

# Smoke and Mirrors: Price patterns, charts and technical analysis

Aswath Damodaran

# The Random Walk Hypothesis

Information	All information about the firm is publicly available and traded on.	New information comes out about the firm.
Market Expectations	Investors form unbiased expectations about the future	Since expectations are unbiased, there is a 50% chance of good or bad news.
Price Assessment	Stock price is an unbiased estimate of the value of the stock.	The price changes in accordance with the information. If it contains good (bad) news, relative to expectations, the stock price will increase (decrease).
Implications for Investors	No approach or model will allow us to identify under or over valued assets.	Reflecting the 50/50 chance of the news being good or bad, there is an equal probability of a price increase and a price decrease.

## The Basis for Price Patterns

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1. Investors are not always rational in the way they set expectations. These irrationalities may lead to expectations being set too low for some assets at some times and too high for other assets at other times. Thus, the next piece of information is more likely to contain good news for the first asset and bad news for the second.
2. Price changes themselves may provide information to markets. Thus, the fact that a stock has gone up strongly the last four days may be viewed as good news by investors, making it more likely that the price will go up today then down.

## The Empirical Evidence on Price Patterns

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- Investors have used **price charts and price patterns** as tools for predicting future price movements for as long as there have been financial markets.
- The first studies of market efficiency focused on the **relationship between price changes over time**, to see if in fact such predictions were feasible.
- Evidence can be classified into three classes
  - Studies that look at the **really short term** (hourly, daily) price behavior
  - studies that focus on **short-term** (weekly, monthly price movements) price behavior and
  - research that examines **long-term** (annual and five-year returns) price movements.

## Testing for price patterns

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- Serial correlation, where you look at how price changes in a period are correlated with price changes in prior periods
- Runs tests, where you look at sequences of “up” or “down” periods and test them against randomness.
- Filter rules and relative strength, where you examine whether investment strategies based upon past price performance beat the market.

## Serial correlation

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- Serial correlation **measures the correlation between price changes in consecutive time periods**
- Measure of how much price change in any period depends upon price change over prior time period.
  - 0**: imply that price changes in consecutive time periods are uncorrelated with each other
  - >0**: evidence of price momentum in markets
  - <0**: Evidence of price reversals

## Serial Correlation and Excess Returns

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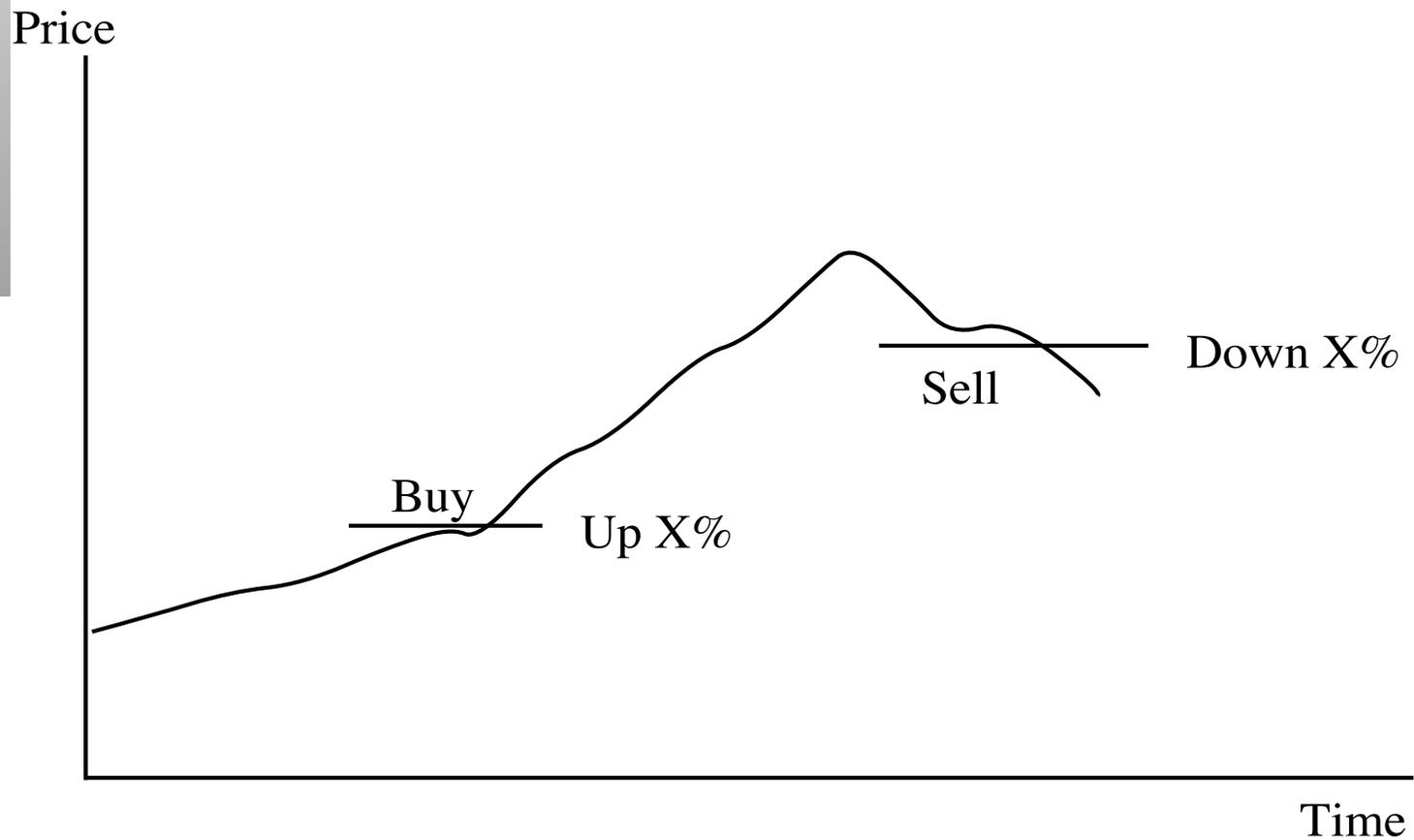
- From viewpoint of investment strategy, **serial correlations can be exploited** to earn excess returns.
  - A **positive serial correlation** would be exploited by a strategy of buying after periods with positive returns and selling after periods with negative returns.
  - A **negative serial correlation** would suggest a strategy of buying after periods with negative returns and selling after periods with positive returns.
  - The correlations must be **large enough** for investors to generate profits to cover **transactions costs**.

## 1. Serial Correlation in really short-term returns

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- Low or no serial correlation: The earliest studies of serial correlation all looked at large U.S. stocks and concluded that the serial correlation in stock prices was small. Other studies confirmed these findings – of very low correlation, positive or negative - not only for smaller stocks in the United States, but also for other markets.
- Market liquidity effect: If markets are not liquid, you will see serial correlation in index returns.
- Bid-ask spread effect: The bid-ask spread creates a bias in the opposite direction, if transactions prices are used to compute returns, since prices have a equal chance of ending up at the bid or the ask price. The bounce that this induces in prices will result in negative serial correlations in returns.

And it is really difficult to make money off really short term correlations..



## Returns on Filter Rule Strategies

<i>Value of X</i>	<i>Return with Strategy</i>	<i>Return with Buy &amp; Hold</i>	<i>No of Trades</i>	<i>Return after costs</i>
0.5%	11.5%	10.4%	12,514	-103.6%
1.0%	5.5%	10.3%	8,660	-74.9%
2.0%	0.2%	10.3%	4,764	-45.2%
3.0%	-1.7%	10.1%	2,994	-30.5%
4.0%	0.1%	10.1%	2,013	-19.5%
5.0%	-1.9%	10.0%	1,484	-16.6%
6.0%	1.3%	9.7%	1,071	-9.4%
8.0%	1.7%	9.6%	653	-5.0%
10.0%	3.0%	9.6%	435	-1.4%
12.0%	5.3%	9.4%	289	2.3%
14.0%	3.9%	10.3%	224	1.4%
16.0%	4.2%	10.3%	172	2.3%
18.0%	3.6%	10.0%	139	2.0%
20.0%	4.3%	9.8%	110	3.0%

## Results of Study

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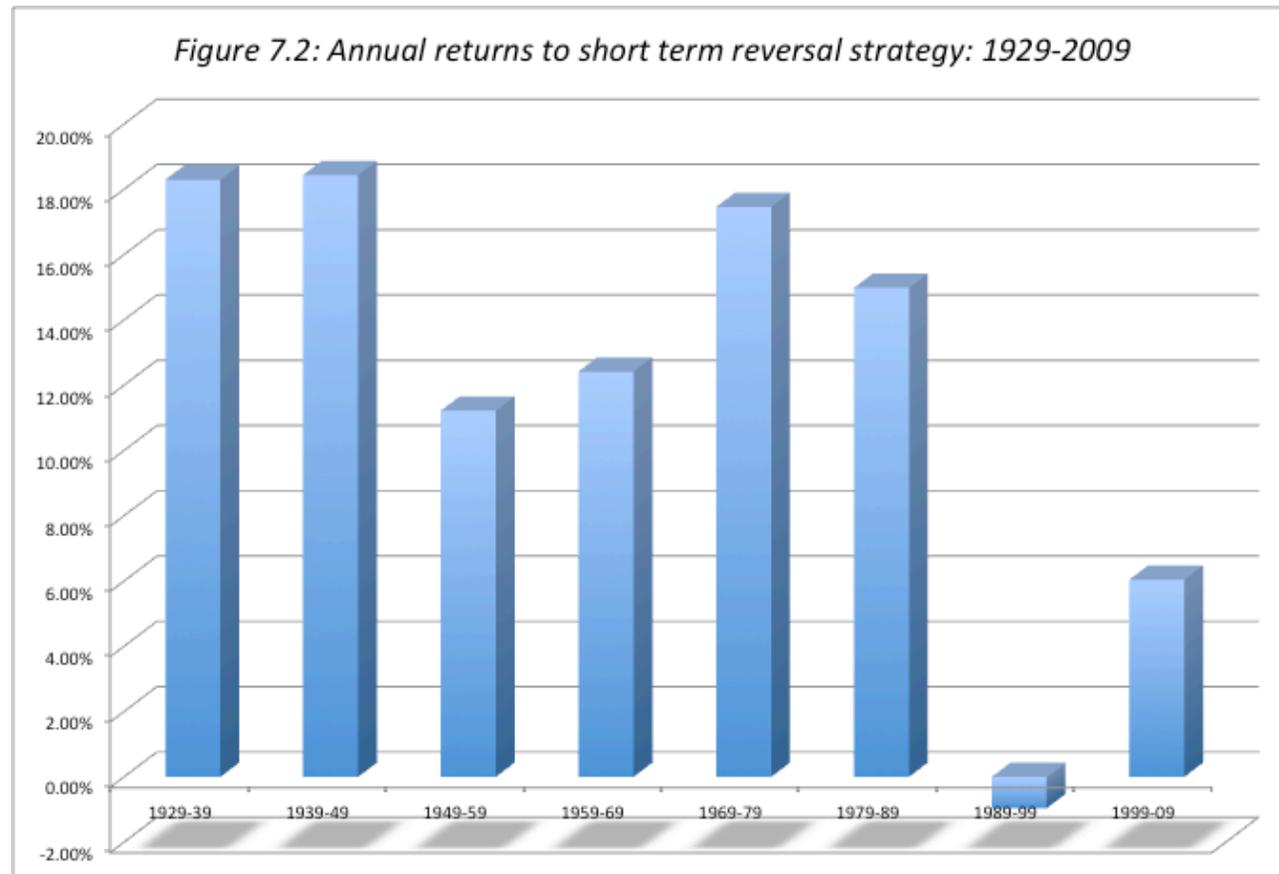
- **The only filter rule that beats the returns from the buy and hold strategy is the 0.5% rule**, but it does so before transactions costs. This strategy **creates 12,514 trades** during the period which generate enough transactions costs to wipe out the principal invested by the investor.
- While this test is dated, it also illustrates **a basic problem with strategies that require frequent short term trading**. Even though these strategies may earn excess returns prior to transactions costs, adjusting for these costs can wipe out the excess returns.
- The advent of computerized high-frequency trading has opened one possible window to making money off really small correlations in the short term.

## 2. Serial correlation in the short term

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- As you move from hours and days to weeks or a month, there seems to be some evidence that prices reverse. In other words, stocks that have done well over the last month are more likely to do badly in the next one and stocks that have done badly over the last month are more likely to bounce back.
- The reasons given are usually rooted in market over reaction, i.e., that the stocks that have gone up (down) the most over the most recent month are ones where markets have over reacted to good (bad) news that came out about the stock over the month. The price reversal then reflects markets correcting themselves.

## Returns from Momentum in short term

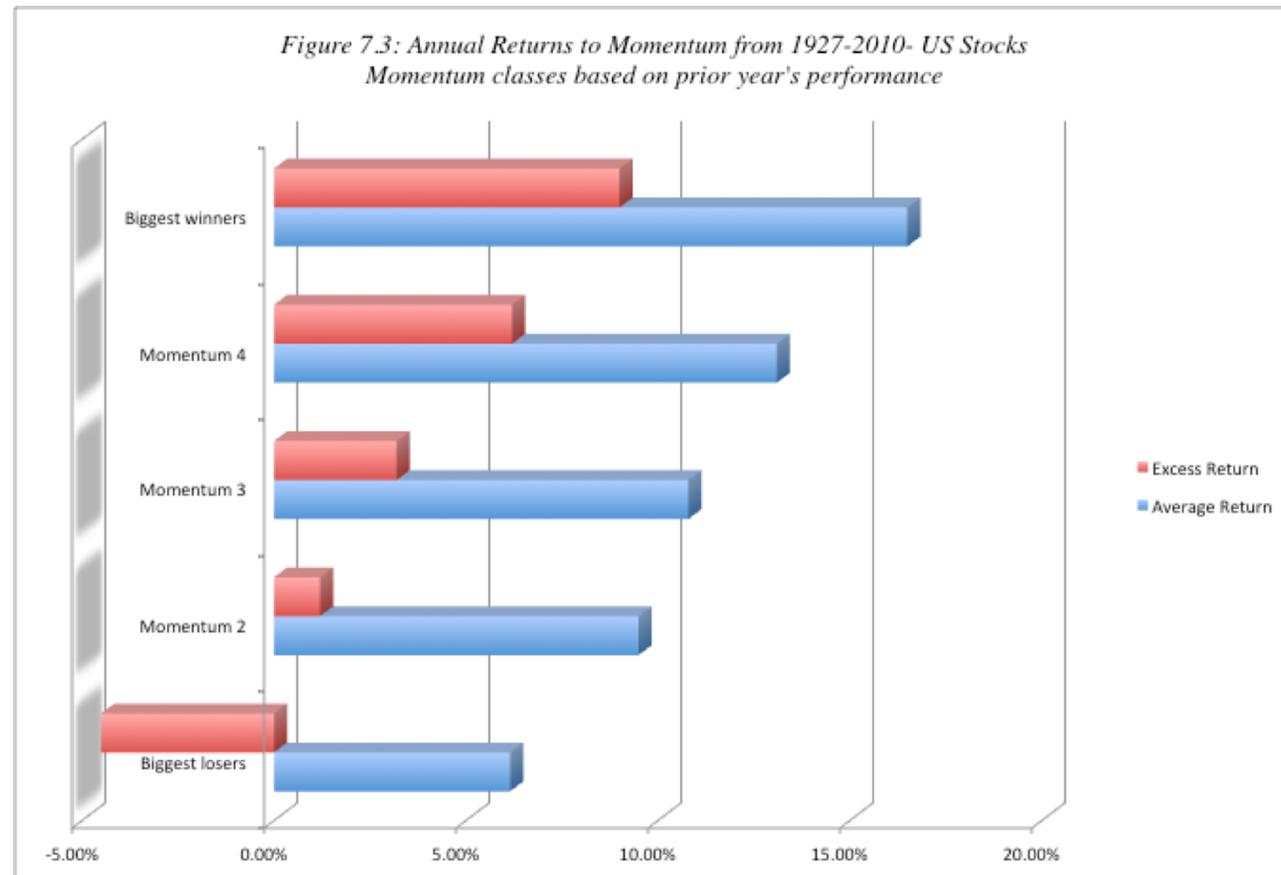


### 3. Serial correlation in the medium term

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- When time is defined as many months or a year, rather than a single month, there seems to be a tendency towards positive serial correlation.
- Jegadeesh and Titman present evidence of what they call “price momentum” in stock prices over time periods of several months – stocks that have gone up in the last six months tend to continue to go up whereas stocks that have gone down in the last six months tend to continue to go down.
- Between 1945 and 2008, if you classified stocks into deciles based upon price performance over the previous year, the annual return you would have generated by buying the stocks in the top decile and held for the next year was 16.5% higher than the return you would have earned on the stocks in the bottom decile.

# Annual returns from momentum classes (based upon most recent year)



## More “evidence” on momentum

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- Volume effect: Momentum accompanied by higher trading volume is stronger and more sustained than momentum with low trading volume.
- Size effect: While some of the earlier studies suggest that momentum is stronger at small market cap companies, a more recent study that looks at US stocks from 1926 to 2009 finds the relationship to be a weak one, though it does confirm that there are sub periods (1980-1996) where momentum and firm size are correlated.
- Upside vs Downside: The conclusions seem to vary, depending on the time period examined, with upside momentum dominating over very long time periods (1926-2009) and downside momentum winning out over some sub-periods (such as the 1980-1996).
- Growth effect: Price momentum is more sustained and stronger for higher growth companies with higher price to book ratios than for more mature companies with lower price to book ratios.

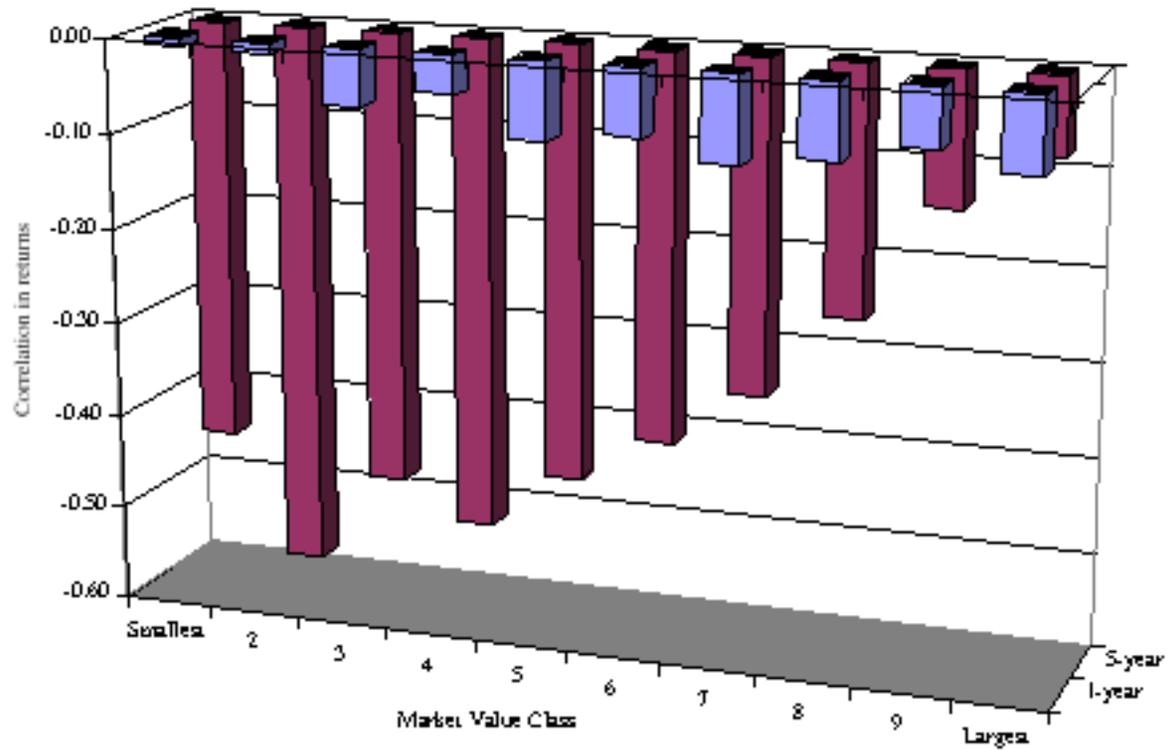
## Long Term Serial Correlation

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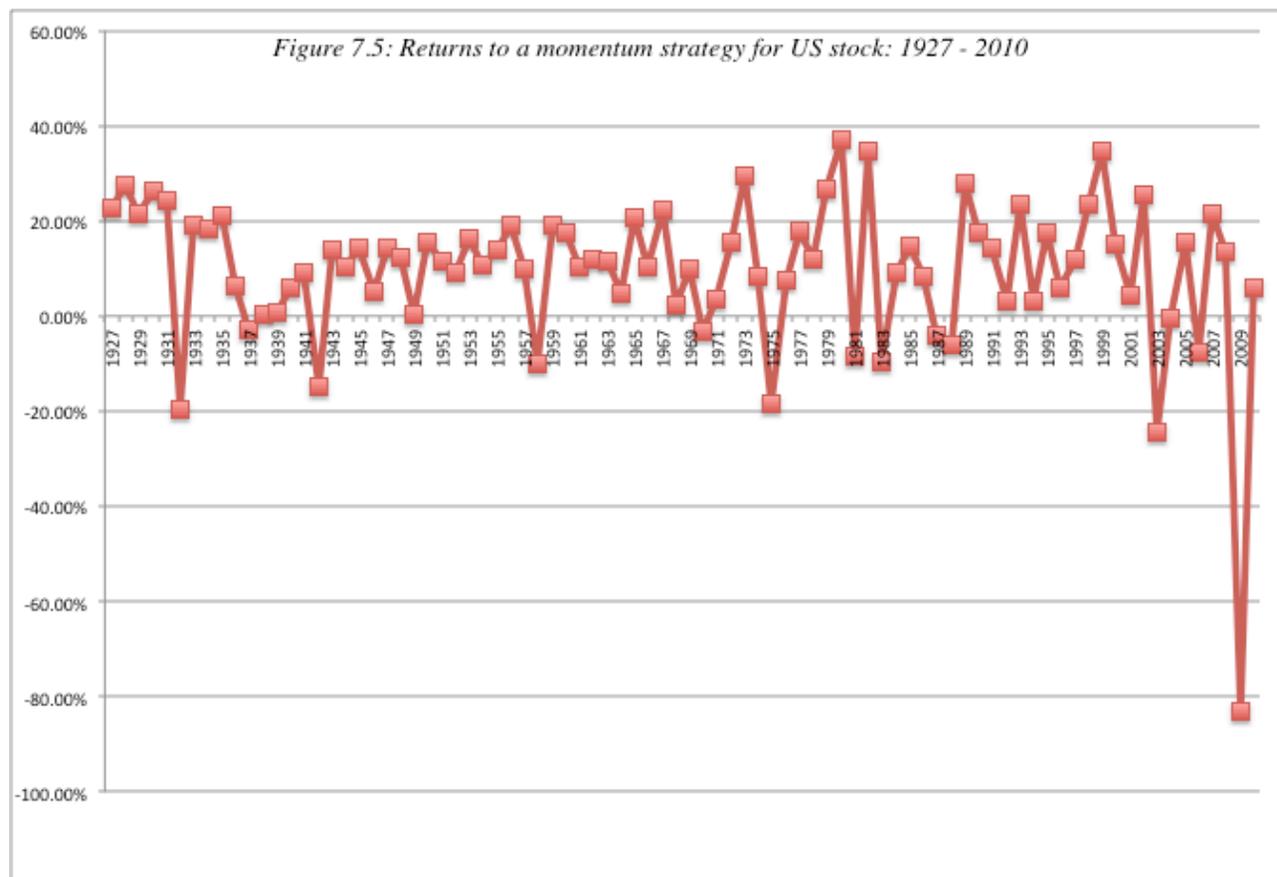
- In contrast to the studies of short term correlation, there is evidence of strong correlation in long term returns.
- When long term is defined as months, there is positive correlation - a momentum effect.
- When long term is defined as years, there is negative correlation - reversal in prices. The effect is much stronger for smaller companies.

## Evidence of long term correlation

Figure 7.2: One year and Five year Correlations: Market Value Class: 1941-1985



# The tipping point... Momentum works, until it does not..



## Extreme Momentum: Bubbles..

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- Looking at the evidence on price patterns, there is evidence of both price momentum (in the medium term) and price reversal (in the short and really long term).
- Read together, you have the basis for price bubbles: the momentum creates the bubble and the crash represents the reversal.
- Through the centuries, markets have boomed and busted, and in the aftermath of every bust, irrational investors have been blamed for the crash.

## Blooper versus Bubble

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### ■ Blooper

- Rational markets can make mistakes. Assessments of value are based upon expectations, which are formed with the information that is available at the time of the assessments. You will be wrong a lot of the time and very wrong some of the time.
- It is therefore entirely possible and very likely, even in an efficient market, to see significant pricing errors.

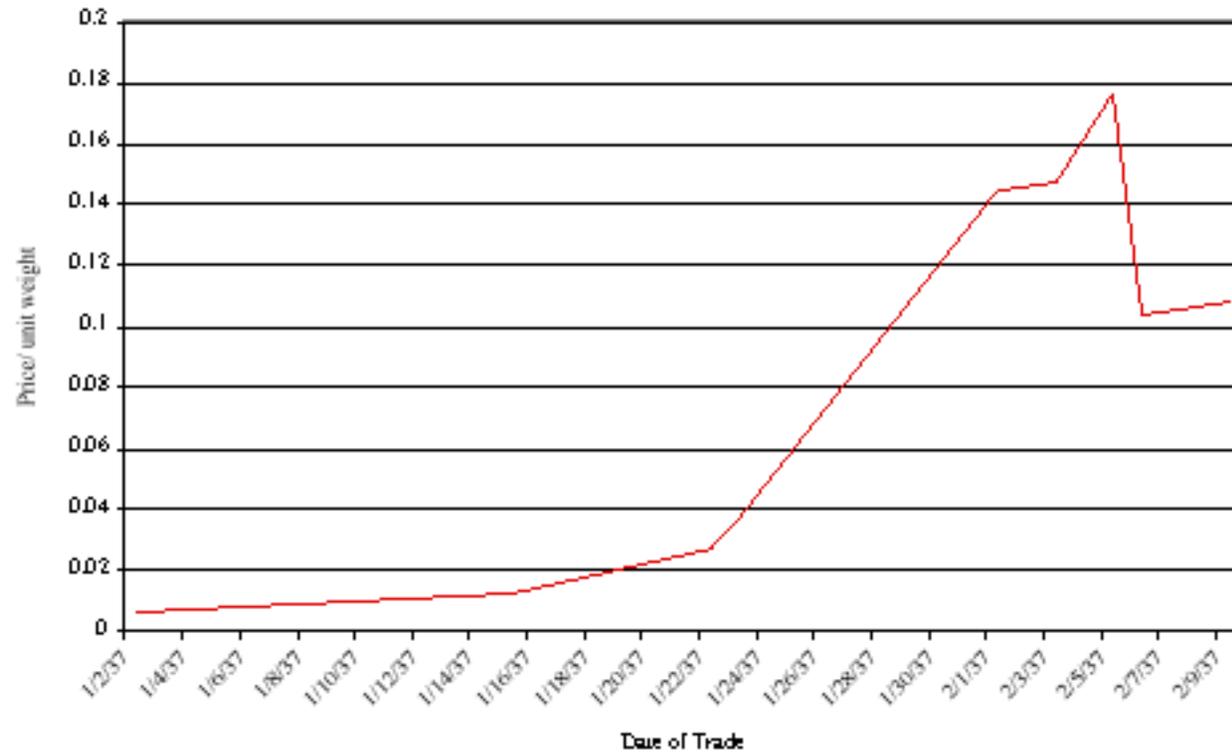
### ■ Bubble

- A bubble is a willful error, suggestive of irrational behavior at some level.
- This irrational behavior manifests itself as an unwillingness or incapacity on the part of investors in the market to face up to reality.

- ### ■ Separating bloopers from bubbles is difficult. There is a tendency on the part of some (the anti-market efficiency crowd) to view all big price adjustments as evidence of bubbles, just as there is a tendency on the part of the others (the true believers in market efficiency) to view all big price adjustments as evidence of bloopers.

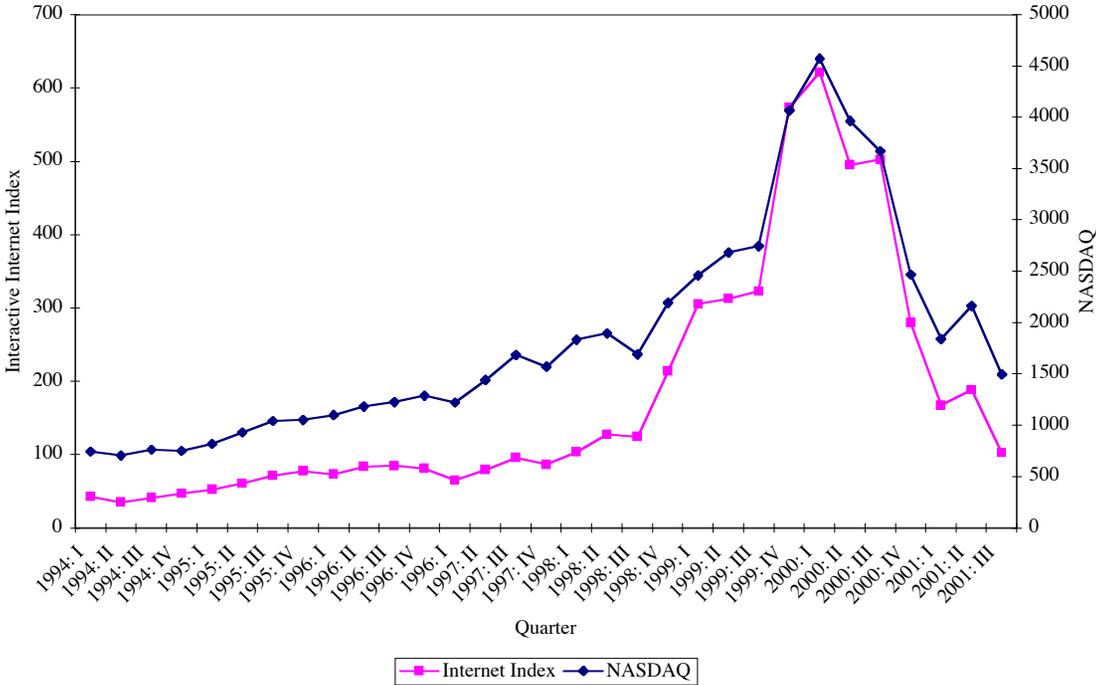
# Is this a bubble?

Figure 7.11: Price of a Tully Bull (Switzer) - January - February 1637



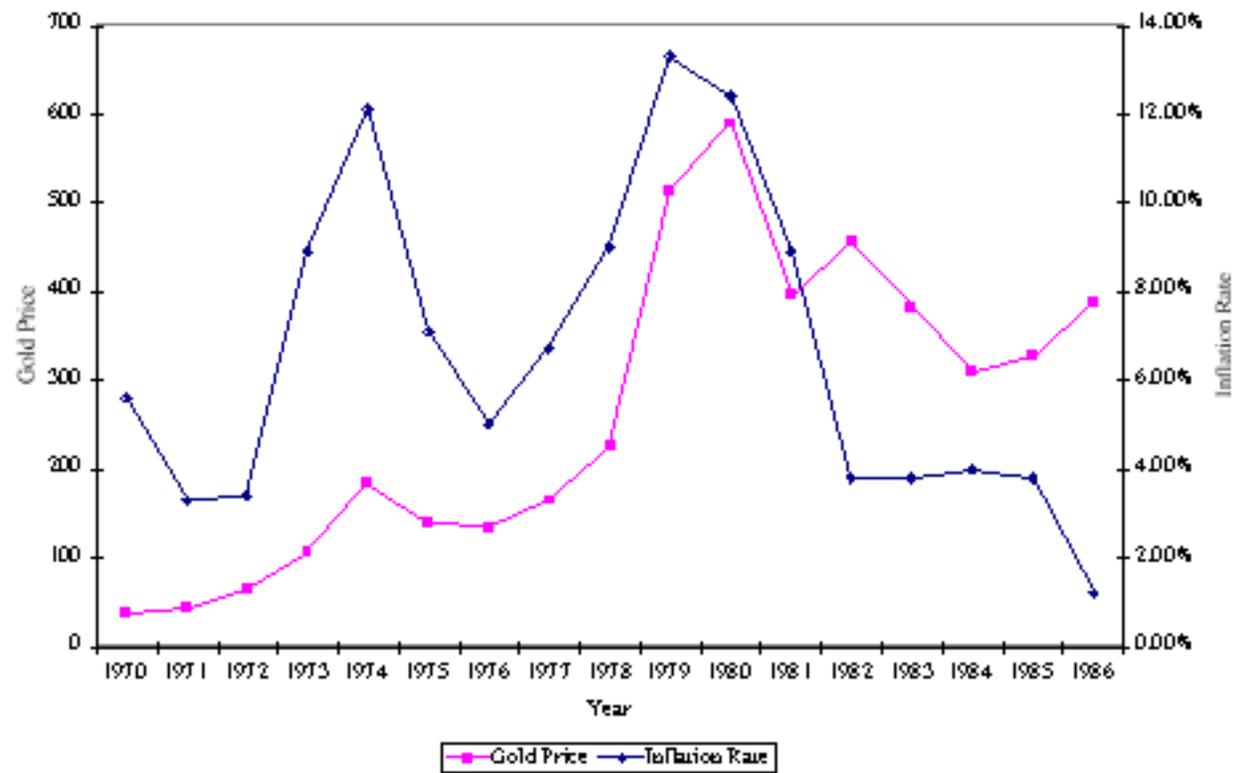
# What about this one?

Figure 7.12: The Tech Boom



# Or this?

Figure 7.13: Gold Prices: 1970-86



## Deconstructing a Bubble

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- There are four phases in every bubble, though the length of each phase may vary from bubble to bubble.
  - The formation of the bubble
  - The sustenance of the bubble
  - The bursting of the bubble
  - The after-math

## The Birth of a Bubble

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- Most bubbles have their genesis in a kernel of truth. In other words, at the heart of each bubble is a perfectly sensible story.
- The bubble builds as
  - Positive reinforcement is provided to irrational or ill-thought out actions on the part of some investors.
  - News about the success of these investors is broadcast to the rest of the market.
  - Other investors imitate the first movers and create a self-fulfilling prophecy...

## The Sustenance of a Bubble

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- Institutional Parasites: Institutions, individuals and other entities make money off the bubble and develop vested interests in preserving and expanding the bubble. These include
  - Investment bankers
  - Brokers
  - Portfolio managers
- Support is provided for the bubble by academics and intellectuals(well-meaning or otherwise) who
  - Proclaim that the old rules no longer apply because
  - Claim new paradigms...
  - Disparage those who do not buy into the bubble as being old-fashioned

## The Bursting of a Bubble

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- There is usually no single precipitating event that causes bubbles to burst, but a confluence of factors.
  - You run out of suckers. The investors who are your best targets are already fully invested in the bubble.
  - You become exhausted trying to explain the unexplainable...
  - Each new entry into the bubble is more outrageous than the previous one and more difficult to explain.
- The first hint of doubt among the true believers very quickly turns to panic as reality sets in... Well devised exit strategies break down as everyone heads for the exit doors at the same time.

## The Aftermath

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- “I was smarter than the average investor” : You cannot find anyone who lost money when the bubble burst. They all claim either that they never invested in it ( denial) or that they saw the correction coming and got out in time (hindsight).
- “It was the investment banker’ s fault” : Investors look for someone to blame and the forces that sustain the bubble (the bubble parasites and intellectuals) become the obvious targets.
- “I will never invest in a bubble again” : Everyone claims that they have learned their lessons and will not be taken in again.

## Seasonal and Temporal Effects on Prices

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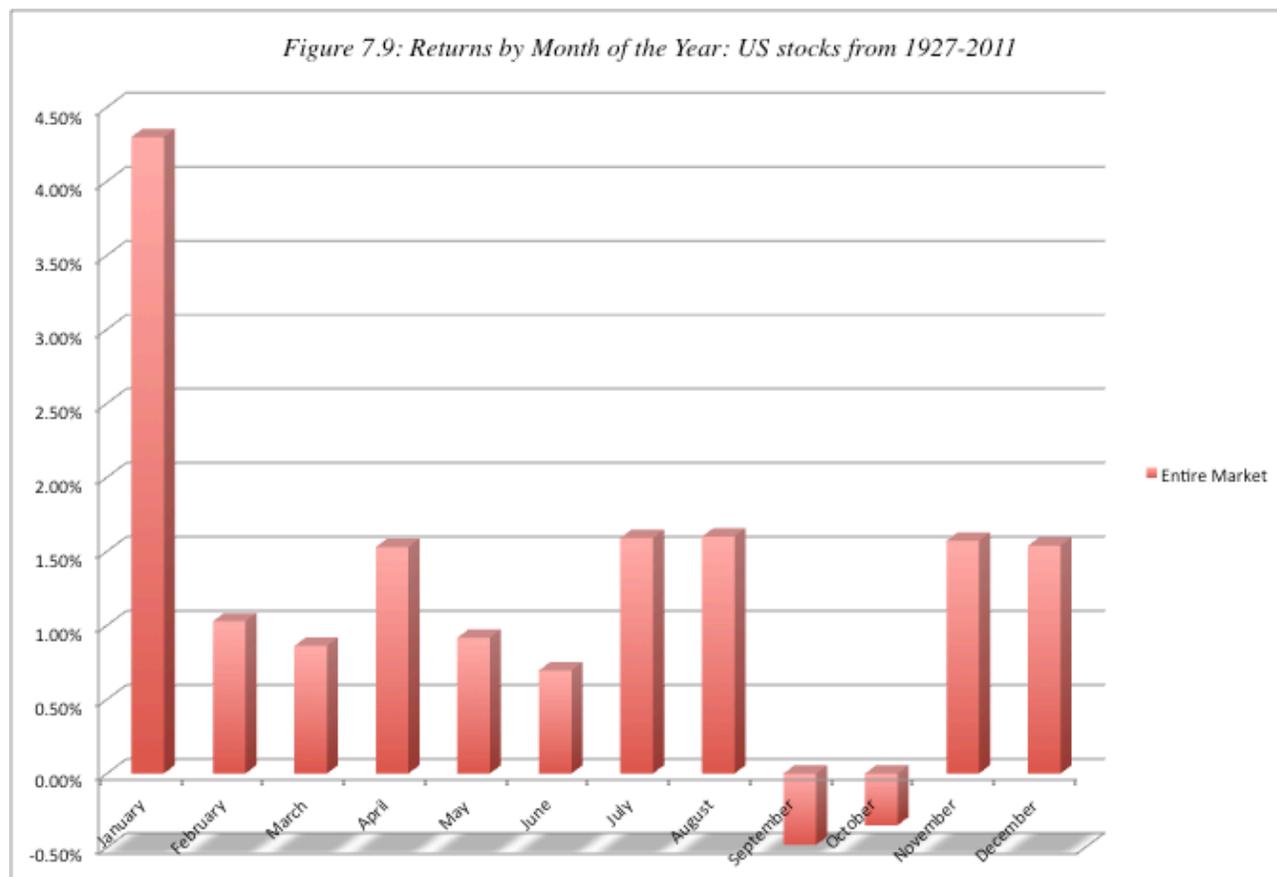
- Empirical studies indicate a variety of seasonal and temporal irregularities in stock prices. Among them are:
  - The January Effect: Stocks, on average, tend to do much better in January than in any other month of the year.
  - The Weekend Effect: Stocks, on average, seem to do much worse on Mondays than on any other day of the week.
  - The Mid-day Swoon: Stocks, on average, tend to do much worse in the middle of the trading day than at the beginning and end of the day.
- While these empirical irregularities provide for interesting conversation, **it is not clear that any of them can be exploited to earn excess returns.**

## A. The January Effect

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- Studies of returns in the United States and other major financial markets consistently reveal strong differences in return behavior across the months of the year.
- **Returns in January are significantly higher than returns in any other month of the year.** This phenomenon is called the year-end or January effect, and it can be traced to the first two weeks in January.
- The January effect is **much more accentuated for small firms** than for larger firms, and roughly half of the small firm premium, described in the prior section, is earned in the first two days of January.

# Returns in January

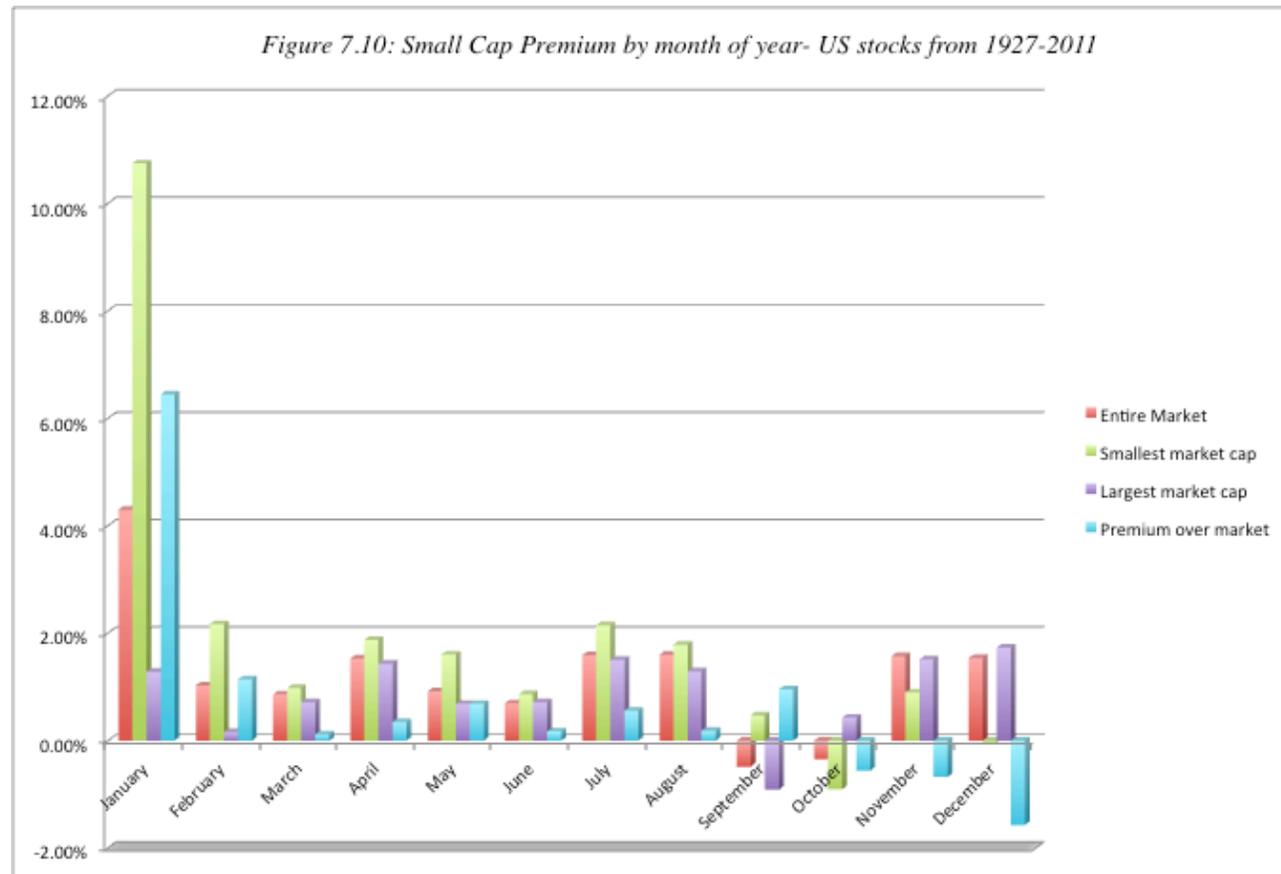


## Explanations for the January Effect

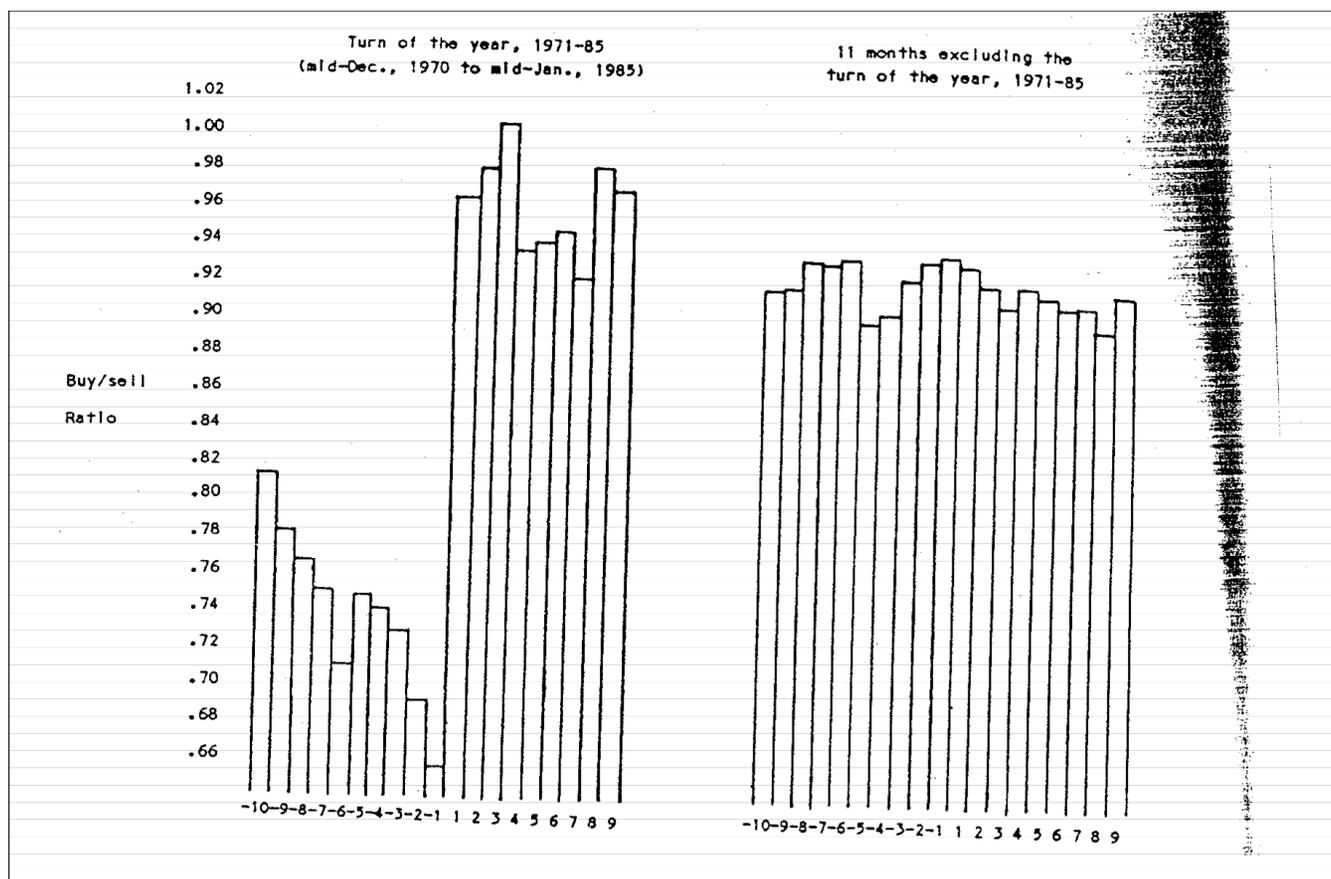
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- A number of explanations have been advanced for the January effect, but few hold up to serious scrutiny.
  - **Tax loss selling by investors** at the end of the year on stocks which have 'lost money' to capture the capital gain, driving prices down, presumably below true value, in December, and a buying back of the same stocks in January, resulting in the high returns. Since wash sales rules would prevent an investor from selling and buying back the same stock within 45 days, there has to be some substitution among the stocks. Thus investor 1 sells stock A and investor 2 sells stock B, but when it comes time to buy back the stock, investor 1 buys stock B and investor 2 buys stock A.
  - A second rationale is that the January effect is related to **institutional trading behavior** around the turn of the years. It has been noted, for instance, that ratio of buys to sells for institutions drops significantly below average in the days before the turn of the year and picks to above average in the months that follow.

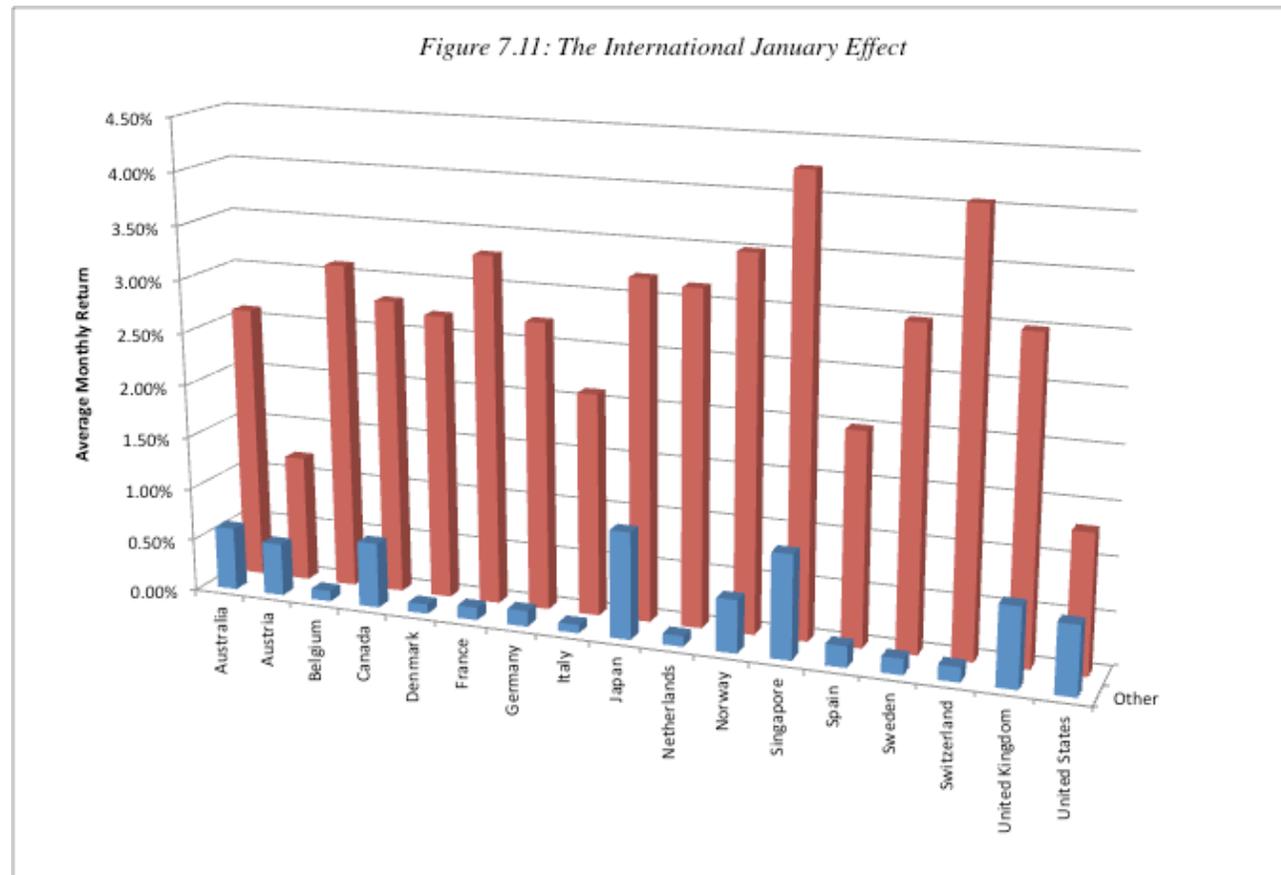
# The Size Effect in January



# Institutional Buying/Selling around Year-end



# Returns in January vs Other Months - Major Financial Markets



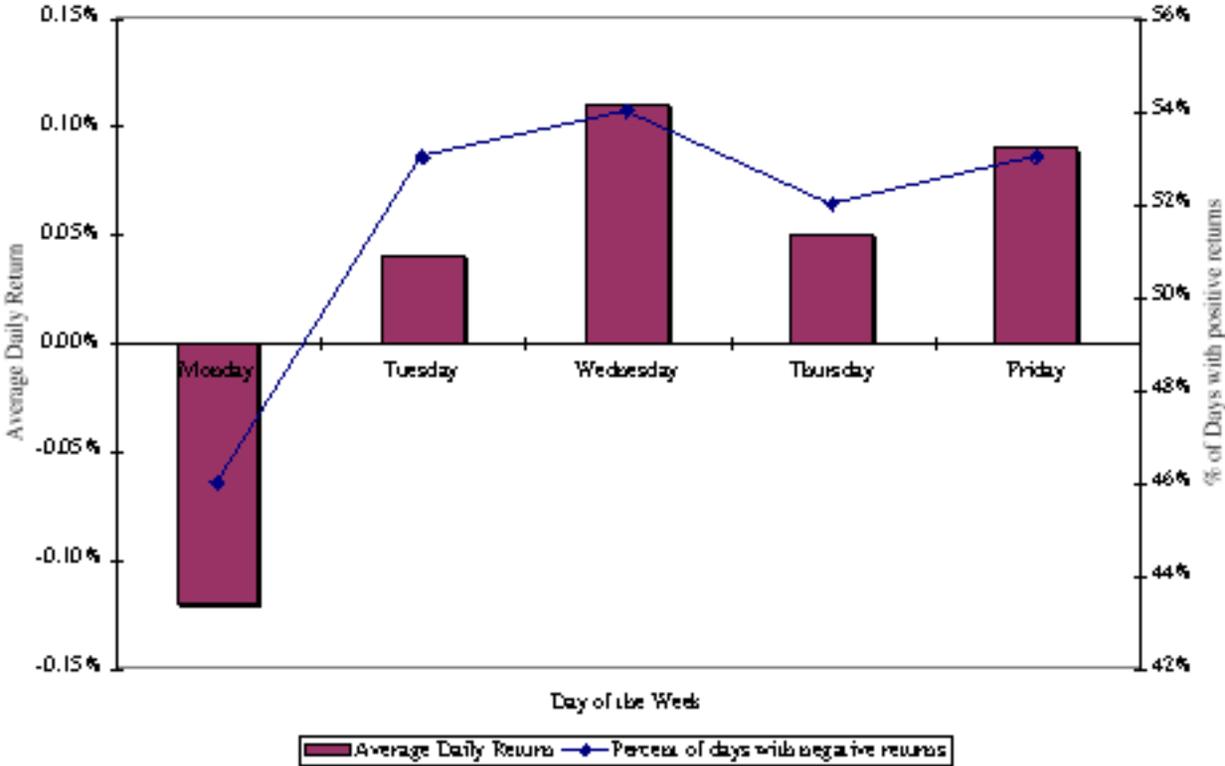
## B. The Weekend Effect

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- The weekend effect is another phenomenon that has **persisted over long periods** and over a number of international markets. It refers to the differences in returns between Mondays and other days of the week.
- Over the years, returns on Mondays have been consistently lower than returns on other days of the week.

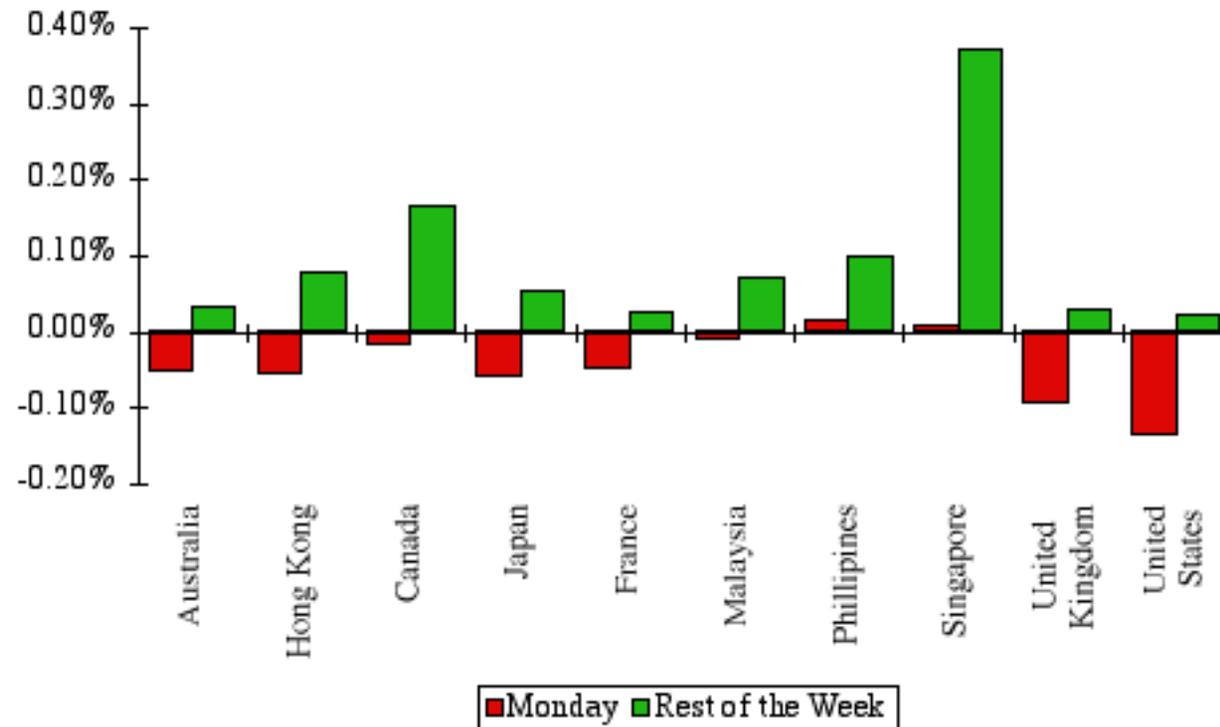
# Returns by Weekday

Figure 7.6: Returns by Day of the Week - 1927-2001

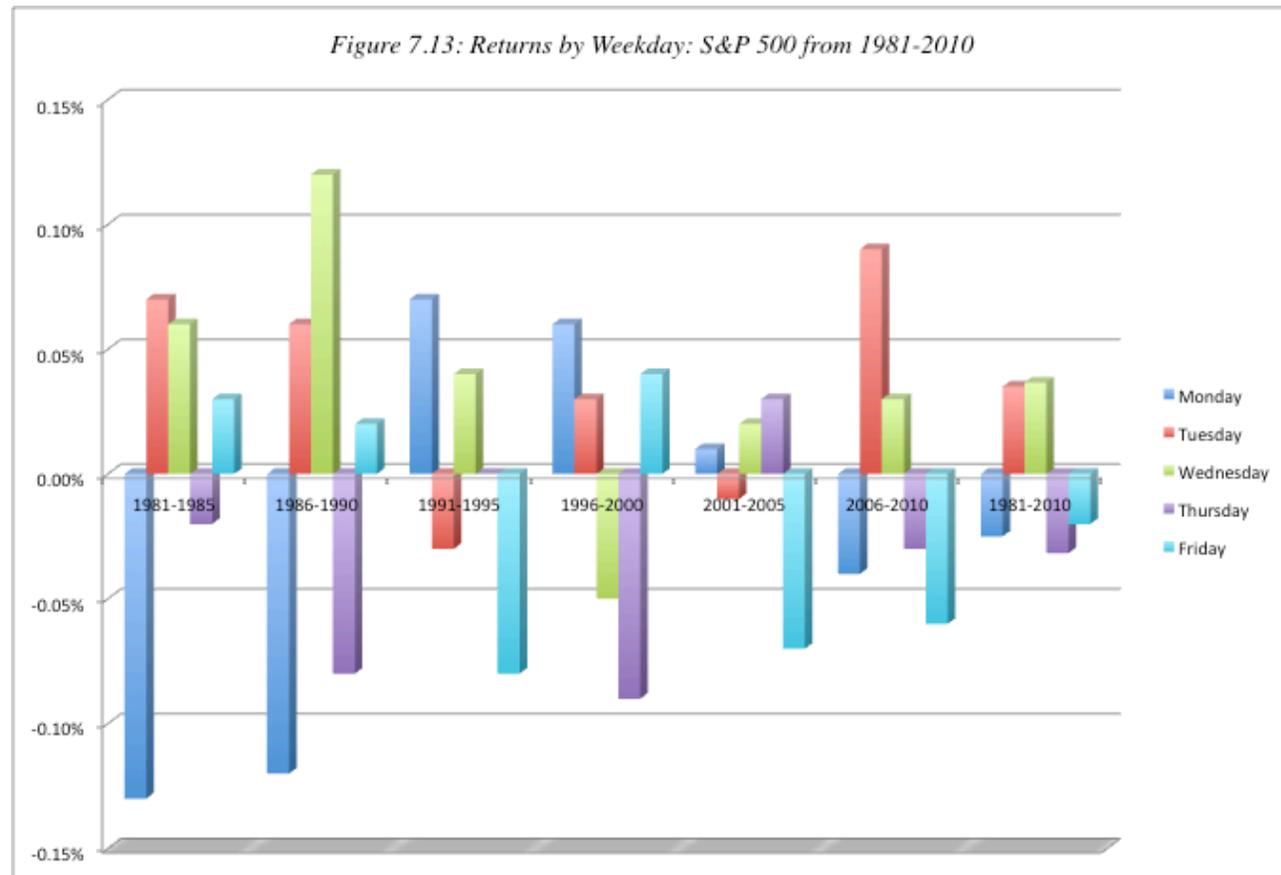


## The Weekend Effect in International Markets

Figure 7.7: Weekend Effect in International Markets



# Has it held up?



## The Weekend Effect: Explanations

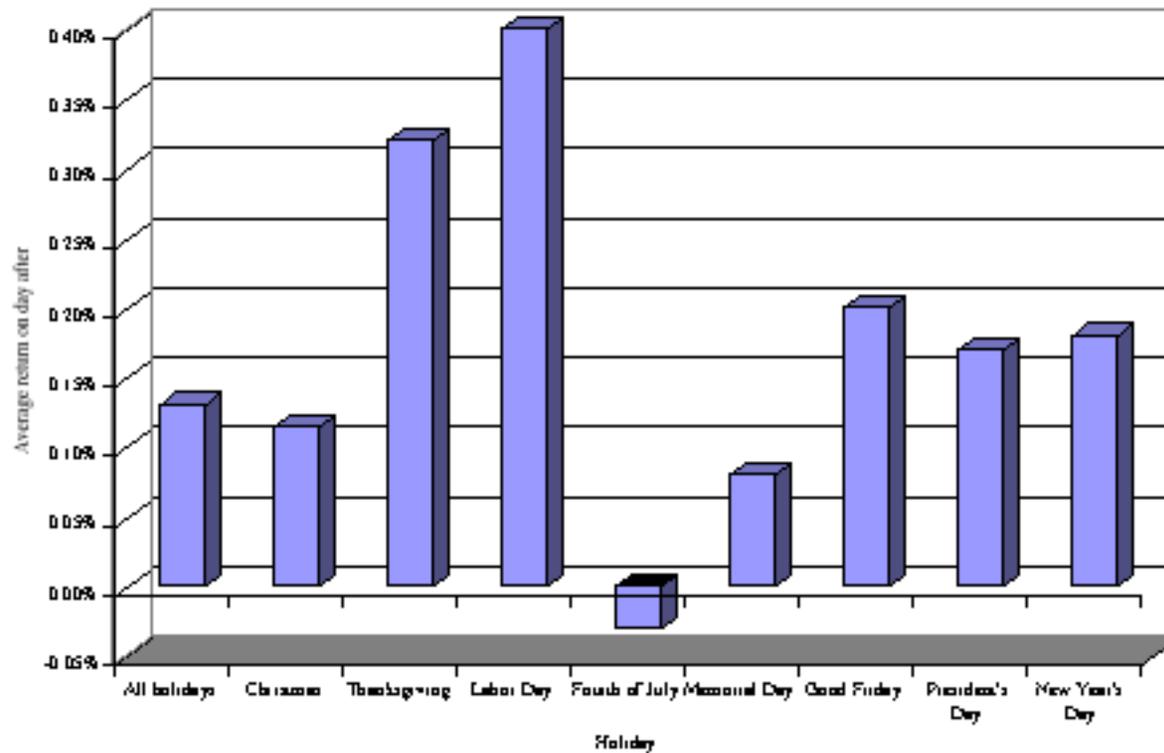
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- First, the Monday effect is really a **weekend effect** since the bulk of the negative returns is manifested in the **Friday close to Monday open returns**. The returns from intraday returns on Monday are not the culprits in creating the negative returns.
- Second, the Monday effect is **worse for small stocks** than for larger stocks.

Third, the Monday effect is **no worse following three-day weekends** than two-day weekends.
- There are some who have argued that the weekend effect is the **result of bad news being revealed** after the close of trading on Friday and during the weekend. Even if this were a widespread phenomenon, the return behavior would be **inconsistent with a rational market**, since rational investors would build in the expectation of the bad news over the weekend into the price before the weekend, leading to an elimination of the weekend effect.

## The Holiday Effect: Is there one?

Figure 7.8: Returns on first trading day after



## Volume and Price: The Evidence



## Foundations of Technical Analysis: What are the assumptions?

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- (1) **Price is determined solely by the interaction of supply & demand**
- (2) **Supply and demand are governed by numerous factors both rational and irrational.** The market continually and automatically weighs all these factors. (A random walker would have no qualms about this assumption either. He would point out that any irrational factors are just as likely to be one side of the market as on the other.)
- (3) **Disregarding minor fluctuations in the market, stock prices tend to move in trends which persist for an appreciable length of time.** ( Random walker would disagree with this statement. For any trend to persist there has to be some collective 'irrationality')
- (4) **Changes in trend are caused by shifts in demand and supply. These shifts no matter why they occur, can be detected sooner or later in the action of the market itself.** (In the financial economist's view the market (through the price) will instantaneously reflect any shifts in the demand and supply.

## On why technical analysts think it is futile to estimate intrinsic values

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- "It is futile to assign an intrinsic value to a stock certificate. One share of US Steel , for example, was worth \$261 in the early fall of 1929, but you could buy it for only \$22 in June 1932. By March 1937 it was selling for \$126 and just one year later for \$38. ... This sort of thing, this wide divergence between presumed value and intrinsic value, is not the exception; it is the rule; it is going on all the time. **The fact is that the real value of US Steel is determined at any give time solely, definitely and inexorably by supply and demand, which are accurately reflected in the transactions consummated on the floor of the exchange.**" (From Magee on Technical Analysis)

## I. Markets overreact: The Contrarian Indicators

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Basis: Research in experimental psychology suggests that people tend to overreact to unexpected and dramatic news events. In revising their beliefs, individuals tend to overweight recent information and underweight prior data.

Empirical evidence: If markets overreact then

- (1) Extreme movements in stock prices will be followed by subsequent price movements in the opposite direction.
- (2) The more extreme the price adjustment, the greater will be the subsequent adjustment

## Issues in Using Contrarian Indicators

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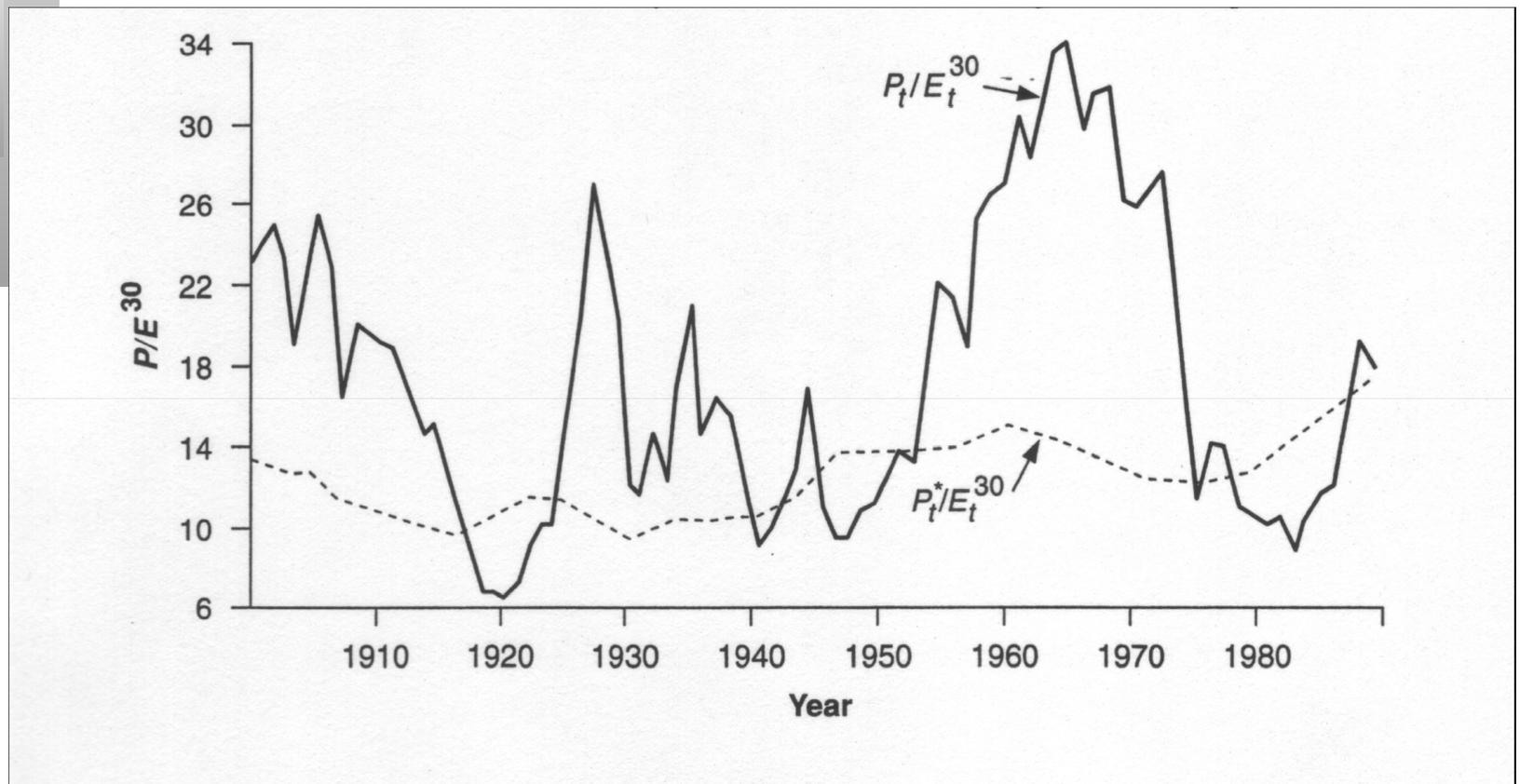
- (1) Why, if this is true, is it that contrarian investors are so few in number or market power that the overreaction to new information is allowed to continue for so long?
- (2) In what sense does this phenomenon justify the accusation that the market is inefficient?
- (3) Is the market more efficient about incorporating some types of information than others?

## Technical trading rules: Contrarian Opinion

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1. Odd-lot trading: The odd-lot rule gives us an indication of what the man on the street thinks about the stock (As he gets more enthusiastic about a stock this ratio will increase).
2. Mutual Fund Cash positions: Historically, the argument goes, mutual fund cash positions have been greatest at the bottom of a bear market and lowest at the peak of a bull market. Hence investing against this statistic may be profitable.
3. Investment Advisory opinion: This is the ratio of advisory services that are bearish. When this ratio reaches the threshold (eg 60%) the contrarian starts buying.

## II. Detecting shifts in Demand & Supply: The Lessons in Price Patterns



## 1. Breadth of the market

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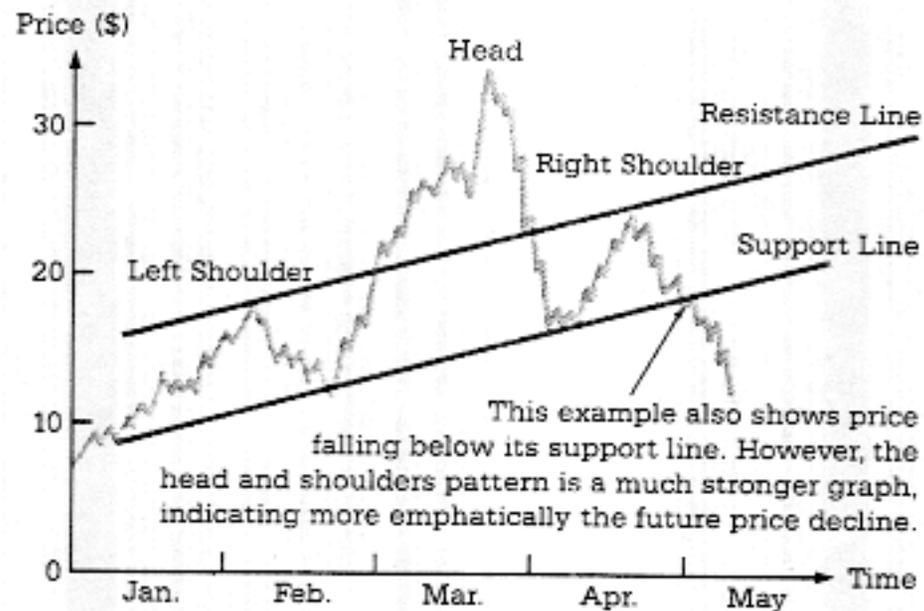
Measure: This is a measure of the number of stocks in the market which have advanced relative to those that have declined. The broader the market, the stronger the demand.

Related measures:

- (1) Divergence between different market indices (Dow 30 vs NYSE composite)
- (2) Advance/Decline lines

## 2. Support and Resistance Lines

A common explanation given by technicians for market movements is that markets have support and resistance lines. If either is broken, the market is poised for a major move.



## Possible Rationale

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- (1) Institutional buy/sell programs which can be triggered by breakthrough of certain well defined price levels (eg. Dow 1300)
- (2) Self fulfilling prophecies: Money managers use technical analysis for window dressing.

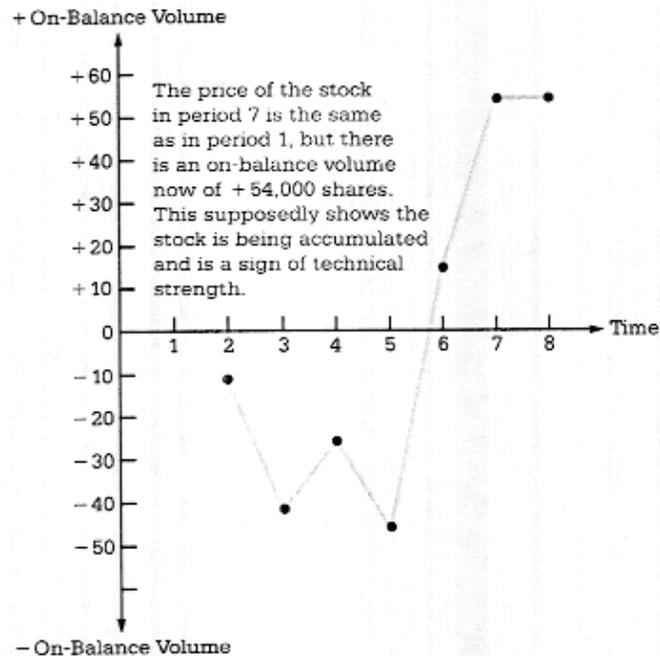
### 3. Moving Averages

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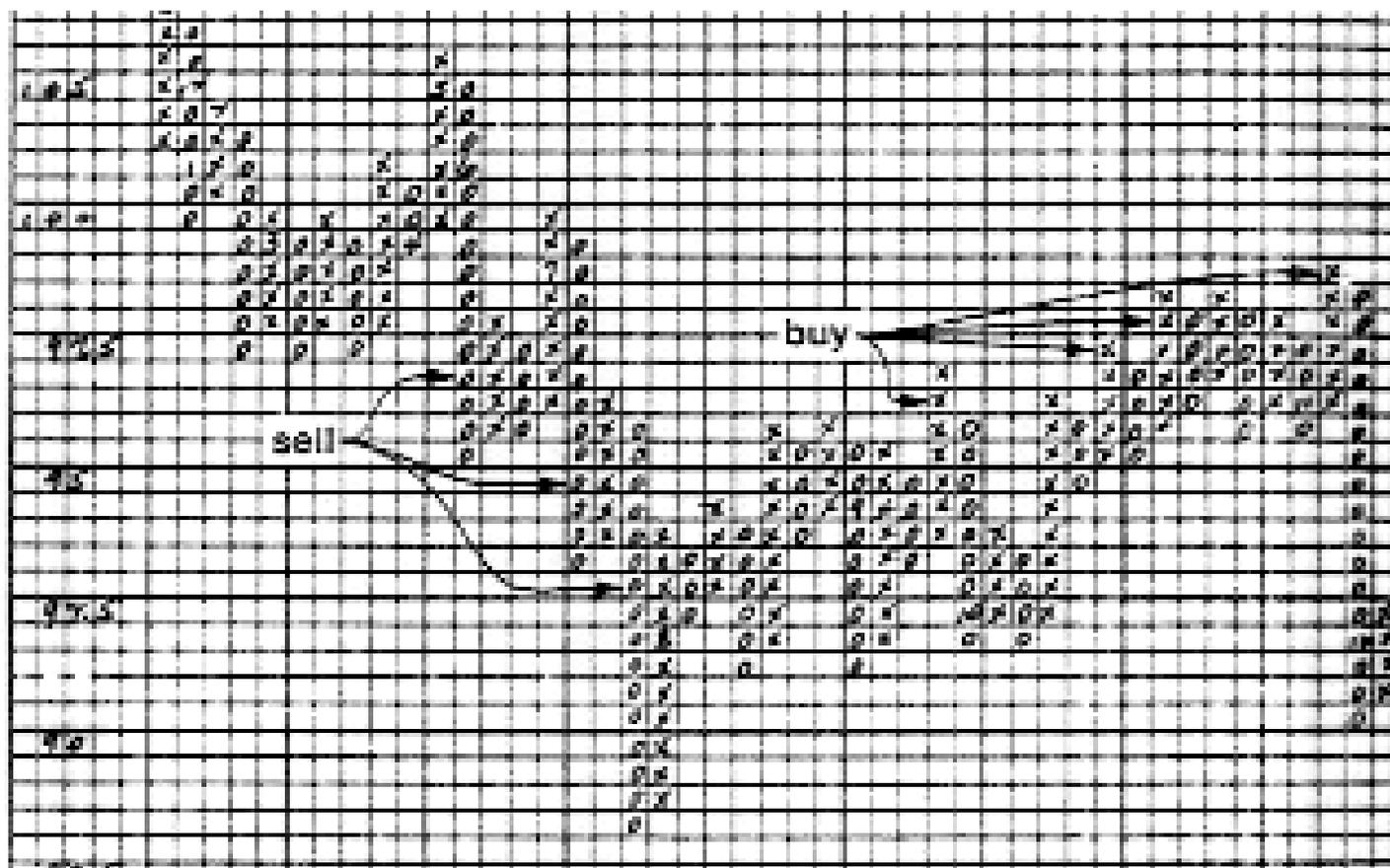
- A number of indicators are built on looking at moving averages of stock prices over time. A moving average line smooths out fluctuations and enables the chartist to see trends in the stock price. How that trend is interpreted then depends upon the chartist.

## 4. Volume Indicators

Some technical analysts believe that there is information about future price changes in trading volume shifts.



## 5. Point and Figure Charts



### III. Market learn slowly: The Momentum Investors

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Basis: The argument here is that markets learn slowly. Thus, investors who are a little quicker than the market in assimilating and understanding information will earn excess returns. In addition, if markets learn slowly, there will be price drifts (i.e., prices will move up or down over extended periods) and technical analysis can detect these drifts and take advantage of them.

The Evidence: There is evidence, albeit mild, that prices do drift after significant news announcements. For instance, following up on price changes after large earnings surprises provides the following evidence.

## Momentum Indicators

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- Relative Strength: The relative strength of a stock is the ratio of its current price to its average over a longer period (eg. six months). The rule suggests buying stocks which have the highest relative strength (which will also be the stocks that have gone up the most in that period).
- Trend Lines: You look past the day-to-day movements in stock prices at the underlying long-term trends. The simplest measure of trend is a trend line.

## IV. Following the Smart Investors: The Followers

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- This approach is the flip side of the contrarian approach. Instead of assuming that investors, on average, are likely to be wrong, you assume that they are right.
- To make this assumption more palatable, you do not look at all investors but only at the smartest investors, who presumably know more than the rest of us.

## Specialist Short Sales

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- The assumption is that specialists have more information about future price movements than other investors. Consequently, when they sell short, they must know that the stock is overvalued.
- Investors who use this indicator will often sell stocks when specialists do, and buy when they do.

## Insider Buying and Selling

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- You can look up stocks where insider buying or selling has increased the most.
- The ratio of insider buying to selling is often tracked for stocks with the idea that insiders who are buying must have positive information about a stock whereas insiders who are selling are likely to have negative information.

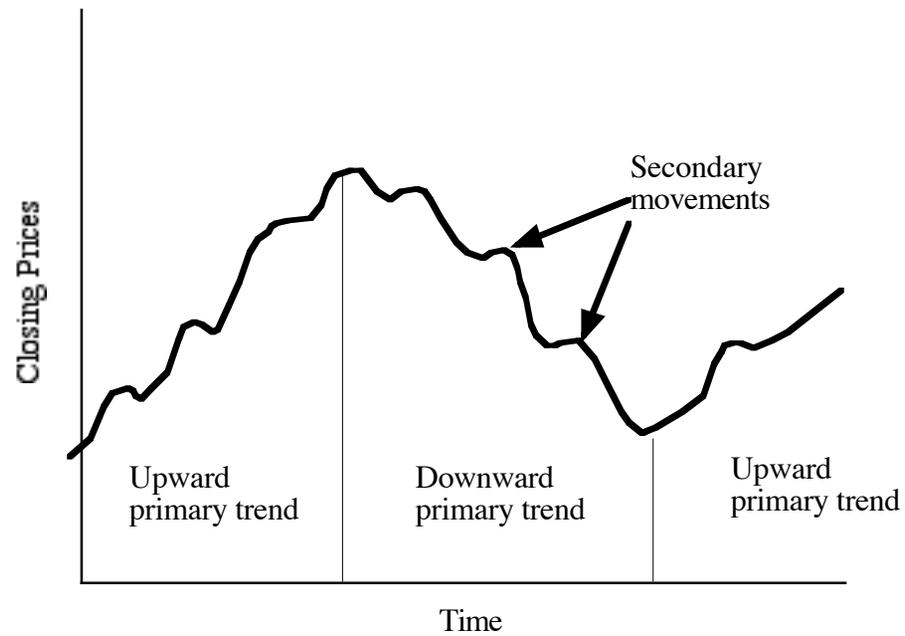
## V. Markets are controlled by external forces: The Mystics

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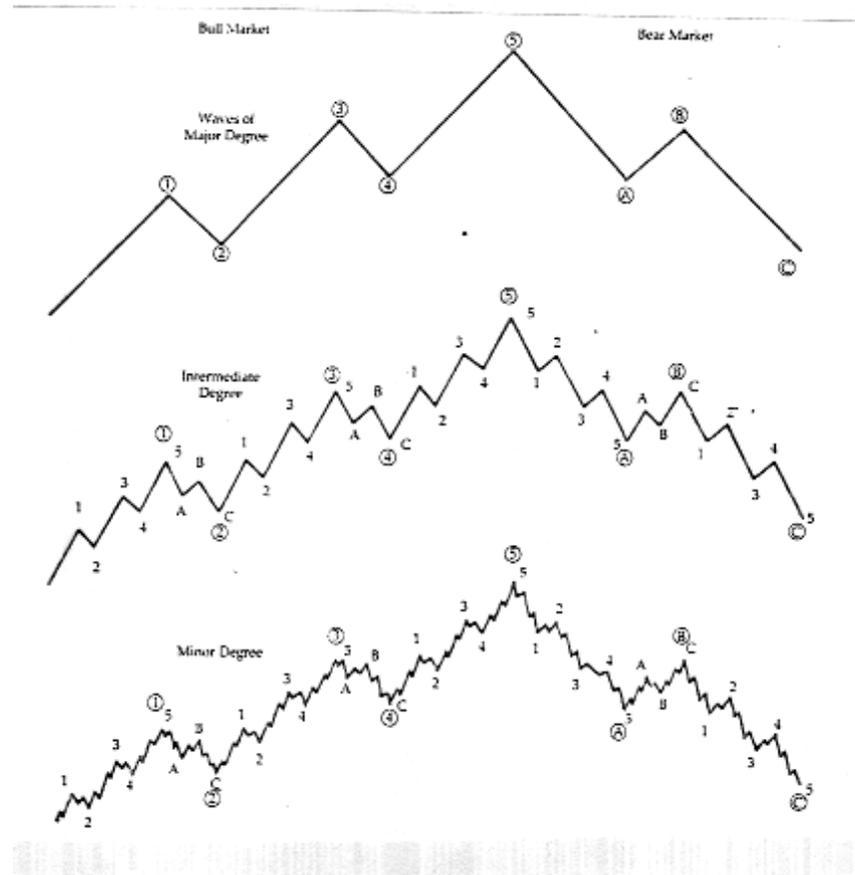
The Elliot Wave: Elliot's theory is that the market moves in waves of various sizes, from those encompassing only individual trades to those lasting centuries, perhaps longer. "By classifying these waves and counting the various classifications it is possible to determine the relative positions of the market at all times". "There can be no bull or bear markets of one, seven or nine waves, for example.

The Dow Theory:" The market is always considered as having three movements, all going at the same time. The first is the narrow movement (daily fluctuations) from day to day. The second is the short swing (secondary movements) running from two weeks to a month and the third is the main movement (primary trends) covering at least four years in its duration.

# The Dow Theory



# The Elliott Wave



## Determinants of Success at Technical Analysis

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- If you decide to use a charting pattern or technical indicator, you need to be aware of the investor behavior that gives rise to its success. You can modify or abandon the indicator if the underlying behavior changes.
- It is important that you back-test your indicator to ensure that it delivers the returns that are promised. In running these tests, you should pay particular attention to the volatility in performance over time and how sensitive the returns are to holding periods.
- The excess returns on many of the strategies that we described in this chapter seem to depend upon timely trading. In other words, to succeed at some of these strategies, you may need to monitor prices continuously, looking for the patterns that would trigger trading.
- Building on the theme of time horizons, success at charting can be very sensitive to how long you hold an investment.
- The strategies that come from technical indicators are generally short-term strategies that require frequent and timely trading. Not surprisingly, these strategies also generate large trading costs that can very quickly eat into any excess returns you may have.