Financial Intermediaries and Monetary Economics

By T. Adrian and H. Shin

Based on a series of papers
by Adrian, Shin, and coauthors
and forthcoming in
Handbook of Monetary Economics

Motivation

This paper reconsiders
the role of financial intermediaries in monetary economics.
Questions to be answered:

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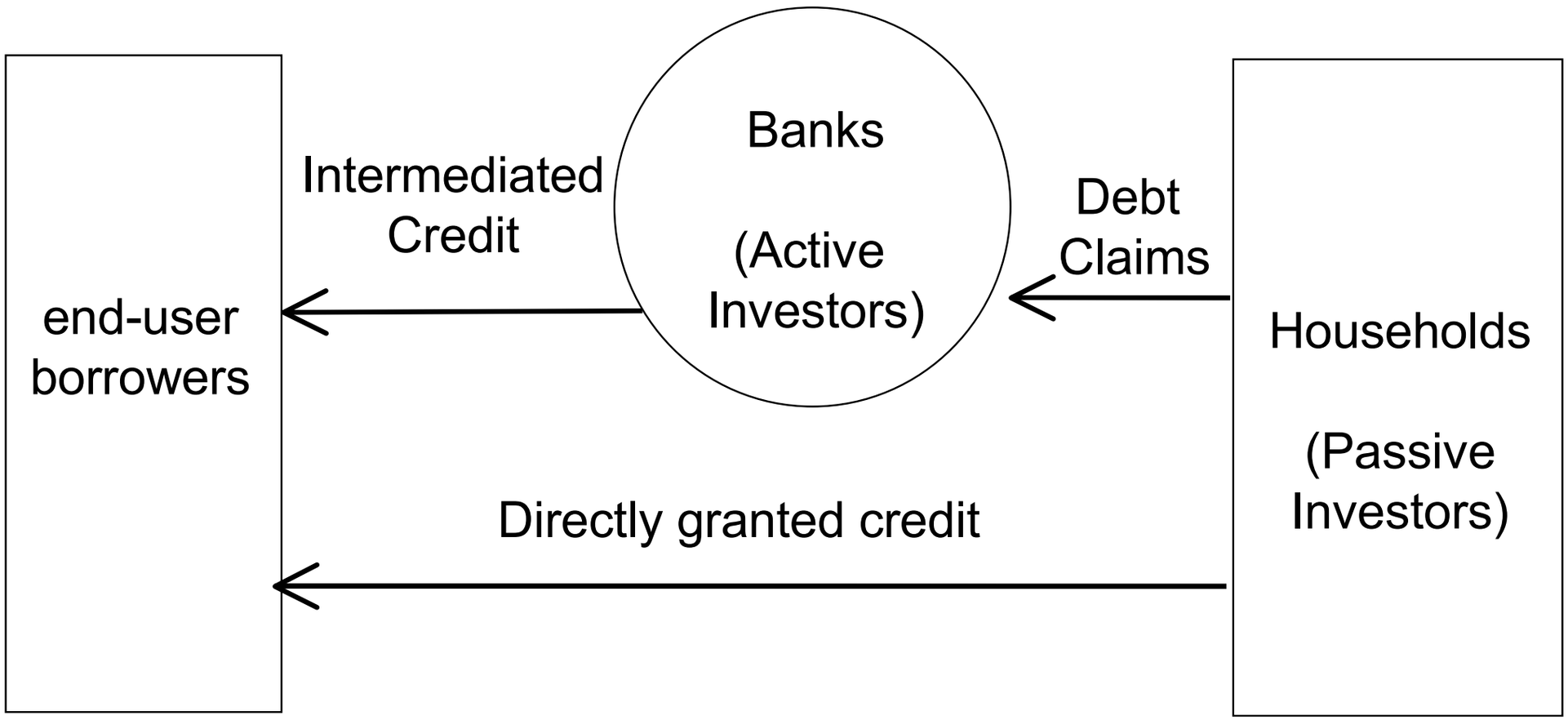
Questions to be answered:

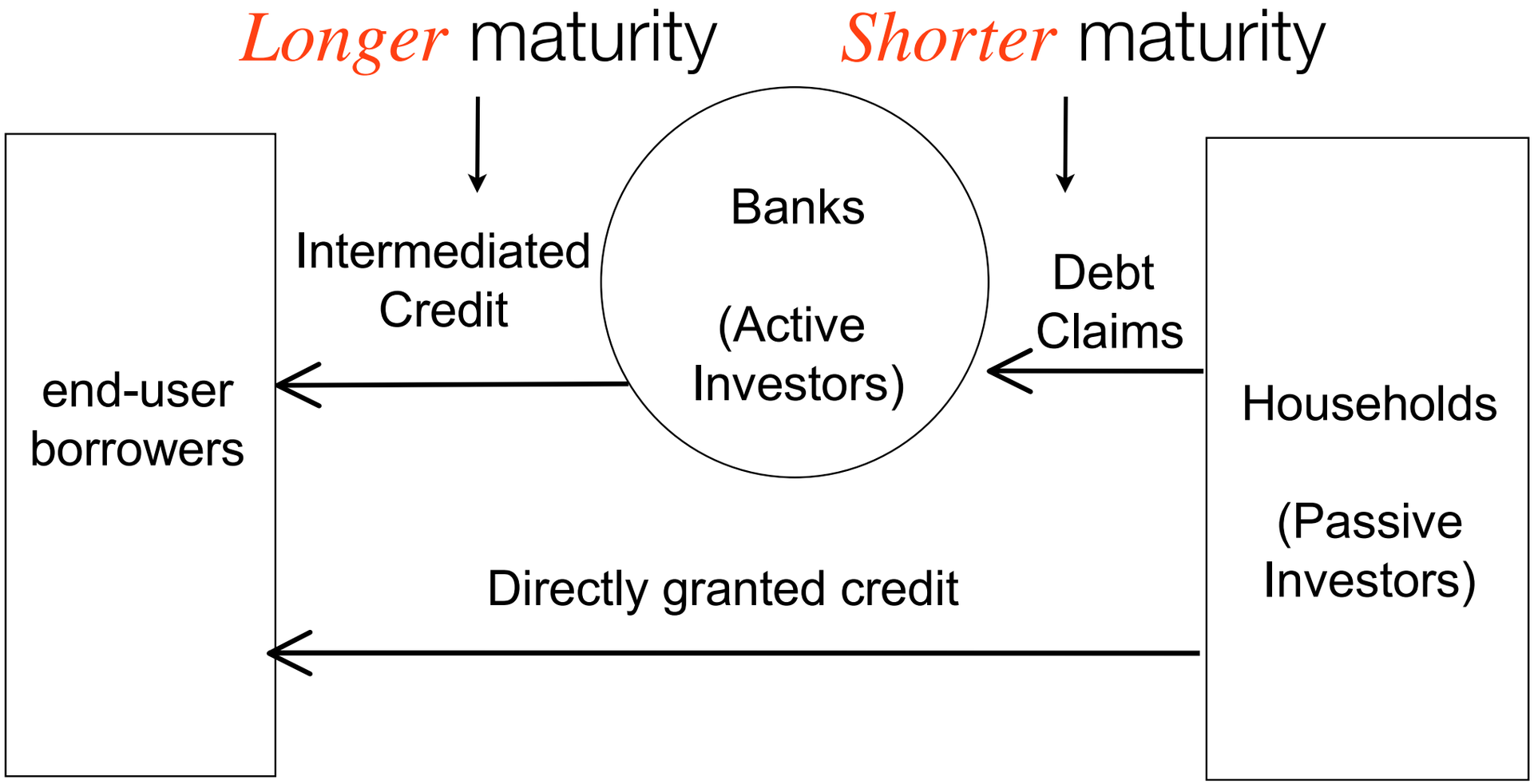
1. What are the channels through which
financial intermediaries influence the real economy (if at all)
2. What implications for monetary policy?

Focus is on the financial intermediary sector itself
rather than borrowers' agency problem ("financial friction").

Sketch of Ideas



Sketch of Ideas (Ctd.)



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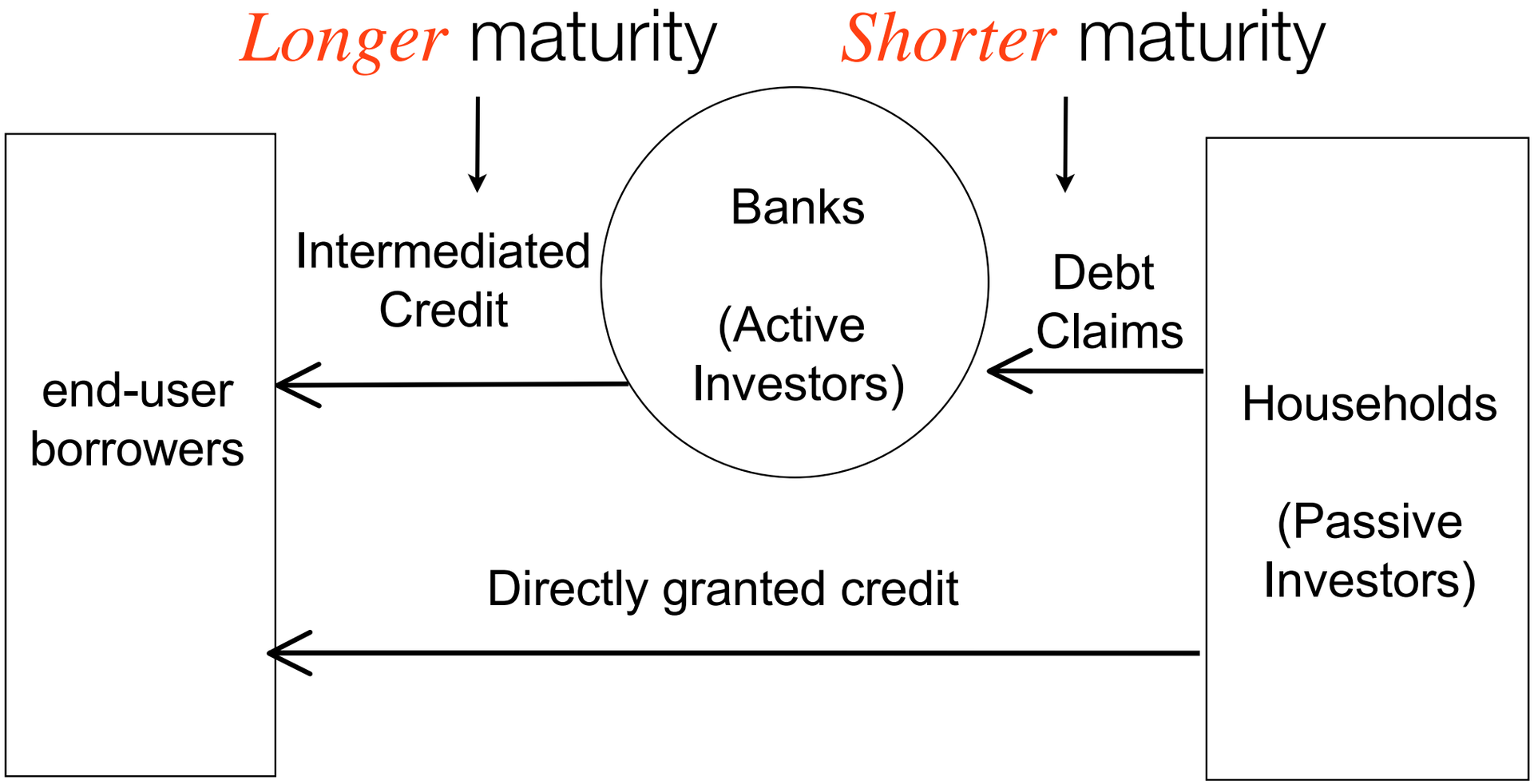
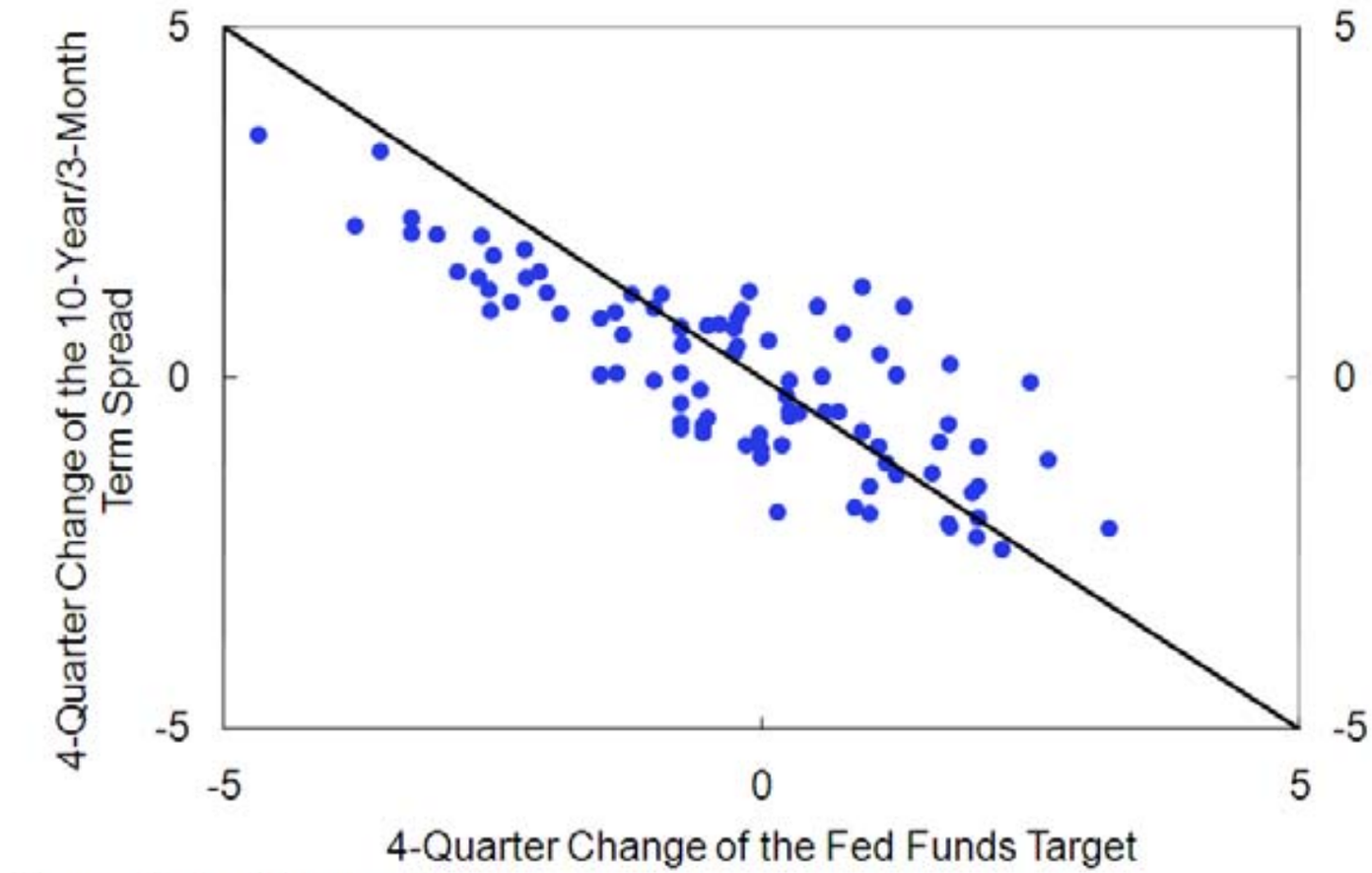


The yield curve affects

the risk-taking capacity of the financial intermediary sector

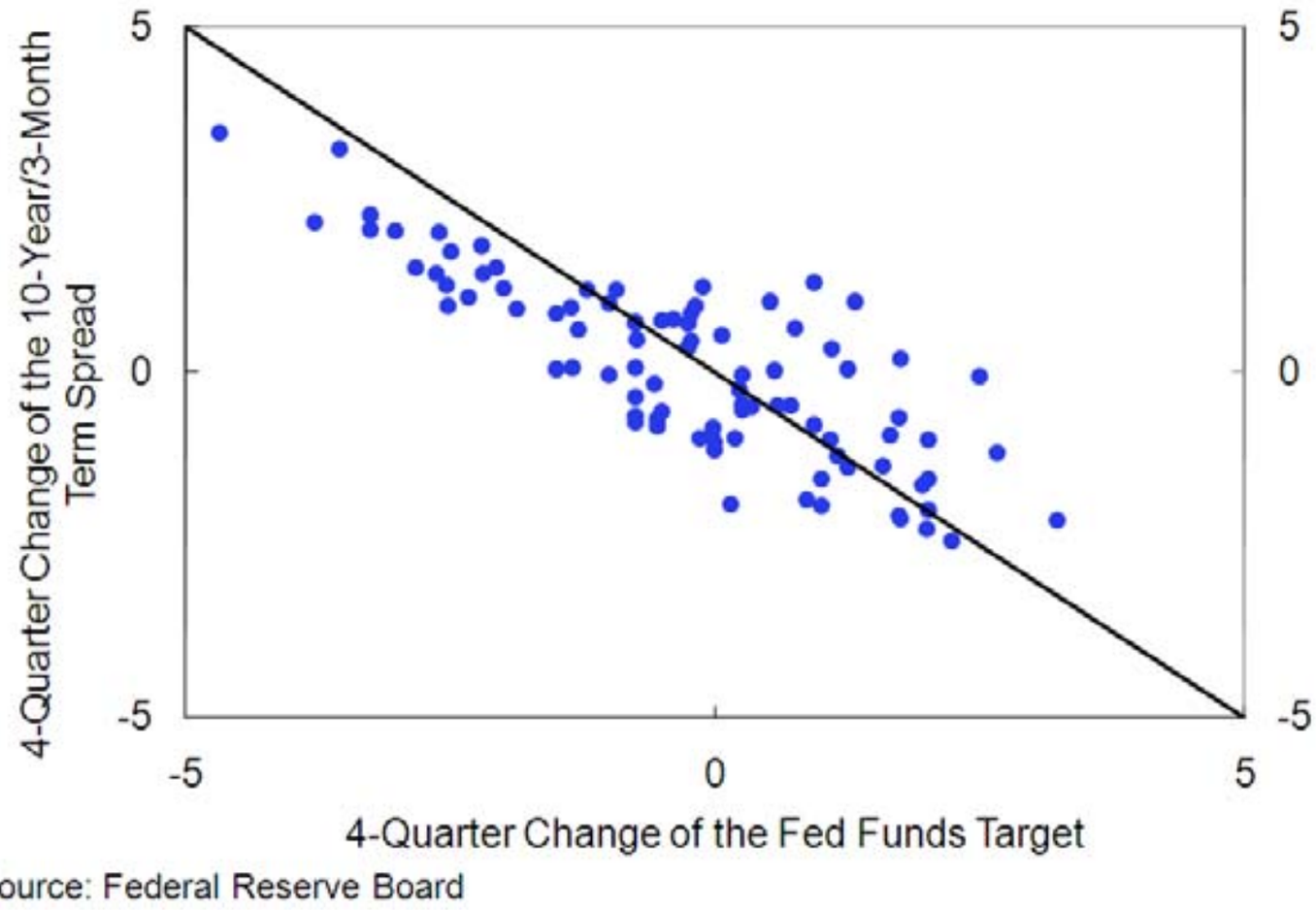
Sketch of Ideas (Ctd.)



Source: Federal Reserve Board

Annually from 1987Q1 to 2008Q3

Sketch of Ideas (Ctd.)



A near perfect negative 1-to-1 relationship...

Thus, shifts in the Fed Funds rate translate into the slope of the yield curve.

Sketch of Ideas (Ctd.)

The Fed Funds rate

↓

The yield curve (term spreads)

Sketch of Ideas (Ctd.)

The Fed Funds rate

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The yield curve (term spreads)

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The risk-taking capacity of the financial intermediary sector

Sketch of Ideas (Ctd.)

The Fed Funds rate

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The yield curve (term spreads)

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The risk-taking capacity of the financial intermediary sector

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The size of lending and risk premium

↓

GDP growth

Results

The Fed Funds rate

↓

1. Build a model of a part of the entire mechanism below.

The yield curve (term spreads)

↓

The risk-taking capacity of the financial intermediary sector

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GDP growth

Results

1. Build a model of a part of the entire mechanism.

2. Provides empirical results that jointly suggest

2-a. The entire mechanism works in reality

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2. Provides empirical results that jointly suggest

2-a. The entire mechanism works in reality

2-b. Commercial banks and
market-based financial intermediaries
(shadow banks and broker-dealers)
have different roles in the mechanism.

Literature

Focus on borrower's BS	Focus on lender's BS

Literature

Focus on borrower's BS	Focus on lender's BS
Bernanke-Gertler (89)	Bernanke-Blinder (88)
Kiyotaki-Moore (97, 05)	Bernanke-Blinder (92)
Holmstrom-Tirole (97)	
Brunnermeier-Sannikov (10)	Adrian, Shin, and others
Gertler-Kiyotaki (10)	

Literature

	Focus on lender's BS
	Bernanke-Blinder (88)
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Literature

	Bernanke-Blinder	Adrian-Shin
Focus on	Commercial banks	Shadow banks Broker-dealers
Drived by	Binding nature of the reserve constraint	Binding nature of VaR constraint

Literature

Focus on borrower's BS	
Bernanke-Gertler (89)	
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Literature

Focus on borrower's BS

Bernanke-Gertler (89)

Kiyotaki-Moore (97, 05)

introduce an agency problem

b/w non-financial borrowers & financial intermediaries

into business cycle analysis.

Literature

Focus on borrower's BS

Holmstrom-Tirole (97)

pay attention to the role of financial intermediary sector

as a borrower.

Literature

Focus on borrower's BS

Brunnermeier-Sannikov (10) provide a dynamic model with

Two types of constraint:

Capital ratio requirement and VaR constraint

Two types of equity: With and w/o control right

Literature

Focus on borrower's BS

Gertler-Kiyotaki (10) overview this literature

Roadmap

Model (Section 2.1 in the paper)

Empirical Hypotheses (Sections 2.2 and 2.3)

Empirical Results (Sections 4 and 6.0)

Skipped:

1. Changing Nature of Financial Intermediaries (in the US) (Section 3)
2. Central Banks as Lender of Last Resort and

Non-traditional Monetary Policy (Section 5)

Model

The Fed Funds rate

↓

The yield curve (term spreads)

↓

The risk-taking capacity of the financial intermediary sector

↓ Model's (only) focus

The size of lending and risk premium

↓

GDP growth

Model (Ctd.)

We begin (and end) with a static partial equilibrium model

Assumption 1: No default. The debt is risk-free.

Assumption 2: No lending & borrowing
(b/w financial intermediaries)

Model (Ctd.)

We begin (and end) with a static partial equilibrium model

Assumption 1: No default. The debt is risk-free.

Assumption 2: No lending & borrowing
(b/w financial intermediaries)

We will show that

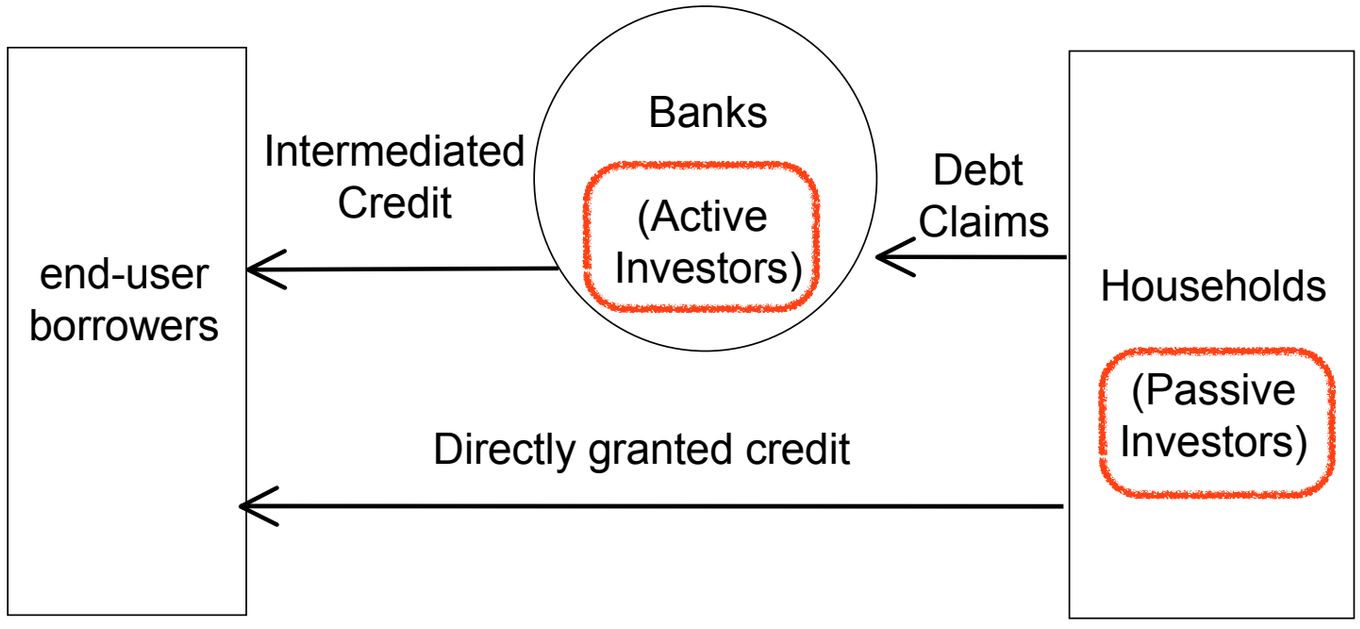
aggregate capital and size of the financial intermediaries
stands in 1-to-1 negative relationship with risk premium

Model: Investors

2 types of investors:

1. Active and leveraged (e.g. Banks, securities firms)
2. Passive and non-leveraged

(e.g. Households, pension funds)



Model: Assets

2 types of assets:

1. Risk-free “cash” with net interest rate of i
2. Risky “security” whose price is p and

whose payoff is a r.v. $w \sim U[q-z, q+z]$ $(q>z)$

Model: The Problem of Investors

Given endowed equity e,

an investor decides how many units of the securities to buy.

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Given endowed equity e,

an investor decides how many units of the securities to buy.

If she buys y units,

the payoff of her portfolio is represented by a r.v. W:

$$W \equiv \tilde{w}y + (1+i)(e - py) \tag{2.1}$$

$$= \underbrace{(\tilde{w} - (1+i)\,p)y}_{\text{risky excess return}} + \underbrace{(1+i)\,e}_{\text{risk-free ROE}} \tag{2.2}$$

Model: The Problem of Passive Investors

Objective function: $U = E(W) - \frac{1}{2\tau}\sigma_W^2$

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FOC: $(q - (1+i)p) - \frac{1}{3\tau}yz^2 = 0$

Demand: $$y_P = \begin{cases} \frac{3\tau}{z^2}(q-(1+i)p) & \text{if } q > p(1+i) \\ 0 & \text{otherwise} \end{cases} \quad (2.5)$$

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Let τ_i be the risk tolerance of the ith investor and $\tau = \sum_i \tau_i$

Then (2.5) gives the aggregate demand of

the Passive investor sector as a whole.

Model: The Problem of Active Investors

Problem: $\max_{y} E(W) \quad \text{subject to } \mathrm{VaR} \leq e$

Demand: $$y = \frac{e}{p(1+i) - (q-z)} \tag{2.8}$$

Model: The Problem of Active Investors

Problem: $\max_{y} E(W) \quad \text{subject to } \mathrm{VaR} \leq e$

Demand: $$y = \frac{e}{p(1+i) - (q-z)} \tag{2.8}$$

As in the case of Passive investor,

(2.8) gives the aggregate demand of

the Active investor sector as a whole.

Model: Equilibrium

Market clearing condition: $y + y_P = S$

(S: Total endowment of the security)

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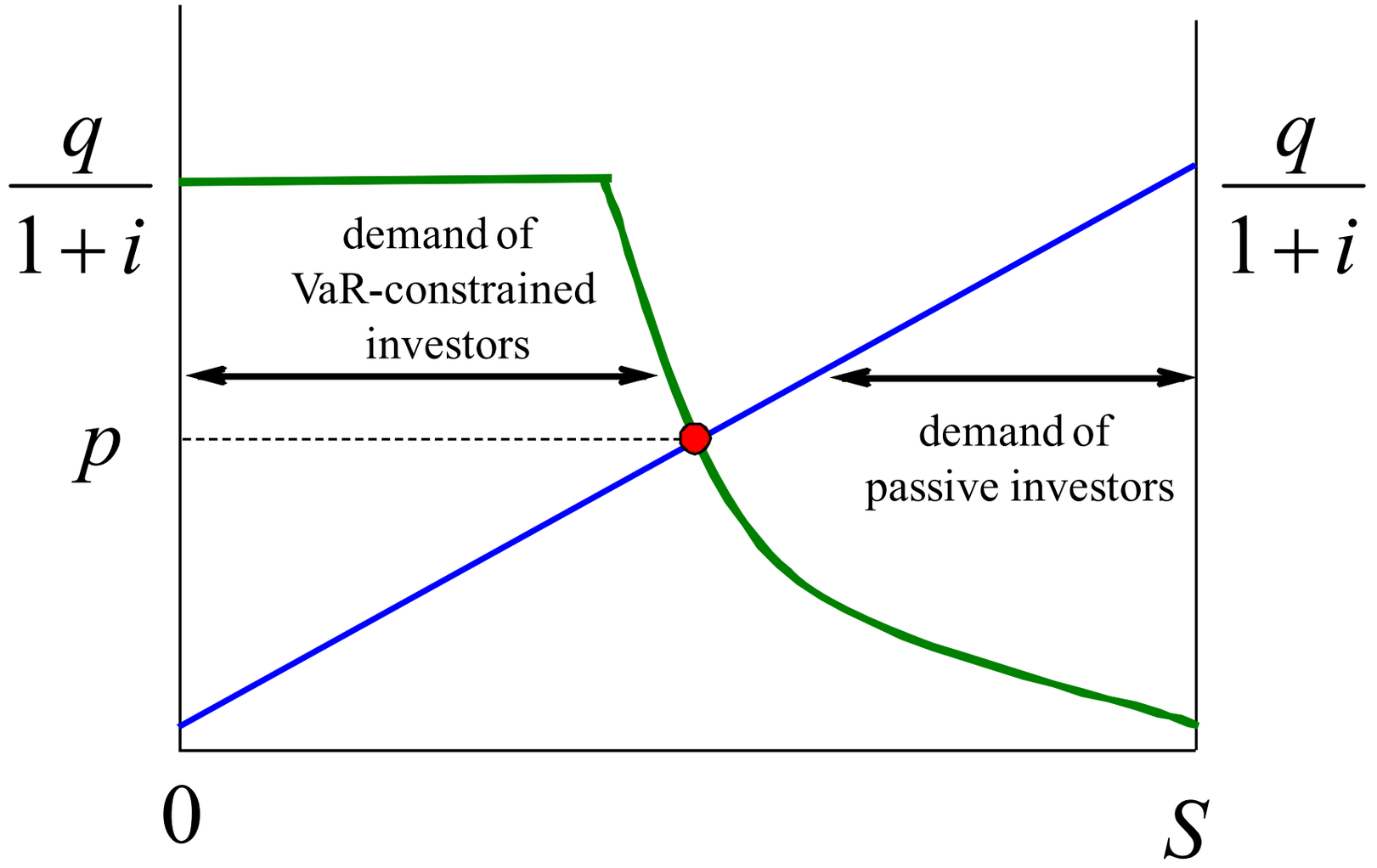
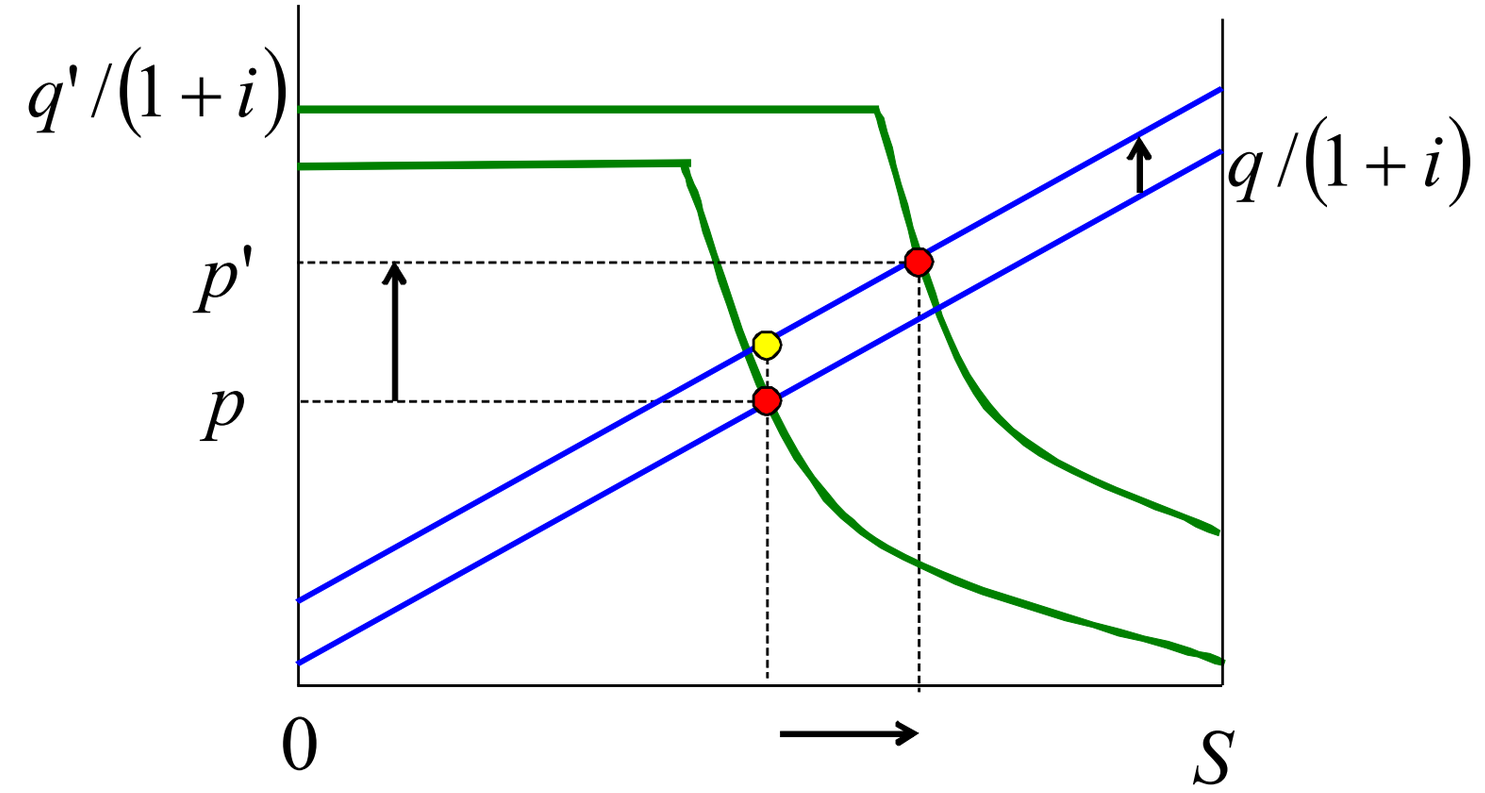


Model: A Comparative Static

Suppose the expected payoff of the security rise from q to $q'(>q)$.



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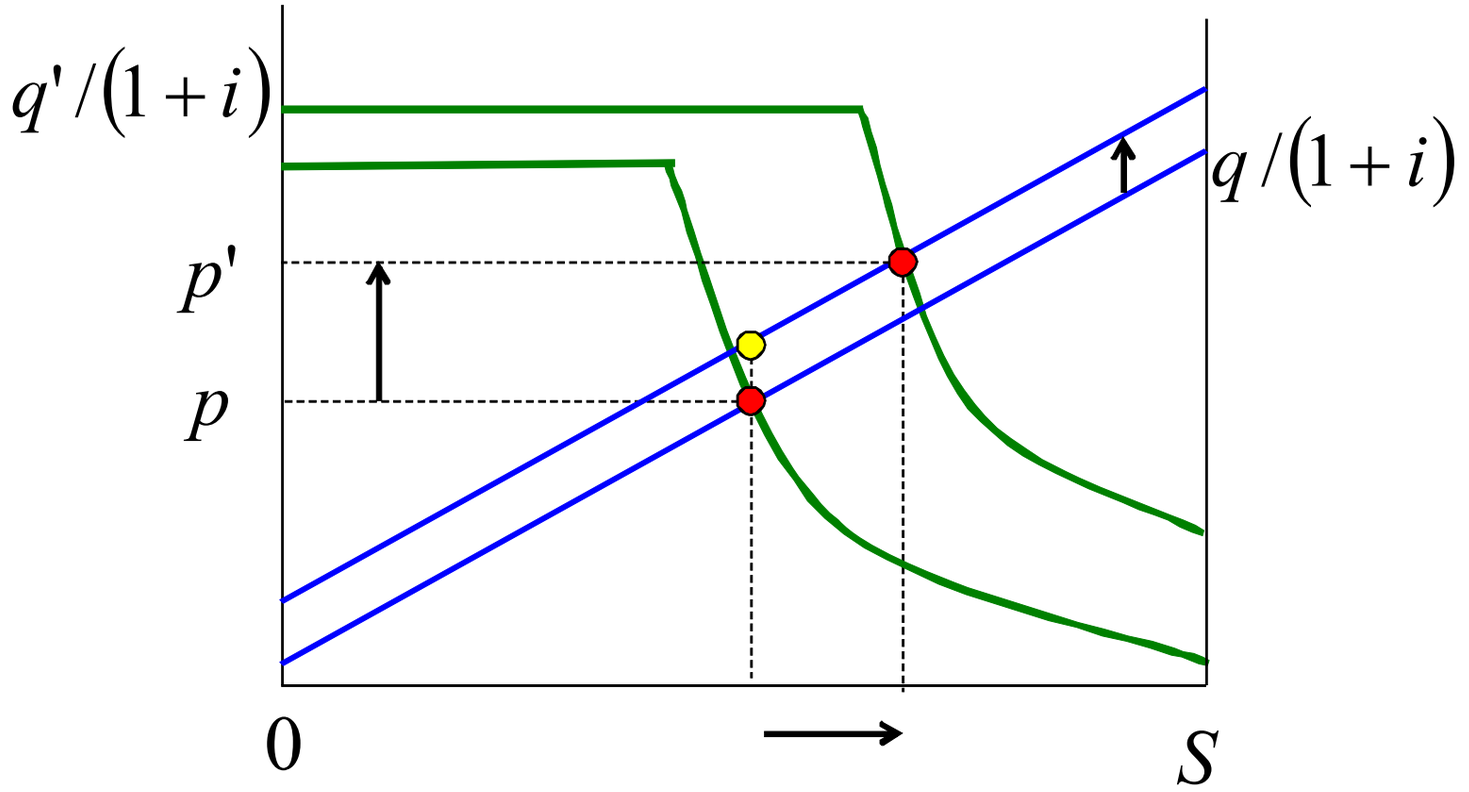
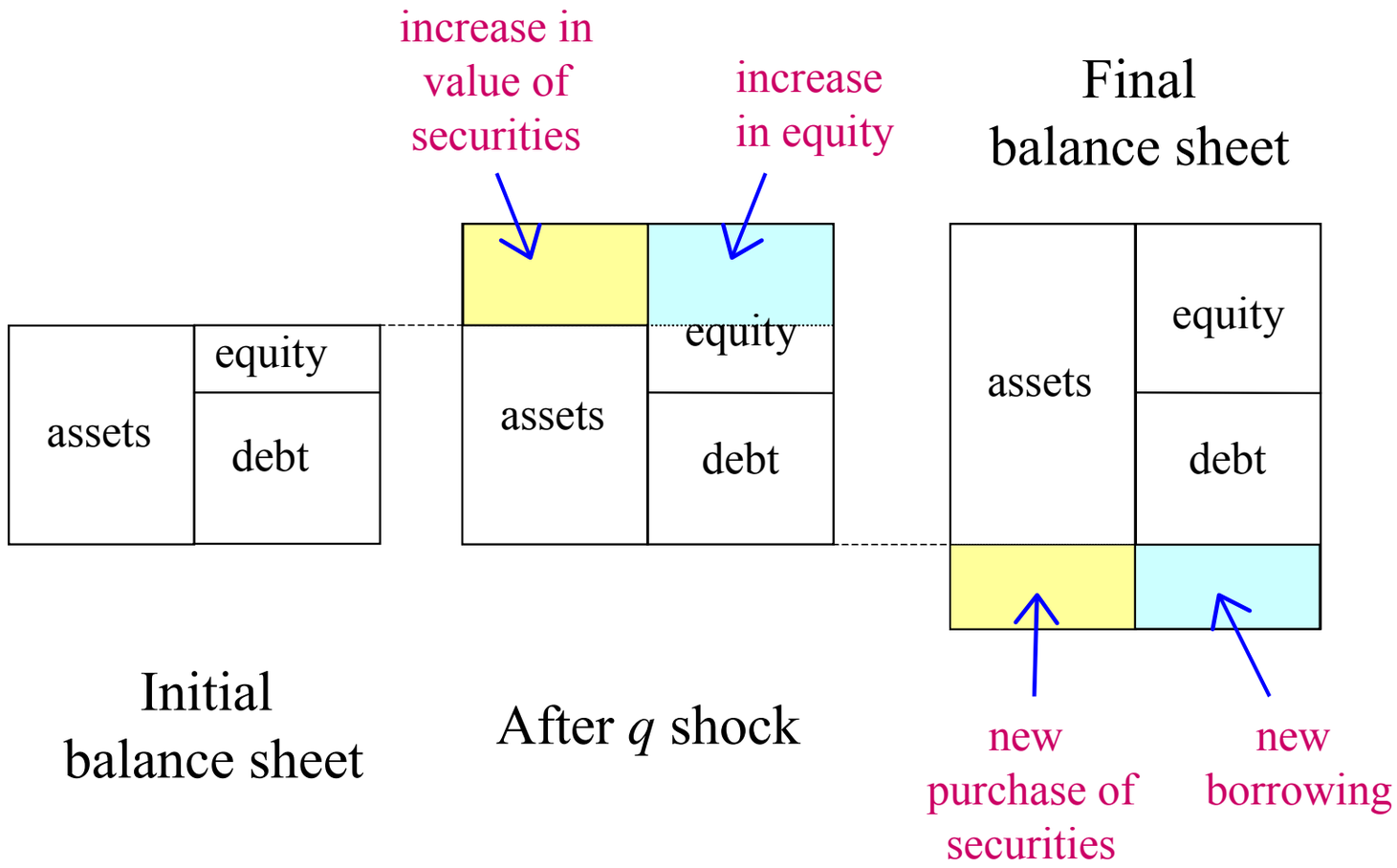


The direction of the change is important

Model: A Comparative Static (Ctd.)



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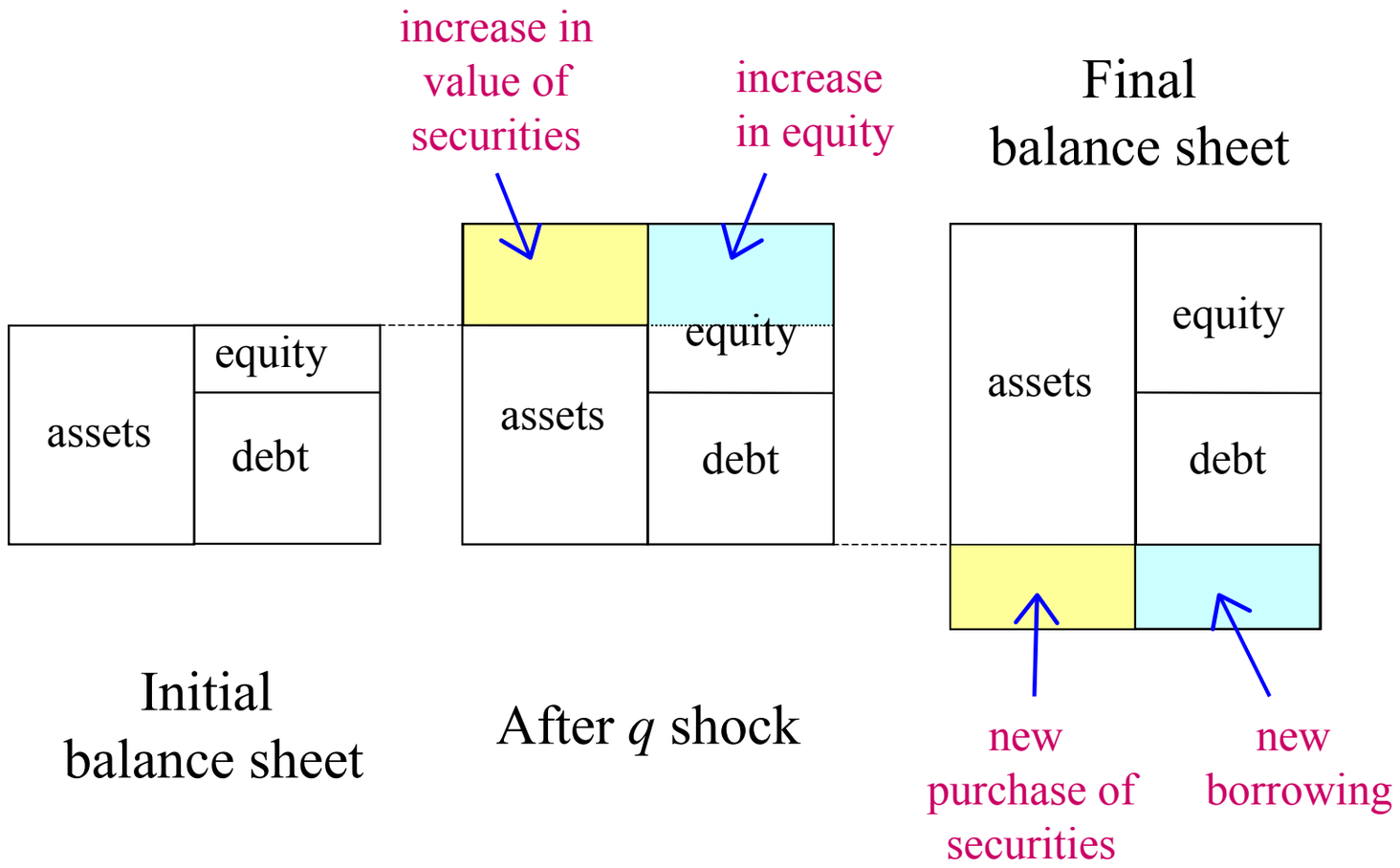
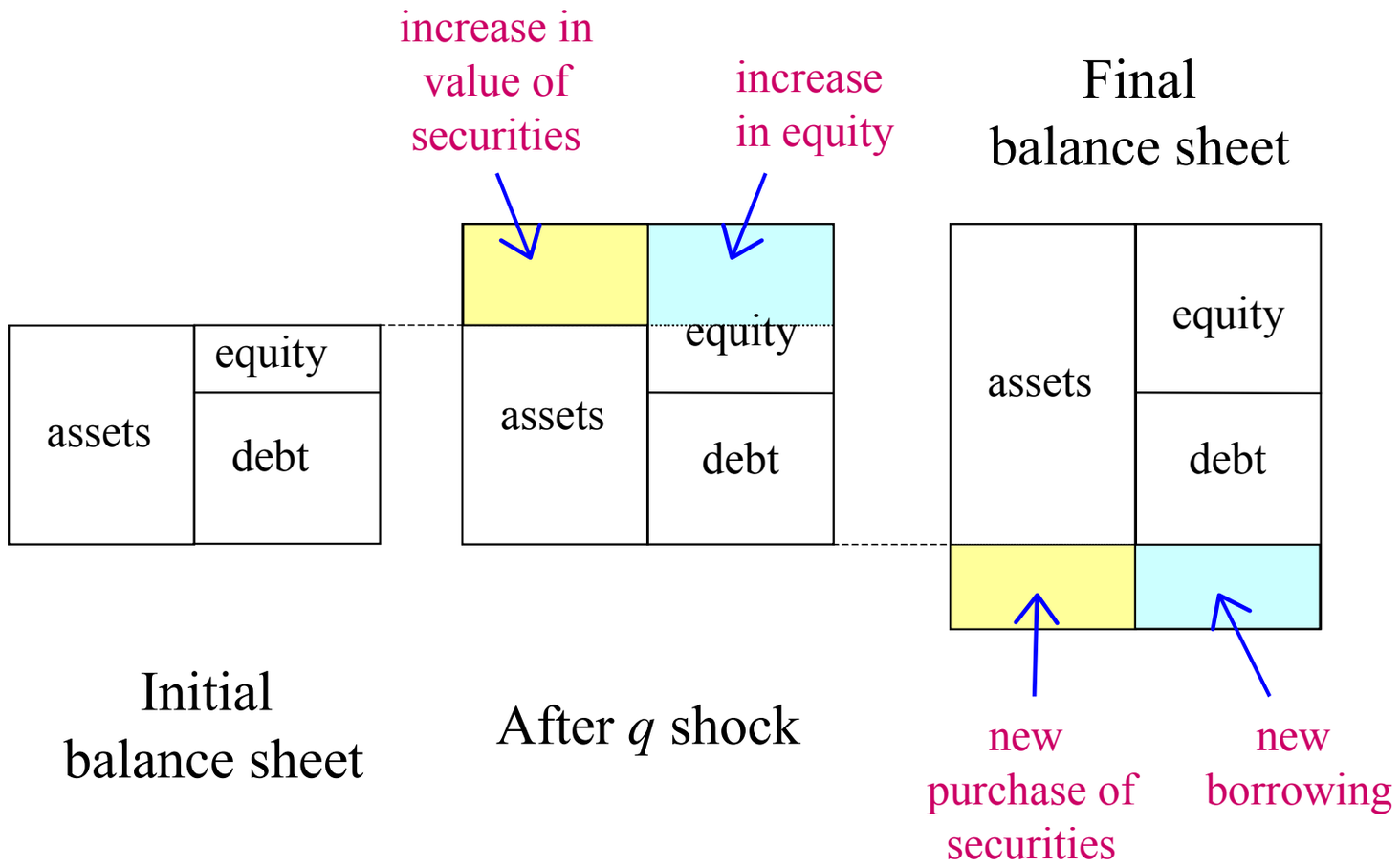


$$e' = \left(p'\left(1+i\right) - \left(q - z\right)\right) y$$

Model: A Comparative Static (Ctd.)



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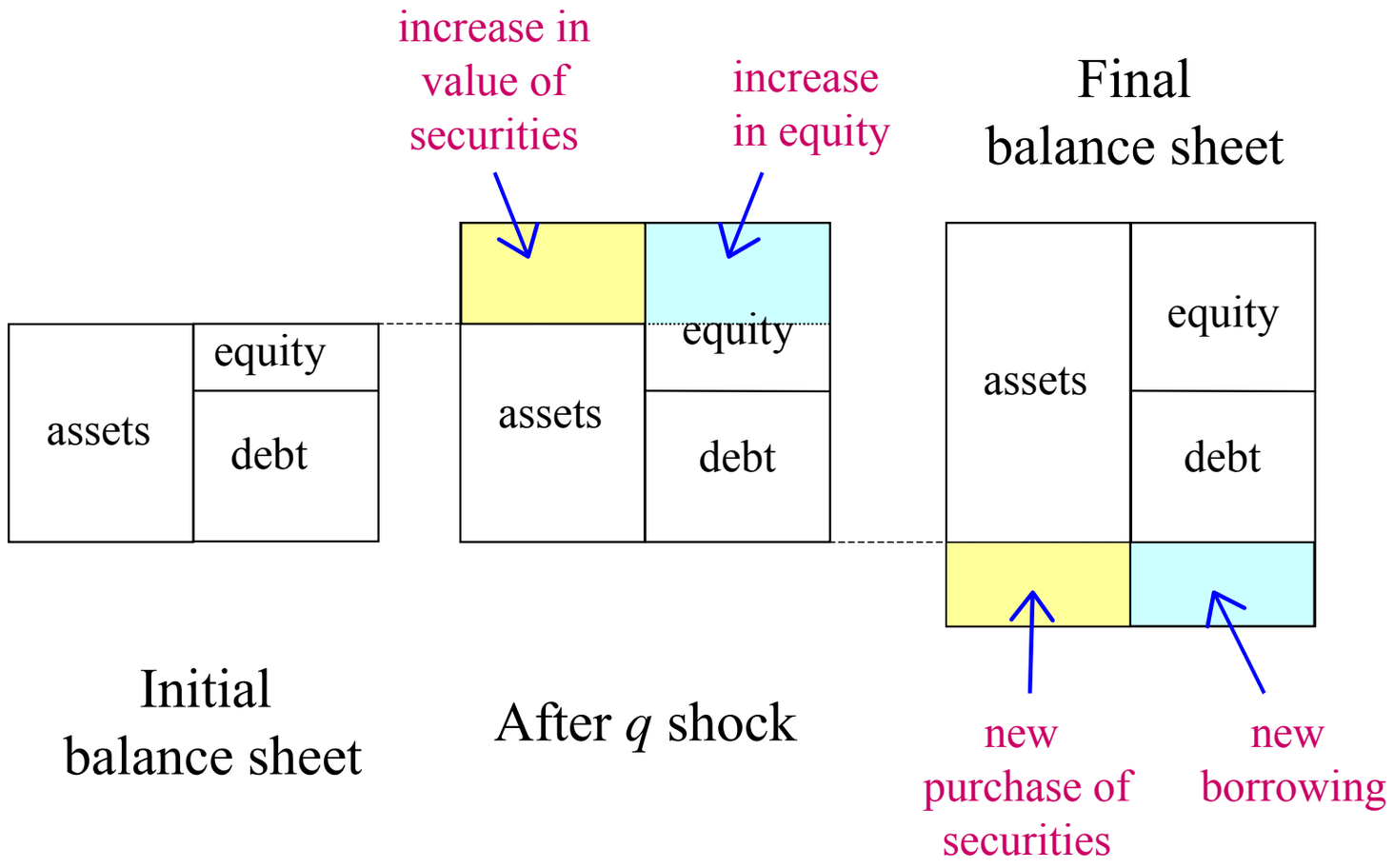

$$e' = (p'(1+i) - (q-z))\, y$$

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$$y' = y\left(1 + \frac{q'-q}{p'(1+i) - q' + z}\right)$$

Model: A Comparative Static (Ctd.)

The equilibrium price of the security is higher than its worst possible discounted payoff and thus $p'(1+i)-q'+z>0$

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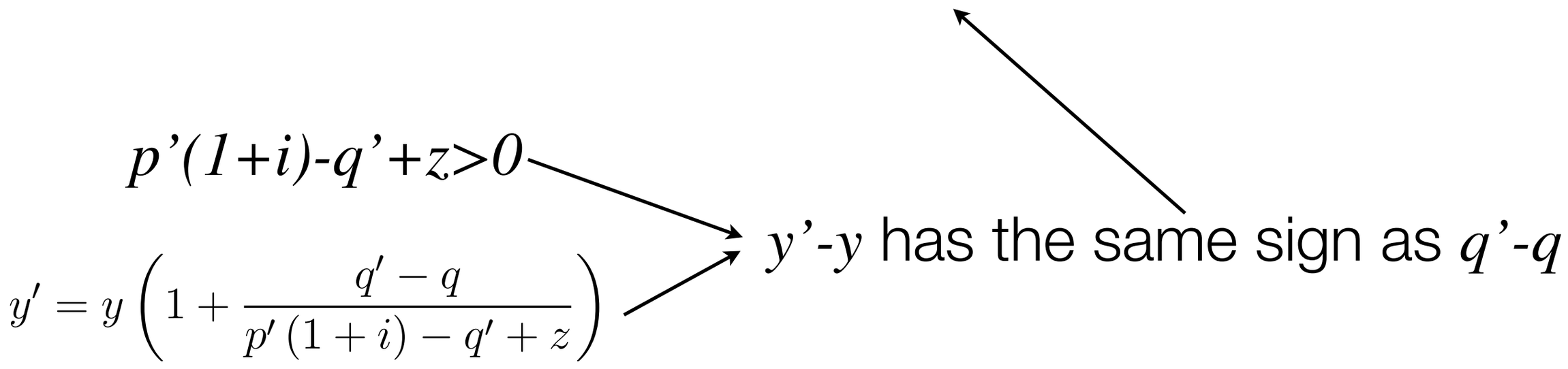
y'-y has the same sign as q'-q

Model: A Comparative Static (Ctd.)

1. The active investors sector amplifies booms and busts



Model: A Comparative Static (Ctd.)

1. The active investors sector amplifies booms and busts

2. The volatility $z\downarrow \rightarrow$The size of amplification$\uparrow$

p'(1+i)-q'+z>0

$$y' = y\left(1 + \frac{q' - q}{p'(1+i) - q' + z}\right)$$

y'-y has the same sign as *q'-q*

Model: A Comparative Static (Ctd.)

1. The active investors sector amplifies booms and busts

2. The volatility $z\downarrow \rightarrow$The size of amplification$\uparrow$

3. Risk tolerance $\tau\uparrow \rightarrow$The size of amplification$\uparrow$

$p'(1+i)-q'+z>0$

$$y' = y\left(1 + \frac{q' - q}{p'(1+i) - q' + z}\right)$$

y'-y has the same sign as q'-q

Model: A Comparative Static (Ctd.)

1. The active investors sector amplifies booms and busts

2. The volatility $z\downarrow \rightarrow$The size of amplification$\uparrow$

3. Risk tolerance $\tau\uparrow \rightarrow$The size of amplification$\uparrow$

4. The size of Active investor sector y

$\rightarrow$The size of amplification$\uparrow$

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Roadmap

Model

Empirical Hypotheses

Empirical Results

Empirical Hypotheses

$$\text{Risk premium } = \frac{q}{p\,(i+1)} - 1$$

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Hypothesis 1:

The equity of the financial intermediary sector $e\uparrow$

$\rightarrow$Risk premium $\downarrow$

Proof: q and i are exogenous and $e\uparrow \rightarrow p\uparrow$

Empirical Hypotheses

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$$\text{Risk premium} = \frac{q}{p\,(i+1)} - 1$$

Hypothesis 2:

The size of the financial intermediary sector $y\uparrow$

$\rightarrow$Risk premium $\downarrow$

Proof: q and i are exogenous and $y\uparrow \rightarrow p\uparrow$

Roadmap

Model

Empirical Hypotheses

Empirical Results

The Macro Risk Premium & GDP Growth

The Fed Funds rate

↓

The yield curve (term spreads)

↓

The risk-taking capacity of the financial intermediary sector

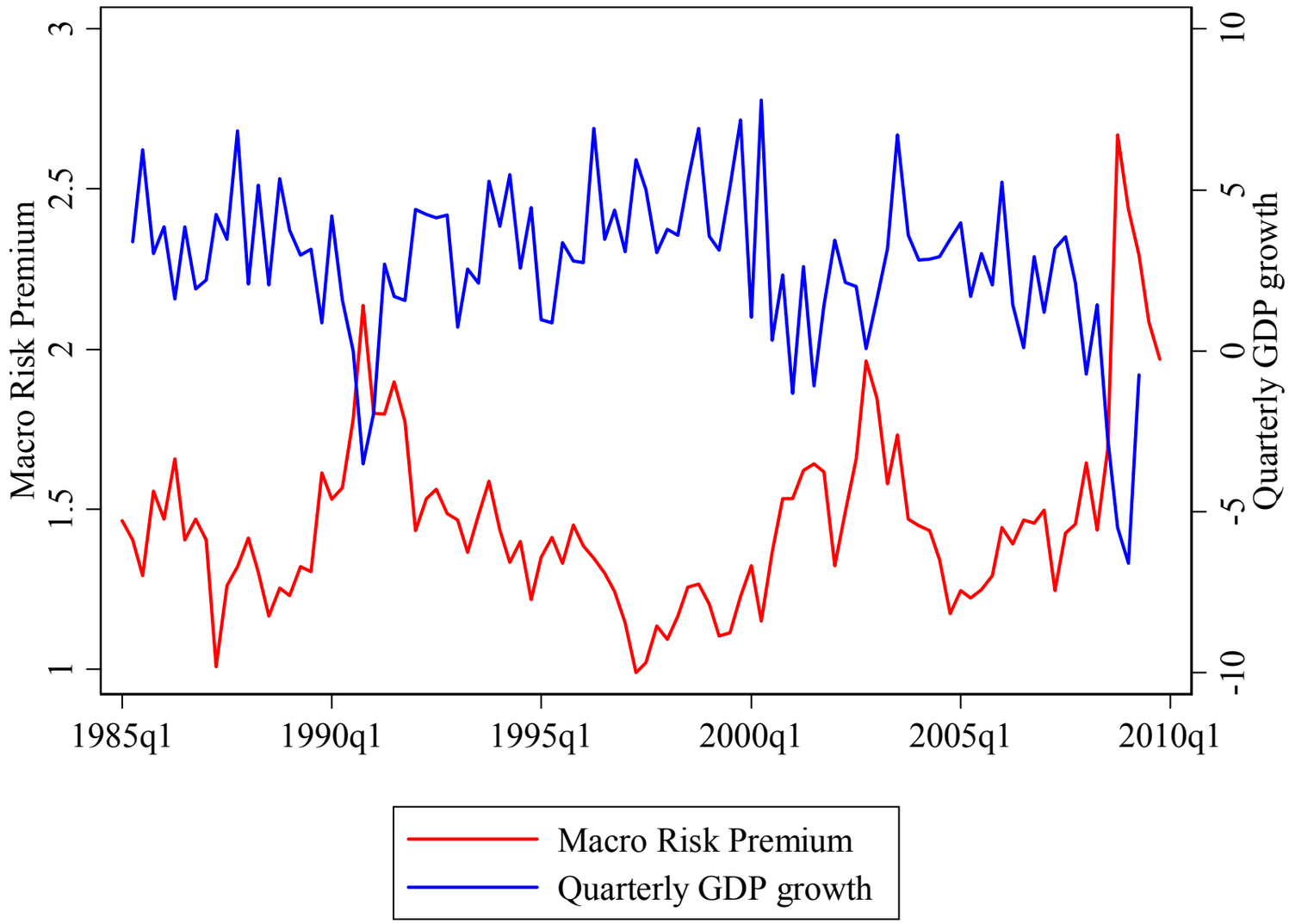
↓

The size of lending and risk premium

↓

GDP growth

The Macro Risk Premium & GDP Growth (Ctd.)



The strong negative relationship
b/w the macro risk premium & GDP growth

Macro Risk Premium & GDP Growth (Ctd.)

The macro risk premium is estimated as
a linear combination of Treasury and corporate bond spreads
that best predict GDP growth:

Macro Risk Premium & GDP Growth (Ctd.)

The macro risk premium is estimated as
a linear combination of Treasury and corporate bond spreads
that best predict GDP growth:

1. The 7 constant maturity yields
published in the H.15 release of the FRB

2. Corporate bond spreads of credit rating
AAA, AA, A, BBB, BB, & B from S&P
in excess of the 10-year constant maturity Treasury yield.

The Macro RP & Risk Appetite

The Fed Funds rate

↓

The yield curve (term spreads)

↓

The risk-taking capacity of the financial intermediary sector

↓

Risk premium and the size of lending

↓

GDP growth

The Macro RP & Risk Appetite (Ctd.)

"Risk appetite"

||

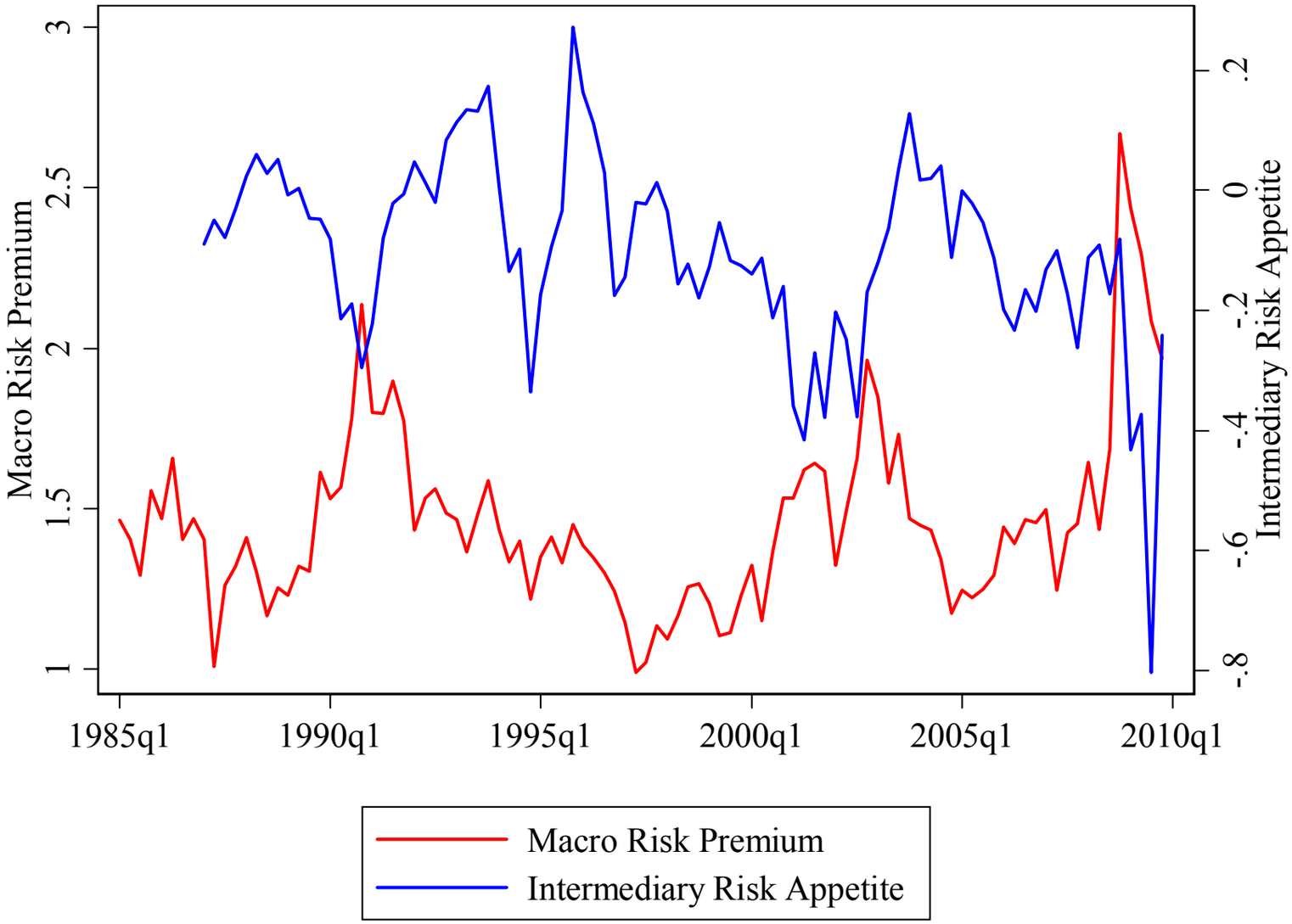
The looseness of BS constraints

||

The shadow value of capital

of leveraged active investors sector in the model

The Macro RP & Risk Appetite (Ctd.)



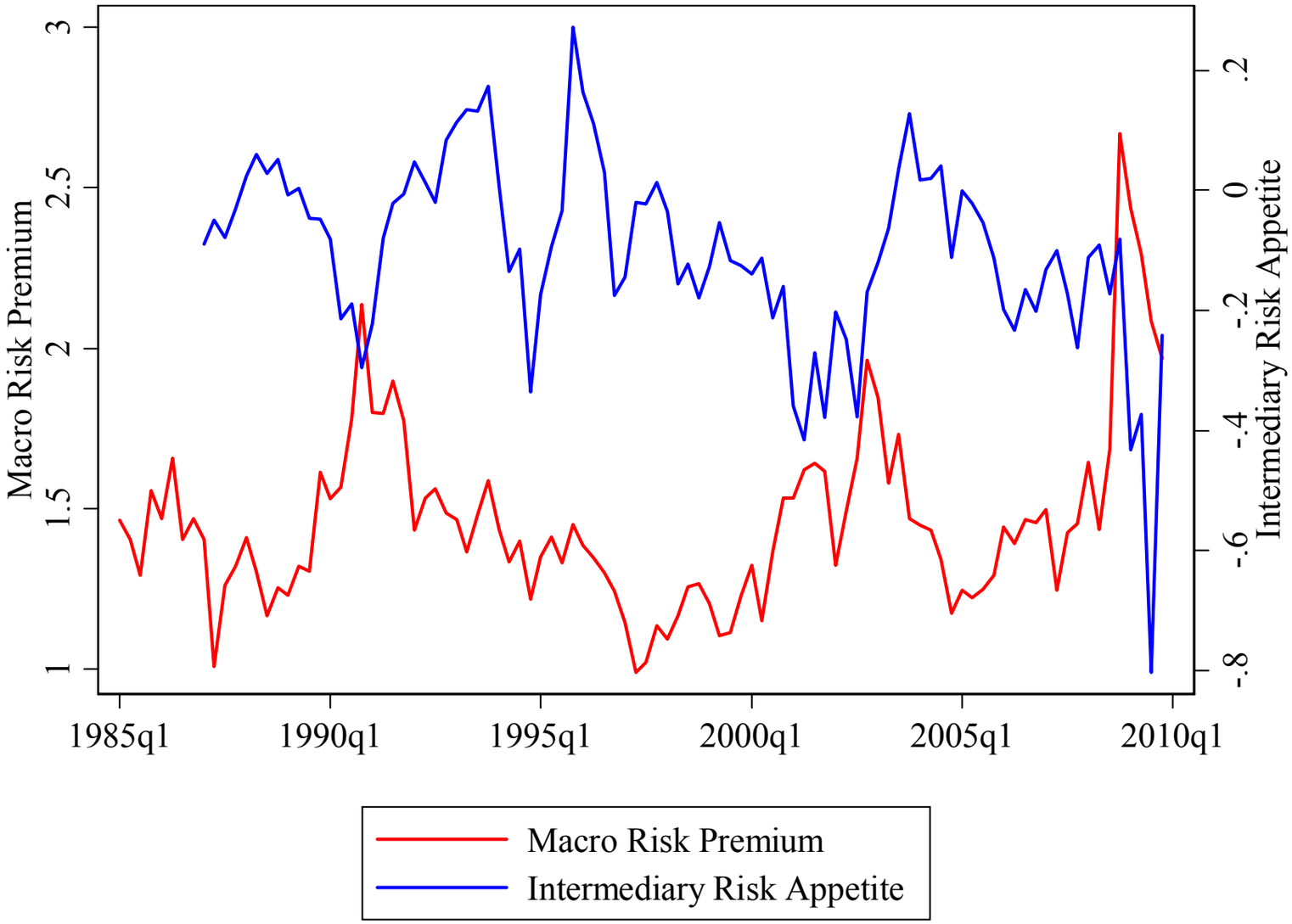
The strong negative relationship

b/w the macro risk premium & risk appetite

The Macro RP & Risk Appetite (Ctd.)

As is similar in the previous analysis,
a measure of risk appetite is estimated as
a linear combination of 1-year lagged BS variables
of the broker-dealers, the shadow & commercial banks
that best predict 1-year change of the macro risk premium.

The Macro RP & Risk Appetite (Ctd.)



The strong negative relationship

b/w the macro risk premium & risk appetite

The Macro RP & Risk Appetite (Ctd.)

Hypotheses 1 and 2

(The equity or size of the financial intermediary sector↑

→Risk premium ↓)

↑ ?

The strong negative relationship

b/w the macro risk premium & risk appetite

GDP & BSs

The Fed Funds rate

↓

The yield curve (term spreads)

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The risk-taking capacity of the financial intermediary sector

↓

~~Risk premium and the size of lending~~

↓

GDP growth

GDP & BSs (Ctd.)

Add lags of additional financial variables

(equity market volatility, term and credit spreads)

→Offset BS movements due to a price effect

GDP & BSs (Ctd.)

Add lags of additional financial variables
(equity market volatility, term and credit spreads)
→Offset BS movements due to a price effect

Add lags of macroeconomic variables
→Control for BS movements
due to past macroeconomic condition

GDP & BSs (Ctd.)

	(1) Quarterly GDP Growth	(2) Quarterly GDP Growth	(3) Quarterly GDP Growth
Broker-Dealer Asset Growth (lag)	0.03*		
Broker-Dealer Equity Growth (lag)	0.18		
Shadow Banks Asset Growth (lag)		0.21***	
Shadow Banks Equity Growth (lag)		0.71**	
Commercial Bank Asset Growth (lag)			0.02
Commercial Bank Equity Growth (lag)			-0.12
GDP Growth (lag)	0.03	-0.18	0.09
PCE Inflation (lag)	-1.01**	-1.00**	-1.16***
VIX (lag)	0.01	-0.03	-0.02
Credit Spread (lag)	-1.37*	-1.81**	-1.01
Term spread (lag)	0.75**	1.18***	0.75*
Fed Funds (lag)	0.40	0.19	0.49*
Constant	4.67***	4.94***	4.44**
Observations	93	93	93
R^2	0.288	0.409	0.263

Quarterly from 1986Q1 to 2009Q2

GDP & BSs (Ctd.)

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GDP Growth (lag)	0.03
PCE Inflation (lag)	-1.01**
VIX (lag)	0.01
Credit Spread (lag)	-1.37*
Term spread (lag)	0.75**
Fed Funds (lag)	0.40
Constant	4.67***
Observations	93
R^2	0.288

Broker-dealer asset growth has *weak* significance for GDP growth.

GDP & BSs (Ctd.)

	(2) Quarterly GDP Growth
Broker-Dealer Asset Growth (lag)	
Broker-Dealer Equity Growth (lag)	
Shadow Banks Asset Growth (lag)	0.21***
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Commercial Bank Asset Growth (lag)	
Commercial Bank Equity Growth (lag)	
GDP Growth (lag)	-0.18
PCE Inflation (lag)	-1.00**
VIX (lag)	-0.03
Credit Spread (lag)	-1.81**
Term spread (lag)	1.18***
Fed Funds (lag)	0.19
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Shadow bank asset growth has *strong* significance for GDP growth.

GDP & BSs (Ctd.)

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Commercial bank asset growth has *no* significance for GDP growth.

GDP & BSs (Ctd.)

Our interpretation

||

Commercial bank BSs are less informative since they did not mark their BSs to market over the time span in our regressions

BSs & The Fed Funds Rate

The Fed Funds rate

↓

~~The yield curve (term spreads)~~

↓

The risk-taking capacity of the financial intermediary sector

↓

Risk premium and the size of lending

↓

GDP growth

BSs & The Fed Funds Rate (Ctd.)

Broker-dealers | Shadow banks | Commercial banks

from robust standard errors.

	(1) Repo (weekly growth)	(2) Repo+CP Growth (weekly growth)	(3) M2 Growth (weekly growth)
Fed Funds (1 week change)	-0.630***	-0.355***	-0.054***
Equity Return (1 week)	-0.022*	-0.013*	0.001**
VIX (1 week change)	-0.052	-0.027	0.001
Treasury spread (1 week change)	0.703	0.291	0.151**
Credit spread (1 week change)	0.311	0.031	0.337**
Repo Growth (1 week lag)	-0.134***	-0.075***	-0.001
CP Growth (1 week lag)	0.022	0.028	-0.020
M2 Growth (1 week lag)	0.515	0.063	-0.016
Constant	0.136*	0.105**	0.050***
Observations	990	990	989
R^2	0.042	0.032	0.121

Weekly from October 1990 to February 2010

BSs & The Fed Funds Rate (Ctd.)

Broker-dealers Shadow banks Commercial banks

from robust standard errors.

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M2 Growth (1 week lag)	0.515	0.063	-0.016
Constant	0.136*	0.105**	0.050***
Observations	990	990	989
R^2	0.042	0.032	0.121

The Fed Funds rate ↓ →All types of short-term liability growth ↑

BSs & The Fed Funds Rate (Ctd.)

Broker-dealers | Shadow banks | Commercial banks

Robust standard errors:

	(1) Repo (weekly growth)	(2) Repo+CP Growth (weekly growth)	(3) M2 Growth (weekly growth)
Fed Funds (1 week change)	-0.630***	-0.355***	-0.054***
Equity Return (1 week)	-0.022*	-0.013*	0.001**
VIX (1 week change)	-0.052	-0.027	0.001
Treasury spread (1 week change)	0.703	0.291	0.151**
Credit spread (1 week change)	0.311	0.031	0.337**
Repo Growth (1 week lag)	-0.134***	-0.075***	-0.001
CP Growth (1 week lag)	0.022	0.028	-0.020
M2 Growth (1 week lag)	0.515	0.063	-0.016
Constant	0.136*	0.105**	0.050***
Observations	990	990	989
R^2	0.042	0.032	0.121

Volatility (VIX)↑→Repo and Repo+CP growth↓

BSs & The Fed Funds Rate (Ctd.)

Broker-dealers | Shadow banks | Commercial banks

Robust standard errors:

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Volatility (VIX)↑→M2 growth↑ (Flight to quality?)

BSs & The Fed Funds Rate (Ctd.)

from robust standard errors:

	Broker-dealers	Shadow banks	Commercial banks
	(1)	(2)	(3)
	Repo	Repo+CP Growth	M2 Growth
	(weekly growth)	(weekly growth)	(weekly growth)
Fed Funds (1 week change)	-0.630***	-0.355***	-0.054***
Equity Return (1 week)	-0.022*	-0.013*	0.001**
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Term and credit spreads↑→Short-term liability growth↑

Summary

1. Build a model of a part of the entire mechanism.

2. Provides empirical results that jointly suggest

2-a. The entire mechanism works in reality

2-b. Commercial banks and
market-based financial intermediaries
(shadow banks and broker-dealers)
have different roles in the mechanism.