



15.482 Healthcare Finance

Spring 2017

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Unit 1, Part 1: Market Efficiency

Unit Outline

- Market Efficiency
- The Time Value of Money
- Valuing Special Cashflows
- Inflation

Fundamental Challenges of Finance

Main Challenges:

- Managing cashflows (money in vs. money out) to earn attractive returns over time
- Managing risk (don't lose it all)

Managing Cash Flows:

- What to buy/sell?
- When to buy/sell it?
- How to finance it?

Fundamental Challenges of Finance For The Biopharma Industry:

- Horizons are long
- Investments are huge and lumpy
- Risk and uncertainty are high (complexity)
- **Complexity is rising, not falling**

Cashflows and Assets

Key Question: What Is An “Asset”?

- Business entity, property, plant, and equipment
- Patents, R&D
- Stocks, bonds, options, and other contractual obligations for future cash payments, exchange of physicals
- Knowledge, reputation, opportunities, etc.

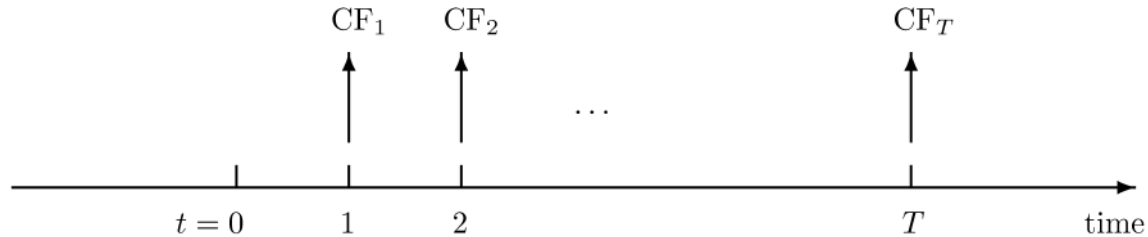
From A Business Perspective, An Asset Is A Sequence of Cashflows

$$\text{Asset}_t \equiv \{CF_t, CF_{t+1}, CF_{t+2}, \dots\}$$

Cashflows and Assets

Valuing An Asset \Leftrightarrow Valuing A Sequence of Cashflows

- Sequences of cashflows are the “basic building blocks” of finance



$$\text{Value of Asset}_t \equiv V_t(CF_t, CF_{t+1}, CF_{t+2}, \dots)$$

The Present Value Operator

What is V_t ?

- How is value determined? What factors are involved in determining the value of any object? Subjective? Objective?

There Are Two Distinct Cases

- No randomness \Rightarrow We have a complete solution
- Randomness \Rightarrow We have a partial solution
 - The reason: missing factors, synergies, unknown unknowns, and other interaction effects

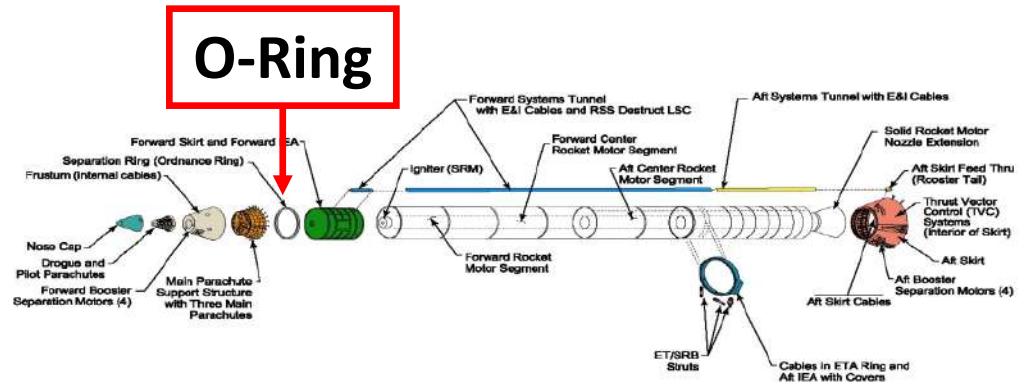
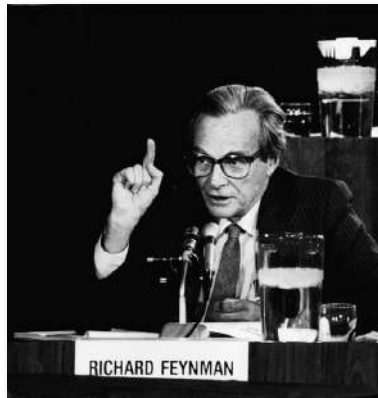
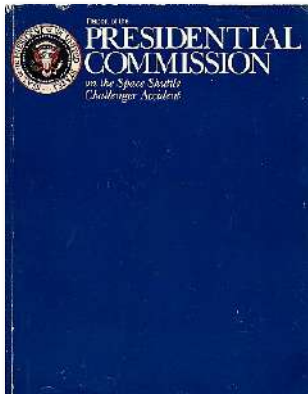
Market Efficiency



January 28, 1986, 11:39am

- 11:47am: “Space Shuttle Explodes”
- 12:17pm: “Lockheed Has No Immediate Comment”
- 12:52pm: “Rockwell Intl Has No Comment”

June 9, 1986



Stock Market Reaction



ELSEVIER

Journal of Corporate Finance 9 (2003) 453–479

Journal of
CORPORATE
FINANCE

www.elsevier.com/locate/econbase

The complexity of price discovery in an efficient market: the stock market reaction to the Challenger crash[☆]

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Received 15 November 2001; received in revised form 8 February 2002; accepted 12 July 2002

Stock Market Reaction

The Stock Market Reflected This Information Within **Minutes:**

Table 2
Intraday stock market behavior around the Challenger crash

Time	Morton Thiokol	Lockheed	Martin Marietta	Rockwell International
<i>Panel A. Stock price movements</i>				
11:30 a.m.	US\$57.25	US\$47.25	US\$35.38	US\$34.75
Noon	Halt	US\$44.50	US\$34.25	US\$32.75
12:36 p.m.	US\$33.00	US\$45.00	US\$32.50	US\$34.13
1:00 p.m.	US\$34.38	US\$45.00	US\$33.00	US\$33.25
<i>Panel B. Stock returns</i>				
11:30–Noon	Halt	– 5.82%	– 3.18%	– 5.76%
Noon– 12:36	– 6.04%	1.12%	– 5.11%	4.20%
12:36– 1:00	– 1.79%	0.00%	1.54%	– 2.56%

This table reports the price movements and stock returns of the four major space-shuttle firms in the period immediately surrounding the 11:39 a.m. crash of the space shuttle Challenger on January 28, 1986. There is no reported price for Morton Thiokol at noon because of an NYSE trading halt in that stock from 11:52 a.m. to 12:44 p.m. The first post-crash trade in Morton Thiokol occurred at 12:36 p.m. on NASDAQ. Data are taken from the price sheets of Francis Emory Fitch.

Stock Market Reaction

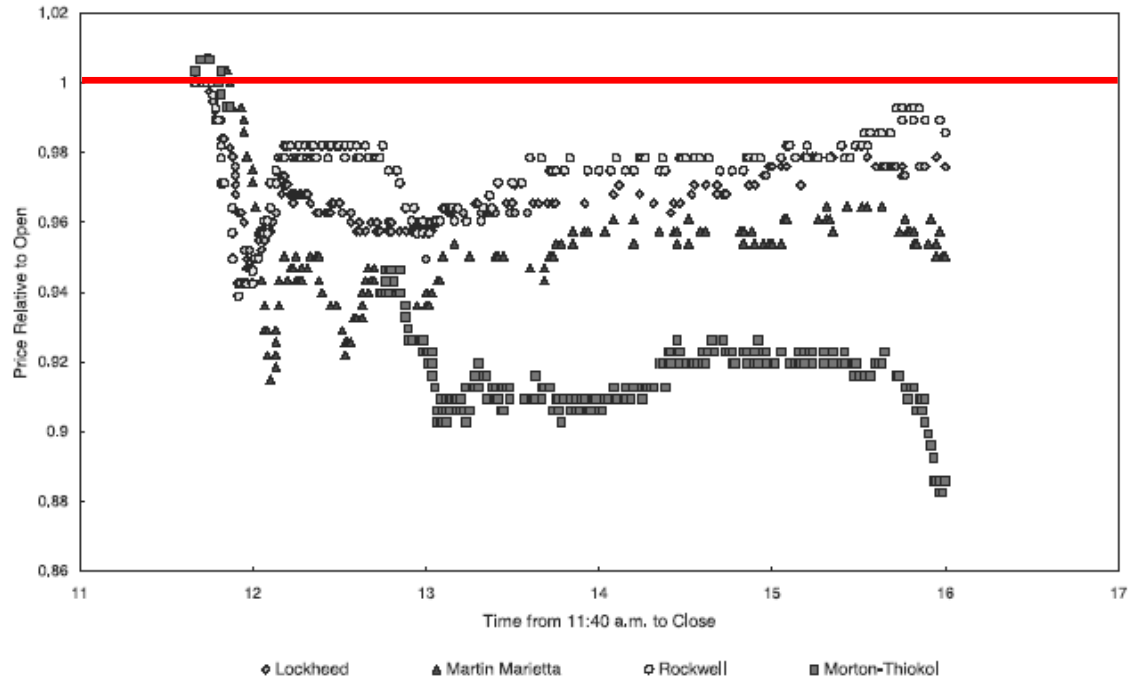


Fig. 1. Intraday stock price movements following the challenger disaster.

The Wisdom of Crowds



$$\begin{aligned}
 x_i &= x + \epsilon_i \\
 \bar{x} &= \frac{1}{n} \sum_{i=1}^n x_i \\
 &= x + \frac{1}{n} \sum_{i=1}^n \epsilon_i \\
 &\approx x
 \end{aligned}$$

A red arrow points from the ϵ_i term in the third equation to a large red 0 , indicating that the sum of errors is zero.

The Madness of Mobs!

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