

# Lecture 20: Technical Analysis

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# The Efficient Market Hypothesis

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The *Efficient Market Hypothesis* states that the price of a financial asset reflects all available public information available, and responds only to unexpected news.

*If so*, prices are optimal estimates of investment value at all times.

*If so*, it is impossible for investors to predict whether the price will move up or down.

There are a variety of slightly different formulations of the Efficient Market Hypothesis (EMH). For example, suppose that prices are predictable but the function is too hard to compute efficiently...

# Implications of the Efficient Market Hypothesis

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EMH implies it is pointless to try to identify the best stock, but instead focus our efforts in constructing the highest return portfolio for our desired level of risk.

EMH implies that technical analysis is meaningless, because past price movements are all public information.

EMH's distinction between public and non-public information explains why *insider trading* should be both profitable and illegal.

Like any simple model of a complex phenomena, the EMH does not completely explain the behavior of stock prices.

However, that it remains debated (although not completely believed) means it is worth our respect.

# Technical Analysis

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The term “technical analysis” covers a class of investment strategies analyzing patterns of past behavior for future predictions.

Technical analysis of stock prices is based on the following assumptions (Edwards and Magee):

- Market value is determined purely by supply and demand
- Stock prices tend to move in trends that persist for long periods of time.
- Shifts in supply and demand cause reversals in trends.
- These shifts can be detected in charts/graphs.

- Many chart patterns tend to repeat themselves.

There have been long and loud debates of the relative merits of technical analysis and *fundamental analysis*, which assesses the profitability and prospects of the given security.

## Technical Analysis: Pro

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Many professionals use it. Many amateurs use it, too. How can this be if it has no value?

M. Taylor and H. Allen, “The Use of Technical Analysis in the Foreign Exchange Market”, J. International Money and Finance, June 1992, 304-314. surveys foreign exchange dealers and find that the vast majority place some weight on technical analysis.

Since market prices reflect supply and demand, any understanding of popular trading strategies can potentially provide an edge.

Given the diverse strategies and goals of different traders (e.g. hedging and risk reduction vs. profit maximization) there may be positive investment opportunities even in an efficient market.

Certain technical analysis methods seem to mirror natural human strategies (buy when it breaks through a high, sell when it is declining, etc.)

Many natural (e.g. daily/annual weather patterns) and human phenomena (e.g. meal times and jet lag) revolve around rhythms and cycles – why not market phenomena which are a combination of both?

## Technical Analysis: Con

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Technical analysis is like driving a car while looking through a rear-view mirror. . .

If you believe in the efficient market hypothesis / random walk theory, technical analysis cannot work, because complete knowledge of past history is encoded in the current price.

In many trading theories, the patterns are ambiguous and the trading strategies not rigorously defined. Thus two people can take the opposite position on a trade while still following the same theory. This makes it difficult to benchmark the quality of the theory.



The cycles of the market may be like the cycles of a child on a swing, periodic, but unpredictable due to irregularities of kicking patterns and wind gusts.

Short-term claims of excellent performance often just reflect luck.

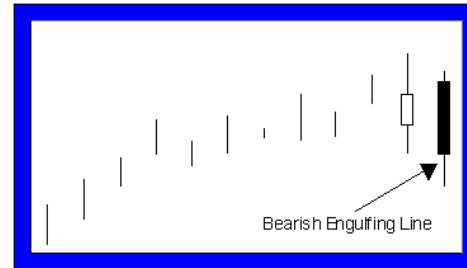
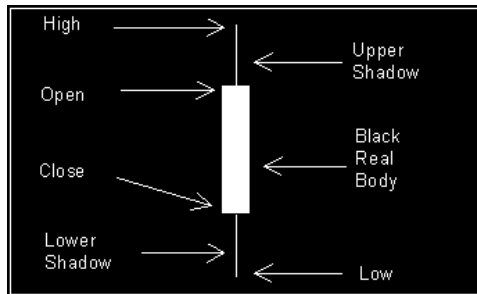
Published studies generally reach ambiguous conclusions, although several do favor technical analysis to some degree.

# Types of Charts

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*Bar charts* show the high and low price for each day, perhaps with a tick for the closing price.

*Candlestick charts* plot high, low, open and close, with shading to indicate whether it was an up or down day.



Certain trading systems look for certain shapes of these bars, such as the “Candlestick hammer”, which looks like a hammer.

The primary merit to such systems appear to be as a visualization tool, making it easy to eyeball recent market activity.

## Trend Reversal / Continuation Patterns

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A broad class of technical trading strategies revolve around the current price with respect to recent history.

The *support level* of a stock is the lower end of its recent trading range.

The *resistance level* of a stock is the upper end of its recent trading range.

The Dow theory suggests buying (selling) when a price is near its support (resistance) level – buy low, sell high.

Combining volume trends with price trends seek to capture market sentiment. Hitting a new low with high volume is bearish, while it might not be as significant with low volume.

B. Lehmann “Fads, Martingales, and Market Efficiency”, *The Quarterly Journal of Economics*, February 1990, pp. 1-28. observed that stocks which fall by a sizable amount one week tend to experience a sizable rise the following week.

N. Jagadeesh, “Evidence of Predictable Behavior of Security Returns”, *J. Finance*, July 1990, 881-898. finds that similar patterns occur on monthly scales.

# Moving Average Indicators

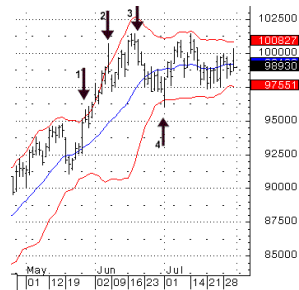
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Typically exponentially weighted moving average models are used to place the current price in context within a *band* determined by the high, low and average prices in the interval. The width of these bands may be governed by extreme values, fixed percentages, or volatility (given movements are less significant in times of high volatility).

# Bollinger Bands

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*Bollinger bands* are windows of (typically) two standard deviations around the (typically) 20-day moving average.

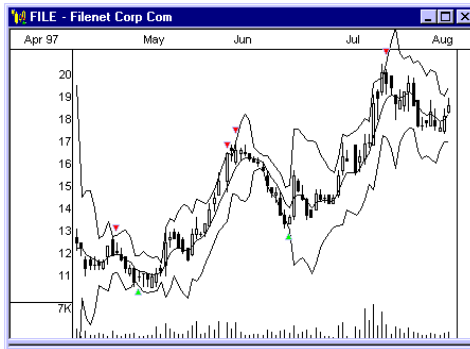


The theory states that (1) movements outside the bands should continue, (2) movements outside and then inside the bands suggest reversals, (3) tightening bands (low price volatility) are often followed by sharp price movements.

# Kirshenbaum Bands

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*Kirshenbaum bands* are derived from the magnitude of the standard error of the regression lines of recent returns. Times of high-predictability imply narrow bands.



*Convergence/divergence* models compare moving averages from one period (e.g. 26 days) to those of another (e.g. 13 days) to detect trends in the market.



# Oscillators

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*Money flow indicators* factor in price changes and volumes to measure how much money is being invested in the security. These strategies assume that markets oscillate between over-bought and over-sold levels.

The notion of *accumulation/distribution* is a cumulative measure of the volume “bought” in up periods subtracted from that of volume “sold” in down periods.

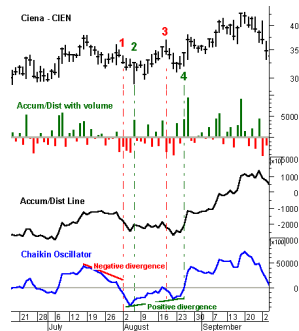
This is a measure of whether money is flowing into or out of the market.

*Directional movement crossovers* compare the differences of high prices and the differences of low prices to suggest a trend

# Chaikin Oscillator

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The *Chaikin oscillator* treats an up or down period depending upon the difference between the close and the average of the high and low.

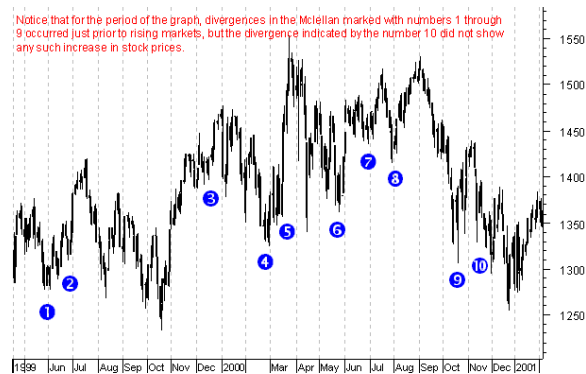


*Relative strength oscillators* compare the gains on up days to losses on down days, when over-bought markets are suggests when there are disproportional numbers of up days.

# McClellan Oscillator

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The *McClellan Oscillator* is a measure of market breadth based on the smoothed difference between the number of advancing and declining issues on the NYSE. The system compares (subtracts) the EWMA's of 19 and 39 day functions.



## Pros vs. Joes Indicators

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The ratio of short-selling between NYSE specialists (market makers) vs others compares smart to dumb money.

The ratio of short-selling interest to the average daily volume of the previous month. If few shares are being sold short, there is less potential demand for future shares since less will be bought to cover short positions.

Put-call ratios measure options activity. Typically call volume is far greater than put volume.

# Insider Indicators

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Insider trading measures the activity of people who have reason to know what is happening inside a company.

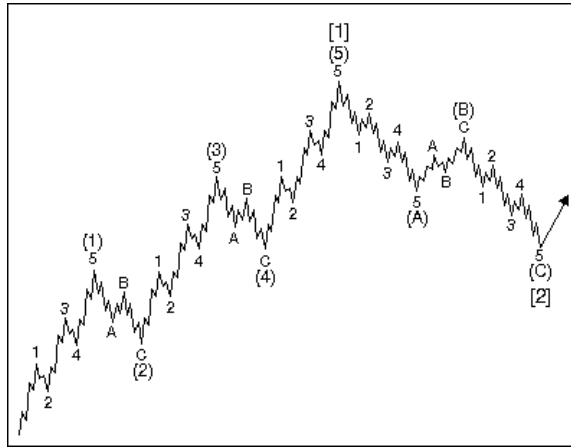
Advisory indices measure what financial advisors are recommending. Results suggest taking a position contrary to financial advisors.

# Elliot Wave Theory

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The popular (but mystical) Elliot Wave Theory was first published in 1939 based on the work of Ralph Nelson Elliot. It claims that market movements and other dimensions of human behavior are based on repetitive patterns of waves.

The theory claims that (1) action is followed by reaction, (2) five waves (peaks or troughs) in the direction of the main trend are followed by three corrective waves. (3) Such a cycle becomes two subdivisions of the next 5-3 wave, (4) The 5-3 pattern of waves is constant, although time spans of each wave may vary.



This recursive composition of waves creates curves that look something like fractal patterns.

# Fibonacci Numbers

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The 5-3 pattern of Elliot Wave theory becomes intertwined with the *Fibonacci numbers*, where  $F_n = F_{n-1} + F_{n-2}$ .

Fibonacci numbers arise in any process modeled by this recurrence, e.g. phyllotaxis in plants.

The thirteen piano keys of an octave are partitioned into 8 white and 5 black.

The *golden ratio of 0.618* is the ratio between successive Fibonacci numbers.

Fibonacci trend lines tend to appear at ratios of 38.2 %, 50%, and 61.8%, according to several trading systems, where values increasing/decreasing by such ratios are deemed significant.





The *Fibonacci peaks* system averages 8-, 13-, and 21-period moving average indicators.

The use of Fibonacci numbers in these systems seem to be numerology more than mathematics.

## Conclusions: Bauer and Dahlquist

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These are drawn from “Technical Market Indicators: Analysis and Performance” by Bauer and Dahlquist, 1999, who studied 60 technical indicators for 878 stocks on daily data from 1985 to 1996.

- *If you trade strictly following technical signals you will on average do worse than buy-and-hold, because ...*
- *Technical indicators on average signal a high proportion of cash positions – Because the magnitude of positive returns historically exceeds those of negative returns, the opportunity cost of a conservative cash position are significant. Thus ...*

- *Technical indicators generally outperform buy-and-hold for stocks that are declining but under perform for those that are rising in price.*
- *Technical indicators do on average contain information that may be of value in trading.* – Bauer-Dahlquist found that 50 of 60 tested indicators returned showed greater than average returns on the days the indicators signaled long/buy. They also found that lower than average (but still positive) returns occurred on days when the indicators signaled short/sell. However, these signals were not sufficient to outperform buy-and-hold.

- *Portfolio management is the important issue in technically-based trading systems* – Portfolio management is trivial for buy-and-hold, but it is not clear how you take advantage of such relatively weak signals as appear to come from technical analysis.
- *Strategy evaluation typically ignores transaction costs, slippage (inability to transact at published prices), and interest* – The first two work against technical analysis, while the latter is not sufficient for such strategies to beat buy-and-hold.
- *Leveraged positions may be necessary to exploit certain opportunities* – However, leverage also increases risk in the event of a downturn.

## Conclusions: Skiena

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Technical analysis is widely used by traders *as justification* for making what are relatively arbitrary decisions.

The “formal” strictures of such methods may well enhance the traders performance just as rhythmic structures like haiku or limericks enhance poet’s performance.

If markets behave as random walks, then technical analysis is every bit as justified as any other trading strategy.

Technical analysis seems able to help identify trends which are occurring, however the evidence is less compelling that it can pick up significant changes in trends.