How Do Business and Financial Cycles Interact?

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Motivation

- 2003-2007: Expansions along with financial booms
- 2008-2010: Recessions along with financial disruptions
- Repeated patterns… Debate in the profession…

- *"[Economists] will have to do their best to incorporate the realities of finance into macroeconomics…"*

  Paul Krugman (September 2, 2009)

- *"If we knew how to 'incorporate the realities of finance into macroeconomics' we would have done so already. We haven't done so, because we don't know how…"*

  John H. Cochrane (September 16, 2009

Some Issues Studied, but Knowledge Limited

- Role of financial factors (credit/asset prices) in business cycles in theory Bernanke and Gertler (1989), Kiyotaki and Moore (1997)
- Procyclical nature of macro-financial variables, crises…

  Backus and Kehoe (1992); Kindleberger (1978), Reinhart and Rogoff (2009)
- **How do business and financial cycles interact?**

  How do recessions (recoveries) relate to financial disruptions (booms)?
- No systematic study with a large dataset of business and financial cycles

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Financial Crises *vs.* Financial Cycles

- Identification of crises more subjective….
  - Crises dated by "events" (forced closure, government takeover etc)

    [BUT, we know how to identify/date cycles]
- Not clear when they start and end; rough annual dating
  - Leading to differences in results, interpretation (84-91 vs 73-75;82-84;88-91)

    Lopez-Salido and Nelson (2010) vs. Reinhart and Rogoff (2009)

    [BUT, we know the end date and use quarterly data w/cycles]
- Silent on how macroeconomic/financial variables evolve over different phases of business and financial cycles

  [BUT, this is what cycles are about and we can look at cycles in credit, house prices, equity prices and exchange rates]

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Objective: Four Questions

- How long are business and financial cycles, and how severe/strong are they?
- Are business and financial cycles synchronized?
- Are recessions (recoveries) associated with financial disruptions (booms) different?
- Do financial market developments correlate with the duration and amplitude of recessions and recoveries?

How? By providing a comprehensive analysis of a large sample of business and financial cycles

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Outline of Presentation

- Dataset & Methodology for Cycles

1. Business and Financial Cycles
   - Duration and Amplitude
2. Synchronization and Likelihood of Cycles
3. Associations: Recessions with Financial Disruptions
Recoveries with Financial Booms
   - Duration and Amplitude
4. Determinants of Recessions and Recoveries

- Conclusion

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Dataset: Period and Countries Included

- Quarterly Data: Macro and Financial Variables

  Output, credit, house price, equity price and real exchange rate

- 44 countries: 21 Advanced Countries
  23 Emerging Markets

- Period: 1960:1-2009:4 for Advanced Countries
  1978:1-2009:4 for Emerging Markets

  (most analysis covers up to 2007:4)

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Methodology: Cyclical Turning Points

- Find turning points in macro and financial variables using a business cycle dating algorithm (Harding and Pagan, 2002)

- Business Cycles: Recessions and Recoveries,
  Financial Cycles: Financial Downturns and Upturns

  - **Financial Disruption:** a peak-to-trough decline in financial variable in the worst quartile of all financial downturns.

    (credit crunch, asset price bust, exchange rate collapse)

  - **Financial Boom:** increase during the recovery in a financial variable in the top quartile of all financial upturns.

    (booms in credit, asset prices, and exchange rates)

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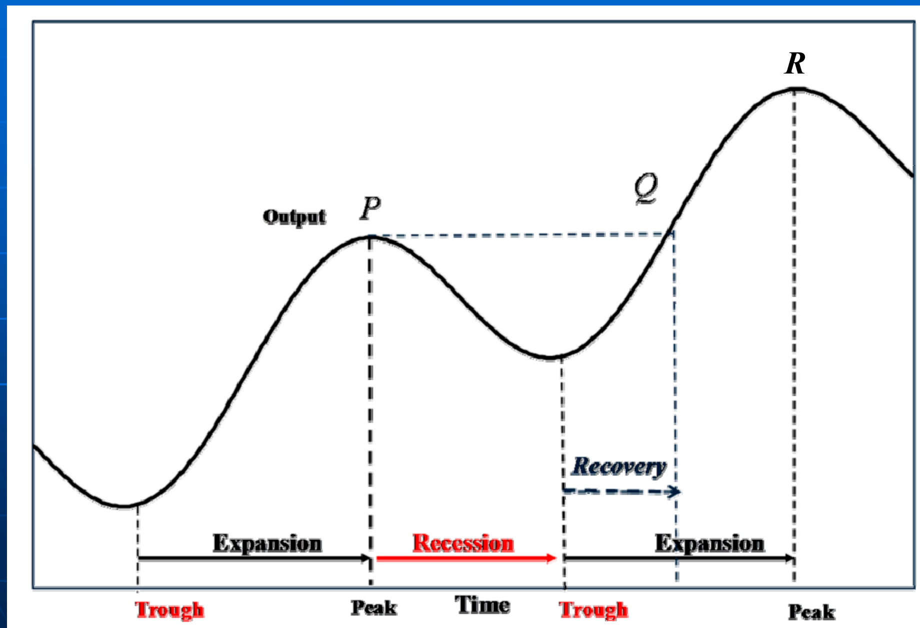
Evolution of Business Cycle



Business and Financial Cycles

- Large dataset of business (***more than 200***) and financial cycles (***more than 1200***)
- Business cycles: Output (Recessions/Recoveries)
  - Recessions: 206 *(Advanced, 122; Emerging 84)* ***(7 US)***
  - Recoveries: 208 *(Advanced, 122; Emerging 86)*
- Financial cycles: Credit, House and Equity Prices, Exchange Rates (Downturns/Upturns)
  - Credit: 218 Downturns; 225 Upturns ***(5 US)***
  - House Prices: 141 Downturns;145 Upturns ***(7 US)***
  - Equity Prices: 384 Downturns; 398 Upturns ***(14 US)***
  - Exchange Rates: 470 Downturns; 501 Upturns

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1. Duration and Amplitude

- How long are business and financial cycles, and how severe/strong are they?

  They can be quite long. Financial cycles are stronger and longer than business cycles.

- ***Recessions/recoveries*** typically last 4-6 quarters
- ***Financial downturns/upturns*** can be 6-18 quarters
- ***Recessions/recoveries*** typically changes in GDP of 2-9 percent
- ***Financial downturns/upturns*** often changes in financial variables of 6 to 60 percent

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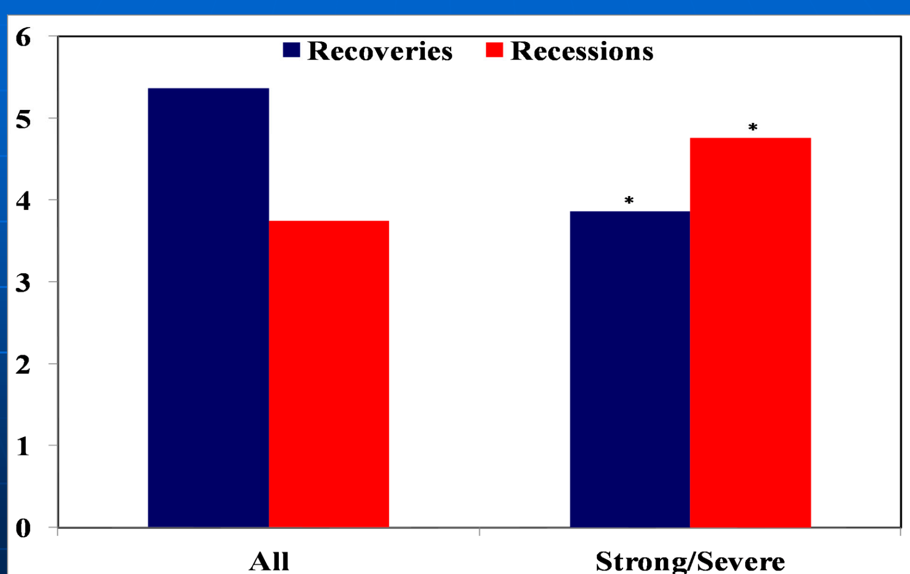
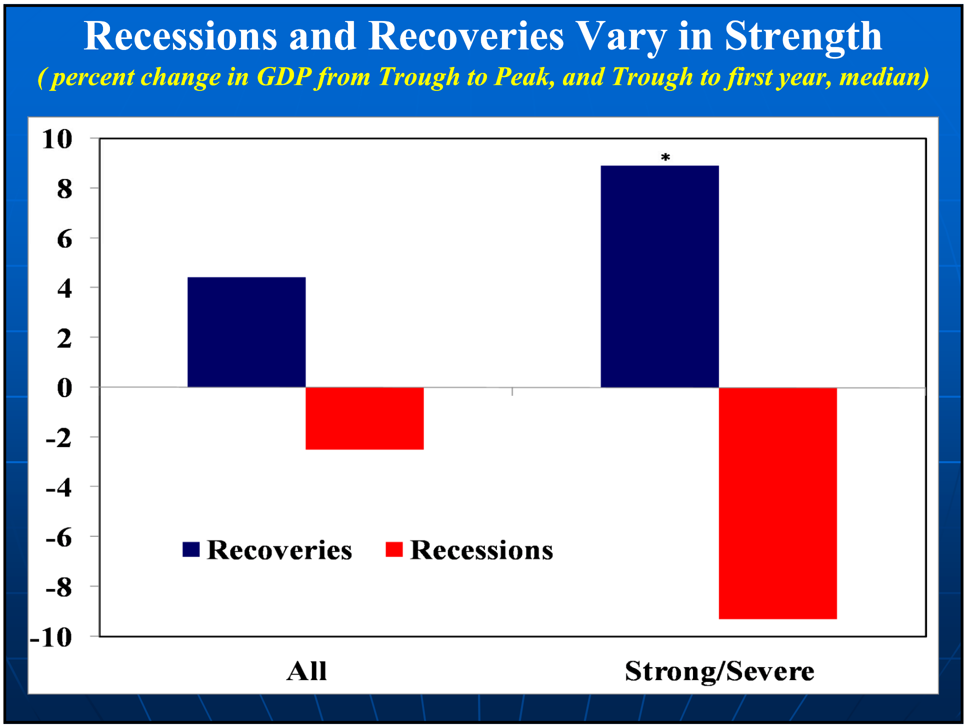
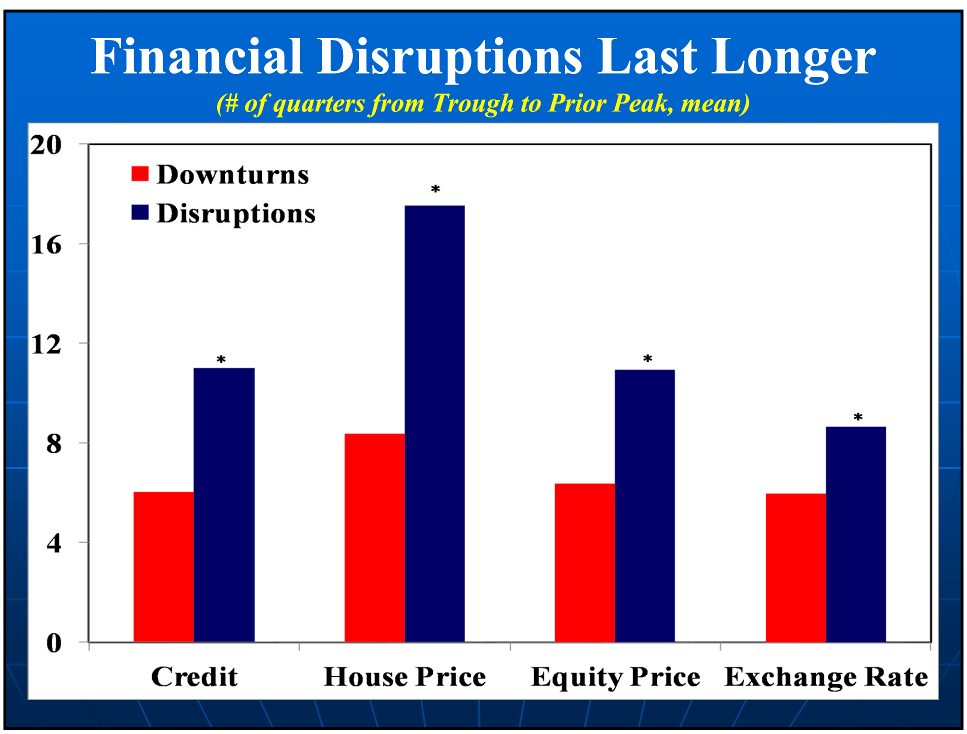
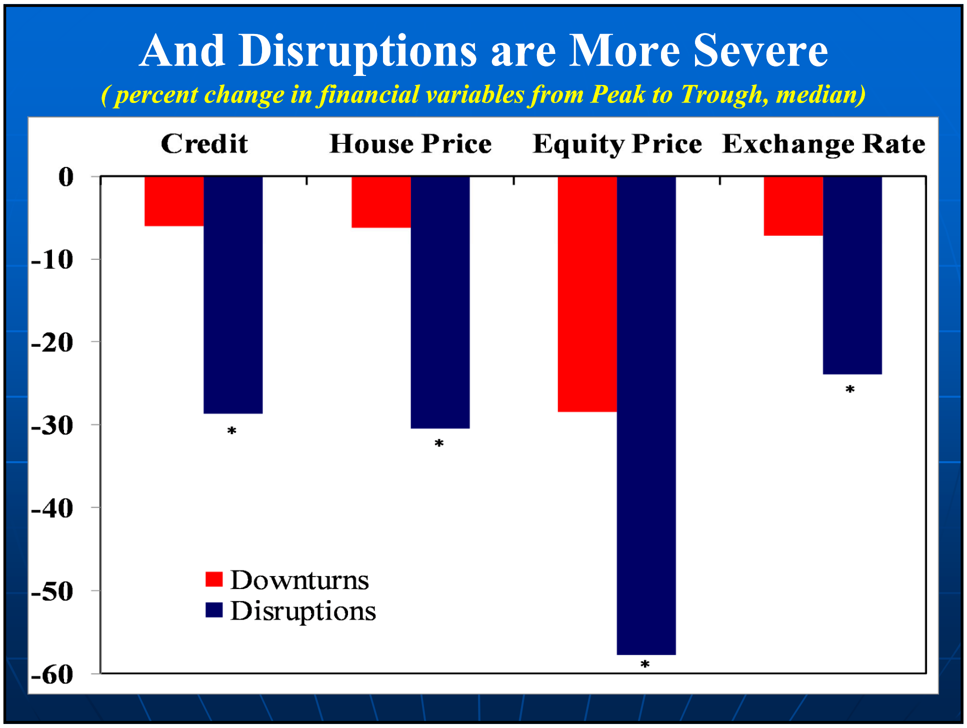
Severe Recessions Longer.. Stronger Recoveries Shorter

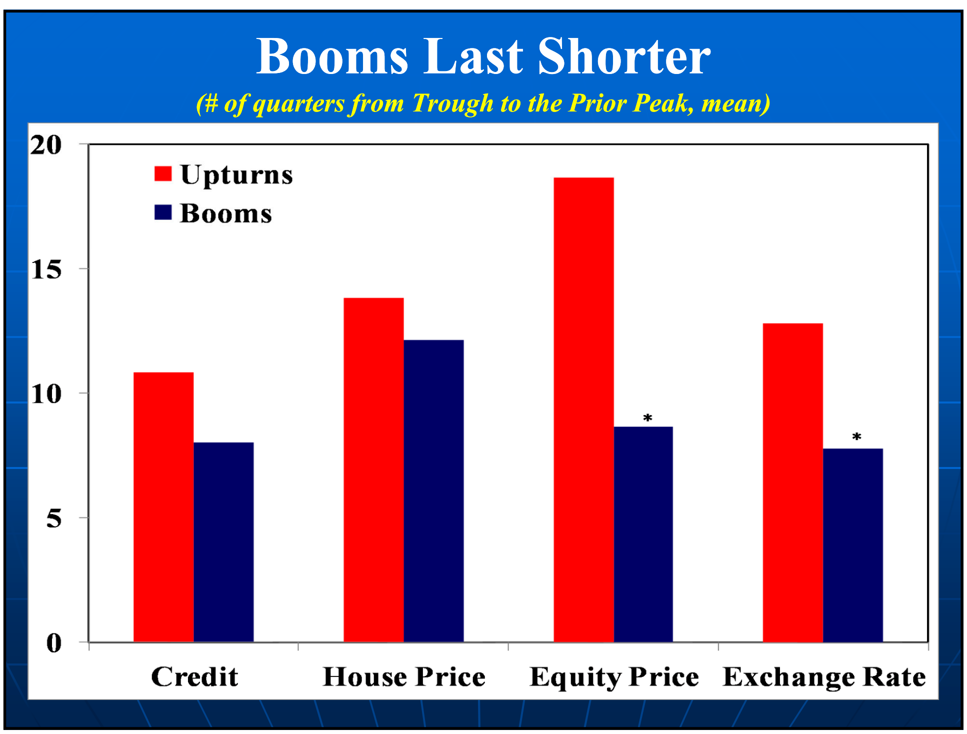
(# of quarters from Peak to Trough, and from Trough to Prior Peak, mean)




Recessions and Recoveries Vary in Strength
(percent change in GDP from Trough to Peak, and Trough to first year, median)
10
8
6
4
2
0
-2
-4
-6
-8
-10
*
Recoveries
Recessions
All
Strong/Severe

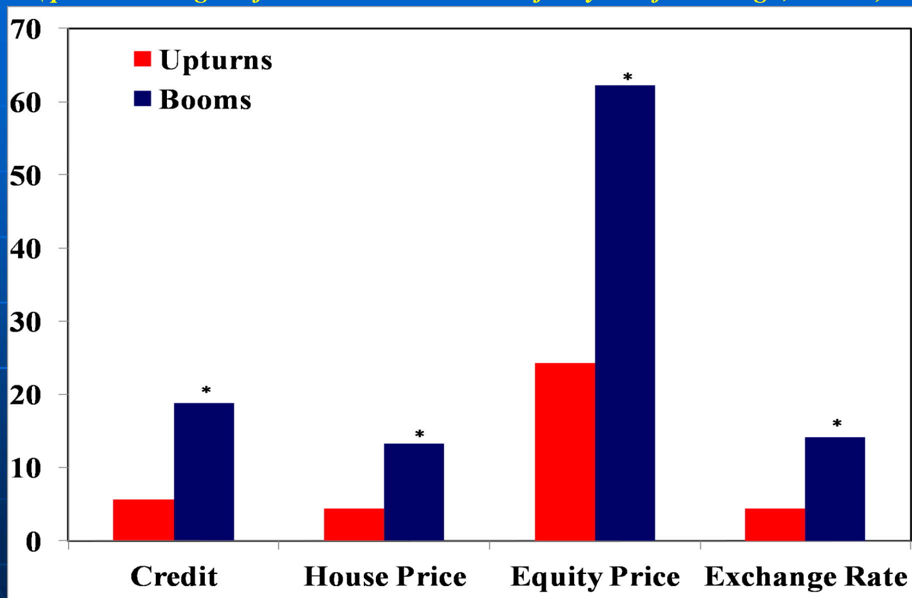

Financial Disruptions Last Longer
(# of quarters from Trough to Prior Peak, mean)
20
16
12
8
4
0
Downturns
Disruptions
*
*
*
*
Credit
House Price
Equity Price
Exchange Rate


And Disruptions are More Severe
(percent change in financial variables from Peak to Trough, median)
Credit
House Price
Equity Price
Exchange Rate
0
-10
-20
-30
-40
-50
-60
*
*
*
*
Downturns
Disruptions


Booms Last Shorter
(# of quarters from Trough to the Prior Peak, mean)
20
15
10
5
0
Upturns
Booms
*
*
Credit
House Price
Equity Price
Exchange Rate

Booms Vary More in Strength

(percent change in financial variables in the first year after Trough, median)



2. Synchronization and Likelihood

- Are business and financial cycles synchronized?

Yes, business cycles are synchronized with cycles in credit and house prices. Likelihood of recessions (recoveries) rises with financial disruptions (booms).

- **Synchronization:** The fraction of time that output cycles and financial cycles are in the same phase (using the concordance statistic)

- **Likelihood: Unconditional**=probability of being in a recession (recovery) in a given quarter;

  Conditional=probability of being in a recession (recovery) in a given quarter while a financial disruption (boom) underway.

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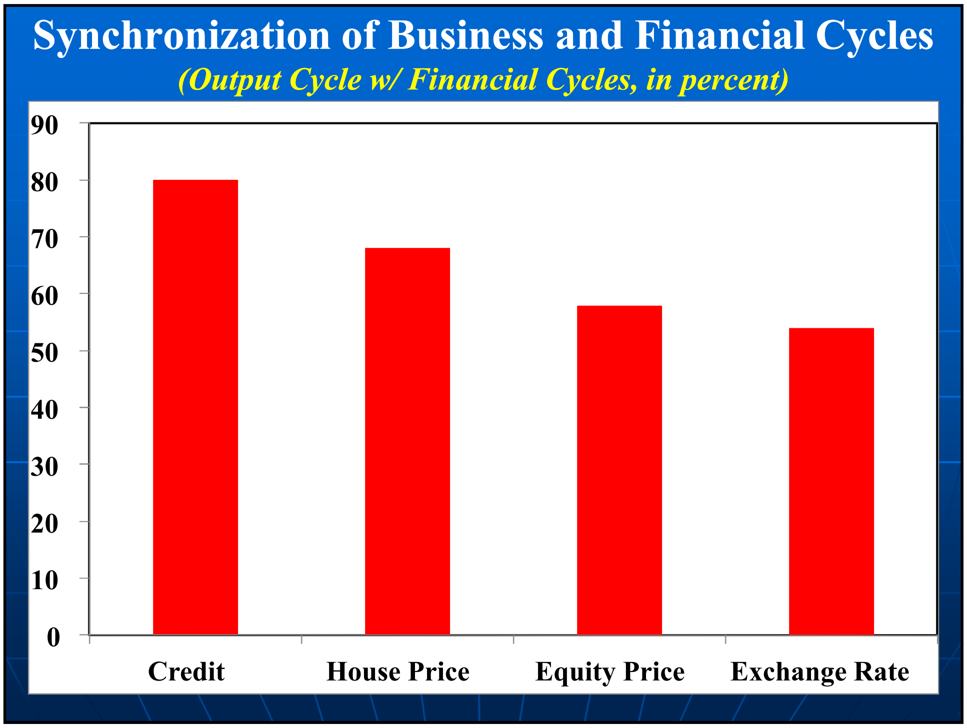
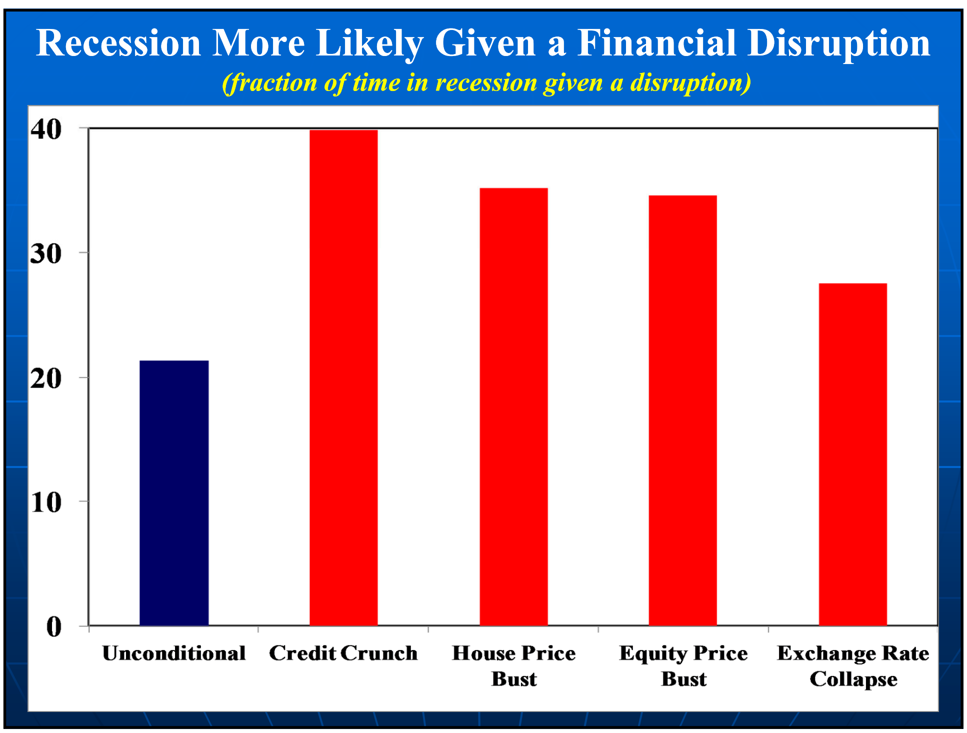
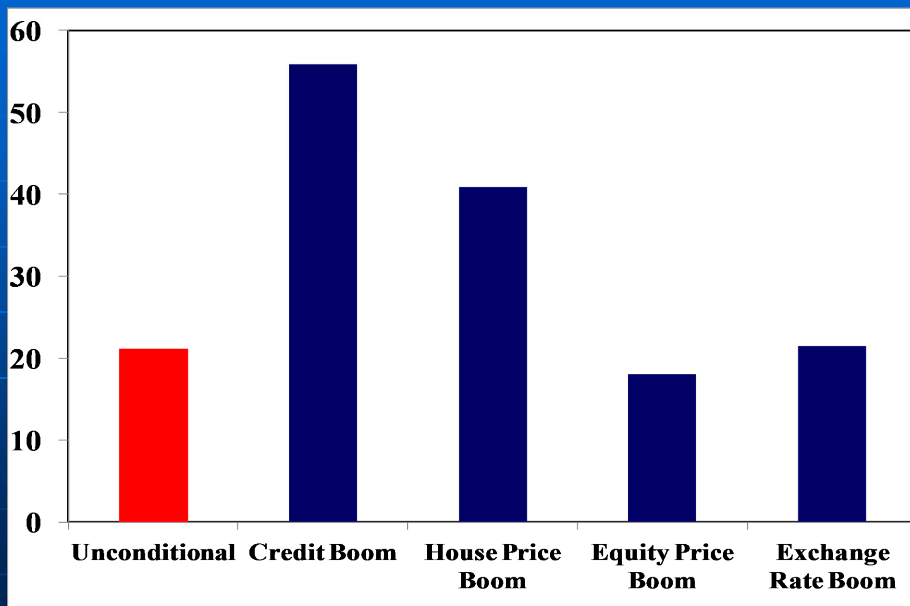

Synchronization of Business and Financial Cycles
(Output Cycle w/ Financial Cycles, in percent)
90
80
70
60
50
40
30
20
10
0
Credit
House Price
Equity Price
Exchange Rate


Recession More Likely Given a Financial Disruption
(fraction of time in recession given a disruption)
40
30
20
10
0
Unconditional
Credit Crunch
House Price Bust
Equity Price Bust
Exchange Rate Collapse

Recovery More Likely Given a Financial Boom

(fraction of time in recession given a disruption)



3. Business Cycles w/ Financial Disruptions and Booms

- Identify recessions (recoveries) coinciding with financial disruptions (booms)
- Disruptions starting before or occurring at the same time with recessions; Booms are ongoing or starts 2 quarters after the recovery
  - 36 (15) Recessions (Recoveries) with Credit Crunches (Booms)
  - 40 (13) Recessions (Recoveries) with House Price Busts (Booms)
  - 72 (43) Recessions (Recoveries) with Equity Price Busts (Booms)
  - 42 (30) Recessions (Recoveries) w/ Exch. Rate Collapses (Booms)
- Are recessions (recoveries) associated with financial disruptions (booms) different?

  Yes, recessions (recoveries) become deeper (stronger).

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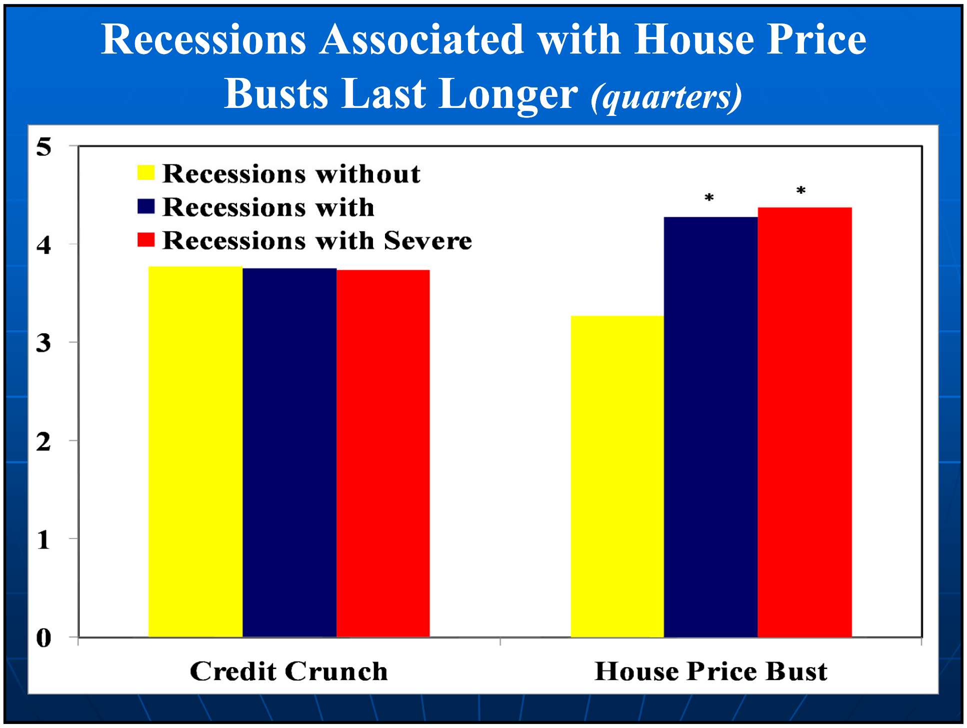
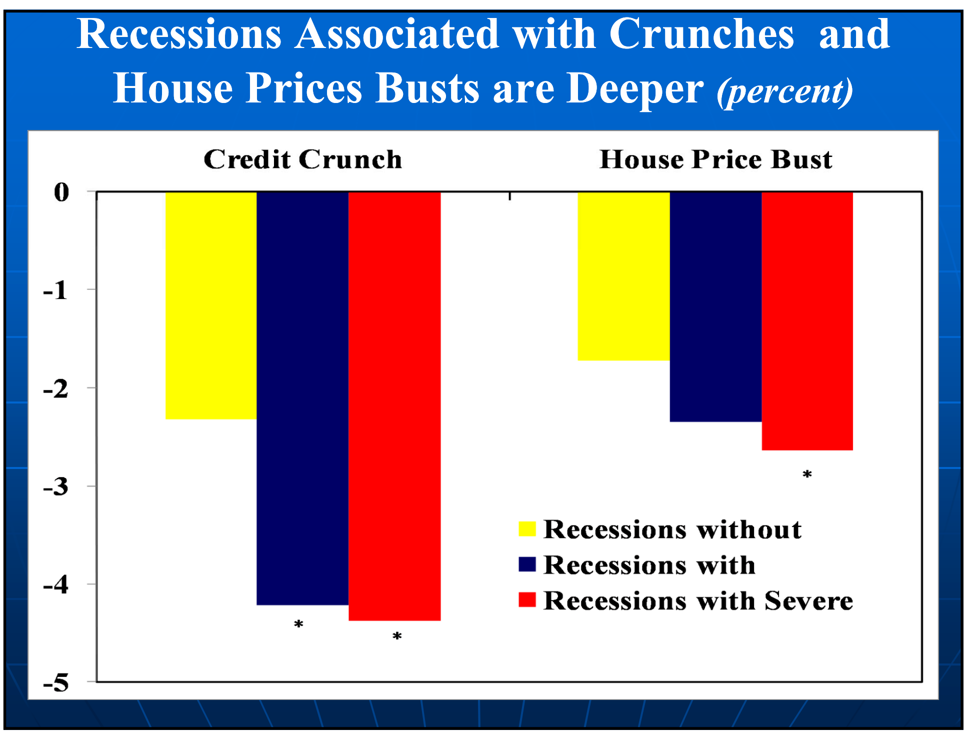
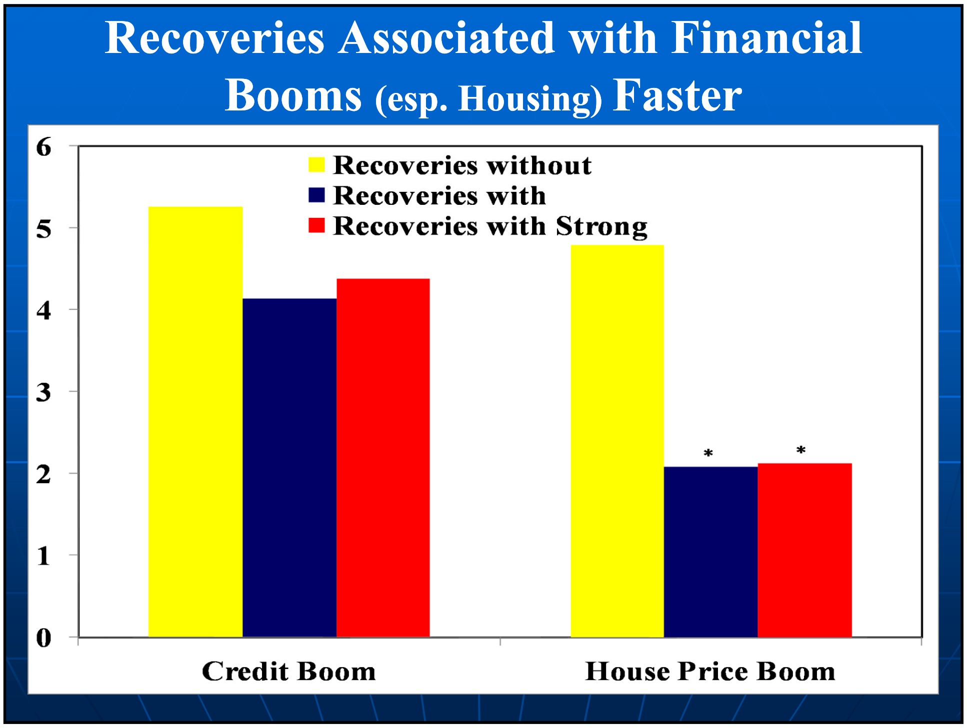
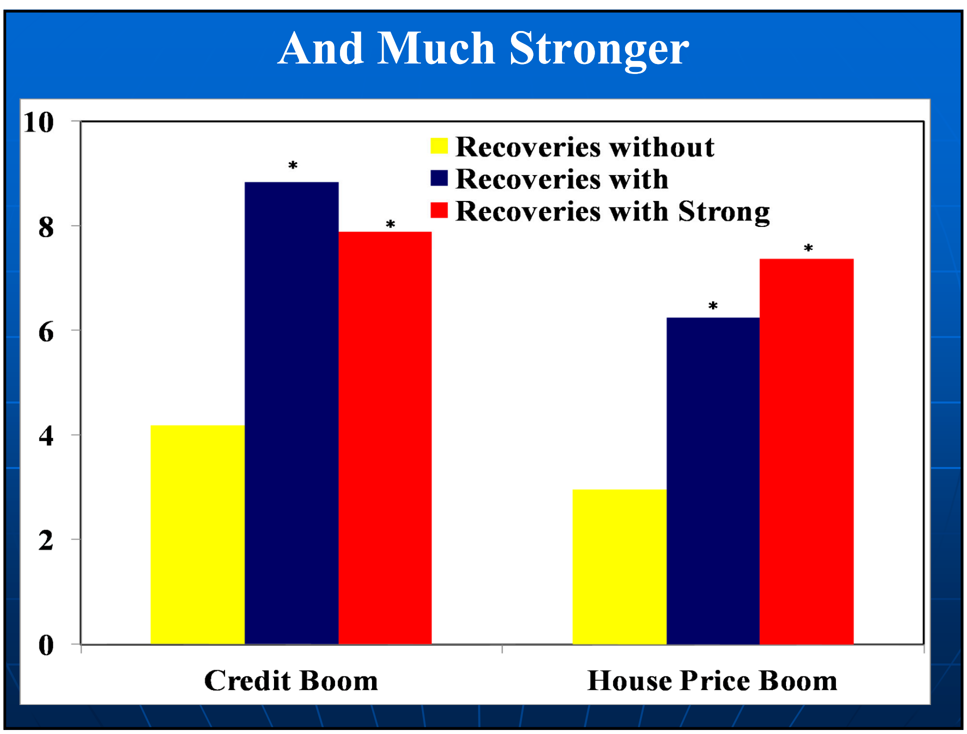

Recessions Associated with House Price Busts Last Longer (quarters)
5
4
3
2
1
0
Recessions without
Recessions with
Recessions with Severe
*
*
Credit Crunch
House Price Bust


Recessions Associated with Crunches and House Prices Busts are Deeper (percent)
Credit Crunch
House Price Bust
0
-1
-2
-3
-4
-5
*
*
*
Recessions without
Recessions with
Recessions with Severe



Recoveries Associated with Financial Booms (esp. Housing) Faster
Recoveries without
Recoveries with
Recoveries with Strong
6
5
4
3
2
1
0
*
*
Credit Boom
House Price Boom



And Much Stronger
Recoveries without
Recoveries with
Recoveries with Strong
10
8
6
4
2
0
*
*
*
*
Credit Boom
House Price Boom

4. How do Business Cycles Depend on Financial Cycles?

- Analysis of empirical links between duration and amplitude of recessions/recoveries and financial market events
- Regress the duration and amplitude on changes in financial variables (credit, house price and equity price); fixed effects
- Also control for various domestic and external factors
- Do financial market developments correlate with the duration and amplitude of recessions and recoveries?
  Yes, especially developments in credit and housing markets.

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Determinants of Duration of Recessions

	(6)	(7)	(8)	(9)	(10)	(11)	(12)
Recession with a House Price Bust		-0.888*** [0.315]				-1.110*** [0.325]	-1.268*** [0.415]
Recession with an Equity Price Bust			-0.352 [0.271]			-0.393 [0.290]	
Recession with a Credit Crunch				0.446 [0.348]		0.757** [0.385]	
Recession with an Exchange Rate Collapse					0.354 [0.361]	0.367 [0.372]	
World output growth							0.559*** [0.165]
Oil price growth							0.015** [0.007]
Trade Openness							0.041*** [0.009]
House price growth							-0.063*** [0.023]
Constant	-3.238*** [0.456]	-3.350*** [0.470]	-3.111*** [0.417]	-3.465*** [0.480]	-3.249*** [0.457]	-3.710*** [0.524]	-5.064*** [0.703]
P (Weibull distribution parameter)	2.655 [0.171]	2.598 [0.166]	2.602 [0.174]	2.583 [0.165]	2.758 [0.189]	2.996 [0.251]	3.371 [0.379]
Number of observations	108	108	108	108	108	108	108
Log Likelihood	-62	-65	-66	-66	-59	-52	-42

Correlates of Duration of Recessions: Summary

Financial events

- Recessions with a House Price Busts: - (longer)
- House Price Growth (*3 year avg. before peak*): -

Other factors

- World Output Growth (*1 year average before peak*): +
- Oil Price Growth (*3 year avg.)*: +
- Trade Openness (at peak): + *(all significant)*

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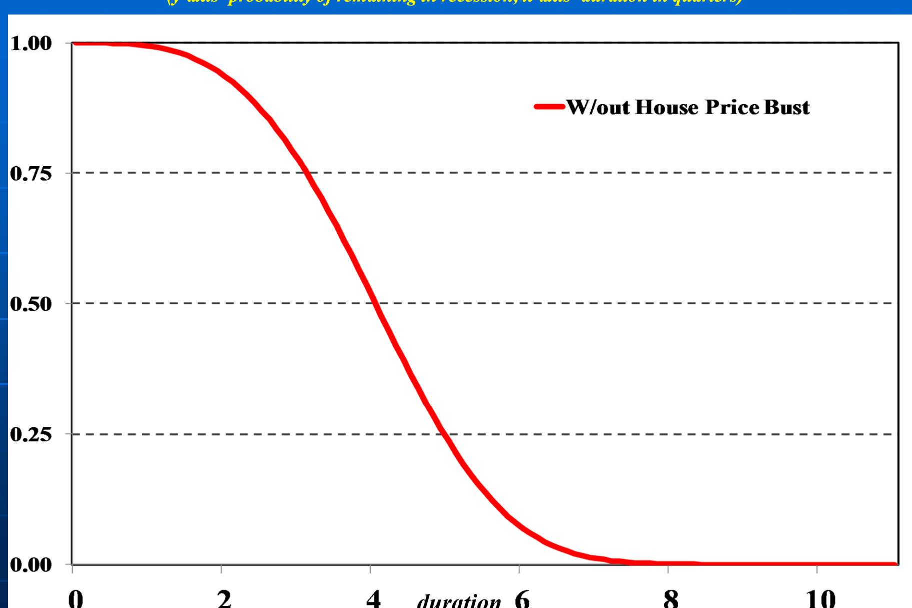
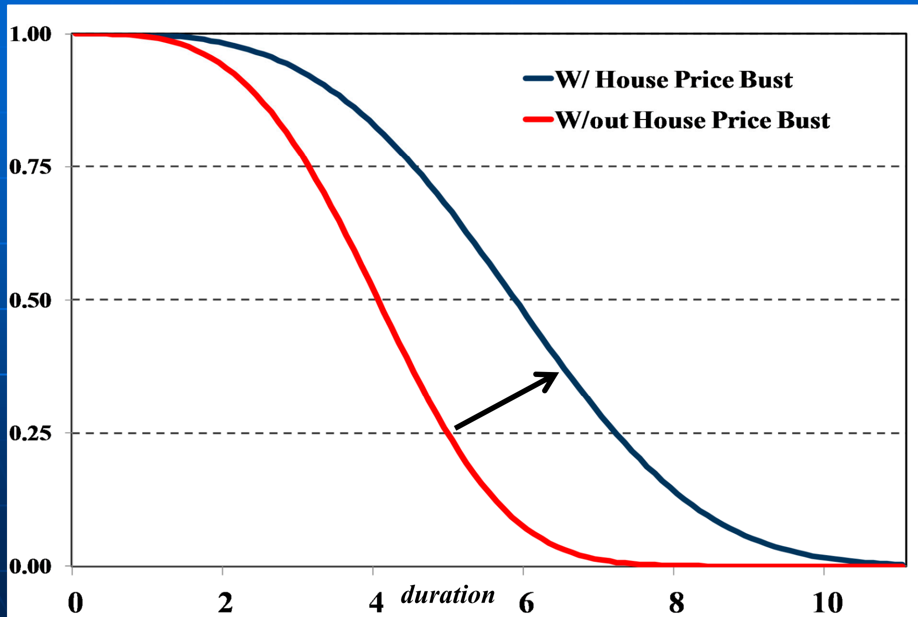
Survival Functions for Recessions - 1

(y-axis=probability of remaining in recession; x-axis=duration in quarters)



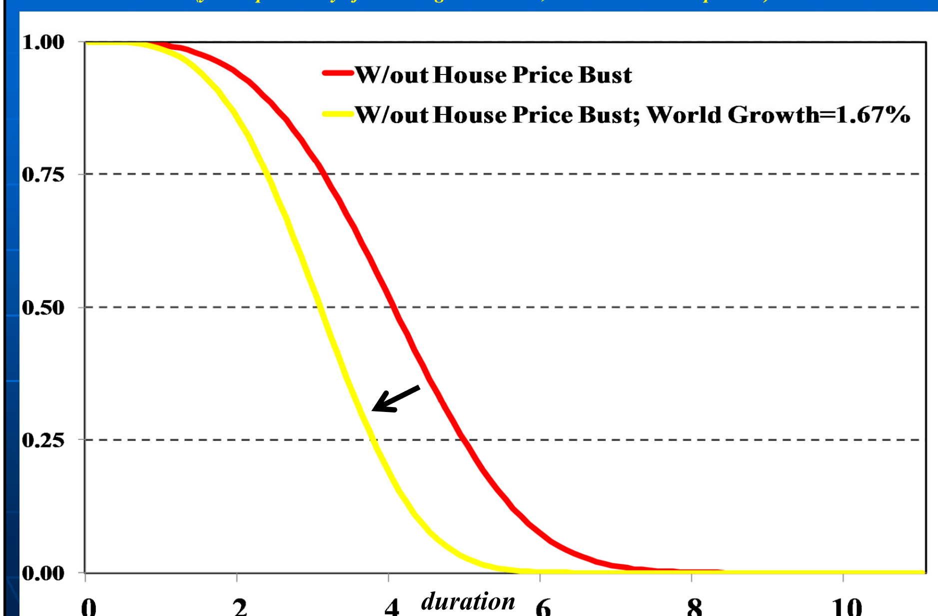
Survival Functions for Recessions - 2

(y-axis=probability of remaining in recession; x-axis=duration in quarters)



Survival Functions for Recessions - 3

(y-axis=probability of remaining in recession; x-axis=duration in quarters)



Determinants of Amplitude of Recessions

	(5)	(6)	(7)	(8)	(9)	(10)	(11)
Recession with a House Price Bust	1.516** [0.602]				1.725*** [0.530]	1.647** [0.618]	1.609** [0.621]
Recession with an Equity Price Bust		1.406** [0.678]			1.551** [0.612]	0.626 [0.525]	
Recession with a Credit Crunch			0.470 [0.513]		-0.215 [0.599]		
Recession with an Exchange Rate Collapse				-0.447 [0.485]	-0.422 [0.462]		
World output growth						-0.324 [0.229]	-0.363* [0.212]
Oil price growth						0.015 [0.015]	0.019 [0.017]
Trade Openness						-0.049** [0.022]	-0.052** [0.020]
House price growth						0.099** [0.040]	0.107** [0.040]
Constant	2.185*** [0.228]	2.201*** [0.270]	2.700*** [0.066]	2.848*** [0.094]	1.598*** [0.382]	5.526** [2.112]	5.993*** [1.879]
Adjusted R-Squared	0.064	0.072	-0.005	-0.004	0.143	0.302	0.296
Number of observations	108	108	108	108	108	108	108
Number of countries	30	30	30	30	30	30	30

Correlates of Amplitude of Recessions: Summary

Financial events

- **Recessions with a House Price Busts: +**
- **House Price Growth (**3-year avg. *before peak***): +**

Other factors

- **World Output Growth (***first year of recession***): -**
- **Oil Price Growth: + (***not significant***)**
- **Trade Openness: -**

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Determinants of Amplitude of Recoveries

	(4)	(5)	(6)	(7)	(8)	(9)
Amplitude of Preceeding Recession	0.746** [0.279]	0.736** [0.285]	0.745** [0.285]	0.774** [0.306]	0.772** [0.319]	0.737** [0.285]
Amplitude of Recovery in World Output	0.670** [0.306]	0.628* [0.320]	0.672* [0.337]	0.691** [0.311]	0.661* [0.350]	0.630* [0.319]
Preceeding Recession with a House Price Bust	-1.358* [0.725]	-1.270* [0.712]	-1.377* [0.767]	-1.401* [0.725]	-1.241 [0.760]	-1.266* [0.717]
Recovery with a House Price Boom	1.505*** [0.496]				1.343 [0.820]	1.040* [0.606]
Recovery with a Credit Boom		2.383** [1.003]			2.213** [1.070]	2.220** [1.063]
Recovery with an Equity Price Boom			0.014 [1.018]		-0.274 [0.938]	
Recovery with an Exchange Rate Boom				-1.422 [1.604]	-1.554 [1.685]	
Constant	0.958 [2.152]	0.984 [2.152]	1.048 [2.137]	1.086 [2.057]	0.955 [2.066]	0.926 [2.164]
Adjusted R-Squared	0.225	0.229	0.223	0.226	0.222	0.226
Number of observations	217	217	217	217	217	217
Number of countries	42	42	42	42	42	42

Correlates of Amplitude of Recoveries: Summary

Financial Events

- Preceding Recession with a House Price Bust: -
- Recovery with a House Price Boom: +
- Recovery with a Credit Boom: +

Other Factors

- Amplitude of Preceding Recession: +
- Amplitude of Recovery in World Output: +

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Latest Recessions: Short but Deep?

- Was the severity of 2007-09 recessions to be expected based on the extent of financial market disruptions?
- Employing the regression models, obtain out-of-sample forecasts of duration and amplitude of latest recessions
  - Latest recessions were on average relatively shorter, but more severe than predicted by the model
  - Duration is predicted to be longer since the world output growth was negative (and massive policy action)... Amplitude is larger, suggesting the unique nature…

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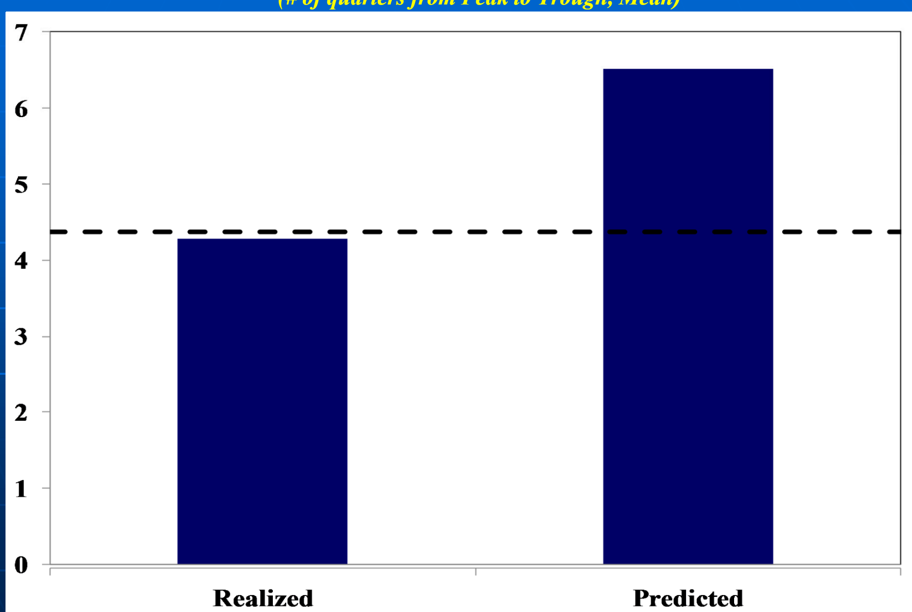
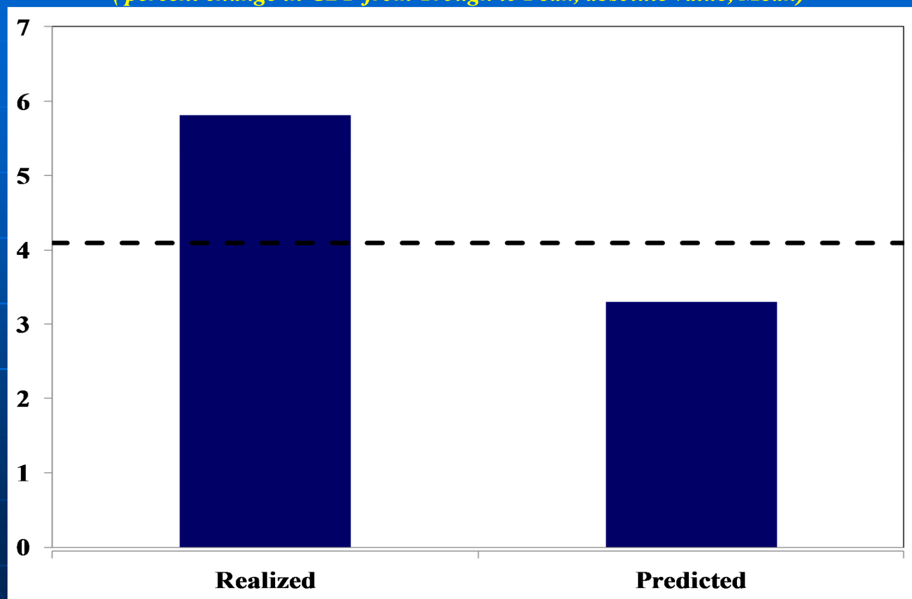
Latest Recessions: Shorter than Predicted

(# of quarters from Peak to Trough, Mean)



Latest Recessions: Deeper than Predicted

(percent change in GDP from Trough to Peak, absolute value, Mean)



Conclusion

- How long are business and financial cycles, and how severe/strong are they?

  They can be quite long. Financial cycles are stronger and longer than business cycles.

- Are business and financial cycles synchronized?

  Yes, business cycles are synchronized with cycles in credit and house prices. Likelihood of recessions (recoveries) rises with financial disruptions (booms).

- Are recessions (recoveries) associated with financial disruptions (booms) different?

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  Yes, especially developments in credit and housing markets.

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How much did we know before the crisis?

*"… asset-price-bust recessions do **<u>not</u>** appear to be necessarily more costly than other recession episodes. Specifically, …, recessions that follow swings in asset prices are **<u>not</u>** necessarily longer, deeper, and associated with a greater fall in output and investment than other recessions…"*

Roger W. Ferguson, January 12, 2005

(Vice Chairman of the FRB over 1997-2006)

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Questions & Comments

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