

## Lecture 3.2

### Market Efficiency

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## Bachelier, 1900

The market price reflects speculative opinion.  
Skeptical about speculators ability to beat market

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## Bachelier

When market equilibrium is reached,  
"The market, the aggregate of speculators, at a given instant can believe in neither a market rise nor a market fall, since, for each quoted price, there are as many buyers as sellers."

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## Bachelier

If the market is in equilibrium, current price is your best predictor of next period's price... because...  
"if the market judged otherwise, it would not quote this price, but another price higher or lower."

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If a firm's prospects are known to be good, people will be willing to pay more for the stocks, and the price will be higher than if they are known to be poor.

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Thus,  
"Past, present, and even discounted future events are reflected in market price..."

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As a result, it's hard to outguess the market:  
 "The mathematical expectation of the speculator is zero."

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Modeled the path of stock prices as  
 Brownian motion  
 independent shocks are pieces of news

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Late 1950's, early 1960's

- Empirical work by several statisticians and economists showed that price changes appeared to be random
- Many economists viewed this as implying that prices were irrational and not subject to economic laws

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Paul Samuelson

- Showed that randomness is not a sign of irrationality
- "Proof the Properly Anticipated Prices Fluctuate Randomly"

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Paul Samuelson:

Theory of speculative price movements

"Random walk with drift"

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"A respect for the evidence compels me to incline toward the hypothesis that most portfolio decision makers should go out of business---take up plumbing, teach Greek, or help produce the annual GNP by serving as corporate executives. Even if this advice to drop dead is good advice, it obviously is not counsel that will be eagerly followed."

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## Eugene Fama:

Empirical tests of behavior of asset prices

Many papers plus 2 surveys:

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## Fama 1970

Classified tests into 3 types:

- 1) weak
- 2) semi-strong
- 3) strong

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## 1) Weak Form Test Example:

Fama/Blume

Tested filter rules

A 2% filter:

wait until stock price rises  $> 2\%$ ,  
then buy and hold until  
price drops  $> 2\%$   
then sell out.

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## Semi-Strong Form:

Can you use publicly available info to  
beat the market?

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## Strong form:

Prices will reflect all info public  
or private

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## takeover announcements

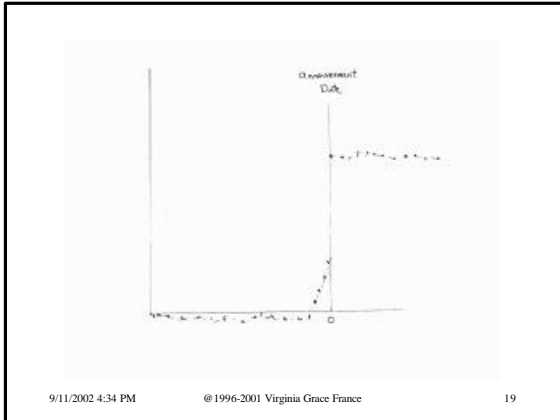
Info is private up to date 0

Does the market respond  
immediately and appropriately?  
Yes

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takeover announcements  
 On average it also runs up before  
 This is probably insider trading  
 Note that, though the info is still  
 private,  
 it has some impact on the market  
 price.

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This sort of study lead to the  
 conclusion that markets are at  
 least semi-strong form efficient,  
 and that they sometimes even  
 reflect info before it becomes  
 public.

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The market price may know more  
 than you do!

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## My Friend the Meteorologist

Information includes models of how  
 things work as well as more  
 conventional facts

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"I can predict the weather. I  
 understand that every time there's  
 a hard freeze in Florida, the OJ  
 futures price jumps through the  
 roof. Let's make some money."

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Richard Roll, "OJ and Weather" looked at the relationship between that market and National Weather Service forecasts. The OJ futures market responds almost instantly.

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"OK, I know that National Weather Service model, we studied it in graduate school. How about if I forecast the forecast?"

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Do you expect to be able to beat the market because you know CAPM?  
What about Black-Scholes?

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Eugene Fama and Merton Miller are walking down the street in Hyde Park. They see a \$20 bill on the sidewalk. They continue walking. Miller says, "Gene, why didn't you pick up the bill?"

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Fama says, "It was counterfeit. Otherwise someone would already have picked it up."

How many Chicago economists does it take to screw in a light bulb?

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None. The market does it for them.

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## Why Markets Can't be Too Efficient: Grossman-Stiglitz Proof by Contradiction

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Suppose you had a world in which everybody believed in a perfectly efficient market. No-one would waste their time doing fundamental research.

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But if that happened, what would keep prices at their fundamental values?

A stock price could fall to any arbitrary value, and no-one would try to outguess the market by buying it up.

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## INFORMATION

"Wall Street... is a quivering communications network, plucking information from the air, putting it on high-speed tickers and speeding it to men who make or lose millions of dollars by knowing things before the rest of the world."

Emma Lathen, When in Greece

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## INFORMATION:

Look at the production of financial information:

- People won't do it at all unless there's a reward.
- People will do more of it if the reward is larger.

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What rewards people in asset markets? Mispricing. Therefore:  
There has to be enough mispricing to compensate those who gather info.

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## Morning Rush Hour on the Dan Ryan:

- Cars change lanes to try to get ahead
- Because the cars are all trying to get ahead, all lanes are always full
- Because the lanes are always full, you won't be able to get through much faster than anybody else
- Cars that change lanes get there a little faster, but not much

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## A Grossman-Stiglitz Market:

- Cars changing lanes: *traders exploiting mispricing*
- Because the cars are all trying to get ahead, all lanes are always full: *assets are usually (more or less) correctly priced*
- Because the lanes are always full, you won't be able to get through faster than anybody else: *don't expect to make extraordinary profits*
- Cars that change lanes get there a little faster, but not much: *traders who find and exploit mispriced assets are rewarded, but not extravagantly.*

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1980's: more and more  
"anomalies"

1991: Fama  
Efficient Markets II

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## Fama 1991

- 1) No market can logically be perfectly strong-form efficient unless info is costless to gather (see Grossman/Stiglitz). Question is, is efficiency a good approximation?

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## Fama 1991

- 2) If you're testing whether markets react "properly" to new information, you're making a joint test of market efficiency and your pricing model.

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## For instance:

Suppose a stock is worth \$101/share. It decides to distribute \$2/share in dividends. Its future prospects are the same, but you now have \$2/share in hand. The stock ought to be worth \$99.

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Theory suggests the stock price drops by the amount of the dividend. Empirically, it drops by less than the amount of the dividend.

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Do you conclude that the market did not react immediately and appropriately?  
That it is inefficient?

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Or do you conclude that the model is wrong?  
Perhaps the model is not taking something into account?  
Information, investor preferences, tax laws,...

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If evidence rejects a prediction of the theory, either:  
1) Pricing model is wrong but the market is efficient  
or  
2) the pricing model is right but the market is inefficient

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