Using Price Information as an Instrument of Market Discipline in Regulating Bank Risk

Alfred Lehar
Haskayne School of Business
University of Calgary

Duane Seppi
Carnegie Mellon University
Tepper School of Business

Günter Strobl
University of North Carolina
Kenan-Flagler Business School

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Market Discipline

"… move our banking and supervisory systems toward increased reliance on market discipline and use of market data in supervision. The alternative, I fear, would be the expansion of invasive and burdensome – and less effective – supervision and regulation."

Alan Greenspan

- Embrace financial markets for bank supervision
- Third pillar of Basel II is market discipline
- Off-site monitoring
- Use market data to identify troubled banks

Empirical Evidence

- Bank assets are not more opaque than other firms' assets (Flannery, Kwan, and Nimalendran, 2004)
- About 40% of FED supervisory reports in 2002 reference market data, mostly equity prices and ratios (Feldman and Schmidt, 2003)
- Equity-based indicators can predict changes in regulatory ratings for up to a year (Krainer and Lopez, 2004)
- Stock price information improves the forecast of bank failures (Curry, Elmer, and Fissel 2004)

Our Paper

- What happens when regulators use market information for bank supervision?

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- What happens when regulators use market information for bank supervision?
- Information content of prices is endogenous
  - Regulator learns from financial markets and targets bad banks
  - Banks risk taking behaviour changes
  - Incentives for investor to acquire information changes
- Using market information will change
  - Information content of prices
  - Risk taking behaviour of bank

Questions Addressed

- Can price information improve the efficiency of the regulator's monitoring function?
- How does market-based bank regulation affect the risk-taking behavior of banks?
- Does a market-based auditing policy change the informativeness of market prices?

The Model – Overview

Bank

- collects \$1 in deposits
- invests in safe or risky asset (q)

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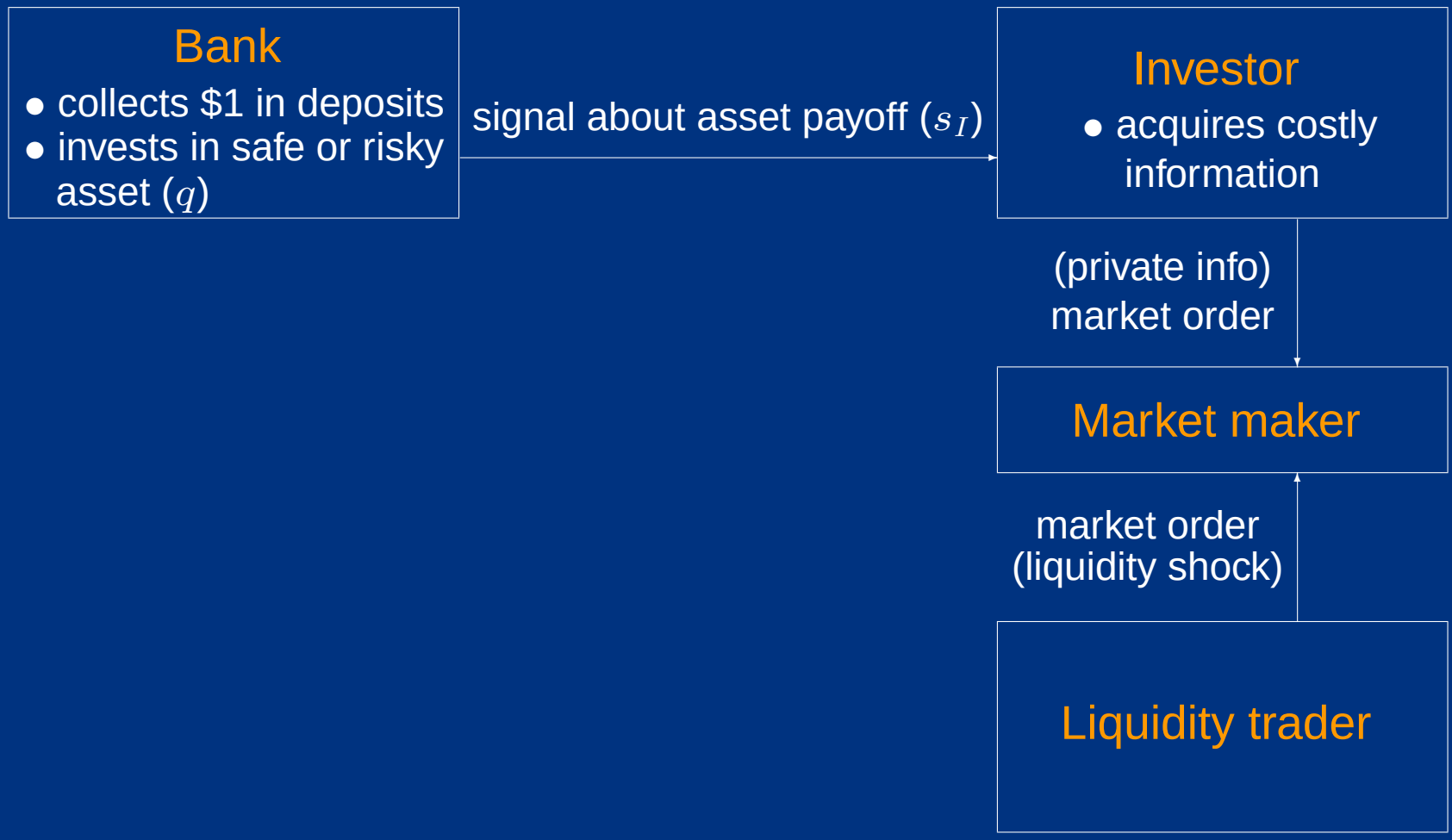
Investor

- acquires costly information

Market maker

Liquidity trader

The Model – Overview



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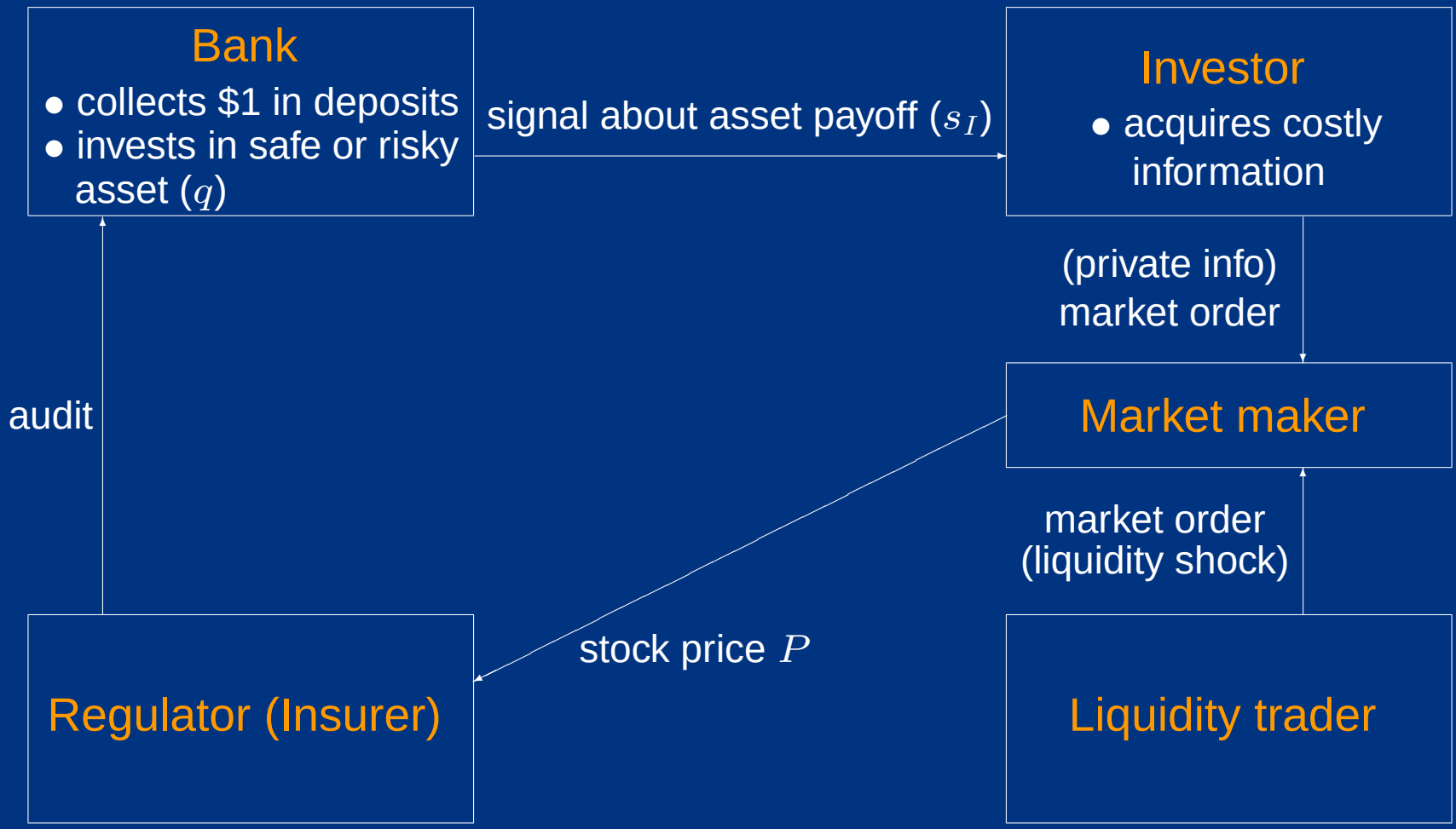

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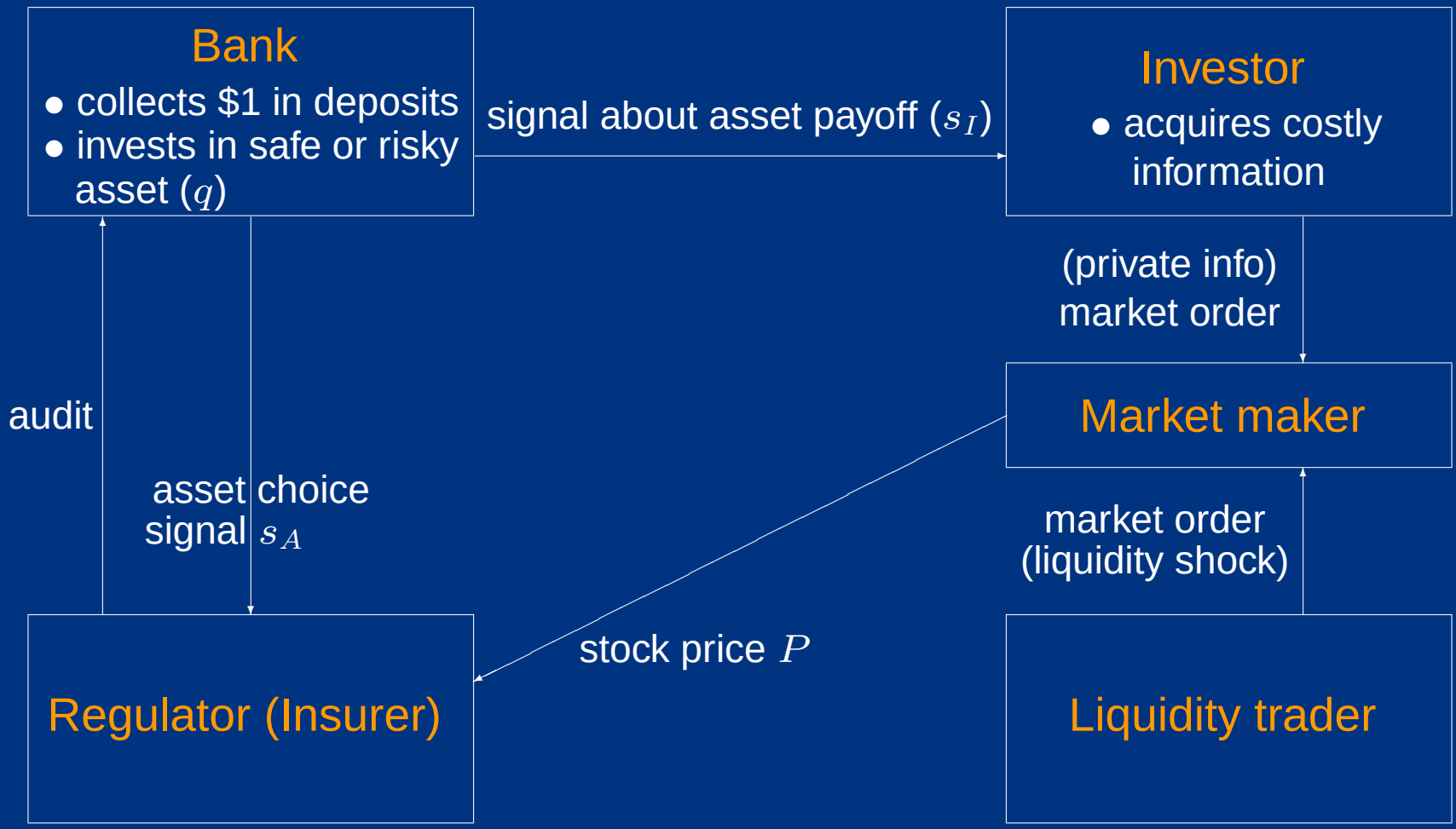

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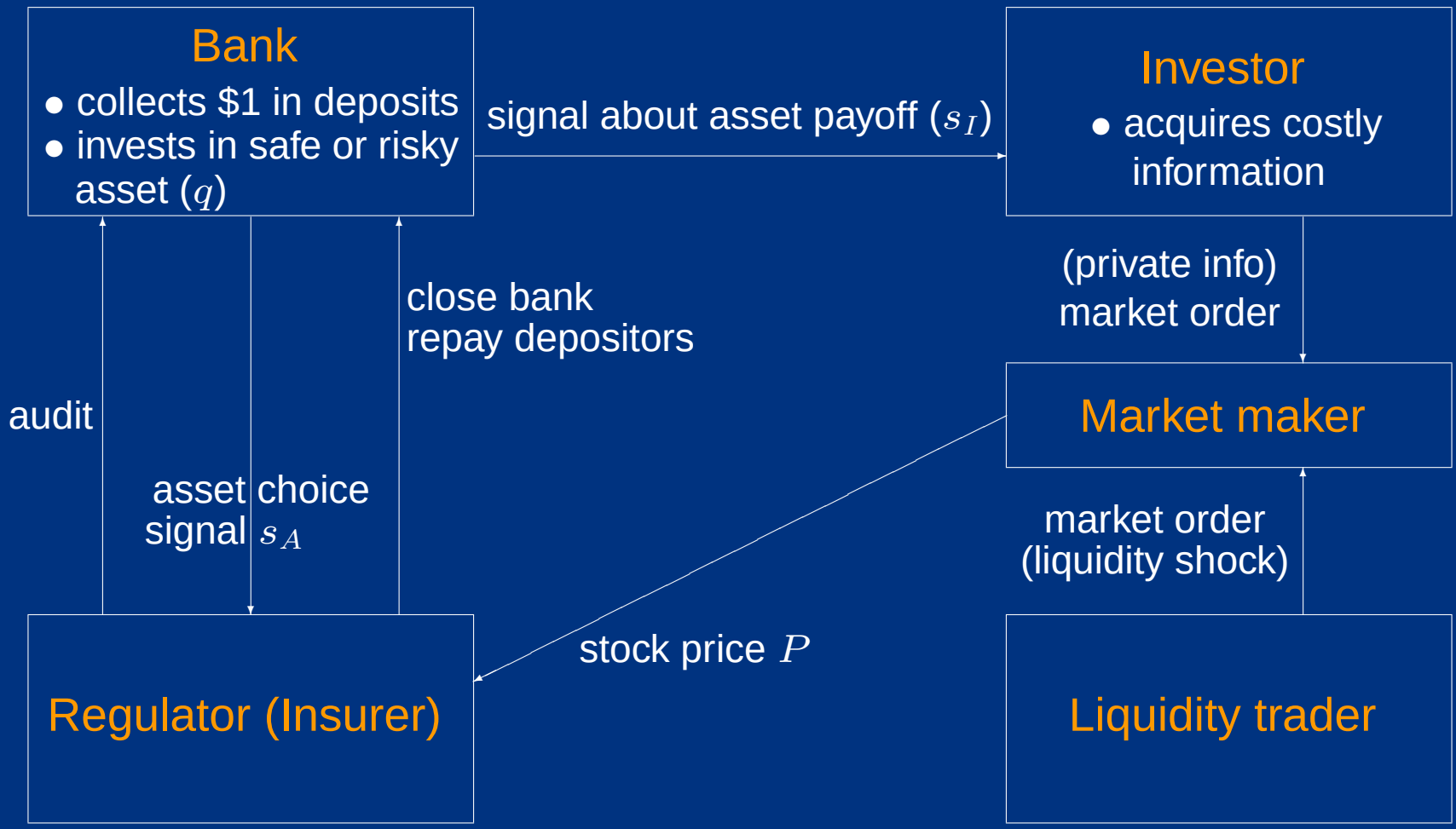

Asset Payoff

- Safe Project: $R_s = 1 + \mu_s$
- Risky Project: $R_r = \begin{cases} 1 + \sigma_r, & \text{with prob. } \frac{1}{2} \\ 1 - \sigma_r, & \text{with prob. } \frac{1}{2} \end{cases}$
- Bank chooses
  - probability of risky project
  - Risk neutral; maximizes expected profit.

Regulator (Insurer)

- After observing stock price P, decides whether to audit the bank: $a(P)$
- Audit:
  - cost c_A
  - regulator observes bank's asset choice and signal s_A
  - right signal with probability $(1+\delta)/2$
- Can close bank: assets can be sold for $\$L$
- Risk neutral; minimizes expected costs (payments to depositors – auditing costs)

Informed Investor

- Can collect information on payoff of risky project
- Observes costly signal s_I with probability ϕ
- s_I correlated with regulator's signal s_A:

$$s_I = \begin{cases} s_A, & \text{w.p. } \rho \\ \text{independent signal, same dist.}, & \text{w.p. } 1-\rho \end{cases}$$

- Risk neutral; chooses ϕ to maximize trading profit, taking q and $a(\cdot)$ as given
- Stock market – discrete version of the Kyle (1985) model

Benchmark Case

- Regulator (ignoring market) minimizes costs
  - + Benefit from closing a bad bank
  - - Cost from incorrect closure of good bank
  - - Cost from failed bad banks
  - - Auditing costs
- Bank maximizes equity Value
  - + Return safe project (w.p. $1-q$)
  - + Return good risky project (w.p. q)
    - no audit
    - audit and regulator gets good signal
- Equilibrium $\hat{q}_{bm}$, $\hat{a}_{bm}$, and DI_{bm}.

Optimal Information Production – Example

$$0.75 \times 32 + 0.25 \times 0 = 24$$

	never audit	always audit	
$E[R_r \mid s_I = 1]$	24		
$E[R_r]$	16		
$E[R_r \mid s_I = -1]$	8		

Optimal Information Production – Example

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P^+		20	
$E[R_r]$	16		
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Expected profit	4		

Optimal Information Production – Example

	never audit	always audit $\rho = 1$	
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Optimal Information Production – Example

	never audit	always audit $\rho = 1$	
$E[R_r \mid s_I = 1]$	24	24	
P^+	20	18	
$E[R_r]$	16	12	
P^-	12	6	
$E[R_r \mid s_I = -1]$	8	0	
Expected profit	4	6	

Optimal Information Production – Example

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$E[R_r \mid s_I = -1]$	8	0	6
Expected profit	4	6	

Optimal Information Production – Example

$Pr[s_A = -1 \mid s_I = 1, \epsilon = 1] = 25\%$

$0.75 \times 24 + 0.25 \times 0 = 18$

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Expected profit	4	6	

$$Pr[s_A = -1 \mid s_I = -1, \epsilon = 1] = 25\%$$

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$0.75 \times 24 + 0.25 \times 0 = 18$

	never audit	always audit	
		$\rho = 1$	$\rho = 0$
$E[R_r \mid s_I = 1]$	24	24	18
P^+	20	18	15
$E[R_r]$	16	12	12
P^-	12	6	9
$E[R_r \mid s_I = -1]$	8	0	6
Expected profit	4	6	3

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$0.75 \times 8 + 0.25 \times 0 = 6$

Regulator's Optimal Auditing Policy

- Focus first on banks with low stock prices
- Provide enough auditing to discipline banks
- Risk shifting incentives are low (i.e. return of safe asset is high $(\mu > \mu_s^c)$)

$$\hat{a}^+ = 0 \qquad \text{and} \qquad \hat{a}^- > 0 \qquad \text{("low-auditing regime")}$$

- Otherwise:

$$\hat{a}^+ \geq 0 \qquad \text{and} \qquad \hat{a}^- = 1 \qquad \text{("high-auditing regime")}$$

Bank's Asset Choice

Bank is less likely to invest in the risky asset in case the regulator's auditing policy takes price information into account,

if and only if

the return on the safe asset is sufficiently high.

$$\hat{q} < \hat{q}_{bm} \quad \text{iff} \quad \mu_s > \mu_s^c$$

Regulator's Commitment Problem

- Auditing is optimal only if

$$\text{Expected Benefits } B(q, P) \geq c_A$$

  - Increasing in q $\quad (\hat{q} : B(\hat{q}, P) = c_A)$
  - Increasing in $Pr[\text{bad state} \mid \text{info}]$: $\quad B^- > B_{bm} > B^+$

- Which B is the relevant one?
  - If $a^- > 0, a^+ = 0$ ("low-auditing regime"): $\quad B^- \geq c_A$
  - If $a^- = 1, a^+ > 0$ ("high-auditing regime"): $\quad B^+ \geq c_A$

$\Rightarrow$ If regulator cannot commit to suboptimal strategy:

$$\hat{q}_{low\text{-}auditing\ regime} < \hat{q}_{bm} < \hat{q}_{high\text{-}auditing\ regime}$$

Efficiency of Market-Based Bank Regulation

Proposition. *The regulator's expected total cost (payments to depositors and auditing costs) in case the regulator's auditing policy takes price information into account is lower than in the benchmark case,*

if and only if

the return on the safe asset is sufficiently high / the payoff variance of the risky asset is sufficiently low:

$$DI < DI_{bm} \quad \textit{iff} \quad \mu_s > \mu_s^c$$

Conclusion

- Can price information improve the efficiency of the regulator's monitoring function?
- How does market-based bank regulation affect the risk-taking behavior of banks?
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  Yes, but only if the bank's risk-shifting incentives are not too large.
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  Yes, but only if the bank's risk-shifting incentives are not too large.
- How does market-based bank regulation affect the risk-taking behavior of banks?
  Can lead to more risk taking, if the regulator cannot commit to an ex-post suboptimal monitoring policy.
- Does a market-based auditing policy change the informativeness of market prices?
  Price informativeness decreases when market-based bank regulation reduces risk taking.

Threat of auditing – Example

Equity holders of the bank lose money in case of an audit only if the regulator receives an incorrect signal in the "good state" and closes the bank.

Example: high correlation $\longrightarrow$ less auditing

	$a = \frac{1}{2}$	$a^- = 1$ $a^+ = 0$
$Pr[\epsilon = 1]$	50%	

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Market is wrong w.p. 25%

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$= Pr[s_A = -1 \mid P = P^-] = 100\%$, when $\rho = 1$

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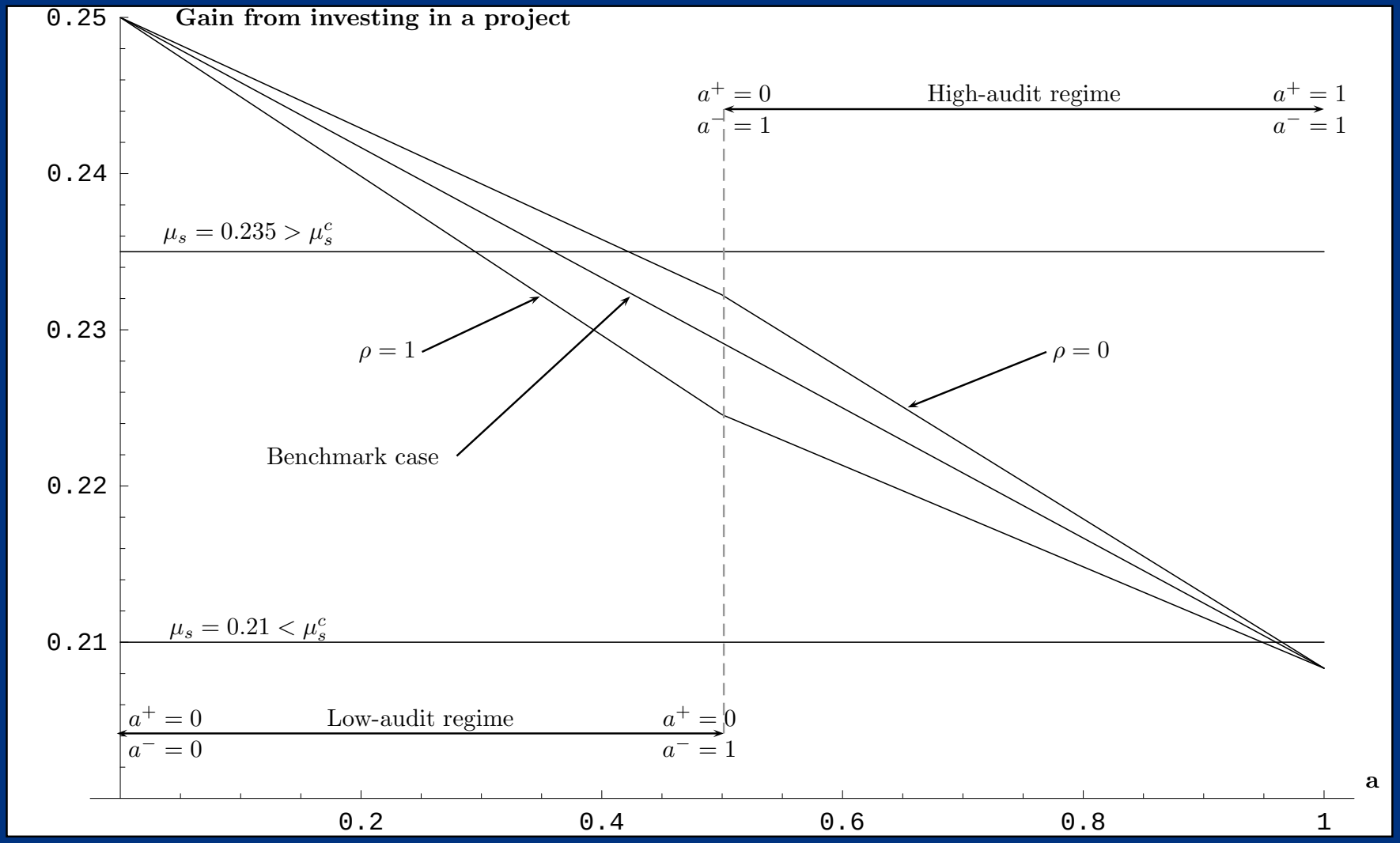
Regulator's Auditing Policy (cont.)



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