

E&G: Chapter 17 - Outline: Market Efficiency.

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I. E&G, Ch. 17: Overview, Definitions:

A. *Allocational Efficiency*

When mkt prices are determined in a way that equates marginal rates of return (adjusted for risk) for all producers and savers.

In an allocationally efficient capital mkt, scarce savings are optimally allocated to productive investments to benefit everyone.

Producer accepts investment projects until ROR on least profitable project equals opportunity cost of acquiring external funds (borrowing/lending rate).

Lender lends excess funds (after entering all attractive investment projects) because the borrowing/lending rate is higher than they might otherwise earn.

B. Distinguish between *efficient* capital mkts and *perfect* capital mkts.

Necessary conditions for *perfect* capital mkts:

1. Frictionless; no transactions costs or taxes; assets perfectly divisible.
2. *Perfect competition* in product and securities mkts.
3. Information is costless; received instantly & simultaneously by all.
4. Everyone is rational expected utility maximizer.

Condition 3. means in securities mkts, all participants are price-takers; in product mkts, producers supply goods & services at minimum avg cost

Given 1. - 4. (perfect capital mkts), product & securities mkts will be *allocationally efficient & operationally efficient*.

C. *Operational Efficiency* - deals with cost of transferring funds (i.e., T.C. = 0). Degree of operational efficiency has to do with how high are T.C.

NOTE: Mkt Efficiency is much less restrictive than Perfect Capital Mkts.

Perfect capital mkts imply efficiency; not vice versa.

In finance, capital mkt efficiency has specific meaning:

In an efficient mkt, prices fully & instantaneously reflect all available info.

i.e., prices are good signals for capital allocation.

Can still have efficient capital mkts, if mkts are not frictionless.

i.e., prices can still reflect all available info. if:

- i. there are T.C.
- ii. human capital is an asset that is not perfectly divisible.
- iii. there is imperfect competition in product mkts.
(e.g. if firm reaps monopoly profits,
efficient capital mkt will determine a security price that
fully reflects the NPV of future stream of monopoly profits.

Thus, can have allocative inefficiencies in product mkts,

but still have efficient capital mkts

(i.e., where prices fully & instantaneously reflect all available info).

Thus, capital markets are “efficient to some degree,”

depending on how many frictions exist (T.C., taxes, regulations, etc.).

Thus, we refer to the “degree of efficiency” or the “extent of efficiency.”

Fama defines three classes of mkt efficiency, according to degree:

D. *Weak Form* Efficiency.

No one can earn Excess Returns (ER)**
from trading rules based on *historical price information*.

1. Must define the following:

$$\text{Risk-Adjusted Expected Return} = E(r_t | \text{Risk});$$

$$\text{** Risk-Adjusted Excess Return} = ER_t = r_t - E(r_t | \text{Risk}).$$

2. Has to do with whether all info contained in *past prices* is fully reflected in current prices.

E. *Semi-Strong Form* Efficiency.

No one can earn ER
From trading rules based on all *publicly available information*.

1. Has to do with whether all publicly available info is fully reflect in current prices.

F. *Strong Form* Efficiency.

No one can earn ER
from trading rules based on *any* information.

1. Has to do with whether all info (public or private) is fully reflected in current prices,
and whether any investor can earn ER.
2. Strong Form tests reflect the strictest requirements;
e.g., if there is private (insider) info, can insiders earn ER?
If mkt is strong form efficient, answer is NO.

The *Efficient Mkt Hypothesis* is thus concerned with:

- 1) the speed with which info is incorporated into prices;
- 2) under what conditions an investor can earn ER.

Implications for Stock Mkt Analysts:

- 1) If mkt is weak form efficient,
trading rules based on past prices can't beat mkt;
- 2) If mkt is semi-strong form efficient,
trading rules based on public info can't beat mkt.
- 3) If mkt is strong form efficient,
then the value of analysis itself is suspect.

An understanding of efficient mkt tests should help us see what types of analysis are useful, & to what degree.

G. Mkt Efficiency with *Costly Information*.

If capital mkts are efficient, no one can earn ER (risk-adjusted).

But w/o ER, there is no incentive to acquire info!

(random selection of securities just as effective)

Paradox: How can prices reflect info if there is no incentive to seek it out?

Thus, How can a securities analysis industry exist?

If info is costless, paradox remains.

BUT if info is costly, there is incentive to seek it out,

and securities analysis industry makes sense.

Consider mkt as a game (Grossman & Stiglitz 1981; Cornell & Roll 1981):

Assume info is costly; investigate implications for mkt efficiency.

Traders can buy info that gives them advantage over traders w/o that info.

If player buys info, T.C. are greater. Any trader can choose to buy the info.

		Player A	
		Buy Info	Don't Buy Info
Player B	Buy Info	A. ER < 0 B. ER < 0	A. ER < 0 B. ER > 0
	Don't Buy Info	A. ER > 0 B. ER < 0	A. normal return B. normal return

The "Prisoner's Dilemma":

If you buy info,

- i. earn ER over trader without info, or
- ii. earn slightly negative return in trade with someone who buys info.

If you don't buy info,

- i. lose (negative return) to trader who bought info, or
- ii. earn normal return in trade with someone who also doesn't buy info.

Stable equilibrium can exist under certain conditions:

- i. if all trading is anonymous;
- ii. if the expected payoff of strategy to buy info equals the expected payoff of random selection strategy.

Implications:

- 1) Gross Returns are higher for those who buy info, but after subtracting info costs, Net Returns are same;
- 2) There is nothing inconsistent about having a security analysis industry AND efficient markets.

H. *Fair Game* Model.

Definition: The process determining prices is a Fair Game if there is no way to use information available at time t to earn ER, on avg.

If information available to investor $\{\phi_t\}$ is incorporated in prices, on avg, then the market represents a Fair Game.

If $\{\phi_t\}$ is not incorporated in prices, on avg, Fair Game does not hold.

For the Fair Game model to hold, there must be no way in which $\{\phi_t\}$ can be used to earn ER, on avg.

NOTE: Fair Game model is based on *average* returns' behavior, not on the entire distribution.
i.e., on avg, across a large number of samples,
the *expected return* must = the *actual return*, for a fair game.

Question: Is Las Vegas a Fair Game?

Yes, because you EXPECT to lose on avg (say, 10%), because of the house percentage. On avg, that's what happens.

A Fair Game does not imply you'll earn a positive return;
only that *expectations are unbiased*.

For weak form tests,	$\{\phi_t\}$ is <i>past prices</i> ;
For semi-strong form tests,	$\{\phi_t\}$ is <i>publicly available</i> info.
For strong form tests,	$\{\phi_t\}$ is <i>all</i> info.

IMPORTANT POINT:

It is sometimes said that, if mkt is efficient,
then best estimate of P_{t+1} is P_t , or $E(r_t) = 0$.

Not true!
Efficient Mkt Hypothesis does not imply $E(r_t) = 0$.

Rather,
Efficient Mkt Hypothesis implies that
past information does not inform us about ER_t , or
how *returns* will deviate from their expectations.*

*Keep in mind distinction between $E(r_t)$ and ER_t !

In fact, $E(r_t)$ is probably > 0 ;
 $E(r_t)$ probably depends on risk
& other characteristics of security.

This is what makes it important to adjust for risk
in considering Excess Returns, ER_t .

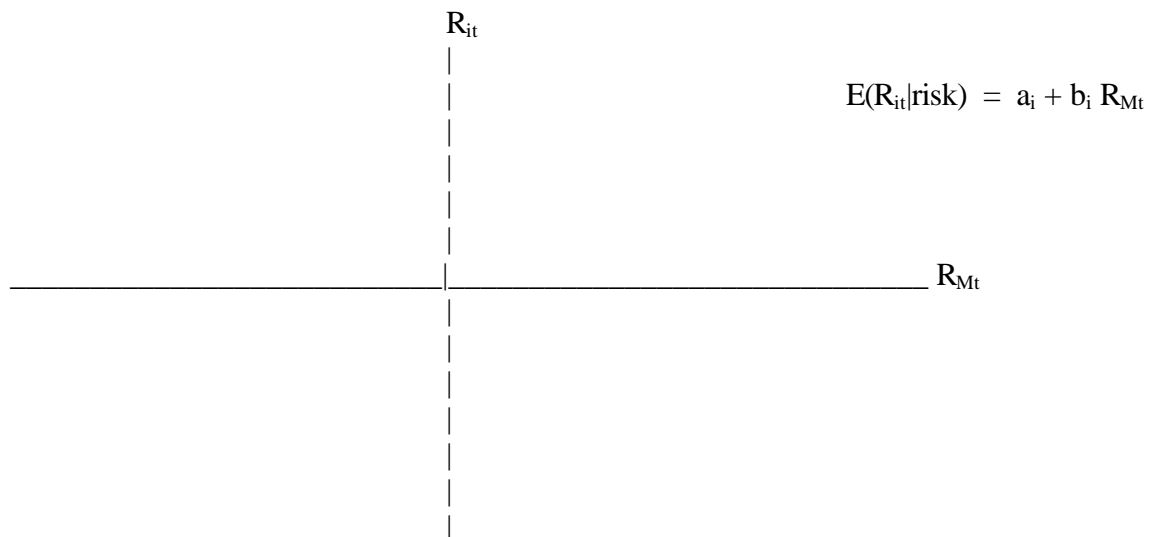
III. Testing Semi-Strong Form Efficiency

Event Study Methodology – A way to examine stock prices around an announcement, to see how quickly stock prices adjust to new information.

Want to measure Excess Returns (ER) = $R_t - E(R_t|\text{risk})$. Must adjust for risk.

Steps:

1. Get data on stock prices for N firms, over some time before and after announcement (monthly, weekly, or daily stock returns).
2. Estimate Market Model: $R_{it} = a_i + b_i R_{Mt} + e_{it}$; for $i = 1, \dots, N$ firms.
Use data over period before announcement, to estimate a_i & b_i .
Apply these estimates to period around the announcement.
3. Fitted values = expected return adjusted for risk, $[E(R_{it}|\text{risk})] = a_i + b_i R_{Mt}$;
Residuals = $e_{it} = R_{it} - E(R_{it}|\text{risk}) =$ our measure of excess returns (ER).



4. Compute average excess return in time period t relative to announcement across firms:

$$AR_t = (1/N) \sum e_{it} .$$

5. Cumulate average excess returns across periods:

$$CAR_t = \sum AR_t .$$

VI. *Market Rationality.*

Have argued that, if capital mkts are efficient,
Prices should adjust *instantaneously & completely* to new info.

Much of this literature focuses on the *speed of adjustment*,
Not whether adjustment is *complete* (in some sense).

May be called literature on “*informational efficiency.*”

Market Rationality focuses on whether adjustment is *complete*;
i.e., do prices accurately reflect investors’ expectations
about the value of stocks (i.e., NPV of future cash flows)?

This also addresses market efficiency.
Much evidence on “*informational efficiency*”
also addresses market rationality.

e.g. 1, if $\text{Price} = f(\text{non-economic variables})$, mkts not rational.
[like, Why do stock splits affect prices?]

e.g. 2, if $\text{Price} = f(\text{Size, Market/Book, E/P, January, ...})$,
markets are not rational.

The presence of a persistent anomaly calls into question
“*Market Rationality*” -- Not so for “*Informational Efficiency.*”

A. Volatility Tests.

Examine volatility of share prices, relative to volatility of fundamental variables that affect prices.

Leroy & Porter (1981), Shiller (1981, 1984)

Find that actual share prices vary more than “theoretical prices” based on fundamental values.

Conclude markets are not rational.

B. Winners vs Losers.

DeBondt & Thaler (1985, 1987)

Argue that investors over-react.

Construct portfolios each December:

Pick 50 stocks that did best & worst, prior 3 or 5 years.

Measure their performance the follow 3 or 5 years.

pf of 50 losers has +ER (especially next January);

pf of 50 winners has - ER.

Note: opposite rule from Relative Strength;

losers pf has more small firms?

Challenge to market rationality?

-- or small firm effect? -- or tax selling effect?

C. U.S. Stock Market Crash of October 1987.

- or Thailand, & Asian Contagion 97;
- or Russia & Latin American Contagion, 98.

Was crash due to big change in news regarding valuation,

- or panic?
- or failure of trading mechanism?
- or formula trading (portfolio insurance)?

Note: Crash is not a challenge to informational efficiency,
unless you can show it was predictable.

However, Crash is a greater challenge to rationality.

- panic, over-reaction, ...?

On the other hand,

formula trading & mkt structure could have combined
to “allow” the crash to occur and, once it occurred,
perhaps people re-evaluated their fundamental valuations
because of the crash.