Public information provided by interested parties

- Accounting disclosures

Implications for

- Asset returns
- Distribution across claim holders

Self-interested disclosures

Sophisticated market

Disclosures backed by necessary accompanying evidence

$\Rightarrow$ verifiable reports, rather than cheap talk

Asset prices determined by residual uncertainty.

Task. Characterize residual uncertainty with self-interested disclosures. Contrast with exogenous public information.

N projects

Success probability r

Liquidation value is $u^s d^{N-s}$ for s successes, $N - s$ failures

Three dates

- Initial ($t = 0$)
- Interim ($t = 1$)
- Final ($t = 2$)

Probability θ that project outcome determined by interim date

Asymmetric information

Manager's **disclosure strategy**

$$(s, f) \mapsto (s', f')$$

where $(s', f') \leq (s, f)$ (verifiability)

Market's **pricing strategy**

$$(s', f') \mapsto V_1$$

V_0, V_2 based on symmetric information.

Manager maximizes V_1

Market sets price to actuarially fair value given disclosure

(i.e.) minimize:

$$(V_1 - V_2)^2$$

Equilibrium (Bayes Nash, and refinements)

Ex ante price V_0

$$V_0 = \sum_{s=0}^{N} \binom{N}{s} (ru)^s ((1-r)\, d)^{N-s}$$

$$= (ru + (1-r)\, d)^N \underbrace{\sum_{s=0}^{N} \binom{N}{s} \left[\frac{ru}{ru+(1-r)d}\right]^s \left[\frac{(1-r)d}{ru+(1-r)d}\right]^{N-s}}_{=1}$$

$$= (ru + (1-r)\, d)^N$$

Full disclosure is never part of any equilibrium

Suppose it is. Then,

$$V_1\left(s,f\right)=u^s d^f\left(ru+\left(1-r\right)d\right)^{N-s-f}$$

But feasible disclosure $(s,0)$ yields

$$\begin{aligned} & u^s\sum_{i=0}^{N-s-f}\binom{N-s-f}{i}\left(ru\right)^i\left(\left(1-r\right)d\right)^{N-s-f-i} \\ = \; & u^s\left(ru+\left(1-r\right)d\right)^{N-s-f} \end{aligned}$$

Contradiction.

Sanitization strategy

$$(s, f) \longmapsto (s, 0)$$

Sanitization is optimal when pricing function is *monotonic* (i.e)

$$(s, -f) \geq (s', -f') \quad \Rightarrow \quad V_1(s, -f) \geq V_1(s', -f')$$

But note:

- there are monotonic equilibria without sanitization
- there are non-monotonic equilibria

Write $V_1(s) = V_1(s, 0)$

Theorem 1 *There is a sequential equilibrium in which the manager uses the sanitization strategy. In any equilibrium in which the manager uses the sanitization strategy,*

$$V_1(s) = u^s \left(qu + (1-q)\, d\right)^{N-s}$$

where

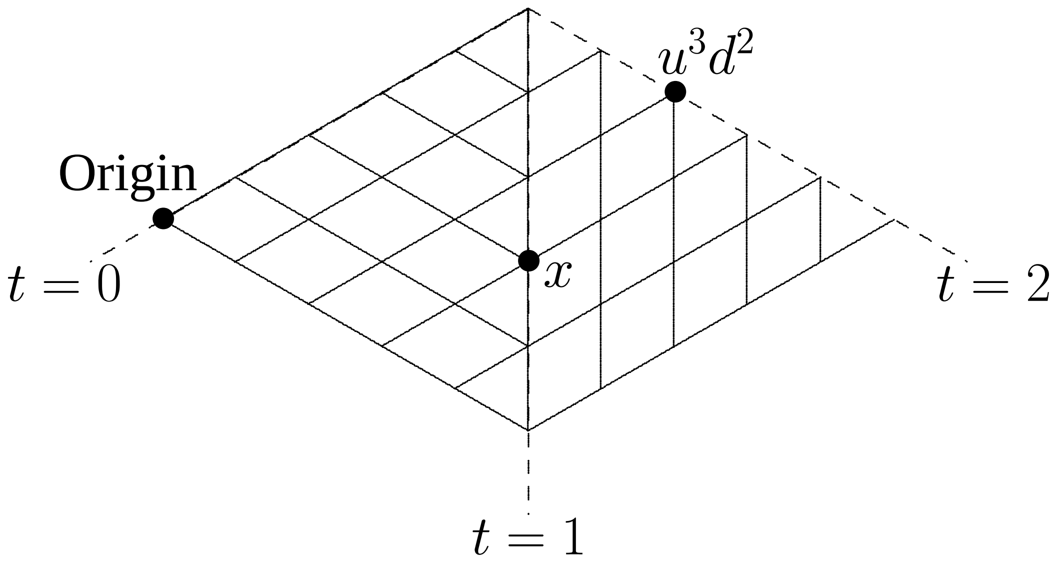
$$q = \frac{r - \theta r}{1 - \theta r}$$

Posterior Density

		actual successes				
		0	$\cdots$	j	$\cdots$	N
	0					
	$\vdots$					
disclosed successes	s			$h(s, j)$		
	$\vdots$					
	N					

$$h\left(j|s\right) = \begin{cases} \binom{N-s}{j-s} q^{j-s}\left(1-q\right)^{N-j} & \text{if} \quad s \le j \\ \\ 0 & \text{otherwise} \end{cases}$$

where $q = \left(r - \theta r\right) / \left(1 - \theta r\right)$.



1.Concatenation of Binomial Trees

Binomial matrices

$$B\left(a\right)B\left(b\right)=B\left(a+b-ab\right)$$

So

$$B\left(r\theta\right)B\left(q\right)=B\left(r\right)$$

Comparative statics

- q is falling in θ
- When $\theta=1$, $q=0$ and $B\left(q\right)$ is identity matrix (“unravelling argument”)

Hypothesis. When information arrives through the disclosures of interested parties, the residual uncertainty is at its greatest when the news is bad and at its smallest when the news is good. When information arrives via an exogenous signal, there is no such asymmetry.

- “Leverage hypothesis”: Var$(R_{t+1}|\, R_t)$ is high for low R_t
  - Black (1976), Econometric literature ...

- (Mis)pricing of defaultable debt
  - Merton (1974)
  - Anderson & Sundaresan (1996)

- Value of private information (Kosowski (2001))

- “Whisper numbers”

Returns

$$R_1 = \frac{V_1}{V_0}$$

$$R_2 = \frac{V_2}{V_1}$$

$$\chi \equiv \frac{qu}{qu + (1-q)\,d}$$

$$\begin{aligned} \mathrm{Var}\,(R_2|s) &= \left[\frac{qu^2 + (1-q)\,d^2}{\left(qu + (1-q)\,d\right)^2}\right]^{N-s} - 1 \\ &= \left(\frac{\chi u + (1-\chi)\,d}{qu + (1-q)\,d}\right)^{N-s} - 1 \end{aligned}$$

Risk Aversion

$$u(c) = \frac{c^{1-\alpha}}{1-\alpha}$$

For

$$\pi \equiv \frac{qu^{-\alpha}}{qu^{-\alpha} + (1-q)\, d^{-\alpha}}$$

$$u^s \left(\pi u + (1-\pi)\, d\right)^{N-s}$$

$$\mathrm{E}\left(R_2 | s\right) = \left(\frac{qu + (1-q)\, d}{\pi u + (1-\pi)\, d}\right)^{N-s}$$

- $\mathrm{E}(R_2|s) > 1$
- $\mathrm{E}(R_2|s)$ decreasing in s

First Period Return

$$\xi \equiv \frac{r\theta}{r\theta u + (1 - r\theta)\,\hat{d}}$$

$$\text{Var}\,(R_1) = \left(\frac{\xi u + (1 - \xi)\,\hat{d}}{r\theta u + (1 - r\theta)\,\hat{d}} \right)^N - 1$$

Variance of R_1 is increasing in θ. Price response at disclosure is larger

- the smaller is the firm
- the less predictable is the earnings series
- the fewer stories there are in the *Wall Street Journal* prior to the earnings announcement

Grant (1980), Atiase (1985) and Freeman (1987)

Whisper Number

Whisper number s sets $\log R_1 = 0$

$$\frac{s}{N} = \frac{\log\left[\frac{ru+(1-r)d}{qu+(1-q)d}\right]}{\log\left[\frac{u}{qu+(1-q)d}\right]} \qquad (1)$$

Whisper number increasing in θ

Unbounded Number of Projects

Two effects

- same as finite case
- large s implies large N

Knife edge case N drawn from Poisson density

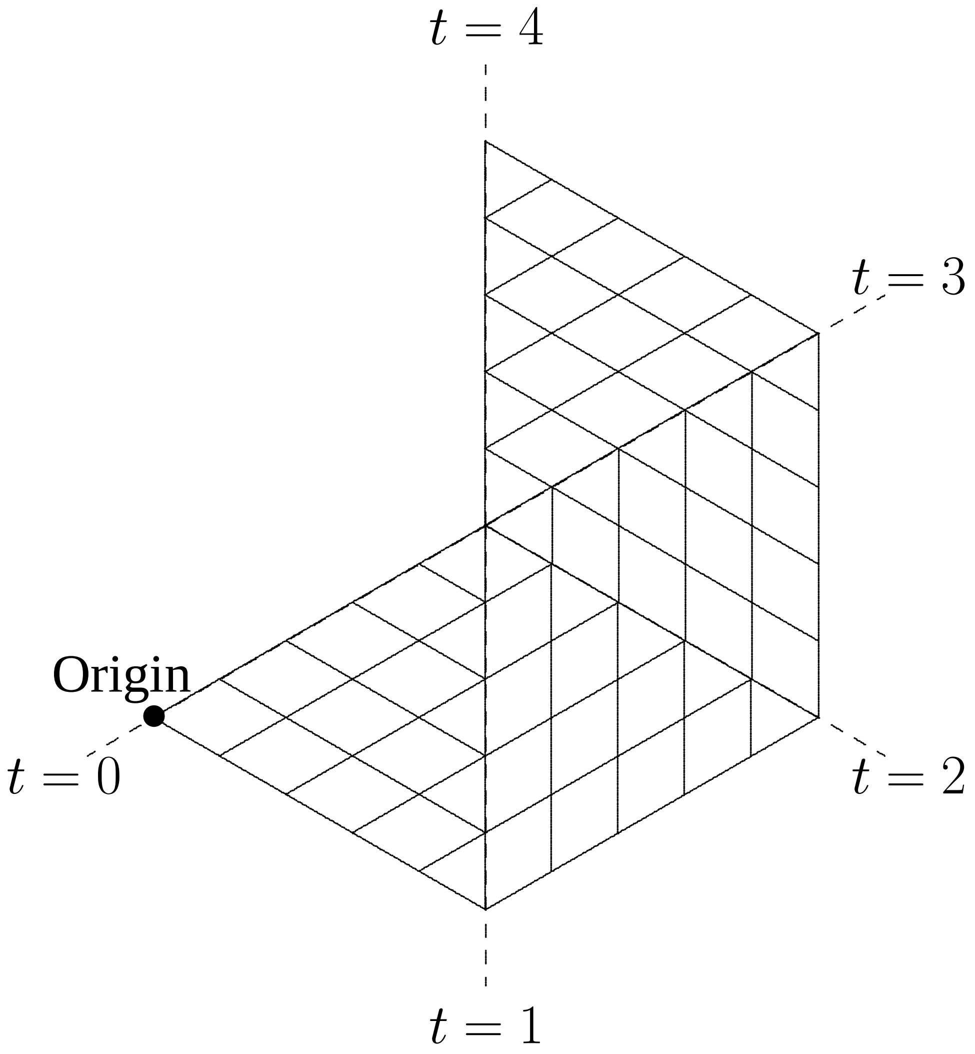
Residual uncertainty

$$h_s\left(j\right) \equiv h\left(s + j\right| s)$$

Theorem 2 *Suppose that the ex ante density $h\left(.\right)$ over the number of successful projects is such that*

$$\frac{k \cdot h\left(k\right)}{h\left(k-1\right)} \tag{2}$$

is a decreasing function of k. Then, the density h_s dominates h_{s+1} in the sense of first degree stochastic dominance.



2.Pricing Spiral with Three Reporting Stages