Very Preliminary

Banks as Secret Keepers

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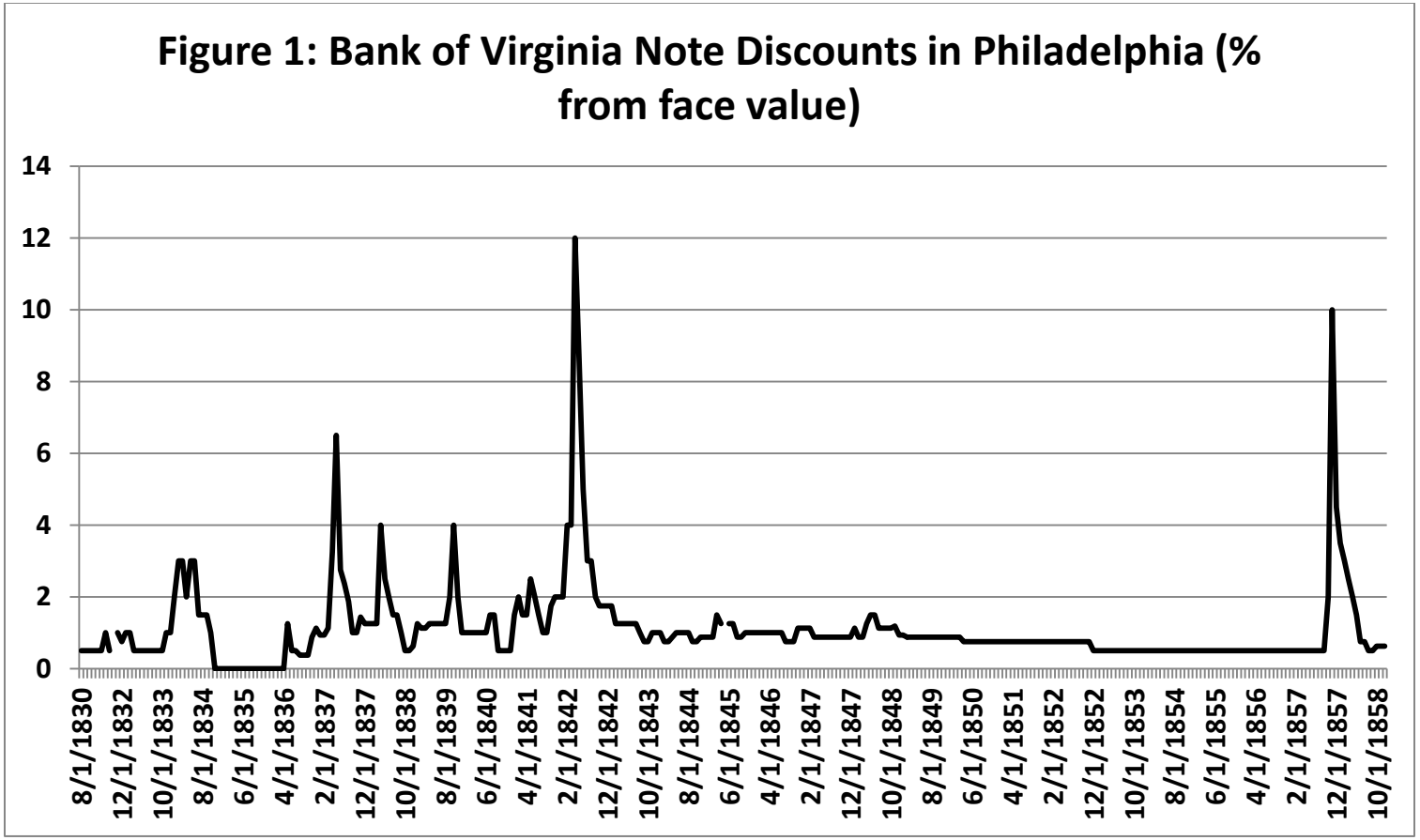
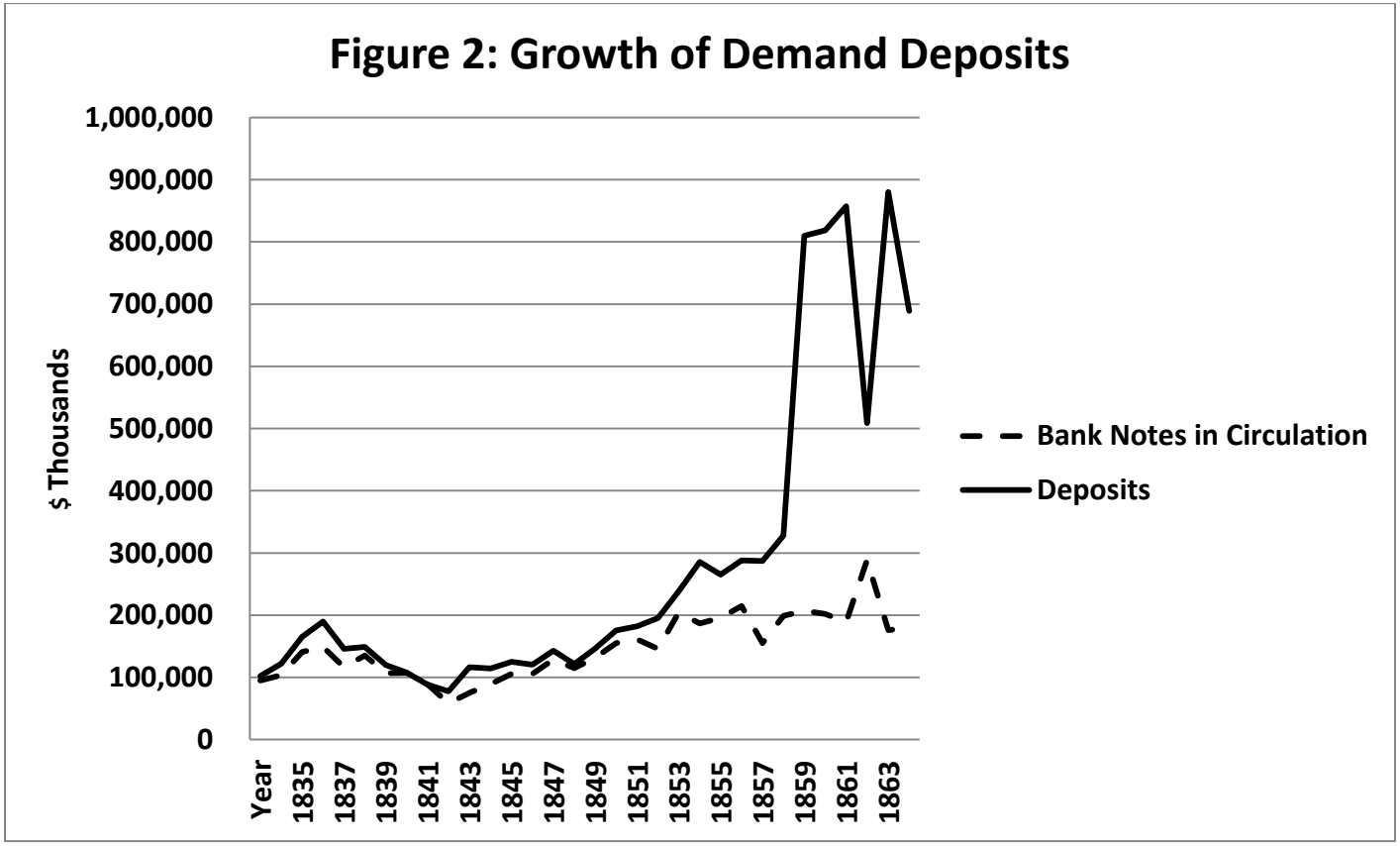
October 2013

Banks are opaque. Why?

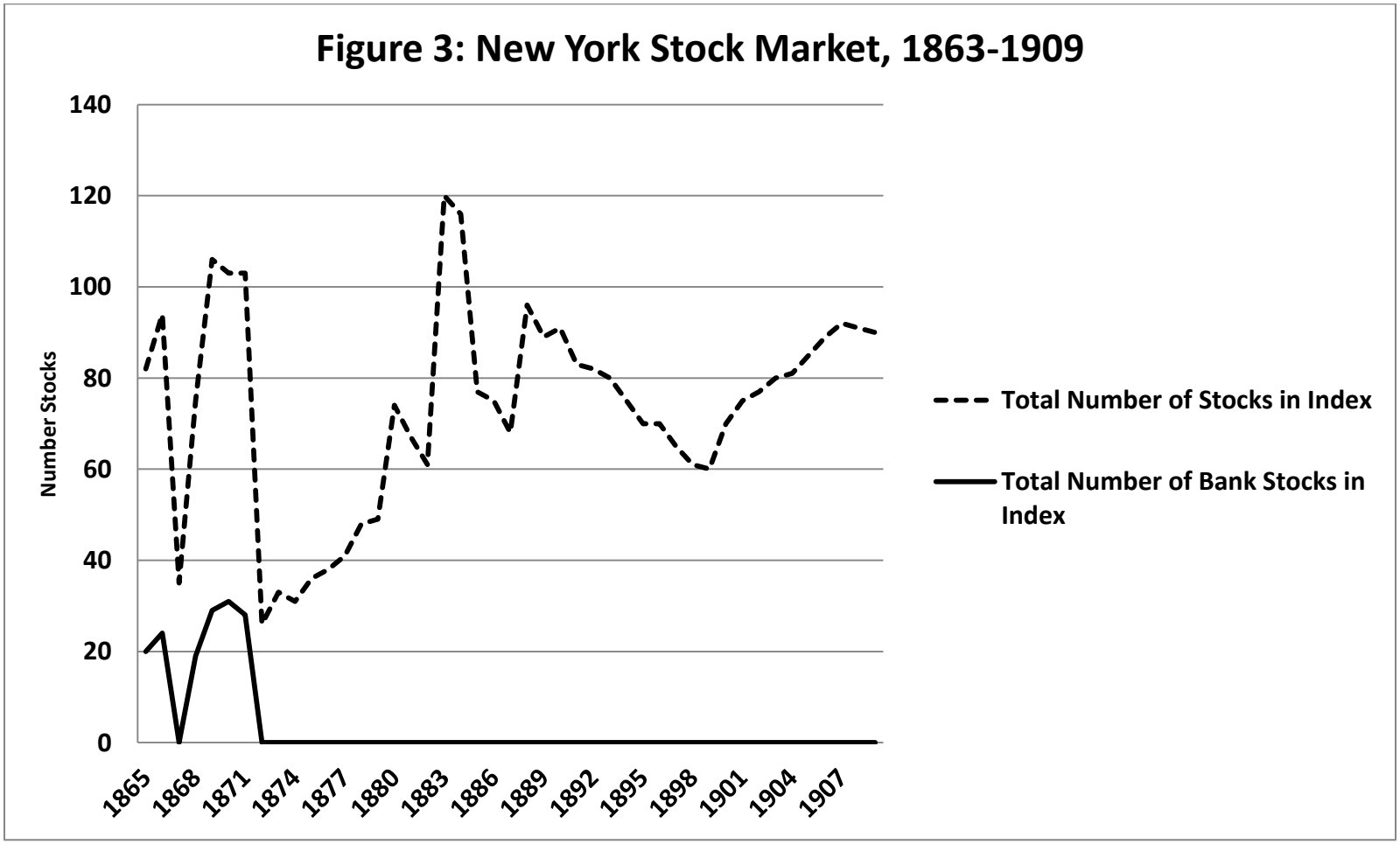
Free bank note discounts were informative.



Demand deposits grew; don't have secondary markets but trade inside clearing houses. Discount information lost.



Banks stocks endogenously stop trading; delisted by banks. So, no information revealed.



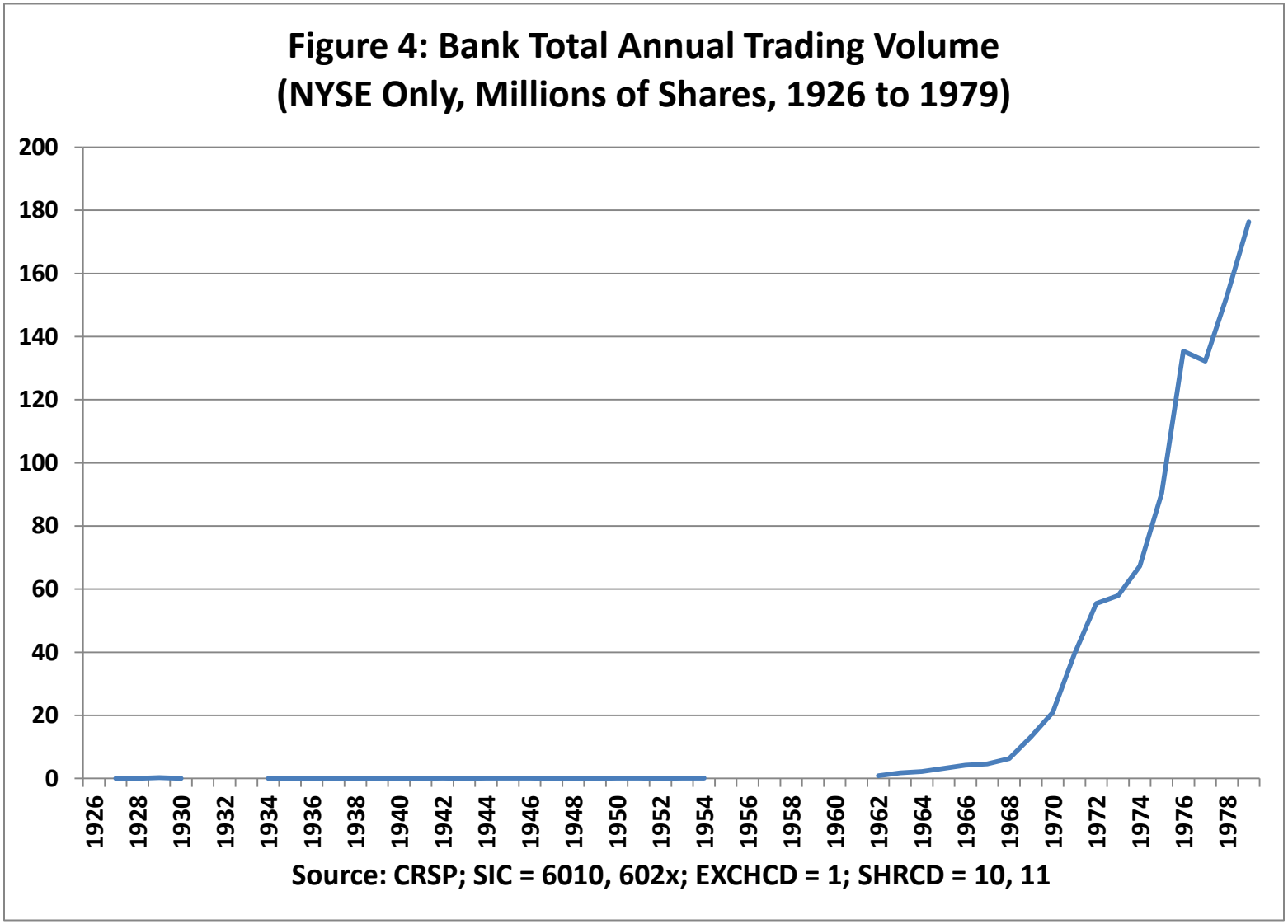


Figure 4: Bank Total Annual Trading Volume
(NYSE Only, Millions of Shares, 1926 to 1979)
200
180
160
140
120
100
80
60
40
20
0
1926
1928
1930
1932
1934
1936
1938
1940
1942
1944
1946
1948
1950
1952
1954
1956
1958
1960
1962
1964
1966
1968
1970
1972
1974
1976
1978
Source: CRSP; SIC = 6010, 602x; EXCHCD = 1; SHRCD = 10, 11

Listed US bank stocks prior to 1962:

Bank of America, 1927-1928

Bank Manhattan, 1927-1928

Bank of New York, 1927-1929
Chase National Bank, 1927-1928
Chatham Phoenix National Bank, 1927-1928
Chemical National Bank, 1927-1928
Commerce Guardian Trust & Savings Bank, 1927-1929
Continental Bank, 1927-1930
Corn Exchange National Bank, 1927-1950
Farmers Loan & Trust, 1927-1928
Hanover National Bank, 1927-1928 National City, 1927-1928
National Park, 1927-1929

Banks delist even after Fed in existence.

Banks as institutions:

- Diamond and Dybvig (1983): Banks exist to smooth consumption.
- Gorton and Pennacchi (1990): Banks exist to create safe debt to be used as a medium of exchange.

Optimal contract for trading:

- Dang, Gorton, Holmström (2012): Debt, backed by debt, is the optimal security for trade. Info-insensitive→sensitive = crisis.

- This paper: information has social value. Banks produce info but are optimally opaque in order to keep their debt trading at par.

One storable good. Three periods: 0, 1, 2. Four risk-neutral agents.

Preferences

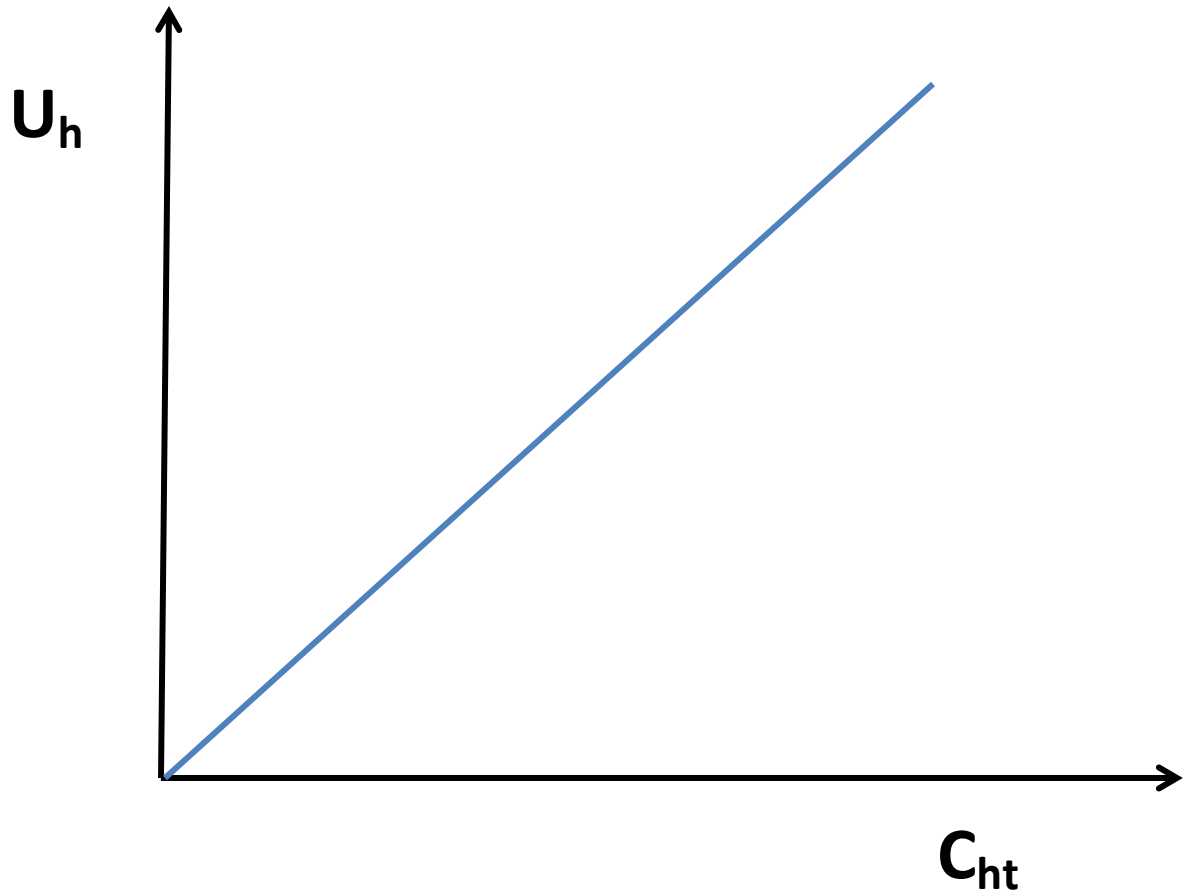
$$U_F = \sum_{t=0}^{2} C_{Ft} \qquad \omega_F = (0, 0, 0)$$

$$U_E = \sum_{t=0}^{2} C_{Et} + \alpha \min\{C_{E1}, k\} \qquad \omega_E = (e, 0, 0)$$

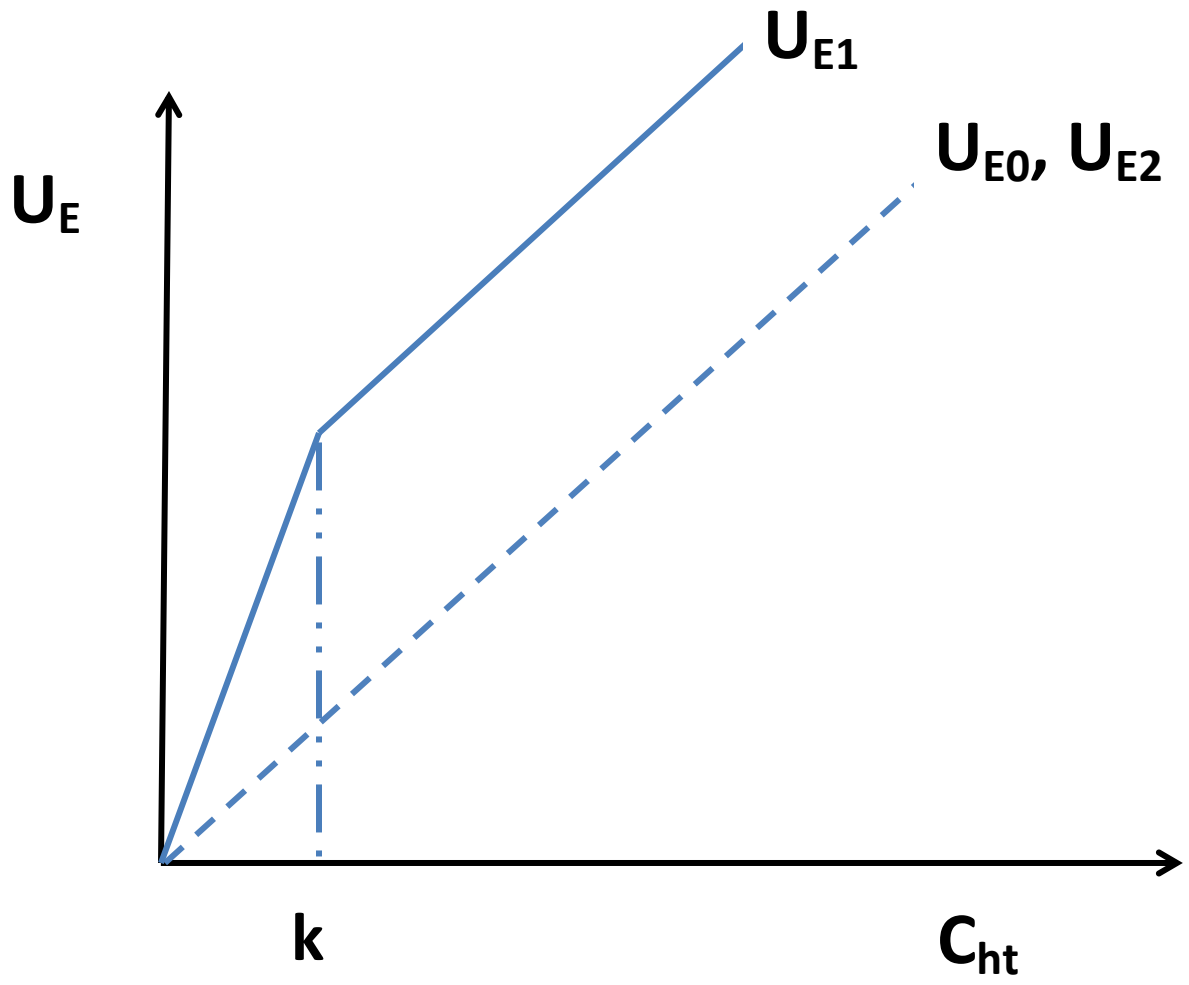
$$U_L = \sum_{t=0}^{2} C_{Lt} \qquad \omega_L = (0, e_L, 0)$$

$$U_B = \sum_{t=0}^{2} C_{Bt} \qquad \omega_B = (0, 0, 0)$$

Preferences for h∈ {F, L, B}



Preferences for E



Technology. The firm has a project.

- **Project X: Invest *w* in period 0.**

In period 2, it pays $\begin{cases} \boldsymbol{x > w \quad prob.\ \lambda} \\ \boldsymbol{0 \quad prob.\ (1-\lambda)} \end{cases}$

Note: $\boldsymbol{\lambda x > w}$**.**

Extension of project at 1

Info arrives to firm at 1.

In period 1 the firm has hard evidence about project failure or success. Firm can show this info to other agents at no cost.

- **Extension: Invest $\widetilde{w}$ in period 1.**
- **In period 2, it pays** $\begin{cases} \hat{x} > \hat{w} & Success\ of\ X \\ 0 & Failure\ of\ X \end{cases}$
- **Note:** $\lambda\hat{x} < \hat{w}$.

Assumptions

- **Early consumers can cover their liquidity or investment needs, but not both:**

$e>k$ and $e>w$ but $e<k+w$

Notation: $k>z\equiv e-w$ **(Note: e – w is residual.)**

- **Jointly the consumers can cover all liquidity and investment needs.**

$$e + e_L > k + w + \widehat{w}$$

Benchmarks

Autarky: Consumers just store.

First Best

- **Period 0: Use *w* from E to finance the project.**
  - **Feasible since e > w**
- **Period 1**
  - **Transfer k – z from L to E. (k>z≡e-w)**
  - **Use $\widehat{w}$ from L to finance a worthy extension.**
  - **Feasible since $e_L > k - z + \widehat{w}$**

Expected Utilities Comparison

Autarky	First Best
$U_F = 0$	$U_F = \lambda x - w + \lambda(\hat{x} - \hat{w}) > 0$
$U_E = e + \alpha k$	$U_E = e + \alpha k$
$U_L = e_L$	$U_L = e_L$
$U_B = 0$	$U_B = 0$

- **F has the bargaining power.**

Capital Markets

Timing in Capital Markets

Date t=0

The firm finances the project of cost w by issuing a security that pays $s(0)$ in case of failure and $s(x)$ in case of success.

Date t=1

The firm learns whether the project will pay x (success) or 0 (failure) in t=2.

If the project succeeds the firm finances an extension of cost $\hat{w}$ by issuing a new security, $s(\hat{x})$.

The early consumer trades a fraction of his security with the late consumer to consume k.

Date t=2

Project payoffs realized and securities are paid.

Financing the Extension

Period 1

- **If project fails:**
  - **F cannot show the extension is profitable, does not issue equity, which publicly reveals that the project failed.**
  - **L buys E's claims on the project, with a value s(0)**
- **Project succeeds:**
  - **F shows extension is profitable; issues new equity $s(\hat{x}) = \hat{w}$ to sell to L, revealing project success.**
  - **L buys fraction θ of E's claim on the project, with value θs(x).**

Financing the Project

Period 0

- F borrows from E by issuing a risky security that pays s(0) or s(x).
- F has limited liability: s(0)≤0 and s(x)≤x →s(0)=0.
- F has the bargaining power.

  From L's resource constraint $\widehat{w} + \theta s(x) \leq e_L$.

- Above assumptions → $\theta s(x) = k - z$, i.e., L has enough funds to cover the investment needs of F and the remaining liquidity needs of E.

- $U_{E|Finance} = (1+\alpha)z + \lambda[(1+\alpha)\theta s(x) + (1-\theta)s(x)]$
- k>z≡e-w so E faces risk.
- Sub in $\theta s(x) = k - z$.
- E must be indifferent between financing the project and autarky/storage:

$$\underbrace{(1+\alpha)z + \lambda s(x) + \lambda\alpha(k-z)}_{\text{Expected gains from financing}} = \underbrace{e + \alpha k}_{\text{Expected gains from storing}}$$

- $\rightarrow \boldsymbol{s(x) = min\left\{\frac{w}{\lambda} + \frac{\alpha(1-\lambda)}{\lambda}(k-z), x + \hat{x} - \hat{w}\right\}}$
  - **First component = certainty equivalent of loan;**
  - **Second is compensation for taking risk of not consuming k, but only (k-z) in period 1.**

(min is limited liability; projects separate)

Expected Utility Comparison

First Best		Capital markets
		$\underbrace{w+\alpha(1-\lambda)(k-z)}$
$U_F = \lambda x - w + \lambda(\hat{x} - \hat{w})$	>	$U_F = \lambda x - \lambda s(x) + \lambda(\hat{x} - \hat{w})$
$U_E = e + \alpha k$		$U_E = e + \alpha k$
$U_L = e_L$		$U_L = e_L$
$U_B = 0$		$U_B = 0$

Capital markets implement $\alpha(1-\lambda)(k-z)$ less welfare.

Financial Intermediation

Date t=0

The early consumer deposits e with the bank. The bank promises an unconditional payment r_1^E at $t=1$ and a conditional payment $r_2^E(g)$ if the project succeeds and $r_2^E(b)$ if the project fails at $t=2$

The bank lends w to the firm with a loan contract, where the firm pays s(0) if the project fails and s(x) if is succeeds.

Date t=1

The firm learns whether the project will pay x (success) or 0 (failure) in t=2.

If the project succeeds the firm finances an extension of cost $\hat{w}$ by issuing a new security, $s(\hat{x})$. The bank maintains this information in secret.

The late consumer deposits e_L and the bank promises a conditional payment $r_2^L(g)$ if the project succeeds and $r_2^L(b)$ if the project fails at $t=2$.

The early consumer withdraws r_1^E and consumes.

Date t=2

Project payoffs realized and loans are repaid.

Financing the Extension

- **If the project fails:**
  - **F cannot show the extension is profitable; no new loan. B *privately* infers project failed.**
- **If the project succeeds:**
  - **F shows the extension is profitable and asks for a new loan of $s(\hat{x}) = \hat{w}$.**
  - **B *privately* infers that the project succeeded.**

"Bank" <u>means</u> that B can maintain loan outcomes in secret; and for now consumers cannot acquire info about the project or loans.

Bank Contracts

	Assets of B (t=1)	Promises to E	Promises to L
Project fails (b) (1-λ)	e_L+z	$k+r_2^E(b)$	$r_2^L(b)$
Project succeeds (g) λ	$e_L+z+s(x)$	$k+r_2^E(g)$	$r_2^L(g)$

	Assets of B (t=1)	Promises to E	Promises to L
Project fails (b) (1-λ)	e_L+z	$k+0$	e_L+z-k
Project succeeds (g) λ	$e_L+z+s(x)$	$k+\frac{e_L-k}{\lambda}$	$e_L+\frac{(1-\lambda)}{\lambda}(k-z)$

Note: E breaks even: $(1+\alpha)k+\lambda r_2^E(g)=e+\alpha k.$

L breaks even: $\lambda r_2^L(g)+(1-\lambda)(e_L+z-k)=e_L.$

Are these promises feasible?

$$\boldsymbol{k + r_2^E(g) + r_2^L(g) \leq e_L + z + s(x) \rightarrow s(x) = \frac{w}{\lambda}}$$

Projects are always financed. The key is to transfer the risk from E to L . . . which can be done if the bank keeps its balance sheet secret.

Expected Utility Comparison

First Best		Banks
$U_F = \lambda x - w + \lambda(\hat{x} - \hat{w})$	=	$U_F = \lambda x - \overbrace{\lambda s(x)}^{w} + \lambda(\hat{x} - \hat{w})$
$U_E = e + \alpha k$	=	$U_E = e + \alpha k$
$U_L = e_L$	=	$U_L = e_L$
$U_B = 0$	=	$U_B = 0$

Private Incentives to Find Out Secrets

- **So far we have assumed that it is impossible to discover the bank's secret.**
- **There may be incentives for L to acquire private information about the bank's balance sheet.**
- **Assume the cost of information production is γ.**

- **If L does not acquire information before depositing:**

$$\lambda r_2^L(g) + (1-\lambda) r_2^L(b)$$

- **If L privately acquires information before depositing:**

$$\lambda r_2^L(g) + (1-\lambda) e_L - \gamma$$

- **L acquires information if:**

$$(1-\lambda)\left(e_L - r_2^L(b)\right) > \gamma$$

Equivalent to: $\boldsymbol{k + w - e > \frac{\gamma}{1-\lambda}}$

High k and w and low e, λ and γ makes banks less feasible.

→High γ makes the bank more opaque.

- **If late consumers have an incentive to produce information, then one thing the bank can do is to produce less money—i.e. promise E less.**
- **The benefit to late consumers from producing info is:**

$$(1-\lambda)\left(e_L - r_2^L(b)\right)$$

and the cost is γ.

- **To prevent info production the bank can offer:**

$$r_2^L(b) = e_L - \frac{\gamma}{1-\lambda}.$$

- **However, this means that:**

$$r_1^E = z + \frac{\gamma}{1-\lambda} < k.$$

- **The bank has to distort (reduce) risk-sharing to keep secrets.**

- **On the other hand, the bank could make a smaller loan, so less of the initial project is financed.**

- **Suppose it is possible for the bank to finance just a fraction η of the initial project and to store the rest of the deposits.**

- **If the bank promises k to E, then in the case of a bad shock, the amount left is:**

$$r_2^L(b) = \eta(e_L + z - k) + (1-\eta)(e_L + z - k + w)$$
$$= e_L + z - k + (1-\eta)w$$

- **So, the condition for L to <u>not</u> produce info is:**

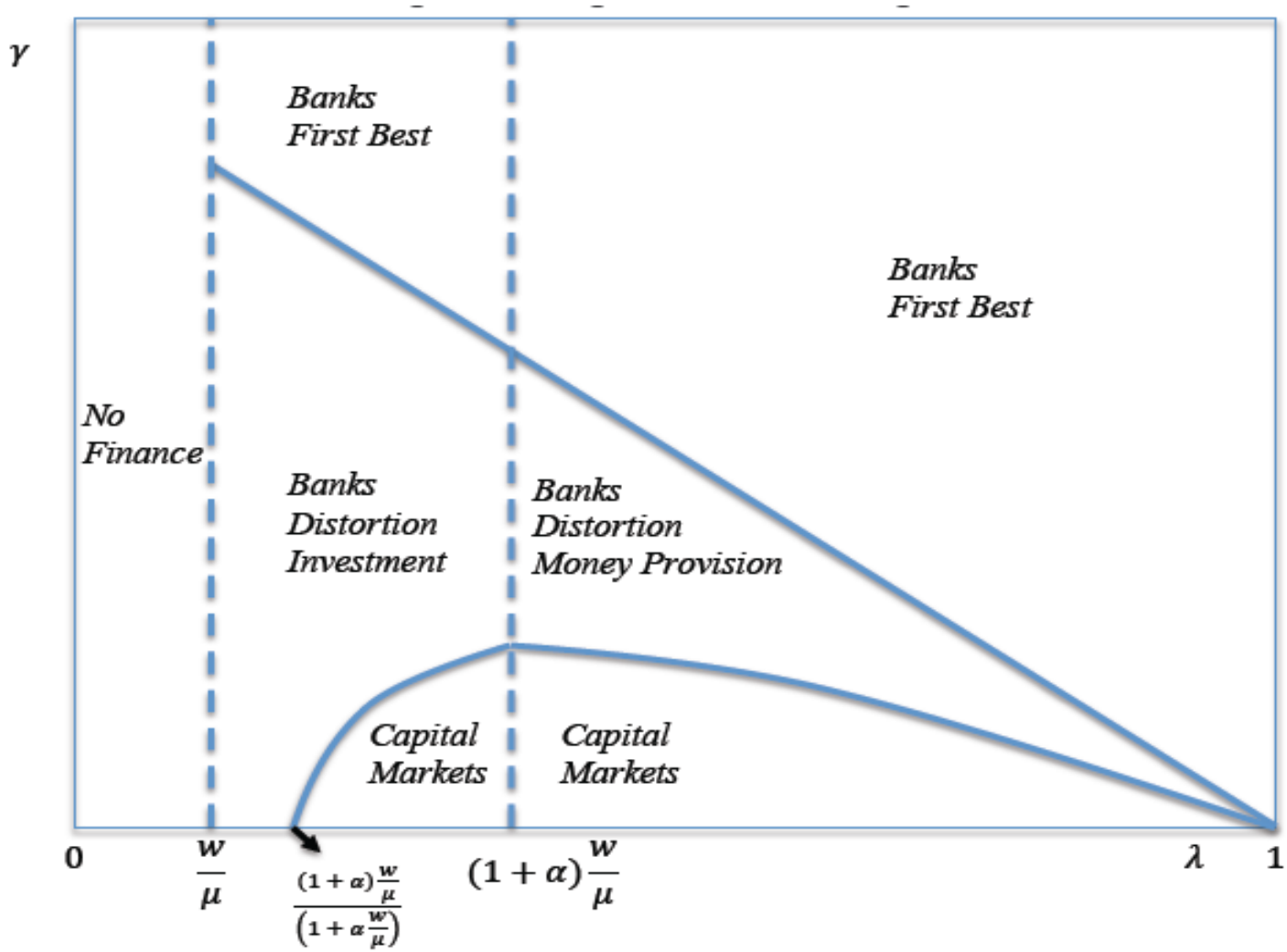
$$(1-\lambda)[e_L - e_L - z + k - (1-\eta)w] < \gamma.$$

Solve for η.

- **Prop 6 provides condition for the bank to prefer distorting risk-bearing rather than distorting investment.**

Optimal Bank Portfolio

- Suppose a continuum of banks, E, L, and F's characterized by: (λ_i, γ_i).
- A mass 1 of each agent and each bank forms a match with single early and late consumers and finances a single project.
- The cost of each project is w.
- Then the previous analysis allows us to characterize which projects are financed by banks with first best risk sharing, those financed by banks that distort risk sharing or investment, and those financed by capital markets.



$$\mu \stackrel{\text{def}}{=} x + \hat{x} - \hat{w}$$

- **Other results on portfolio choice.**

Final Comments

- **Obvious policy implications.**