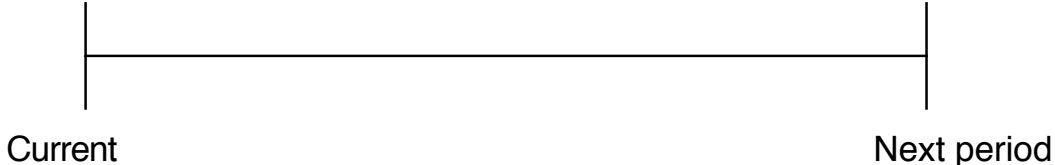


# Price patterns, charts and technical analysis: The momentum studies

Aswath Damodaran

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# 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

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

- 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 four classes
  - Studies that look at the really short term (Minutes & Hours) price behavior
  - Studies that focus on short-term (Daily & Weekly price movements) price behavior
  - Studies that look at medium term (many months or yearly) returns
  - Studies that examine long-term (five-year returns) price movements.

# 1. Serial Correlation in really short-term returns: Minutes & Hours

- Low or no serial correlation: The general consensus of studies in really short term returns (minutes, hours) is that there is very low serial correlation, with two structural effects:
  - a. Market liquidity effect: If markets are not liquid, you will see serial correlation in index returns.
  - b. 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.
- To make money of these serial correlations, you have to trade fast and at low cost. Increasingly, computers are beating human beings at this game (HFT).

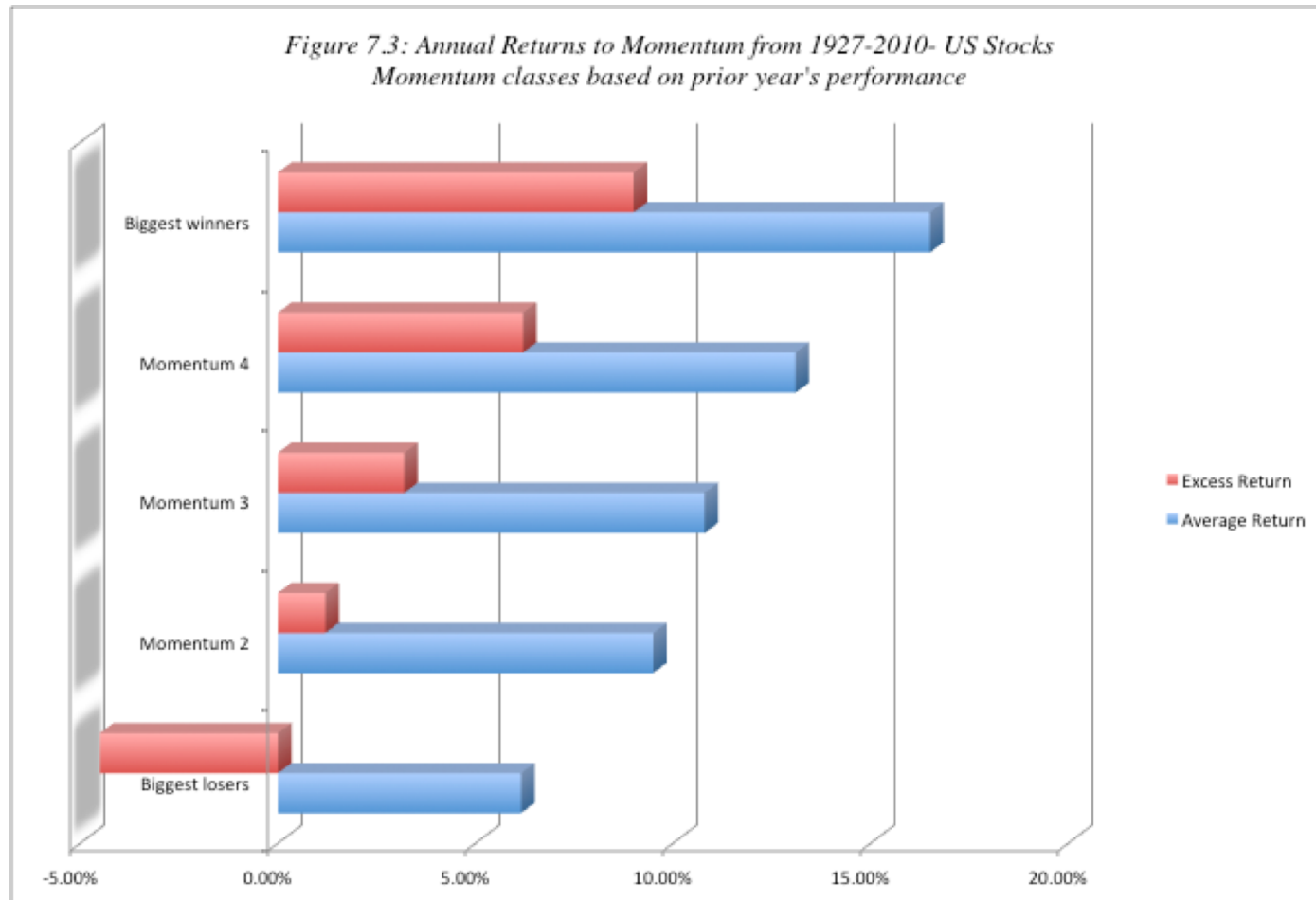
## 2. Serial correlation in the short term: From hours to days and weeks



### 3. Serial correlation in the medium term: Many months or a year

- 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 2010, 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 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



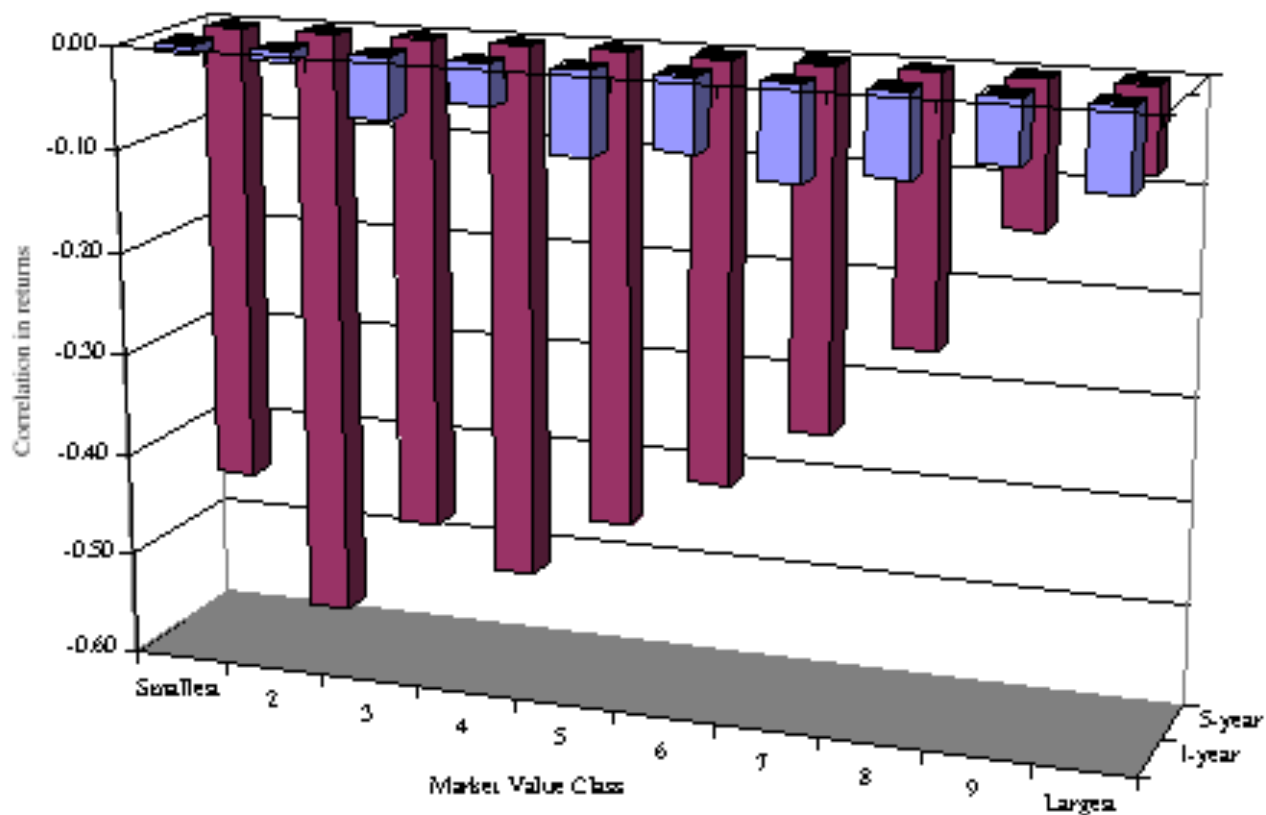


# More “evidence” on momentum

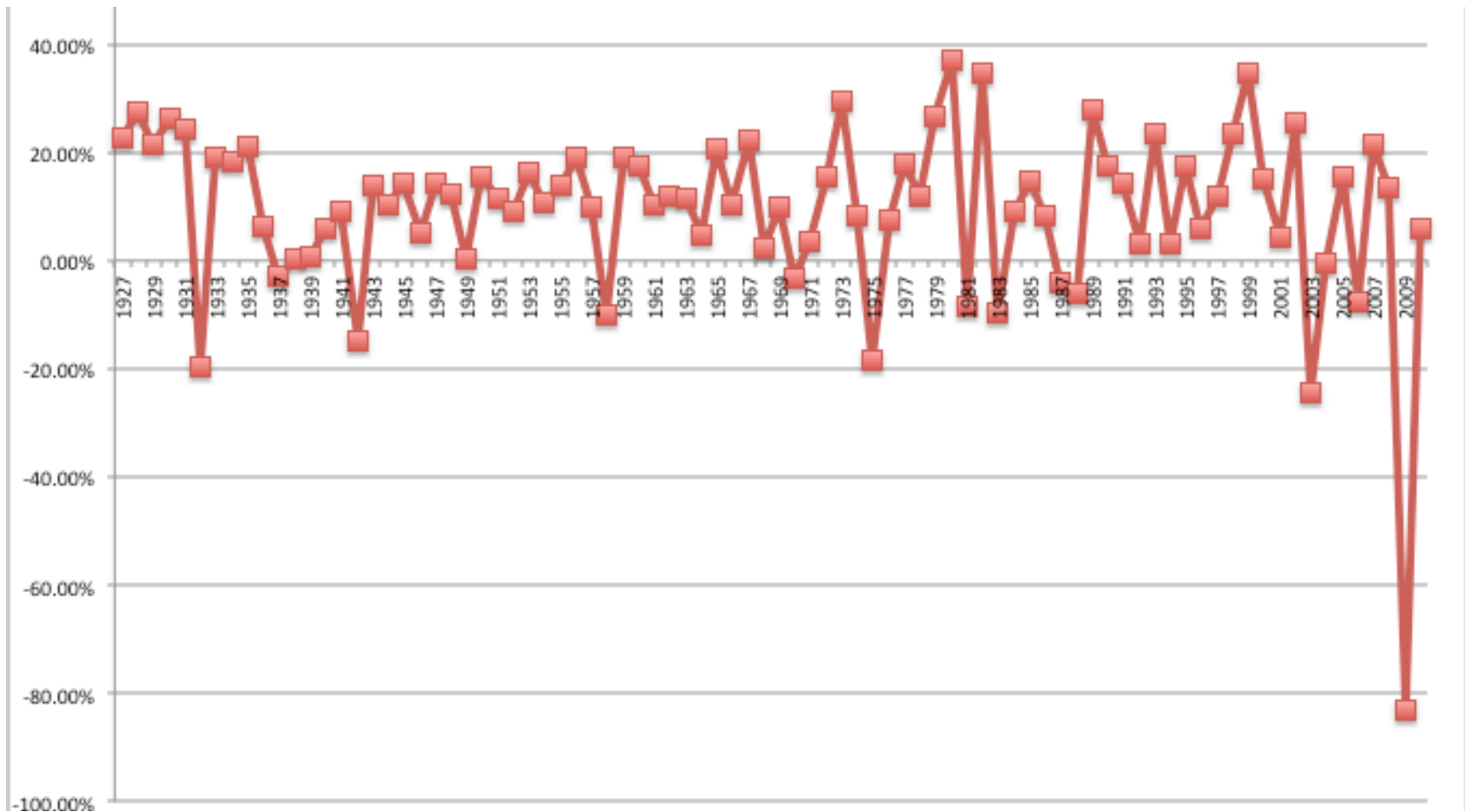
1. Volume effect: Momentum accompanied by higher trading volume is stronger and more sustained than momentum with low trading volume.
2. Size effect: While some of the earlier studies suggest that momentum is stronger at small market cap companies, a more recent study that looks at US stocks from 1926 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.
3. 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).
4. 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.

# 4. Long Term Serial Correlation: Over many years

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



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



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# Extreme Momentum: Bubbles..

- 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

- 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.