

Lecture 3: Rational Expectations +

pad

the Efficient Markets Hypothesis

common stock - principal means of raising equity capital

~~and~~

dividends - periodic (eg quarterly) payments made from net earnings

valuation is PDV of all future cash flows

From One-Period Valuation to Generalized Dividend Valuation

$$P_0 = \frac{D_1}{1+r} + \frac{P_1}{1+r}$$

$r \equiv$ required return on equity investments

but at $t=1$:

$$P_1 = \frac{D_2}{1+r} + \frac{P_2}{1+r}$$

therefore:

$$P_0 = \frac{D_1}{1+r} + \frac{D_2}{(1+r)^2} + \frac{P_2}{(1+r)^2}$$

by extension:

$$P_0 = \sum_{t=1}^m \frac{D_t}{(1+r)^t} + \frac{P_m}{(1+r)^m} = \sum_{t=1}^{\infty} \frac{D_t}{(1+r)^t}$$

→ But some stocks don't pay dividends!

If you buy the stock, you're implicitly assuming that it will pay dividends *someday* e.g. after the firm completes the rapid growth phase of its life cycle

→ How to guess future dividends?

assume constant dividend growth rate

$D_1 = D_0 \cdot (1+g)$ $D_2 = D_1 \cdot (1+g)$ etc.

therefore:

$P_0 = D_0 \cdot \sum_{t=1}^{\infty} \left(\frac{1+g}{1+k} \right)^t = D_0 \cdot \frac{1+g}{k-g}$ when: $g < k$

→ what's your "required return on equity investments" ?

- depends on your preference AND
- increases with risk

MORE RISK means LOWER STOCK PRICE

→ if you're uncertain you want risk premium
→ risk premium increases w/ degree of uncertainty

- as information changes, required return changes leading to changes in stock price

Rational Expectation

1.3

→ Most easily understood in comparison with what preceded it: "Adaptive Expectations"

$$E[\pi_t] = (1-\lambda) \sum_{i=0}^{\infty} \lambda^i \pi_{t-i} \quad \text{where } 0 < \lambda < 1$$

expected inflation = weighted average of past values of inflation

→ Adaptive expectations imply that you only look to past when forming expectations of future

→ But what if the Federal Reserve (or some other authority) makes a credible announcement that future will be very different from the past? People change their expectation

→ Suppose that the Federal Reserve increases the money supply ~~with~~^{at} a constant growth rate but there is some stochasticity in actual value

~~ln(M_t) = ln(M_{t-1}) + c + u_t~~

$$\ln(M_t) = \ln(M_{t-1}) + c + u_t$$

constant growth rate ↗ ↖ white noise

→ Then when firms set ~~their~~ their prices in the current period they consider:

- money supply in previous period
- growth rate of money supply
- shocks (to production or money supply)

$$\ln(P_t) = \ln(M_{t-1}) + c + \delta u_t$$

↑
↑

constant rate of money growth
shock

response parameter
 $0 < \delta < 1$

→ So inflation rate:

$$\pi_t \equiv \ln(P_t) - \ln(P_{t-1})$$

$$\pi_t = \ln(M_{t-1}) - \ln(M_{t-2}) + \delta(u_t - u_{t-1})$$

$$\hat{\pi}_t = c + \delta u_t + (1-\delta)u_{t-1}$$

→ and because $E[u_t] = 0$ and $E[u_{t-1}] = 0$

rational expectation of inflation rate

$$E[\hat{\pi}_t] = c$$

so if Fed announces an increase in rate of money growth (and announcement credible) then expectation of inflation change immediately

(p. 5)

→ So if expectations of inflation are rational, should ~~the~~ expectation of financial market variables be rational too? You bet!

The Efficient Markets Hypothesis

→ Expectation of price (or other variable) should be equal to optimal forecast of that price

↳ forecast using all available information

→ If there is a change in the way a price (or other variable) moves, then the way in which expectations of the variable are formed will change too

→ forecast errors of expectations will be zero on average & cannot be predicted ahead of time (otherwise you would update your expectations)

→ Current prices in a financial market will be set so that the optimal forecast of a security's return equals the security's equilibrium return

$$\text{rate of return} = \frac{P_{t+1} - P_t + C}{P_t}$$

(p. 6)

- suppose that the equilibrium rate of return on a stock is ~~10%~~ 5%
- but ~~price~~ today's price is less than the optimal forecast of tomorrow's price, so that the optimal forecast rate of return is 10%
- there's an unexploited profit opportunity so market participants buy the stock until its price is bid up to the point where optimal forecast rate of return is equal to equilibrium rate of return of 5% thus satisfying the efficient market's condition
- an efficient market eliminates all unexploited profit opportunities
- NOTE: Not everyone needs to ~~be~~ have good information. A few people seeing unexploited profit opportunities will ~~drive~~ drive the price to the point where the efficient market condition holds.

Stronger version of Efficient Mkt Hypo (p. 7)

→ assume expectations rational

→ also assume that prices reflect market fundamentals (i.e. items that directly impact future income stream of those securities)

→ IMPLICATIONS

- securities' prices are correct so one investment is as good as any other
- securities' prices reflect all available info
- securities' prices can be used to assess the cost of capital

→ well, guess what?

"Markets can be irrational longer than you can remain solvent."

★ If look back on prices of mortgage backed securities over the past decade would anyone conclude that those prices were "correct"?

What's the evidence on the Efficient Mkt Hypo?

↙

Evidence on Efficient Mkt Hypothesis

7.8

In favor (early work)

→ if there are no unexploited profit opportunities, then you cannot expect an abnormally high return (so no one can beat the market)

- comparison of mutual fund returns w/ market returns showed that mutual funds do not beat the market even when ~~the~~ the funds were grouped by profitability in previous period

→ if stock prices reflect all public info then positive announcements about company will not raise share price (because that information is already factored in)

- evidence in favor

→ random walk should characterize movements if everyone expects firm X's stock price to rise 1% this week, then it will immediately rise 1% all future changes should be unpredictable ⇒ random walk

- evidence in favor

→ if stocks follow a random walk, then technical analysis ("head-and-shoulders", Bollinger Bands, etc.) is a waste of time

• yes, it's a waste of time

Evidence Against

→ small firms sometimes earn abnormally high returns over extended periods of time

→ abnormal price increases from Dec to Jan. (i.e. "January effect")

→ "overshooting" - pricing errors corrected slowly (major violation of Ebb Meltz Hoyer)

→ "excessive volatility" indicates that prices driven by something other than fundamentals

→ mean reversion - stocks w/ low returns in one period tend to have higher returns in subsequent periods, so not random walk but mean reversion weaker in post WWII data

→ new information not immediately incorporated on average stock prices tend to rise for some time after ~~positive earnings news~~ unexpectedly high profits announced (Jensen & Meckling)

Efficient Market Hypothesis may be a good starting point, but not generally applicable to all firm mkt behavior

(p.10)

Moreover ... **CRASHES**

- 1987 "Black Monday"
- 2000 Tech Crash
- 2008 ~~Subprime~~ Subprime

- New information can cause optimal forecast to change, but...
- Something other than fundamentals drives stock prices
- Bubbles (eg "dot-com", housing bubble)
 - asset prices exceed fundamental value for long periods
 - could be rational ~~to hold~~ to hold the asset if you think someone is irrational enough to purchase it from you at a higher price, but...
 - such a "rational" explanation assumes irrationality