Overview

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• High frequency trading
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• Personal growth as a trader
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• General references
• Conclusions and comments
Background
Motivation #1: Job Opportunities

- Professional opportunities span multiple fields — e.g., finance, healthcare and high tech.
- Data scientists are in high demand but short supply.
- Average salaries are much higher for data scientists who are skilled in data analysis and financial systems.

BY 2018
it is estimated that 440k+ jobs will need deep data analytics skills, and 4 million jobs will require a light understanding of data and analysis.
Motivation #2: Personal Investing

- 1929
- 1987
- 1994
- 2001
- 2008
- 2015 !!

7 year cycles!
The Crash of 1929. Buying the dip worked awesome . . . right up until it didn't.
The 1987 crash recovered very quickly compared to 1929. But that doesn't matter to people who lost it all during that move.
Nasdaq crash of 2000 was almost exactly like the 1929 Dow Crash.
Crash of 2008 was vicious and the recovery took years.
Buy and Hold?

Paper Wealth!

Terrible Outcome for Buy and Hold
Motivation #3: Research

- Pattern recognition of time series
- Intelligent system technologies
  - Fuzzy/neural systems
  - Machine learning
  - Evolutionary algorithms
  - Collaborative agent systems
  - Evolving structure systems
- High speed computing architectures
- Decision support for human traders
- Algorithm development
- Automated trading systems
What Moves the Markets?

- Publicly available news
- International conflicts
- Fundamental analysis of a company’s value
- Market manipulation by central banks
- Macro-economic reports
- Upgrades and downgrades of companies
- Human perception and emotion

“Macroeconomic news bearing on fundamental values ... explains only about one-fifth of the movement in stock prices”

Novice Traders Are Emotional Slaves Trying to Make Predictions
Evolution of Trading

- Computerization of order flow began in early 1970s
- Full electronic execution of the NASDAQ started in 1990
- Pit trading vanished from most exchanges
- Conversion from fractional reporting of stock prices on the NYSE to decimals greatly improved liquidity.
- 2001 study by IBM showing that algorithms outperformed human traders
Algorithmic Trading

- Use of electronic platforms for entering orders with an algorithm that executes pre-programmed instructions for timing, price, and quantity of the order.
- Basic algorithms use linear regression, game-theoretic, and predictive models. Machine learning, neural networks, and genetic algorithms are also useful.
- Some algorithms use historical prices and volumes of equities. Some scan news to identify trends.
High Frequency Trading

• Use of extraordinarily high-speed networks, computers, and programs for generating, routing, and executing orders
• Use “co-location” services and individual data feeds offered by exchanges and others to minimize network and other types of latencies
• Submit numerous orders that are canceled shortly thereafter
• End the trading day as close to a flat position as possible
**Dark Pools**

- Dark pools are a form of alternate trading system. They are used by institutional traders to execute large trades with as little market movement as possible.
- Dark pools are regulated as broker-dealers rather than as exchanges.
- Trades are not displayed to other market participants and are matched anonymously.
- Once trades are executed, however, they are immediately reported to the consolidated tape, which provides public post-trade transparency.

http://www.pwc.com/us/InvestorResourceInstitute
Trading Pits at the CME prior to 2015
... Nasdaq Electronic Exchange
What Assets can be Traded?

- Stocks
- Commodities
- Bonds
- Exchange Traded Funds (ETFs)
- Options
- Futures
- Forex pairs
Technical Analysis
Market Analysis

**Fundamental Analysis**
- What the stock should be worth

**Technical Analysis**
- What the stock is worth
Four Aspects of Analysis

- Supply & Demand
- Trends
- Technical Analysis
- Consolidation
- Chart Pattern Recognition
Supply/Demand

Support = Demand
- Demand is greater than supply
- Price goes up.

Resistance = Supply
- Supply is greater than demand
- Price goes down.
Line Chart
Japanese Candlestick Charts

• Ancient method of technical analysis developed by Japanese traders in 1600's to trade rice contracts
• Homma Munehisa is often referred as “The Father of The Japanese Candlestick Charting”.
• He reasoned that studying the emotions of the market could help in predicting prices.
• He understood that there was a difference between the value of rice and its price.
Candlestick Chart
Trend Analysis

Market Vectors Gold Miners ETF GDX - Daily ARCX
L=19.62 0.10% PC=19.60 O=19.65 Hi=19.79 Lo=19.48 C=...

Volume (100000000,-1) 16940577.00

24.00
23.50
23.00
22.50
22.00
21.50
21.00
20.50
20.00
19.50
19.00
18.50
18.00
17.50
17.00
16.50

120,000-
80,000-
40,000-
16,940,5
Consolidation
Supply and Demand
Technical Indicators

- Average volume
- **Average true range**
- Put/call volume
- **Implied volatility**
- Moving averages
- **RSI, MACD, CCI, ADX**
- Oscillators
- Parabolic SAR
- **Fibonacci price retracements and projections**
- Fibonacci time extensions
- Elliott waves and Gann levels
- Bollinger bands
- Linear regression channel
- Keltner channels
- **TTM Squeeze and waves**
Moving Averages

- Line representing the average price over a fixed period
- Strength of trend is determined by price above, below, or near a key moving average
- Can act as
  - Entry points
  - Trend indicators
  - Exit points
  - Dynamic support and resistance
- Slope of moving average determines trend direction
Daily Chart of SPY. Is there any clue here that SPY was about to release built up energy to the upside?
Squeeze Indicator

• Proprietary technical analysis indicator developed by John Carter
• Provides advance warning that a large change in price may occur
• Uses three indicators
  – *Bollinger Bands*, based on a standard deviation move in price from the mean
  – *Keltner Channel*, based on a volatility move in price from the mean
  – *Momentum Indicator*, based on the velocity of price changes for a fixed time interval
AAPL - Weekly NASDAQ L=631.55 7.24 1.16% B=631.49 A=631.55 O=626.98 Hi=634.6

TTM Squeeze (Close,1,"Futures=1 Stocks=2 FX=3",20,1.5,2,... 0.00 115.96
Fibonacci Levels

• Presented in the book *Liber Abaci* by Leonardo Fibonacci in 1202
• Known to Indian mathematicians during 6th century
• Fibonacci sequence is 0, 1, 1, 2, 3, 5, 8, 13, 21, 34, 55, 89, 144, 233, 377, 610, ...
• Retracement can be measured by taking the high and low points on a chart and marking the key Fib ratios of 38.2%, 61.8%, and 78.6%.
• 50% is a key reversal level, but not a Fib level
• Targets can be measured using the Fibonacci extensions 127.2% and 161.8%
Sector Rotation Model

The image presents a sector rotation model that illustrates how different sectors of the economy, such as Technology, Basic Materials, Energy, Staples, and Utilities, perform during various market phases. The model indicates that during Full Recession, Market Bottom, and Full Recovery, Bull Market phases are typically associated with a different balance of sector performance. The specific dynamics and timing of these phases are crucial for investors to understand market trends and make informed decisions.
<table>
<thead>
<tr>
<th>Sector SPDR Fund</th>
<th>% Change</th>
</tr>
</thead>
<tbody>
<tr>
<td>S&amp;P 500 Index</td>
<td>-3.40%</td>
</tr>
<tr>
<td>Consumer Discretionary (XLY)</td>
<td>+4.73%</td>
</tr>
<tr>
<td>Consumer Staples (XLP)</td>
<td>-1.75%</td>
</tr>
<tr>
<td>Energy (XLE)</td>
<td>-16.95%</td>
</tr>
<tr>
<td>Financials (XLF)</td>
<td>-4.45%</td>
</tr>
<tr>
<td>Health Care (XLV)</td>
<td>+5.00%</td>
</tr>
<tr>
<td>Industrials (XLI)</td>
<td>-8.54%</td>
</tr>
<tr>
<td>Materials (XLB)</td>
<td>-10.25%</td>
</tr>
<tr>
<td>Technology (XLK)</td>
<td>-1.81%</td>
</tr>
<tr>
<td>Utilities (XLU)</td>
<td>-8.62%</td>
</tr>
</tbody>
</table>

http://www.sectorspdr.com/sectorspdr/tools/sector-tracker
Apple Inc AAPL - Monthly NASDAQ

L = 113.37  0.40%  PC = 112.92  O = 112.17  Hi = 113.3...
Toyota
Gold
Crude Oil
US Dollar Index $DXY - Monthly
ICEUS L=96.15 0.56% PC=95.61 O=95.79 Hi=96.3...

TTM Squeeze (Close,1,"Futures=1 Stocks=2 FX=3",20,1.5,2,... 0.00 9.56
Japanese Yen

Japanese Yen Custom Continuous Contract @JY=103XN - Monthly CME L=0.82190 ...

TTM Squeeze (Close,1,"Futures=1 Stocks=2 FX=3",20,1.5,2,... 0.0000 -0.0913
Euro

Euro FX Custom Continuous Contract @EC=103XN - Monthly CME L=1.1183 -0.02% ...

TTM Squeeze (Close,1,"Futures=1 Stocks=2 FX=3",20,1.5,2,... 0.0000 -0.1632
STOXX 50
S&P 500
S&P 500 (daily chart)
Trading Systems
What can be Controlled in Trading?

- You cannot control the direction of the market
- You cannot control the outcome of your trades
- You can only control how much money you will lose
Plan Your Trade

Before entering any trade, the following trade criteria must be known:

• Entry price
• Target for exiting the trade (profit)
• How much money will be risked (stop loss)
Probabilistic Mindset

• Anything can happen
• You don’t need to know what is going to happen next in order to make money
• There is a random distribution between wins and losses for any given set of variables that define an edge
• An edge is an indication of a higher probability of one event happening over another
• Every moment in the market is unique
Baseball is ninety percent mental and the other half is physical.

(Yogi Berra)
Money Management

Risk no more than 1-2% of portfolio in any one position

• $25,000 trading account
  – $500 risk per position
  – If trade has $0.50 stop loss => 1000 shares
  – If trade has a $1.00 stop loss => 500 shares

• Adjust share size according to risk tolerance
Trade Management

Dollar Risk
- 1/3rd of Potential Profit
- Potential Profit is $1.00 - Stop = $0.33

Percentage Risk
- IBD recommends 7-8% pullback in price

Technical Stop
- May be the best
- Based on a technical price level
- Or based on analysis technique
Trading Strategies

- Trend following
- Mean reversion
- Weekly/daily squeeze
- Growth
- Floor trader pivots
- Pairs trading
- Options
- Arbitrage
- Fund rebalancing
Mean Reversion Strategy
Growth Strategy

- Unusual daily volume
- Unusual weekly volume
- Daily squeeze setting up
- Weekly squeeze setting up
- 8 day moving average > 50 day moving average
- New 52 week high
Growth Strategy Scan

* Weekly squeeze fired long with last 15 bars and no loss of momentum
* Daily squeeze setting up but has not yet fired
* Average daily trading volume > 1000 shares

<table>
<thead>
<tr>
<th>Symbol</th>
<th>Last</th>
<th>Vol (avg)</th>
<th>Vol %change</th>
<th>Market Cap(mil)</th>
<th>RS</th>
<th>Rank</th>
<th>Float</th>
<th>Shares Short</th>
<th>% of Float</th>
<th>Has Options?</th>
<th>Has Weekly?</th>
</tr>
</thead>
<tbody>
<tr>
<td>ACRE</td>
<td>12.92</td>
<td>337360</td>
<td>-25</td>
<td>370</td>
<td>86</td>
<td>130</td>
<td>27.22M</td>
<td>508.82K</td>
<td>1.81%</td>
<td>✓ ✓ ✓</td>
<td>X X X</td>
</tr>
<tr>
<td>ALK</td>
<td>75.81</td>
<td>1496180</td>
<td>-10</td>
<td>9652</td>
<td>96</td>
<td>11</td>
<td>126.84M</td>
<td>9.45M</td>
<td>7.25%</td>
<td>✓ ✓ ✓</td>
<td>X X X</td>
</tr>
<tr>
<td>CCE</td>
<td>51.87</td>
<td>4853480</td>
<td>-39</td>
<td>11883</td>
<td>91</td>
<td>8</td>
<td>209.80M</td>
<td>3.90M</td>
<td>1.69%</td>
<td>✓ ✓ ✓</td>
<td>X X X</td>
</tr>
</tbody>
</table>

Scan results as of 8/29/2015 4:55:18 PM
Trading System Design

- **Asset class**: stocks, ETFs, futures, options, forex pairs
- **Type of trading system**: trend following, mean reversion, trading ahead of fund rebalancing, pairs trading, delta-neutral strategies, transaction cost reduction
- **Trading strategy**: buy in demand, sell in supply, buy premium, sell premium, hedging, pairs trading, spread trading
- **Trade duration**: interday, swing (multiple-days), position
- **Trading time frame**: monthly, weekly, daily, 240 min, 60 min, 30 min, 15min, 5min
Trading Systems Design (cont.)

- **Entry rule:** supply/demand levels, support/resistance lines, trend lines, Fibonacci retracement, Elliott waves, moving averages, stochastic indicators, MACD, RSI, CCI, Bollinger bands

- **Exit rule for risk management:** stop loss, target exit, Fibonacci extension, Bollinger bands, max dollar risk on each position

- **Rule for money management:** dollars to invest in each position

- **Goals/objectives:** comfortable retirement, portfolio stability, capital preservation, speculation hedge

- **Performance evaluation metrics:** R-multiple distribution, Sharpe ratio, MAR ratio, Ulcer index/UPI, average 1 yr trailing return, max monthly drawdown, longest drawdown, R-squared, scalability, risk of ruin trading stops, risk of low returns, risk of system death, risk of price shock wrt % max equity
Next Steps ...
Research Directions

• Decision support for human traders
  – Using historical data of price and volume, technical indicators, candlestick pattern recognition, volatility

• Automated trading systems
  – Automated selection of trading strategies
  – Automated execution of trades

• High speed computing architectures
  – Reconfigurable FPGAs
  – HFT algorithm development

• Intelligent system technologies
  – Multi-agent systems
  – Evolutionary systems
  – Evolving structure systems
Personal Growth as a Trader/Investor

• Determine long term trends on the major indices in the major markets: S&P 500, Euro Stoxx50, Nikkei 225, Hang Seng, ...
• Learn technical analysis to identify supply and demand.
• Trade a few important ETFs to gain experience and have “skin in the game.”
• When you are proficient with trading stocks and ETFs using technical analysis, learn options and futures.
• Use this experience to protect your personal wealth.
• When you can better understand market dynamics, you will be prepared for the next major downturn.

Remember ...“Stocks take the stairs up and the elevator down”
Trading Books

Trading Education

• Online Trading Academy, CA USA, intensive courses on trading stocks, options, futures, and forex; free resources on website; daily trade rooms (www.tradingacademy.com)

• SimplerOptions Inc., TX USA, webinar classes on options trading; free resources on website, daily trade room (www.simpleroptions.com)

• Equity Management Academy, Los Angeles, CA, trading education for precious metals, mining stocks, and crude oil; daily trade room www.ema2trade.com

• Investopedia, free resources on website; (www.investopedia.com)
References


Remember ...

• Have an effective sell strategy to limit losses or harvest gains.
• Create rules around a trading timeframe that fits your tolerance for risk.
• Don’t violate your rules.
• Start your analysis with higher trading time frames.
• Don’t lose sight of the critical importance of money management.
• Use experience to improve your trading skills.
• Analysis and trading of the financial markets can provide significant opportunities for employment, protection of personal wealth, and research.

• A prerequisite to developing and applying algorithmic trading systems is a practical understanding of how to determine supply and demand, and apply the tools of technical analysis.
For further information ...

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References (cont.)

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