portion of one's portfolio is fully invested, including dividends reinvestments, at all times.

~ Momentum Investing Strategy: This type of investing attempts to identify stocks that are going up and avoid stocks that are going down. Firms with rising stock prices over the previous 3-12 months are said to be in price momentum. Firms with positive earnings surprises are said to be in earnings momentum[24].

~ Contrarian strategy: This is a strategy oriented to selecting out-of-favor stocks based upon purely technical assumptions that what has gone down must go up. The investors try to identify stocks that are going down which is very risky in the short-term, even if resulting in high returns in the long-term[25].

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[22] Traderstatus.com, http://www.traderstatus.com/swing.htm

[23] Traderstatus.com, http://www.traderstatus.com/swing.htm

[24] Rouwenhorst, K. Geert, http://mayet.som.yale.edu/~geert/papers/momsli.pdf
Zurich Financial Services Group,
http://www.zurich.com/educationcenter/glossaries/edu_strategiesmomentum_slot.jhtml

[25] Zurich Financial Services Group,
http://www.zurich.com/educationcenter/glossaries/edu_strategiescontrarian_slot.jhtml

Other strategies that are used are those implemented by the Wall Street gurus who have years of experience investing in stocks. On the next pages is a table that explains all the different types of strategies in an easy to use reference comparison.

Other strategies that are used are those implemented by the Wall Street gurus who have years of experience investing in stocks. On the next pages is a table that explains all the different types of strategies in an easy to use reference comparison.

The table shows that variables and variable values the decision to buy or sell a stock are based on. For example, looking at Peter Lynch's strategy in column one, he is concerned with Price to Earnings Growth ratio (PEG ratio), which is an indicator that compares the price/ earnings ratio of a stock to the earnings growth of the company. For him to invest in a stock, it has to have a PEG ratio that is greater than zero but less than or equal to 1.8. On the other hand, Martin Zweig is not bothered by the PEG ratio of a company. For Peter Lynch, for a stock to be in his Portfolio, it must demonstrate an Earnings Per Share growth (EPS), growth of between 20 and 50%. Martin Zweig is not concerned with it. On yield adjusted PEG ratio, Lynch prefers PE to be 0.5 or less the growth rate plus the yield but not greater than 1. He also goes for companies that have very low debt or no debt at all. For a company to pass his criteria, its debt must be less than 80% of total equity. The stock's annual sales must be equal to or greater than $1.9 billion for him to invest in a company.

For Martin Zweig, a company's PE ratio has to be greater than 5 and less than 43 but also should never be more than three times the current market PE. Earnings per share (EPS) growth have to be equal to or greater than 15% for Zweig to have that company in his portfolio. He also pays more emphasis on quarterly earnings comparing the current

quarter with the past four. EPS has to be greater than zero for quarter 5 and growth from quarter 5 to quarter 1 has to be greater than 0.

Peter Lynch emphasis on taking advantage of what you already know about a company and not how the market is doing. For his portfolio, he holds on to a company for medium to long term.

Pages incorrectly numbered in original

IQP/MQP SCANNING PROJECT

	P. Lynch	Benjamin Graham	Martin Zweig	Motley Fools	David Dreman	Kenneth Fisher	James O'Shaughnessy
Sector		If in Technology sector. Fail All others Pass					
Market Cap					x < $963M Fail x > $963M Pass		x < $1Billion Fail x > $1Billion Pass

PEG Ratio	Best Case
	If (0.5 < x ≤ 1) Pass
	Better Case
	If (1 < x ≤ 1.5) Pass
	If (1.5 < x ≤ 1.8) Pass
	If (x > 1.8) Fail
				(fool ratio)
				x >1.3 F worst
				x <1.3 Fail
				x > 0.65 Fail
				0.5 < x < 0.65
				Pass
				x < 0.5 Pass
				Best			

PE Ratio		If x >15% Fail If x ≤ 15% Pass	If (x < 5) Fail If x ≥ 43 Fail If x ≥ 3 *Mkt PE Fail If x >5 Pass If x < 43 Pass If x ≤ 3*Market PE Pass		x > Bottom 20% Fail x < Bottom 20% Pass		
Price Book Ratio (PBR)		If PB* PE > 22 Fail If PB > 1.5 Fail If PB*PE ≤ 22 Pass Best case If PB ≤ 1.5 Pass			x < Bottom 20% Pass x > Bottom 20% Fail		

EPS Growth	If (20% < x ≤ 25%)
	Pass Best
	If (25% < x ≤ 50%)
	Pass
	If > 50% fail
			If x < 15% Fail
			If x ≥ 15% Pass
			If x ≥ 30% Pass best
				x >25% Pass
				x <25% Fail
					Y1 > S&P 500 P
					Q2toQ1< S$PF
					Q2toQ1> S&P p
						x < 15% Fail
						x > 15% Pass
							Y1>Y2>Y3>Y4>Y
							5: Pass
							Else Fail

Yield Adjusted PEG Ratio	If (1 < x ≤ 0.5) Pass best case						

	P. Lynch	Benjamin Graham	Martin Zweig	Motley Fools	David Dreman	Kenneth Fisher	James O'Shaughnessy
	If (0.5 < x ≤1) Pass If >3 Fail						
EPS		(10 years) I f x < 30 % Fail If x ≥ 30 % Pass					
GI/Sales growth				x >30% Fail 0 < x < 30% Pass x < 0% Pass Best			

DE Ratio	If = 0 Pass Best Case
	If (30 ≤ x < 50) Pass Normal
	If (50 ≤ x < 80) Pass Mediocre
		If industrial co. DE > 100% Fail
		If Industrial co. ≤ 100% Pass
		If utilities, phone, railroad LTD /E > 230%Fail
		If utilities, phone, railroad LTD /E ≤ 230%Pass
			If x ≥ IA Fail
			If x < IA Pass
				x >5% Fail
				0 < x < 5% pass
				x = 0 Pass Best case
					x > 20 % Fail
					0 < x < 20% Pass
					No debt Pass Best Case
						x > 40% Fail
						x < 40% Pass	

Price Dividend Ratio (PD)					x > Bottom 20% Fail x < Bottom 20 % Pass		
Price-Research Ratio(PRR)						x >15% Fail 10 < x < 15 Pass-OK 5 < x <10% Pass x <5% Pass-Best	
Price to Sales Ratio(PS)						x >0.4 Fail x <0.4 Pass	x >1.5 Fail x <1.5 Pass
Free Cash Flow/Share				x < 0 Fail x > 0 Pass		x > 0 Pass x < 0 Fail	x > Mkt Ave. Pass x < Mkt Ave. Fail

	P. Lynch	Benjamin Graham	Martin Zweig	Motley Fools	David Dreman	Kenneth Fisher	James O'Shaughnessy
Ave. net profit Margin						x <5% Fail x >5% Pass	
Daily dollar volume				x < 1M Fail 1M < x < 25M Pass x > 25M Fail			
SALES	If x ≥ $1 billion Pass If x < $1 billion Fail	If x < $340 M Fail If ≥ $340 M Pass		x >500M Fail x <500M Pass			x > 12 months Mkt Ave. Pass x < 12 Months Mkt Ave. Fail
Price				x < 7 Fail 7 < x <20 Pass x > 20 Neutral			
EA	If x ≥ 5% Pass If x ≥ 13.5% Pass Best Case If x < 5% Fail						
ROA	If ≥ 1% Pass If x < 1% Fail						
Current Ratio		If x < 2 Fail If ≥ 2 Pass			x > IA or x > 2 Pass Else Fail		
Quarterly Earnings			If Q1 EPS ≥ 0 Fail If Q1 EPS >0 Pass If Q5 EPS < =0 Fail If Q5 EPS > 0 Pass +veQ5to Q1<0 F _veQ5to Q1>0 P		Q1<Q2 Fail Q1>Q2 Pass		
Pretax Profit Margins					x < 8% Fail x > 8% Pass x >22% Pass Best Case		
LTD		If LTD > Net Current Assets Fail					

	P. Lynch	Benjamin Graham	Martin Zweig	Motley Fools	David Dreman	Kenneth Fisher	James O'Shaughnessy
		If LTD ≤ Net Current Assets Pass					
Profit Margin				x > 7% Fail x < 7 % Pass			
Profit Margin Consistency				Y1>Y3 >y3 P Y1>Y#, Y2>.9* Y3 p Else Fail			
Relative strength				x < 90 Fail x > 90 Pass			
Insider Holdings				x <10% Fail x >10% Pass			
R&D- Sales ratio				Y1 < Y@ Fail Y1> Y12 Pass			
Ave. shares outstanding				Y1>Y2*120% F X = 103% Y1>x*Y2 … Y5>x*Y6 Fail Otherwise Pass			x > Mkt Ave. Pass x < Mkt Ave. Fail
ROE					Top 3rd of all Pass x > 27% Pass Best Else Fail		
PSR						x > .75 Best 0.75 < x < 1.5 good 1.5 < x <3 Hold	
Dividends							Top 50 Pass Else Fail

Table 3: Guru Strategies Criteria

Key

P ~ Pass
F ~ Fail
LTD ~ Long term debt in relation to net Current Assets
DE ~ Total debt to Equity Ratio
ROA ~ Return on Assets
NCA ~ Net Current Assets
PB ~ Price Book Ratio
IC ~ Industrial Companies
IA ~ Industry Average
PSR ~ Price to Sales Ratio
EA ~ Equity to Assets
PEG ~ Price-earnings growth ratio
Relative strength ~The company out performs 90% or more of the market for the past year.

In our project, we utilized the strategies from two of the gurus of Wall Street – Peter Lynch and Martin Zweig. We will explain the steps that we used to arrive with our data in an Excel spreadsheet. There were two specific software packages we used that were provided by Thomson Financial – Thomson Analytics and Datastream Advance. Another package we used was Webstat which helped in our data analysis.

Thomson Analytics

Thomson analytics is an Internet-based analytics tool that combines source data, flexible universal searching, and instant charting to give you the data and tools for in-depth research. Thomson Analytics provides up to the minute data that is fully accessible. This tool is a key link to important intelligence on corporate industry and market financials. It includes historical research and statistics as well as five-year forecasts. The information available is mostly from leading industry authorities such as Standard and Poor's 500[26], Securities and Exchange Commission[27], DataStream, Global Access, Interactive Data Corporation, Worldscope [28].

DataStream Advance

Advance is a reporting and charting interface specifically designed for use with DataStream's financial data service. *Advance*'s easy-to-use interface lets users request over 100 standard Datastream reports, charts and data from DataStream's financial data service. The Datastream historical financial database provides users with world stock

[26] Standard and Poor's 500, (S&P 500, http://www.standardandpoors.com)
[27] Securities and Exchange Commission, (SEC, http://www.sec.gov/)
[28] Thomson Analytics Users Guide (Professional Resource center) http://business.wm.edu/prc/guides/ThomsonAnalytics.pdf November 6th 2002

market indices, fundamentals and economic data. Using Datastream Advance, we copied the data into Excel spreadsheet for both index sets.

Webstat[29]

WebStat is a statistical data analysis package for the World Wide Web. It is written in the form of a Java applet which loads text or Excel files from your local machine or via the Web. It transforms data using mathematical expressions, sorts and ranks data columns. Simulation data is done from a wide range of distributions. Analysis results produce HTML output that can be easily saved as a Web page or pasted into a word processor. It also provides interactive graphics for exploratory analysis.

[29] Webstat, www.webstatsofware.com

*c. **Data Analysis***

1. Design algorithm in Excel for pass/fail cases to satisfy the guru criteria. 4-5 satisfied cases pertaining to Peter Lynch's strategy implies a "PASS'. 3 satisfied cases pertaining to Martin Zweig's strategy implies a "PASS".
2. Once you get a "PASS" for that stock the first time, stay in for three years no matter what the case. Check again for the next time you pass and repeat.
3. Calculate returns of each company when in.
4. Calculate average returns for your portfolio for the number of companies you are in.
5. Separate the stocks into average returns for pre 2000 and post 2000. Pre 2000 timeline starts from January 1996 to June 1999. Post 2000 timeline starts from July 1999 to December 2002. The reason this was done was so we could have an equal number of rows to use for calculating the null hypothesis and because of unavailability of very recent data.
6. Calculate the null hypothesis with the data provided.
7. Conclude reason data is not equal for both timelines.

*d. **Null hypothesis***

In hypothesis testing, the first test is the formulation of two hypotheses that are mutually exclusive and also collectively, exhaustive of the possible states of reality. Each of these complementary hypotheses implies the invalidity of the other, the null hypothesis (H_o) and the alternative hypothesis (H_A).

Null hypothesis represents that proposition about an unknown population parameter, which is tentatively assumed to be true. Alternative hypothesis is initially assumed to be false but is later accepted as true if there's strong evidence against null hypothesis.[30]

We need to use null hypothesis so that we can tell the difference between the mean of pre 2000 (when the stock market almost exponentially increased in value) and post 2000 (the period when the stock market of both DJI and NASDAQ 100, fell from amazingly high returns). The difference between the means in each of the two portfolios, will determine if the null hypothesis will be accepted or rejected, thus adopting alternative hypothesis.

From the guru table, we used Peter Lynch and Martin Zweig investment strategies. The analysis of the data obtained is summarized in the two excel spreadsheets (both for the Dow Jones Industrial Average).

From the data analysis using webstatsoftware.com, we used a test statistic of the difference between the means of pre 2000 and post 2000 which will help us establish the invalidity of our null hypothesis.

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[30] Statistics for business and economics, Heinz Kohler, second edition p340.

6. Results

Some of the results from the portfolios disagree with the null hypothesis where we had assumed that, Ho = $\mu_1 - \mu_2 = 0$. We therefore adopt alternative hypothesis, we had initially assumed to be false. This is also supported by average of the results from pre 2000 and post 2000. Returns were calculated for each month using the following formula:

$$\text{Returns} = \frac{P_T - P_{T-1}}{P_{T-1}}$$ where T = month, P = price

Returns are defined as a profit or yield, as from labor or investments.

On the following pages, the figures describe the null hypothesis analysis that we performed using the two strategies.

The figures below show results of the null hypothesis on Martin Zweig strategy for both DOW Jones Industrials (4a) and NASDAQ 100 (4b).

Martin Zweig

Two Sample T Statistics

Two Sample T-test results (with pooled variances):

μ_1 - mean of Pre

μ_2 - mean of Post

$H_0 : \mu_1 - \mu_2 = 0$

$H_A : \mu_1 - \mu_2$ not equal 0

Difference	Sample Mean	Std. Err.	DF	T-Stat	P-value
$\mu_1 - \mu_2$	0.03475188	0.016540859	82	2.100972	0.0387

Figure 4a: DOW Jones Industrials - Zweig

Two Sample T-test results (with pooled variances):

μ_1 - mean of Pre2000

μ_2 - mean of Post2000

$H_0 : \mu_1 - \mu_2 = 0$

$H_A : \mu_1 - \mu_2$ not equal 0

Difference	Sample Mean	Std. Err.	DF	T-Stat	P-value
$\mu_1 - \mu_2$	0.030294113	0.026514601	82	1.1425445	0.2566

Figure 4b: NASDAQ 100 - Zweig

The figures below show results of the null hypothesis on Peter Lynch's strategy for both DOW Jones Industrials (5a) and NASDAQ 100 (5b).

Peter Lynch

Two Sample T Statistics

Two Sample T-test results (with pooled variances):

μ_1 - mean of Pre

μ_2 - mean of Post

$H_0 : \mu_1 - \mu_2 = 0$

$H_A : \mu_1 - \mu_2$ not equal 0

Difference	Sample Mean	Std. Err.	DF	T-Stat	P-value
$\mu_1 - \mu_2$	0.030620689	0.012160449	82	2.5180557	0.0137

Figure 5a: DOW Jones Industrials - Lynch

Two Sample T-test results (with pooled variances):

μ_1 - mean of Pre2000

μ_2 - mean of Post2000

$H_0 : \mu_1 - \mu_2 = 0$

$H_A : \mu_1 - \mu_2$ not equal 0

Difference	Sample Mean	Std. Err.	DF	T-Stat	P-value
$\mu_1 - \mu_2$	0.005905469	0.0051381686	82	1.1493335	0.2538

Figure 5b: NASDAQ 100 - Lynch

From figures 5a and 5b above, μ_1 and μ_2 represent mean total of the investment in our portfolio for pre and post 2000. The mean for pre 2000 was taken from January 1996 to June 1999 and for post 2000, it was taken from July 1999 to December 2002. The mean was calculated by adding all the returns in the portfolio for each month and dividing by the total number of months.

Next, we performed the null hypothesis analysis on the cumulative returns from the two indices. These returns are what we used in calculating μ_1 and μ_2. On the next page, the two figures show the null hypothesis analysis of the two indices for both timelines – pre 2000 and post 2000.

The figures below show results of the null hypothesis on both DOW Jones Industrials (6a) and NASDAQ 100 (6b).

Two Sample T Statistics

Two Sample T-test results (with pooled variances):

μ_1 - mean of Pre2000

μ_2 - mean of Post2000

$H_0 : \mu_1 - \mu_2 = 0$

$H_A : \mu_1 - \mu_2$ not equal 0

Difference	Sample Mean	Std. Err.	DF	T-Stat	P-value
$\mu_1 - \mu_2$	0.035824094	0.015045357	82	2.381073	0.0196

Figure 6a: Dow Jones Industrial Average

Two Sample T-test results (with pooled variances):

μ_1 - mean of Pre2000

μ_2 - mean of Post2000

$H_0 : \mu_1 - \mu_2 = 0$

$H_A : \mu_1 - \mu_2$ not equal 0

Difference	Sample Mean	Std. Err.	DF	T-Stat	P-value
$\mu_1 - \mu_2$	1.2964094	0.58856165	82	2.202674	0.0304

Figure 6b: NASDAQ 100 Average

Next, we performed a null hypothesis test comparing the two strategies for both pre and post 2000 timelines. These were done for both the indices. The figures below show the null hypothesis test done for Lynch and Zweig's strategy for NASDAQ 100 for both timelines.

Two Sample T-test results (with pooled variances):

μ_1 - mean of Lynch

μ_2 - mean of Zweig

$H_0 : \mu_1 - \mu_2 = 0$

$H_A : \mu_1 - \mu_2$ not equal 0

Difference	Sample Mean	Std. Err.	DF	T-Stat	P-value
$\mu_1 - \mu_2$	-0.013855995	0.01980393	82	-0.6996588	0.4861

Figure 7a: Lynch and Zweig NASDAQ 100 Pre 2000

Two Sample T-test results (with pooled variances):

μ_1 - mean of Lynch

μ_2 - mean of Zweig

$H_0 : \mu_1 - \mu_2 = 0$

$H_A : \mu_1 - \mu_2$ not equal 0

Difference	Sample Mean	Std. Err.	DF	T-Stat	P-value
$\mu_1 - \mu_2$	0.010532649	0.018363802	82	0.573555	0.5678

Figure 7b: Lynch and Zweig NASDAQ 100 Post 2000

The figures below show the null hypothesis test done for Lynch and Zweig's strategy DOW Jones Industrials for both pre and post 2000.

Two Sample T-test results (with pooled variances):

μ_1 - mean of MZPre

μ_2 - mean of PLPre

$H_0 : \mu_1 - \mu_2 = 0$

$H_A : \mu_1 - \mu_2$ not equal 0

Difference	Sample Mean	Std. Err.	DF	T-Stat	P-value
$\mu_1 - \mu_2$	-0.0033054652	0.010561488	82	-0.31297344	0.7551

Figure 8a: Lynch and Zweig DOW Jones Industrial Pre 2000

Two Sample T-test results (with pooled variances):

μ_1 - mean of MZPost

μ_2 - mean of PLPost

$H_0 : \mu_1 - \mu_2 = 0$

$H_A : \mu_1 - \mu_2$ not equal 0

Difference	Sample Mean	Std. Err.	DF	T-Stat	P-value
$\mu_1 - \mu_2$	-0.0074366573	0.01760487	82	-0.42242044	0.6738

Figure 8a: Lynch and Zweig DOW Jones Industrial Post 2000

a. Summary of Returns for Portfolio

The table below shows summary of returns on NASDAQ 100 and DOW Jones Industrial Average, from null hypothesis testing, using Peter Lynch and Martin Zweig strategies.

	NASDAQ 100		**DOW Jones Industrial**		
Strategy	*Pre 2000 (Returns)*	*Post 2000 (Returns)*	*Pre 2000 (Returns)*	*Post 2000 (Returns)*	**Guru Criteria**
Peter Lynch	0.004468 ↕	-0.00144	0.01634 ⇔	-0.01427 ↕	PEG, PE, DE, ROA, EPS, SALES, EA
Martin Zweig	0.018324	-0.01197	0.01304 ⇔	-0.02171	PE, EPS, SALES, DE
Cumulative Returns	0.019736	-0.03264	0.013198	-0.02263	

Table 4: Summary of Returns

From the table above, Marin Zweig's strategy performed pretty well in the technology stocks during the pre 2000. As compared to Peter Lynch's strategy, it surpassed it by a very large margin. This can be seen with the arrows in the above table. Unfortunately, Zweig's strategy is very selective when it comes to the stock market. Most of the companies that satisfied were technology companies. This is where the effect of the dotcom bust can be felt on Zweig's strategy. Above, in the table, the returns showing the major difference between the two timelines are expressed using arrows. Zweig's returns had more losses as compared to Lynch's strategy that lost a little investment on

returns. Looking at the cumulative returns, we can see that the strategies avoid a huge loss in the post 2000 for both indices, especially in the NASDAQ 100.

From Peter Lynch's strategy on pre 2000, he performed much better on Dow Jones Industrial Average (DJIA) compared to NASDAQ 100 by a factor of 3½ times. On post 2000, he received a very poor performance, especially in NASDAQ 100 compared to DJIA by a factor of 10.

Based on Peter Lynch's investment strategy, it would be more advisable to invest in the DJIA than NASDAQ 100. If we invested heavily in the NASDAQ 100, using his strategy, we would not have made decent returns on our investment. This is particularly true due to the fact that most of the NASDAQ 100 stocks are from the dotcom industry and he emphasizes on investing in the companies that have had a good background in the past. Most of NASDAQ 100 stocks are new comers compared to DJIA where most stocks have been in the index for a fairly long time. His investment strategies and especially the most famous Price-to-Earnings Growth (PEG) ratio is what the investor should look for, and not what the market is doing but focus on individual companies.

The variables that both investors use are quite similar except for the fact that Peter Lynch has three extra variables – Price-to-Earnings Growth ratio (PEG), Equity per Asset (EA), and Returns on Assets (ROA). Even though all of Zweig's criteria are included with Lynch's, the ratios he looks for are different those his. This can be seen in table 3. For an example "PASS" case, the EPS growth for Peter Lynch has to be between 20% and 50, while for Martin Zweig, the growth from the fifth quarter to the first quarter has to be greater 30%.

Martin Zweig's strategy on pre 2000 also had a good performance in both DJIA and NASDAQ 100. His strategy performed much better on NASDAQ 100 stocks compared to DJIA. On post 2000, his strategy performed very poorly in the two indices.

From Martin Zweig's investment strategy it would be more advisable to invest in the NASDAQ 100. He made enormous returns in NASDAQ 100 in pre 2000 than in post 2000. This is reflected in table 4. His strategy, which heavily resulted to investing in the NASDAQ 100, did not perform quite as well in the post 2000. His investment variables of looking at the quarterly earnings, Earnings Per Share (EPS) growth rate and debt to equity ratio did not perform well and should be reconsidered in the post 2000. More on how these variables were calculated are included in the data appendix.

From our results, we can ascertain that during the pre 2000 time, there was big boom in the dotcom market. Perhaps the only mistake that was made was timing. The Internet triggered new hope for businesses all over the world multiplying the possible customer numbers infinitely.

So much effort went into being the first to corner the Internet markets in each sector that things got a little rushed and culminated in rather a lot of similar companies all competing for attention at the same time. It also perhaps did not allow quite enough time for the trend of home computing to catch on and gave each company limited time to make or break before admitting defeat.

At present, it is still feasible to invest in dotcoms, but the high returns expected will not come till later on in the future. The strategies based on Lynch and Zweig are long-term and will take a few years before a profit can be seen.

7. Conclusion

Based on these available trading strategies, we simulated our investment in the dotcom stock market and analyzed which strategy would be feasible based on the prevailing economic situation in the United States. Based on the portfolios of Peter Lynch and Martin Zweig, it was quite evident that their strategies faired much better in pre 2000 than in post 2000. This was a characteristic duplicated in the two indices, DOW Jones Industrial and the NASDAQ 100. In the mid to late nineties, there was an upsurge of new products and especially in the technology industry.

Companies like Cisco, EMC, Dell Computers, AOL and Yahoo, all introduced new products and services into the market. This saw the sky rocketing of their stocks value. In the post 2000, most of these companies had very poor performance, which helped to explain the poor performance on Martin Zweig in comparison to Peter Lynch.

We had performed null hypothesis testing in our data using the two strategies by Lynch and Zweig. At present, the strategies would work but in comparison between Peter Lynch and Martin Zweig, it is more advisable to use Lynch's strategy since his returns were greater and more stable than Zweig's in the post 2000 economy. Zweig's strategy is more selective with stocks because of his limited variables, but Lynch's strategy is more diverse and is based on knowing more of the company's background.

While there was a statistical significant difference in returns between the two indices, there was no significant statistical difference between the two strategies. This was according to the null hypothesis analysis performed.

8. Data Appendix

Book value per share = Number of shares outstanding

Current ratio = Current assets/current liabilities

Day's receivables = 365/Receivable turnovers

Day's inventory = 365/ Inventory turnover

Debt ratio = Total debt/ Total assets = (Total assets – Total owners equity/ Total assets)

Debt-to-equity= Total debt/ Total equity

Dividend yield = Expected dividend per share/ stock price

Earnings per share (EPS) = Net income/ Number of shares outstanding

Equity multiplier = Total assets/ Total owner's equity

Fixed assets turnover = Sales/ Net fixed assets

Gross profit margin = Gross profit/ Total sales

Inventory Turnover = Cost of sales/ Average Inventory

Market to book ratio = Price per share/ Book value per share

Payout ratio = Dividend per share/ Earnings per share

Price-to-Earnings (PE) ratio = Market price per share/ Current earnings per share

Price-to-Earnings Growth Ratio = Price Earnings Ratio (PE)/ Growth in Earnings per Share

Profit margin = Net income/ Sales

Quick Ratio = (Current assets – Inventories)/ current liabilities

Receivables turnover = Sales / Accounts receivable

Return on assets (ROA) = Net income/ Total assets

Return on equity (ROE) = Net income/ Total owner's equity

Return on investments (ROI) = Earnings after taxes (EAT)/ Total assets

Sales growth = Current year's sales – Last year's sales/ Last years sales

Total assets turnover = Sales/ Total Sales

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