Economics 210A
Spring 2015

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LECTURE 12
Financial Crises

April 15, 2015

I. Overview

Central Issue

- What are the macroeconomic effects of financial crises?

What Is a "Financial Crisis?"

- Many candidates: Could involve sovereign debt, the exchange rate, intermediation, asset prices, ….
- Today's papers all focus on developments involving financial intermediation.
- And if the goal is to focus on "crises," need some way of distinguishing crises from more run-of-the-mill disruptions.

Different Definitions of a Crisis in Intermediation

- Widespread failures and/or government intervention.
- Widespread runs.
- Sharp rise in the cost of credit intermediation.

Papers

- Reinhart-Rogoff: Aftermaths of crises in a large sample of countries.
- Jalil: Detailed study of the United States, 1825–1929.
- Romer-Romer: Advanced countries in postwar period, before Great Recession.

II. Reinhart and Rogoff, "The Aftermath of Financial Crises," Chapter 14 of *This Time is Different: Eight Centuries of Financial Folly*

Two Key Steps

- Identifying crises.
- Estimating their effects.

Reinhart and Rogoff's Definition

"We mark a banking crisis by two types of events: (1) [systemic, severe] bank runs that lead to the closure, merging, or takeover by the public sector of one or more financial institutions and (2) [financial distress, milder] if there are no runs, the closure, merging, takeover, or large-scale government assistance of an important financial institution (or group of institutions) that marks the start of a string of similar outcomes for other financial institutions."

Reinhart and Rogoff, *This Time is Different*, p. 11.

Reinhart and Rogoff's Application of Their Definition

- Secondary sources.
- No discussion of why they classified things as they did.

TABLE A.4.1 Continued

Country	Brief summary	Year	Source
Japan	Banks suffered from a sharp decline in stock market and real estate prices. In 1995, estimates of non-performing loans were $469–1,000 billion or 10–25 percent of GDP; at the end of 1998 they were estimated at $725 billion or 18 percent of GDP; and in 2002 they were 35 percent of total loans. Seven banks were nationalized, sixty-one financial institutions closed, and twenty-eight institutions merged.	1992–1997	Bordo et al. (2001), Caprio and Klingebiel (2003)

From: Reinhart and Rogoff, *This Time Is Different*, p. 371.

Issues

- Quality of the empirical technique?
- Might reverse causation be important?
- Could the procedures for identifying crises introduce bias?
- What is the logic behind the samples?
- Lack of a control group.

As a benchmark for the 2007 US sub-prime crisis, we draw on data from the 18 bank-centered financial crises from the postwar period, as identified by Kaminsky and Reinhart (1999) and Gerard Caprio et. al. (2005). These crisis episodes include:

> *The "Big Five" Crises*: Spain (1977), Norway (1987), Finland (1991), Sweden (1991), and Japan (1992), where the starting year is in parentheses.
>
> *Other Banking and Financial Crises*: Australia (1989), Canada (1983), Denmark (1987), France (1994), Germany (1977), Greece (1991), Iceland (1985), Italy (1990), New Zealand (1987), United Kingdom (1974, 1991, 1995), and United States (1984).

From: Reinhart & Rogoff, "Is the 2007 US Sub-Prime Financial Crisis So Different?" *AER*, 2008.

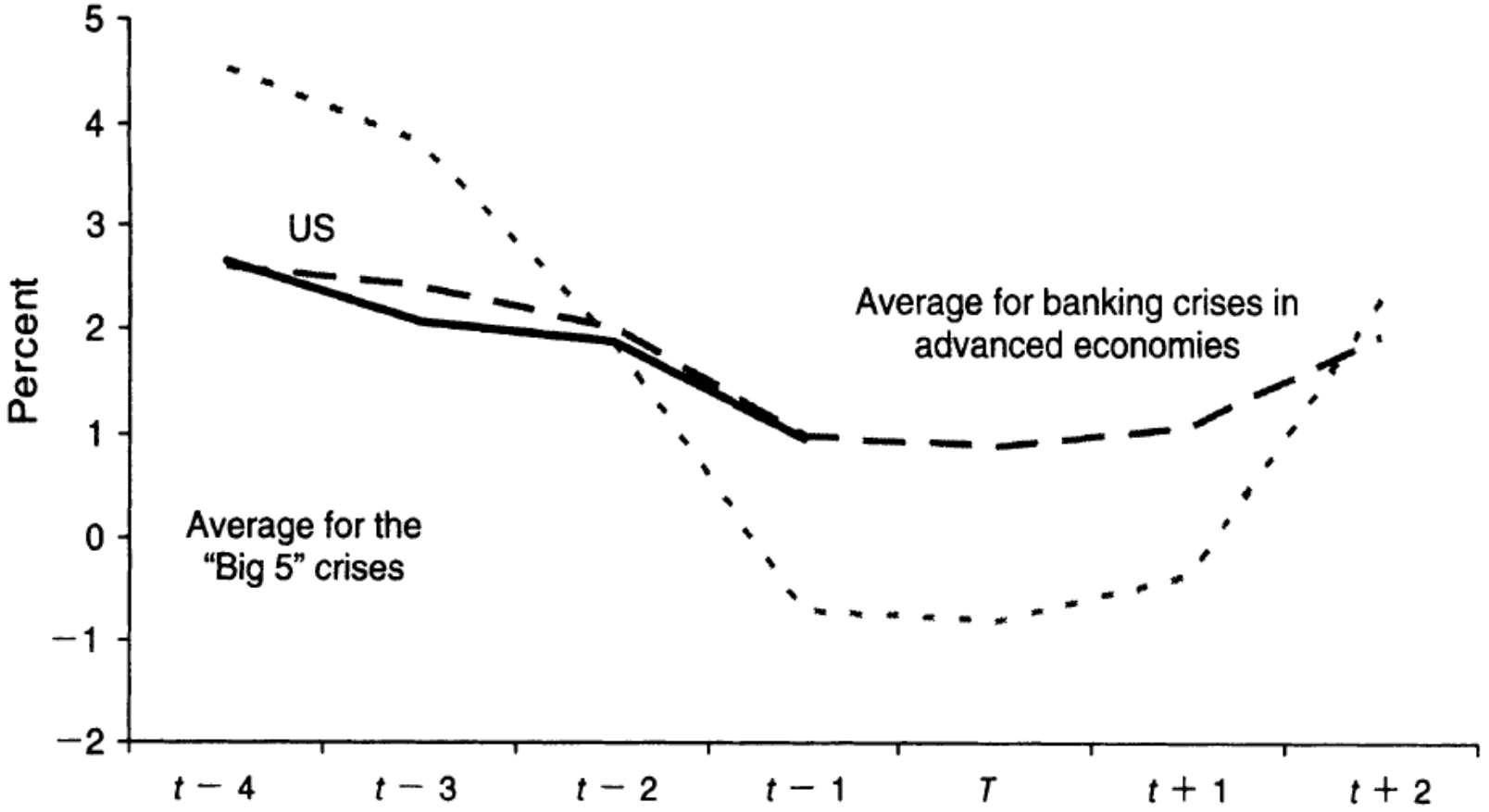


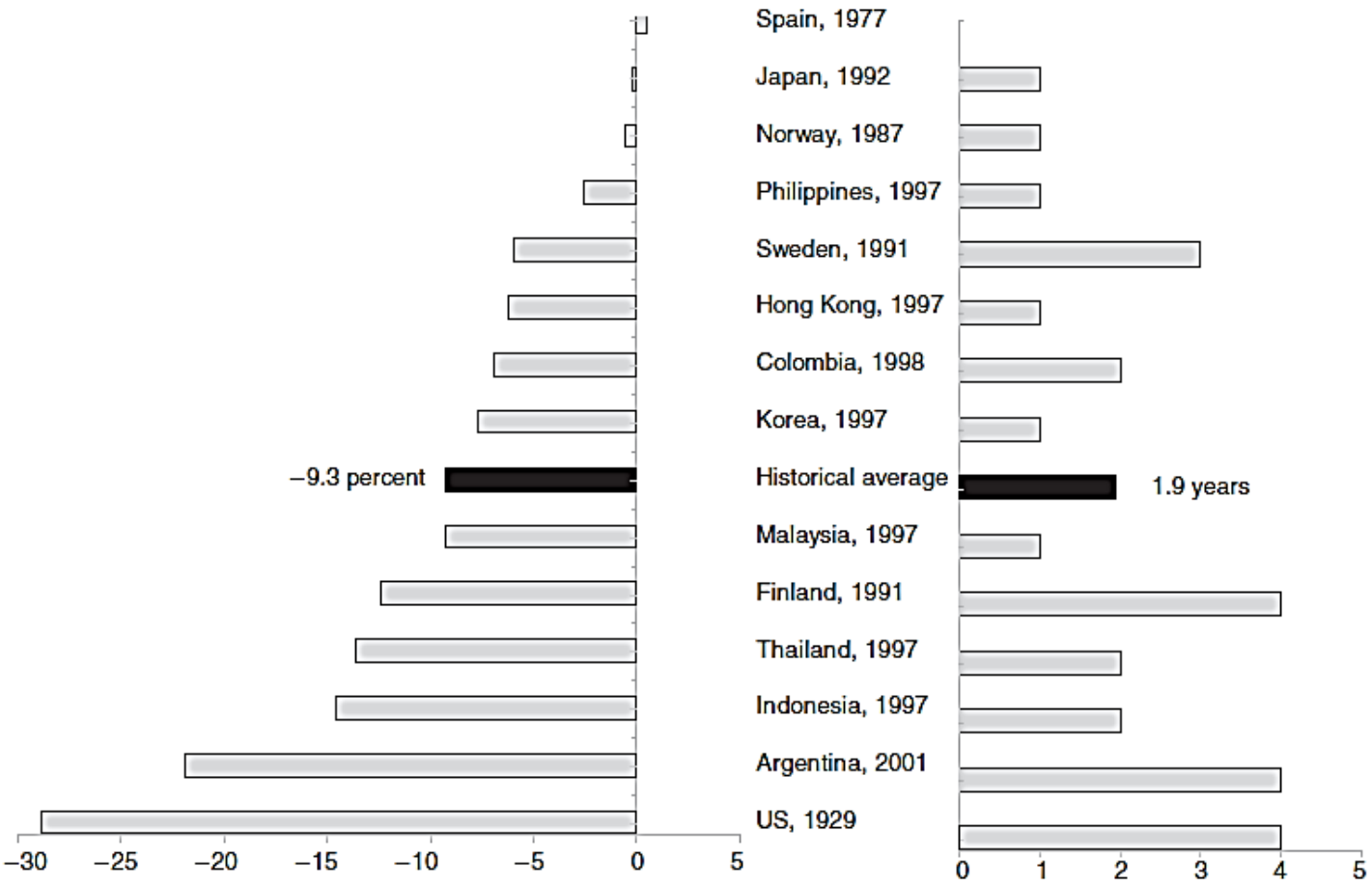
FIGURE 4. REAL GDP GROWTH PER CAPITA AND BANKING CRISES
(*PPP basis*)

From: Reinhart & Rogoff, "Is the 2007 US Sub-Prime Financial Crisis So Different?"

Sample in Chapter 14

- 21 major banking crises.

- 6 recent; 13 other postwar (5 in advanced countries, 8 in developing); 2 others (Norway 1899, U.S. 1929).



From: Reinhart and Rogoff, *This Time Is Different*.

TABLE A.4.1 Continued

Country	Brief summary	Year	Source
United States	During the Great Depression, thousands of banks closed; failures were correlated with particular Federal Reserve districts. The Bank of the USA failed in December 1930; between August 1931 and January 1932, 1,860 banks failed.	1929–1933	Bernanke and James (1990), Bordo et al. (2001)
	There were 1,400 savings and loan and 1,300 bank failures.	1984–1991	Bordo et al. (2001), Caprio and Klingebiel (2003)

From: Reinhart and Rogoff, *This Time Is Different*.

Real GDP in Finland, 1985–1996

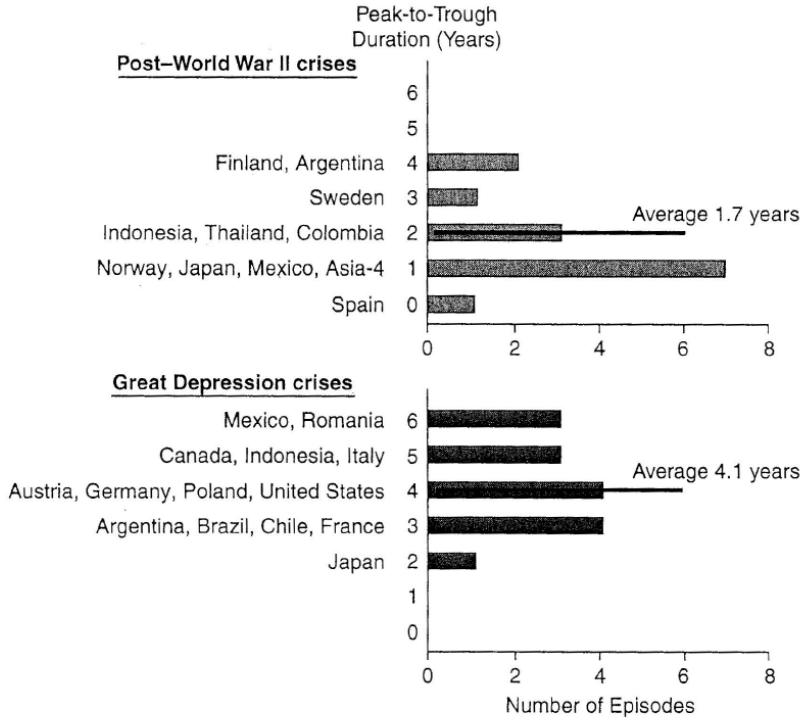


Figure 14.7. The duration of major financial crises: Fourteen Great Depression episodes versus fourteen post–World War II episodes (duration of the fall in output per capita).
Sources: Appendix A.3 and the authors' calculations.
Notes: The fourteen postwar episodes were those in Spain, 1977; Norway, 1987; Finland, 1991; Sweden, 1991; Japan, 1992; Mexico, 1994; Indonesia, Thailand, and (grouped as Asia-4 in the figure) Hong Kong, Korea, Malaysia, and Philippines, all 1997; Colombia, 1998; and Argentina, 2001. The fourteen Great Depression episodes were comprised of eleven banking crisis episodes and three less systemic but equally devastating economic contractions in Canada, Chile, and Indonesia during the 1930s. The banking crises were those in Japan, 1927; Brazil, Mexico, and the United States, all 1929; France and Italy, 1930; and Austria, Germany, Poland, and Romania, 1931.

From: Reinhart and Rogoff, *This Time Is Different*.

Conclusion

III. Jalil, "A New History of Banking Panics in the United States, 1825-1929: Construction and Implications"

Jalil – Overview

- Like Reinhart and Rogoff, interested in the macroeconomic effects of financial crises.
- But focuses on one country over a defined period: United States, 1825–1929.
- Again, two key steps:
  - Identifying crises.
  - Estimating their effects.

Previous Panic Series

- Bordo-Wheelock
- Thorp
- Reinhart-Rogoff (2 versions)
- Friedman-Schwartz
- Gorton
- Sprague
- Wicker
- Kemmerer
- DeLong-Summers

Table 1 Nine Panic Series, 1825-1929 [Excerpts: 4 series, 1825-1889]

Bordo-Wheelock Banking Panic 1825-1864	Thorp Panic 1825-1864	Reinhart-Rogoff: Table A.3.1 Banking Crisis 1825-1864	Reinhart--Rogoff: Table A.4.1 Banking Crisis 1825-1864
1825	1825	1825	Jan 1825
1833	1833		
		1836	
1837	1837		1836 - 1838
1839	1839		
			March 1841
	1847		
1857	1857	1857	Aug 1857
			Dec 1861
			April 1864
1873	1873	1873	Sept 1873
1878 (financial distress)			
1884 (financial distress)		1884	May 1884
1890 (financial distress)		1890	1890

From: Jalil, "A New History of Banking Panics in the United States, 1825–1929"

Jalil's Definition of a Panic

- A financial panic occurs when fear prompts a widespread run by private agents … to convert deposits into currency (a banking panic)." (p. 7)

- "A banking panic occurs when there is an increase in the demand for currency relative to deposits that sparks bank runs and bank suspensions." (p. 7)

- "A banking panic occurs when there is a loss of depositor confidence that sparks runs on financial institutions and bank suspensions." (p. 11)

Implementing the Definition

- Use articles in *Niles Weekly* Register, *the Merchants' Magazine and Commercial* Review, and *The Commercial and Financial Chronicle*.
- A banking panic requires accounts of a cluster of bank suspensions and runs.
- A cluster means 3 or more, and excludes ones mentioned in articles that do not reference other suspensions or runs or general panic.
- A panic ends if there are no references to panics or suspensions for a full calendar month.
- A panic is major if it is mentioned on the front page of the newspaper and if its geographic scope is greater than a single state and its immediately bordering states.

TABLE 2
New Series on Banking Panics, 1825-1929

Major Banking Panic	Non-Major Banking Panic
Nov 1833 - Apr 1834	
Mar - May 1837	
Oct 1839	
	Jan - April 1841 (PA, DE, MD, NC, VA, IL)
	Mar 1842 (PA)
	May - Jun 1842 (New Orleans)
	Oct 1851 (NY, NJ, MD)
	Sep 1854 - Feb 1855 (OH, IN, MI, WI, IA, MO, NY, CA)
Aug - Oct 1857	
	Nov 1860 (suspension of specie payments by banks in the South)
	Dec 1861 (generalized suspension of specie payments)
Sep 1873	
	May 1884 (NYC, PA, NJ)
	Nov 1890 (New York City)
May - Aug 1893	
	Dec 1896 (IL, MN, WI)
	Dec 1899 (Boston and New York City)
	Jun - Jul 1901 (New York: Buffalo and NYC)
	Oct 1903 (PA, MD)
	Dec 1905 (Chicago)
Oct - Nov 1907	
	Jan 1908 (New York City)
	Aug - Sep 1920 (Boston)
	Nov 1920 - Feb 1921 (North Dakota)
	Jul 1926 (FL, GA)
	Mar 1927 (FL)
	Jul - Aug 1929 (FL)

From: Jalil, "A New History of Banking Panics in the United States, 1825-1929"

Concerns?

TABLE 6
Major Panics and Downturns

Panic	Percent Change in Davis Index
1833	-4.5% from 1833 to 1834
1837	-1.4% from 1837 to 1838
1839	-4.7% from 1839 to 1840
1857	-8.0% from 1856 to 1858
1873	-6.0% from 1873 to 1875
1893	-15.3% from 1892 to 1894
1907	-15.6% from 1907 to 1909

From: Jalil, "A New History of Banking Panics in the United States, 1825–1929"

Jalil's Impulse Response Function – Overview

- Suppose there is a crisis in period *t* (specifically, a crisis that was unexpected given current and lagged output, and lagged values of the crisis dummy)?

- How does this affect output in periods *t*, *t*+1, *t*+2, *t*+3, …?

Impulse Response Function – Mechanics

- Jalil's model is:

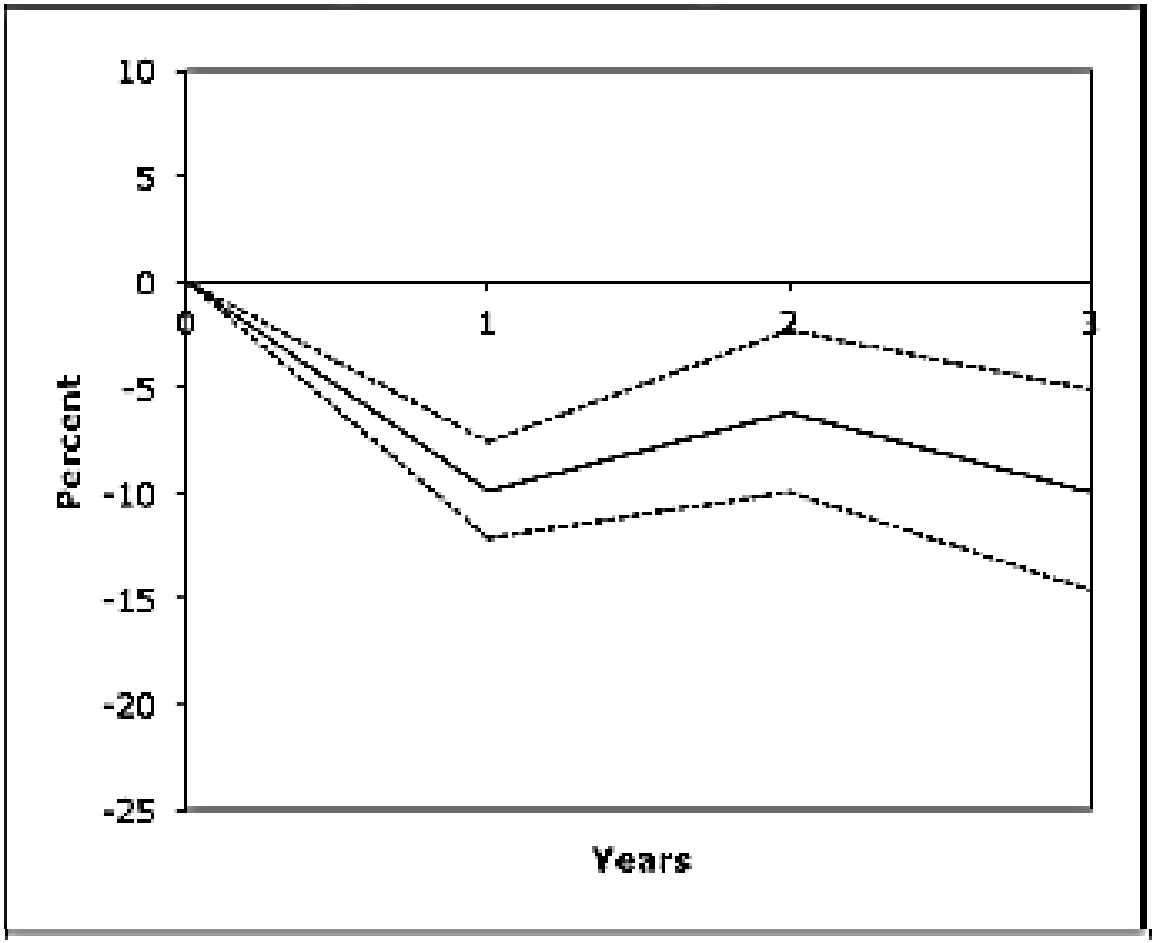
$$F_t = a + b\Delta Y_t + \sum_{i=1}^{3} \alpha_i F_{t-i} + \sum_{i=1}^{3} \beta_i \Delta Y_{t-i} + u_t,$$

$$\Delta Y_t = c + \sum_{i=1}^{3} \gamma_i F_{t-i} + \sum_{i=1}^{3} \delta_i \Delta Y_{t-i} + v_t,$$

where *F* is the crisis dummy and ΔY is the change in log output, and *u* and *v* are uncorrelated with one another and over time.

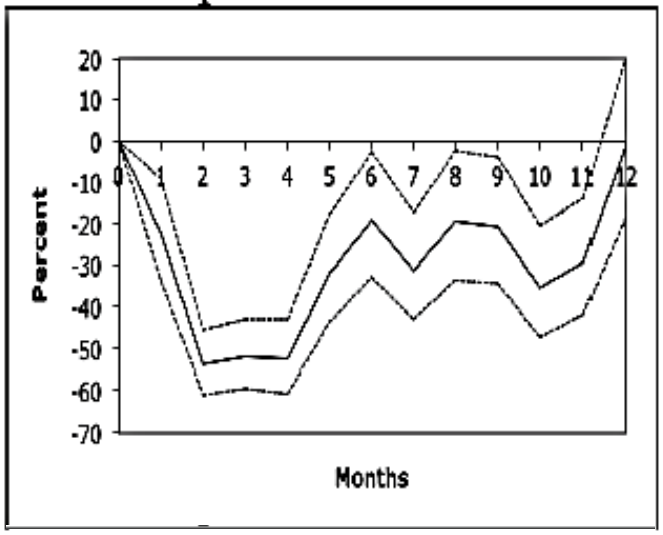
- Then the impulse response function of ΔY to *F* is γ_1 after 1 period, $\gamma_2 + \delta_1\gamma_1$ in period 2, ….
- The impulse response function of the level of log output is γ_1 after 1 period, $\gamma_1 + \gamma_2 + \delta_1\gamma_1$ in period 2, ….

Panel B. Response of Output to Panic

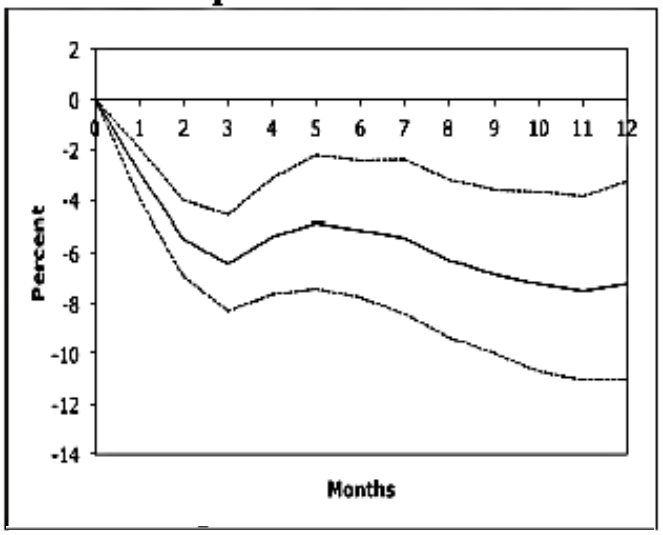


From: Jalil, "A New History of Banking Panics in the United States, 1825–1929"

Panel C. Response of Construction to Panic

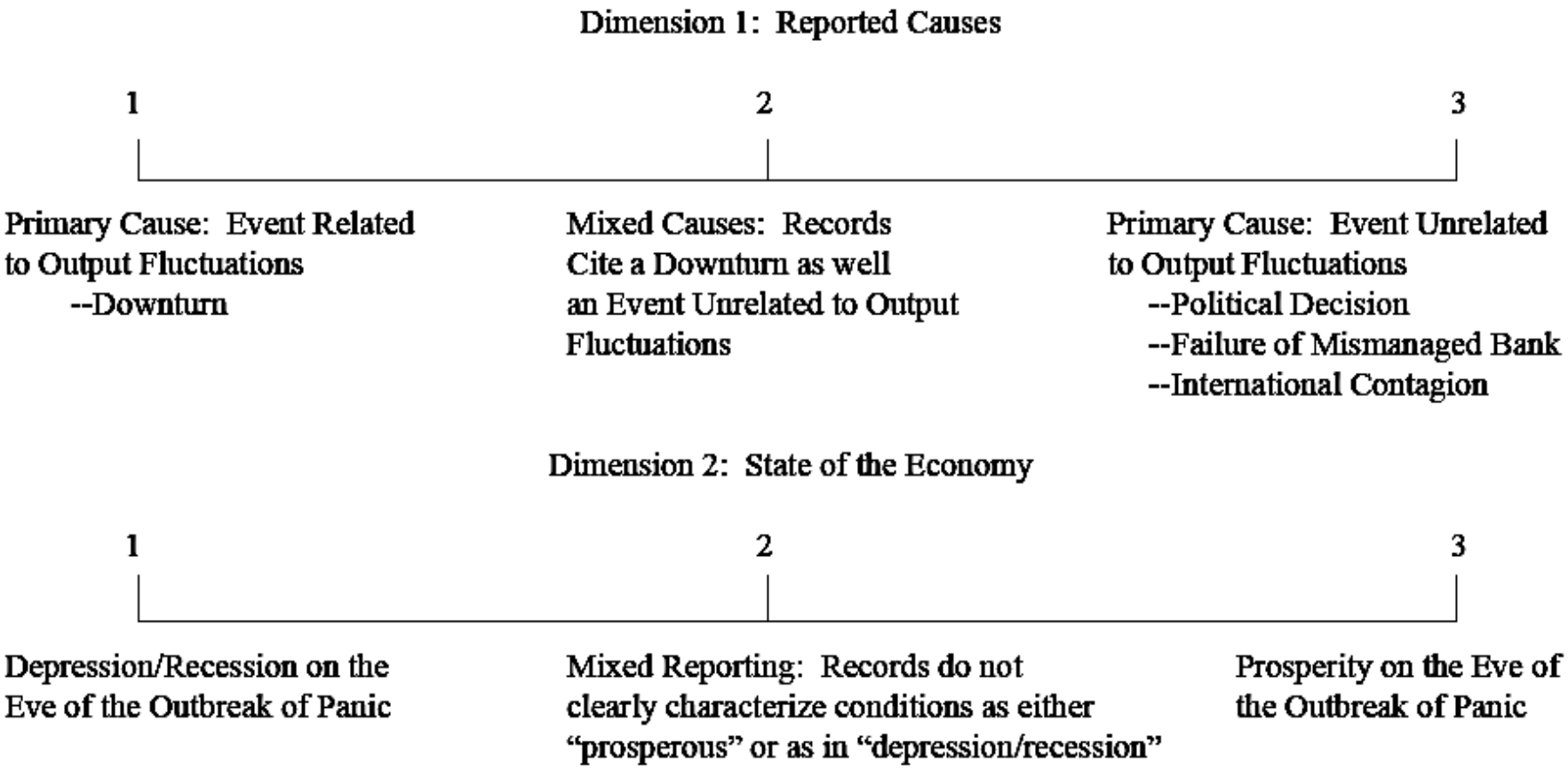


Panel D. Response of Prices to Panic



From: Jalil, "A New History of Banking Panics in the United States, 1825–1929"

FIGURE 2
Classification Algorithm



From: Jalil, "A New History of Banking Panics in the United States, 1825–1929"

TABLE 7
Classification of Panics

Panic	Dimension 1	Dimension 2
1833	3	3
1837	No Rank	No Rank
1839	No Rank	No Rank
1857	3	3
1873	3	3
1893	3	1
1907	2	1

From: Jalil, "A New History of Banking Panics in the United States, 1825–1929"

Panic of 1857: Failure of Mismanaged Bank

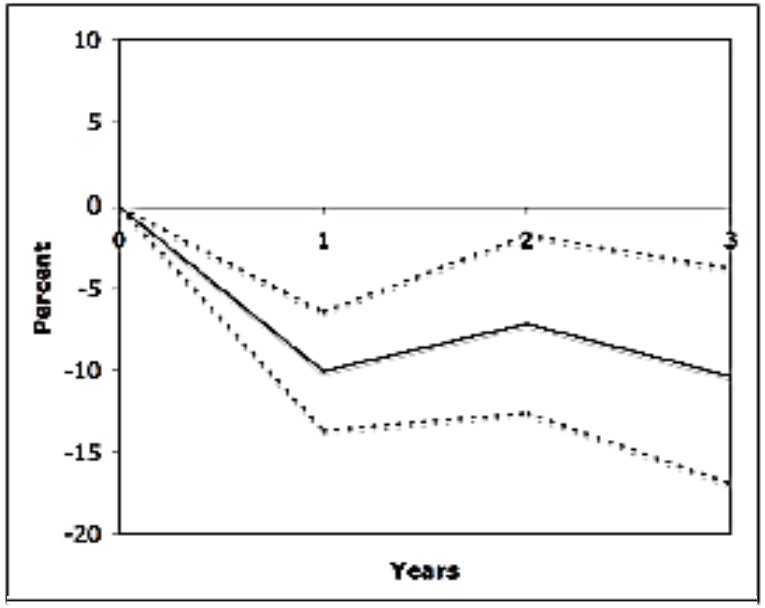
The catalyst for the Panic of 1857 was the failure of the Ohio Life Insurance Company. Its failure was attributed to mismanagement and fraudulent activities.[61] The collapse of this banking firm triggered the panic. The Ohio Life was considered one of the most reputable firms in the nation and initially, the cause of its failure was unknown. Its demise shocked the financial community and sparked runs on banks throughout the country. Over the succeeding weeks, fear spread and the panic gained in intensity. The news reports identify this contagion of fear following the failure of the Ohio Life as the cause of the panic.

From: Jalil, "Appendix to A New History of Banking Panics in the United States, 1825–1929"

FIGURE 3
Results of the Restricted VARs

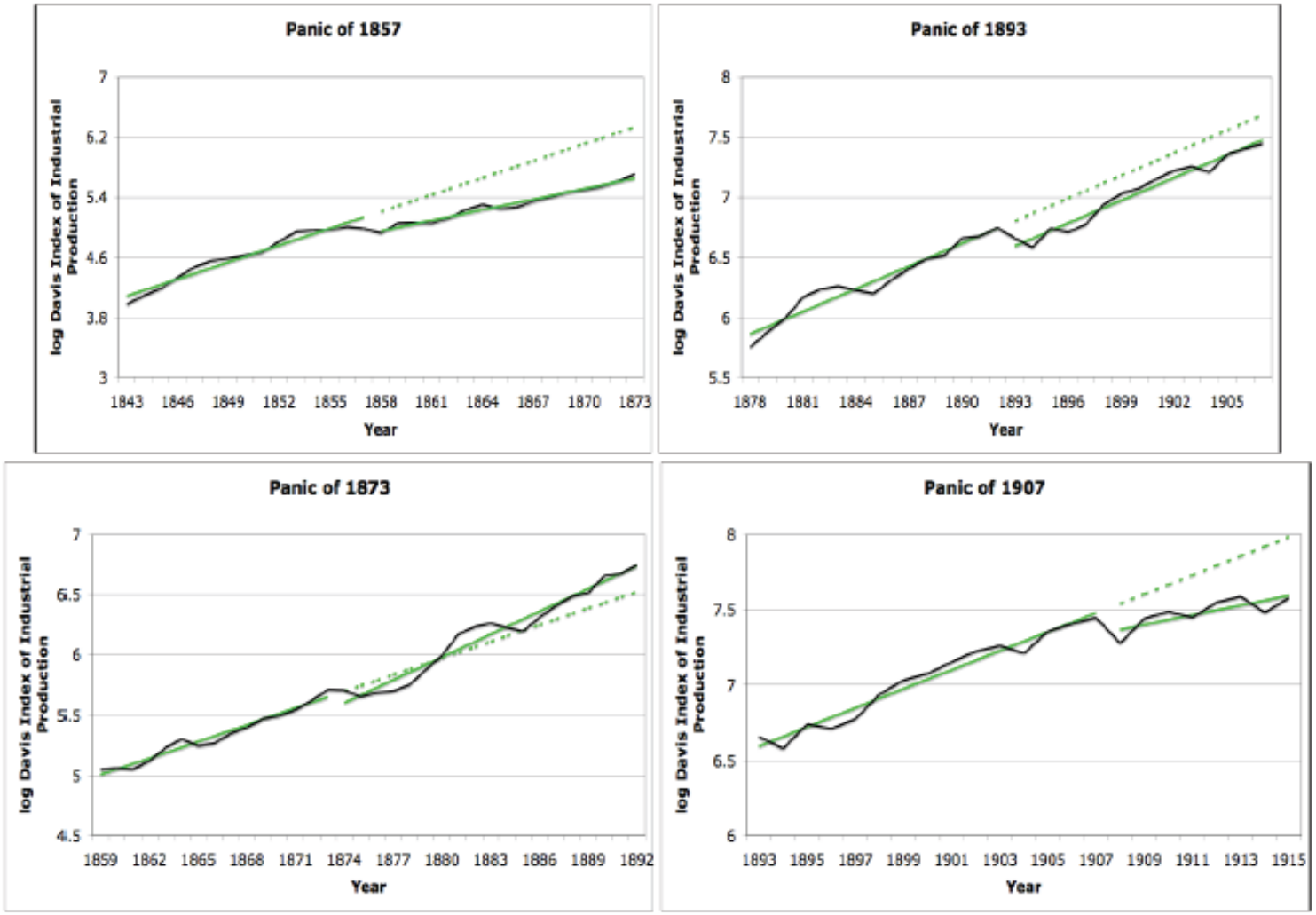
Panel A. Response of Output to Panic

Specification 1



From: Jalil, "A New History of Banking Panics in the United States, 1825–1929"

FIGURE 5
Actual and Projected Trend Lines (Panics of 1857, 1873, 1893, and 1907)



From: Jalil, "A New History of Banking Panics in the United States, 1825–1929"

Conclusion

IV. Romer and Romer

"New Evidence on the Impact of Financial Crises in Advanced Economies"

Motivation for the Paper

- Understanding the aftermath of 2008 crisis.
- Dissatisfaction with existing cross-country evidence.
    - Mixes advanced and developing economies; existing chronologies differ substantially and use somewhat imprecise criteria; empirical analysis very simple.
- Careful studies (such as Jalil) only look at a single country in the quite distant past.

Overview

- Focus on advanced countries in the period 1967-2007.
- Develop a measure of financial distress based on a consistent, real-time narrative source.
- Estimate the average impact of financial crises using conventional regression techniques.
- Investigate the variation in outcomes across episodes.

New Measure of Financial Distress

- Read *OECD Economic Outlook*.
- Look for rises in the cost of credit intermediation.
- Group similar episodes together.
- Scale distress from 0 to 15.

Making Narrative Work Rigorous

- Have a high quality source.
- Have a precise definition of what one is looking for.
- Look at universe; don't pick and choose.
- Read carefully, critically, and honestly.
- Document choices.
- Cross-check.
- How well do each of the papers for today do in following these steps?

Sample Entry in the Appendix

Sweden, 1993:1 – Moderate Crisis (Regular)

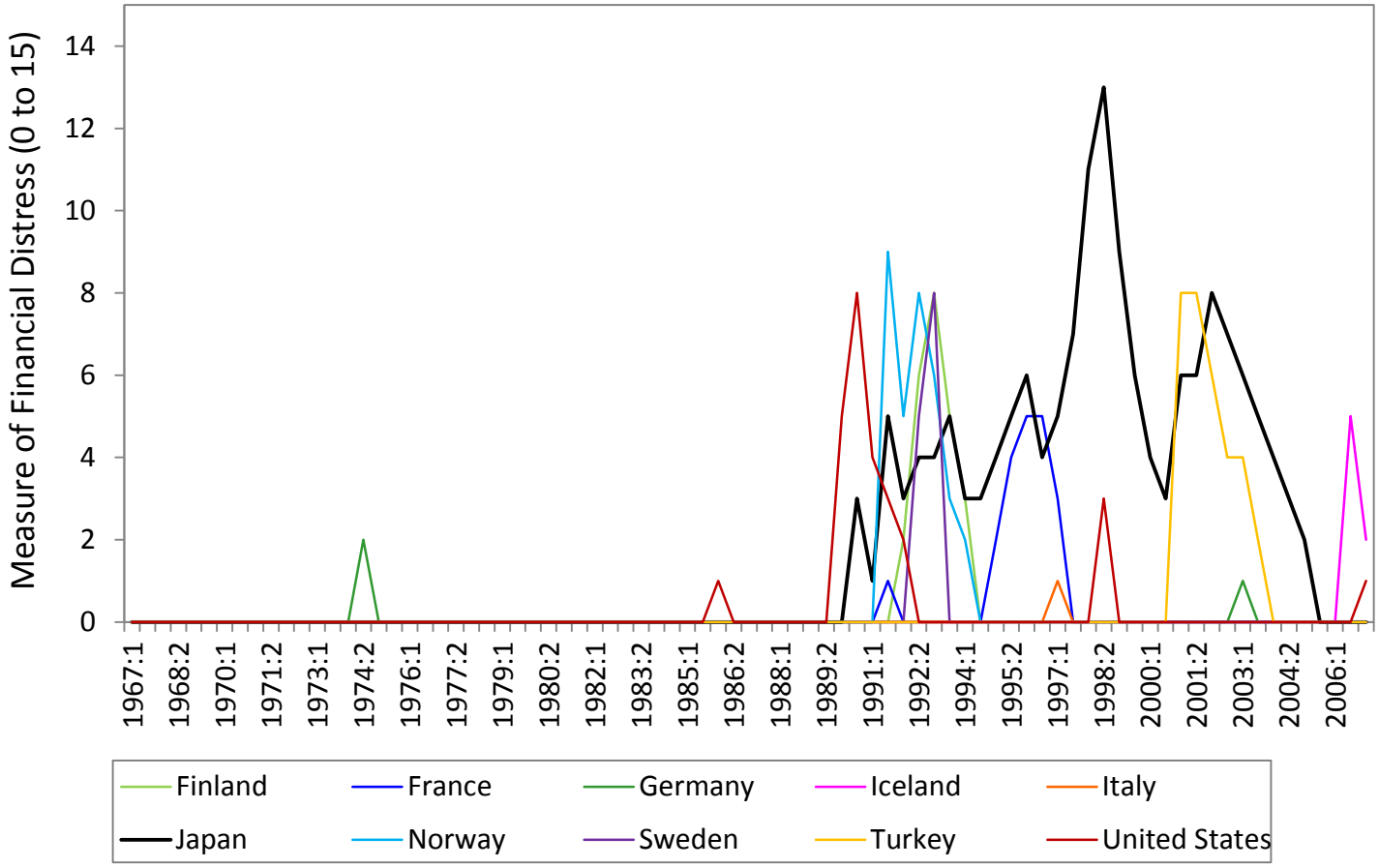
In the summary of its entry, the OECD said, "Steeply falling property values have led to a sharp increase in corporate bankruptcies and heavy loan losses in banks' balance sheets" (p. 113). A paragraph devoted to the financial system reported (p. 115):

> Falling asset values and corporate bankruptcies linked to the collapse in the commercial property market have provoked an unprecedented increase in banks' loan losses. These reached Skr 70 billion in 1992 (7.7 per cent of outstanding loans), up from Skr 36 billion in 1991. Losses are widely expected to remain high in 1993. With the capital bases of most major banks rapidly eroding, the Government has guaranteed that banks can meet their commitments. Government rescue operations are officially estimated to burden the 1992/93 budget by Skr 22 billion (1½ per cent of GDP), with off-budget loans and guarantees amounting to an additional Skr 46 billion (over 3 per cent of GDP). It is not known what scale of rescue operations will be needed in the 1993/94 budget.

Finally, in discussing risks to the outlook, the OECD stated, "greater weakness of demand could be accentuated by rising capital costs in the event of larger loan losses. This would … risk reducing credit supply" (p. 115).

This episode is similar to Norway in 1992:2 and Finland in 1993:1. The most obvious difference is that in this case, the OECD devoted a sentence in its summary to the financial-market problems. But the financial system was starting from a slightly better position than Finland's was (as described above, we code Sweden in 1992:2 as a minor crisis–regular, whereas we classify Finland in 1992:2 as a minor crisis–plus). And, in contrast to the discussion of Norway, there was no explicit reference to firms facing difficulties in obtaining financing. We therefore also classify this episode as a moderate crisis–regular.

Figure 1
New Measure of Financial Distress

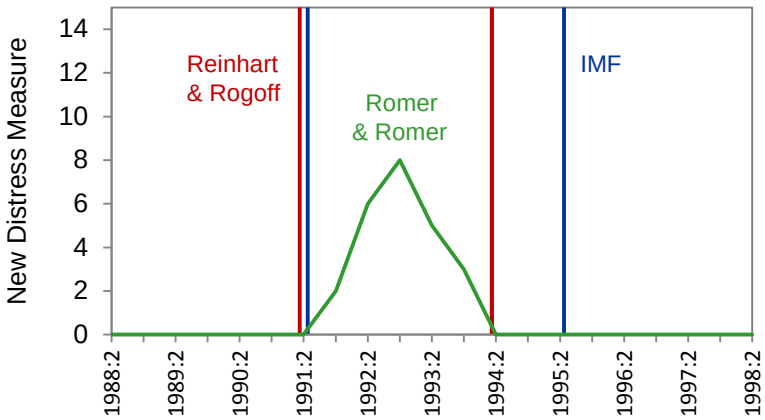


Comparison to Other Chronologies

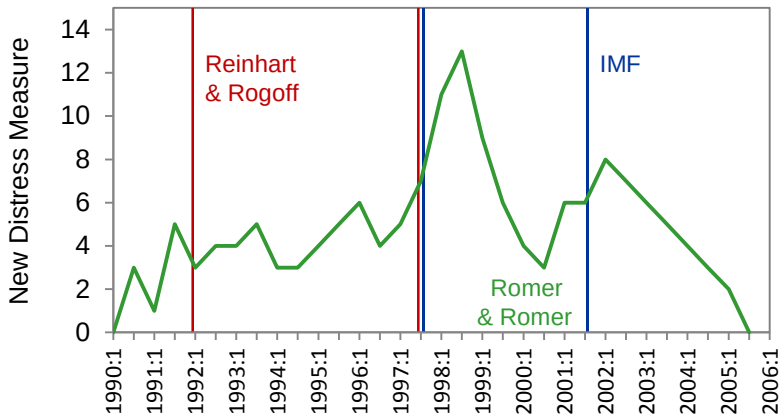
- Look at Reinhart and Rogoff and IMF Systemic Crises Database.
- IMF identifies 8 systemic crises in OECD countries in period we look at.
- We find something in 6 of those cases.

Comparison of Crisis Chronologies for Key Episodes

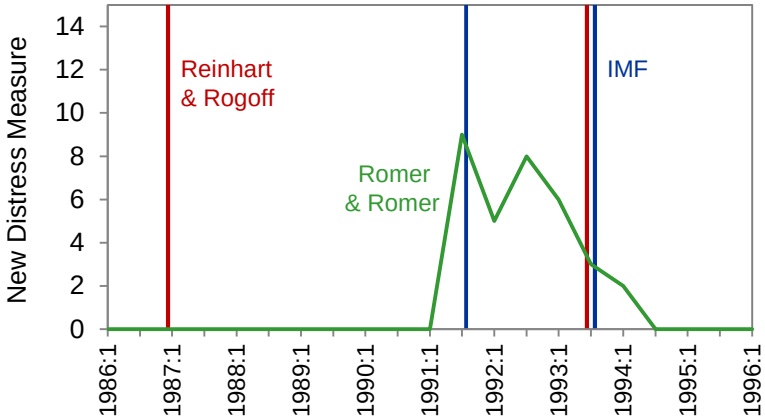
a. Finland



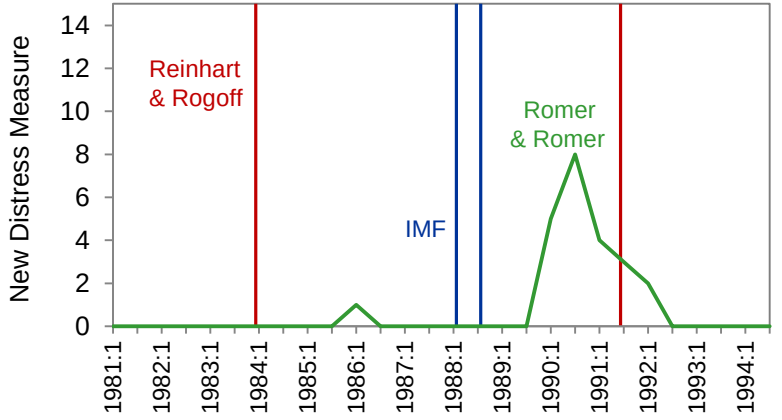
b. Japan



c. Norway



d. United States



Estimating the Relationship between Output and Financial Distress

- Almost surely have OVB.
- Panel Data
  - GDP or IP for 24 countries, 1967-2007.
  - Both distress and output are semiannual.
- Use Jordà local projection method to estimate the impulse response function.

VAR versus Jordà Local Projection Method

- VAR (of Distress and Output)
  - Estimate a two-equation system.
  - Form the IRF by feeding an innovation to distress through both equations.
- Jordà Local Projection Method
  - Regress output at various horizons after time *t* on distress at *t* and control variables.
  - Sequence of coefficients for various horizons is the impulse response function.

Specification for Output Regressions

(1) $$y_{j,t+i} = \alpha_j^i + \gamma_t^i + \beta^i F_{j,t} + \sum_{k=1}^{4} \varphi_k^i F_{j,t-k} + \sum_{k=1}^{4} \theta_k^i y_{j,t-k} + e_{j,t}^i,$$

- the *j* subscripts index countries
- the *t* subscripts index time
- the *i* superscripts denote the horizon (half-years after *t*)
- $y_{j,t+i}$ is the log of output (either industrial production or real GDP) for country *j* at time *t+i*
- $F_{j,t}$ is the financial distress variable for country *j* at time *t*
- the α's are country fixed effects
- the γ's are time fixed effects

Timing Assumption

(1) $$y_{j,t+i} = \alpha_j^i + \gamma_t^i + \beta^i F_{j,t} + \sum_{k=1}^{4} \varphi_k^i F_{j,t-k} + \sum_{k=1}^{4} \theta_k^i y_{j,t-k} + e_{j,t}^i,$$

- Assume that distress can affect output within the period, but output cannot affect distress contemporaneously.
- Almost surely not true; causation likely runs both directions.
- Also try the obvious alternative timing assumption.

Impulse Response Function

(1) $$y_{j,t+i} = \alpha_j^i + \gamma_t^i + \beta^i F_{j,t} + \sum_{k=1}^{4} \varphi_k^i F_{j,t-k} + \sum_{k=1}^{4} \theta_k^i y_{j,t-k} + e_{j,t}^i,$$

- The impulse response function is the sequence of β^i for *i* = 0 to 10.
- Multiply by 7 to get the response to a moderate crisis.

Figure 3
Impulse Response Function, Output to Distress
a. Industrial Production, Full Sample

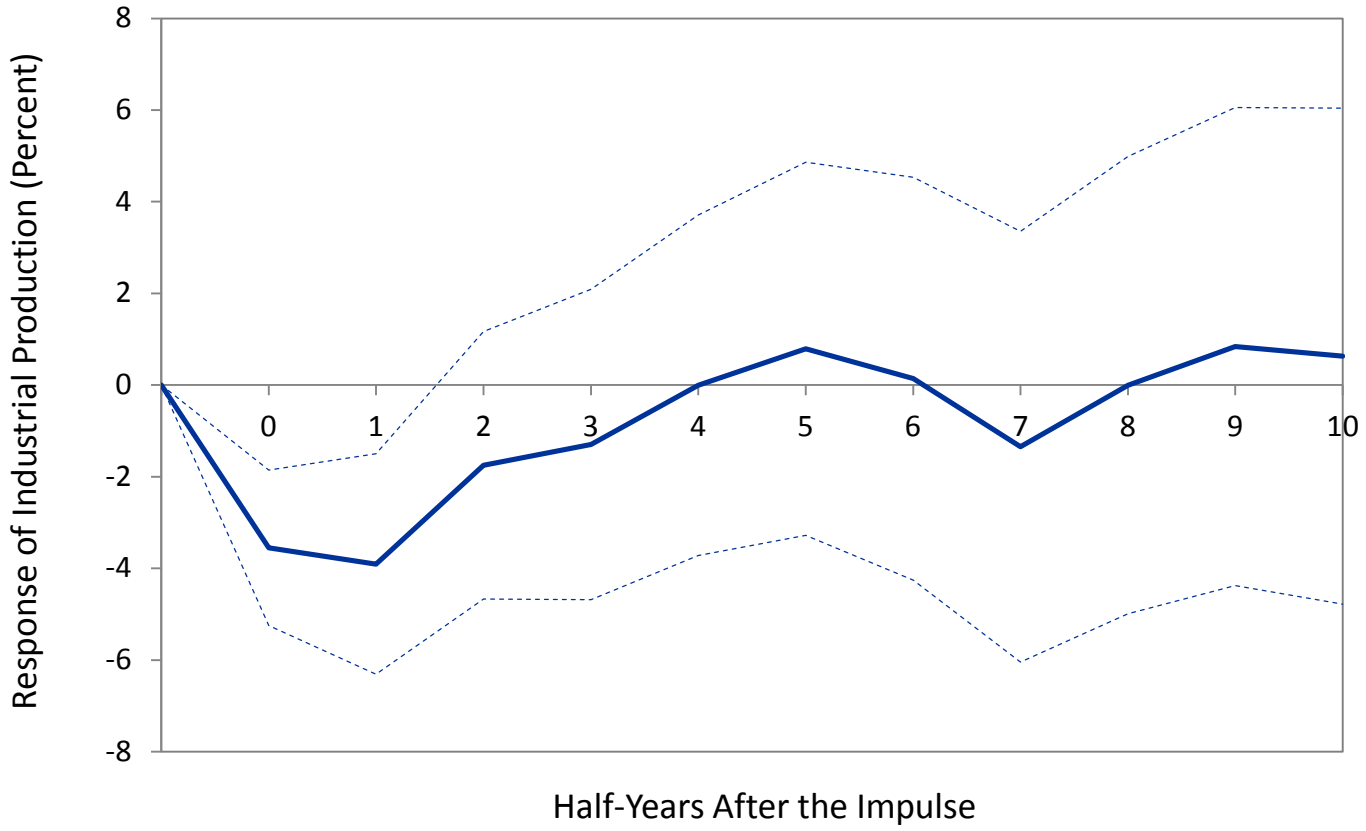


Figure 3
Impulse Response Function, Output to Distress
b. GDP, Full Sample

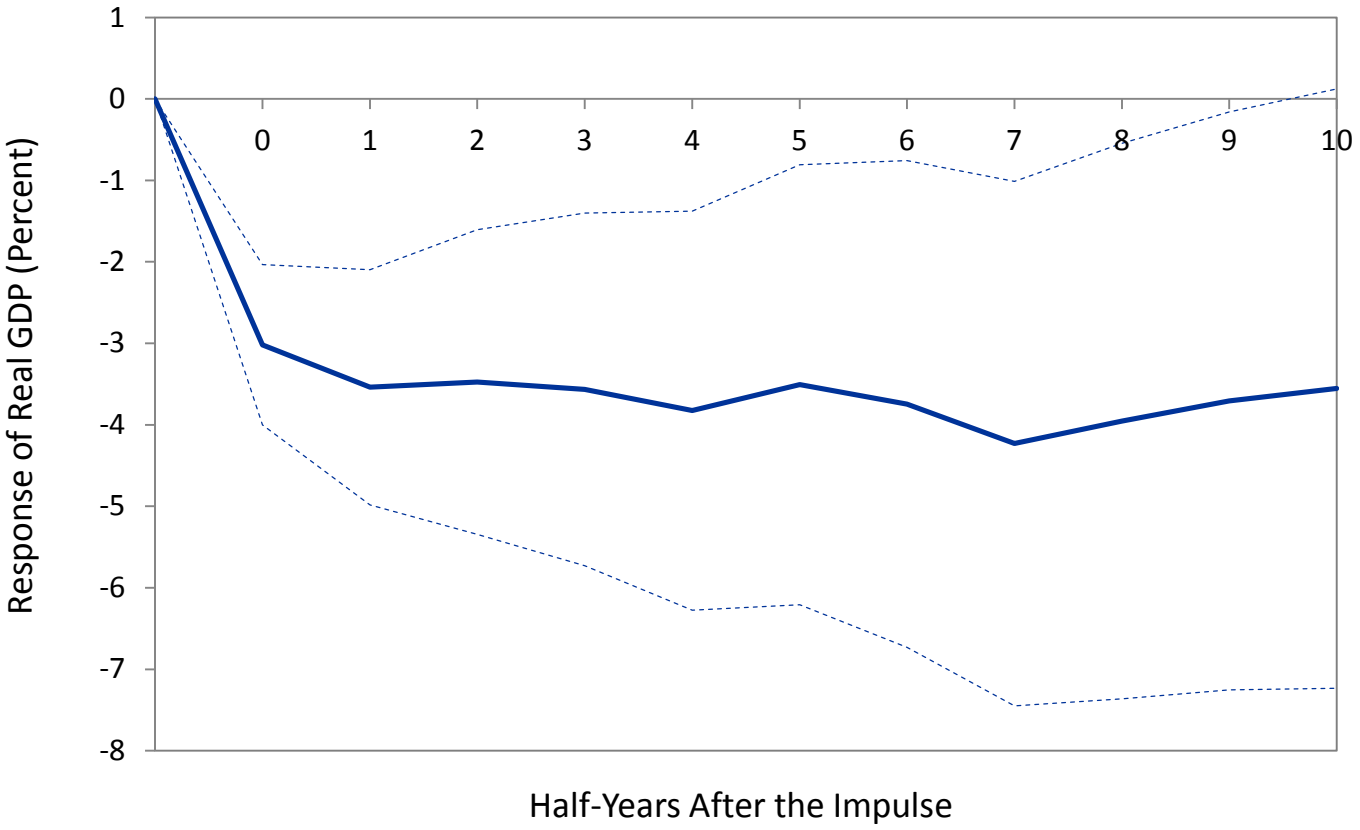


Figure 1
New Measure of Financial Distress

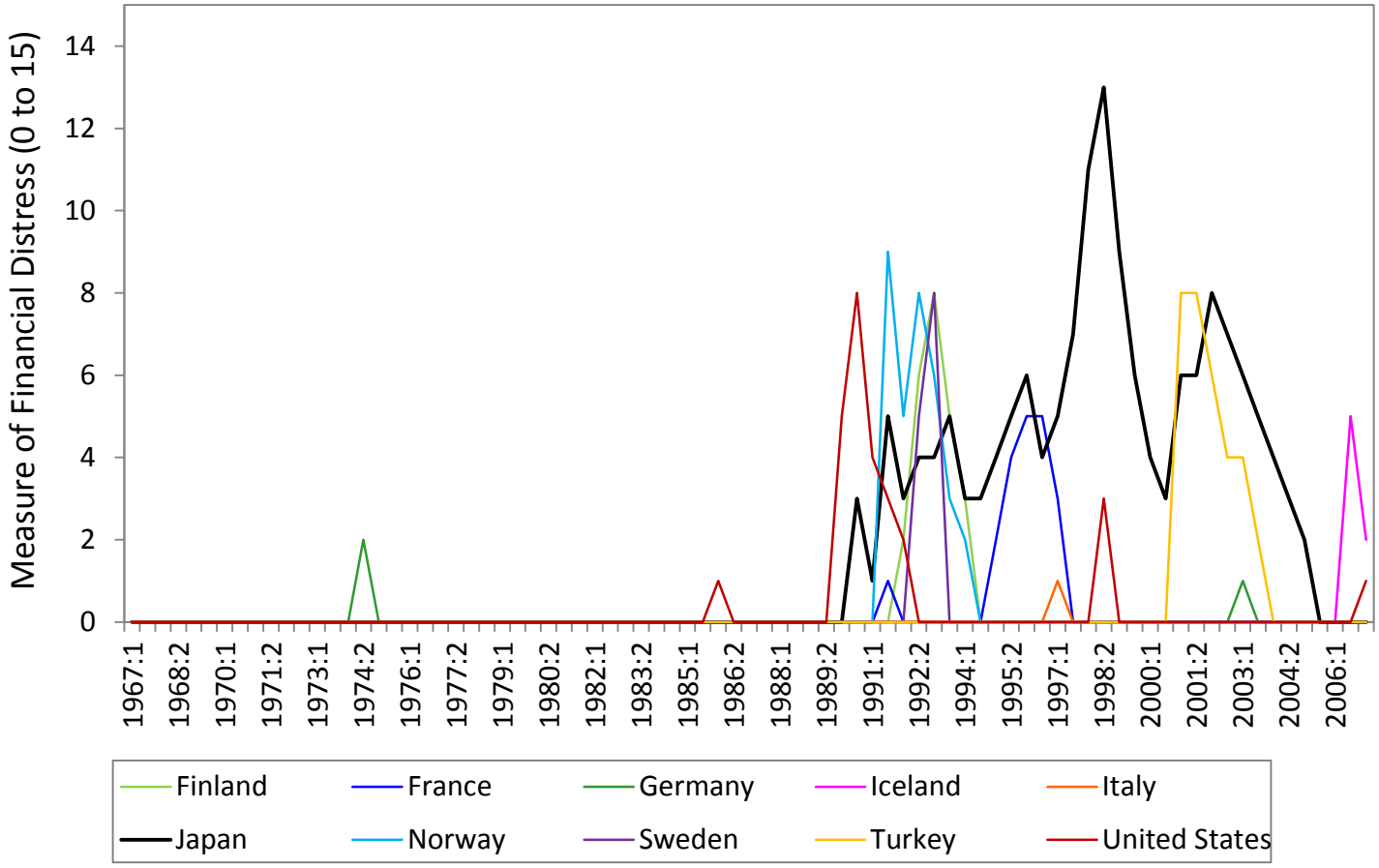
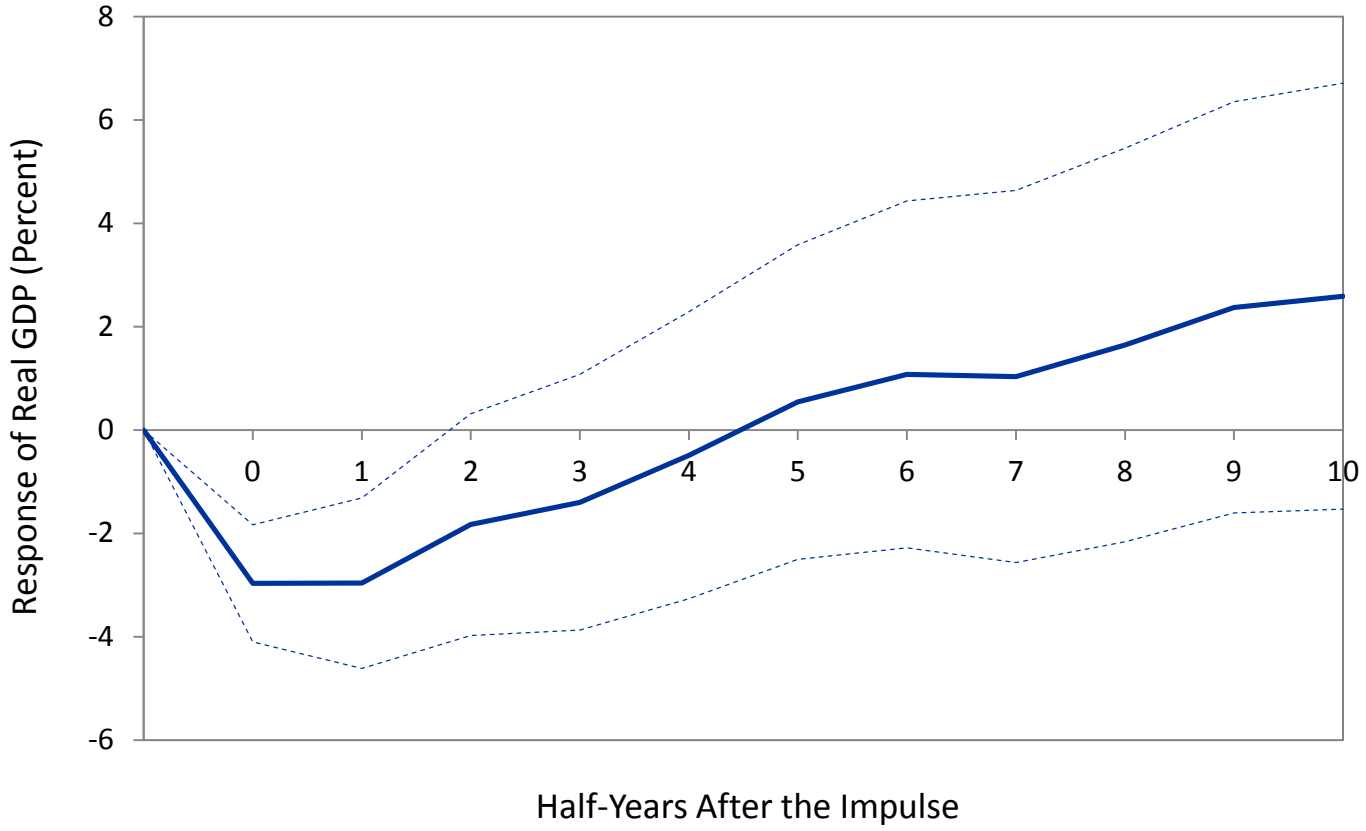


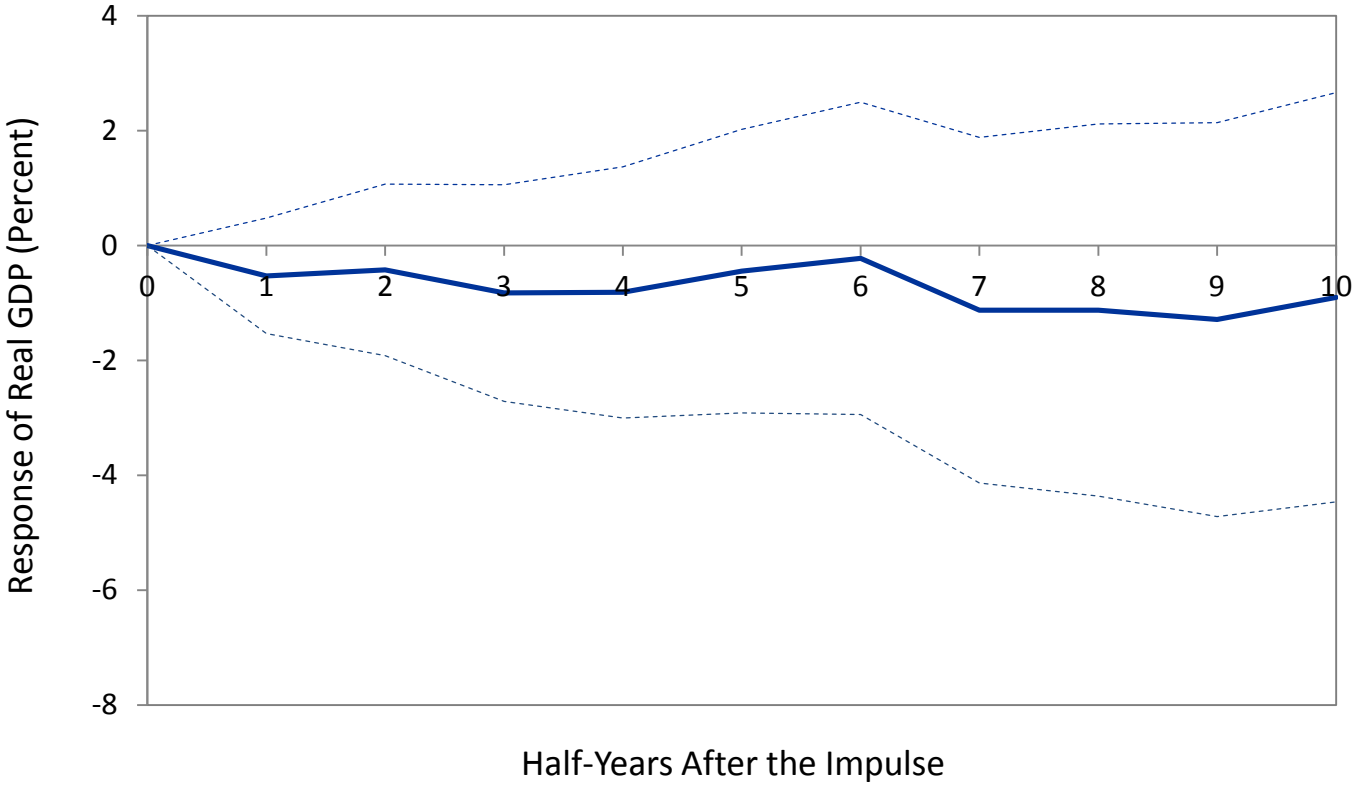
Figure 4
Impulse Response Function, Output to Distress
b. GDP, No-Japan Sample



Evaluation of Empirical Evidence

- Is it appropriate to exclude Japan?
- Other concerns?
- Robustness? What do we need to show?

Figure 6
Impulse Response Function, GDP to Distress
a. Distress in *t Cannot* Affect Output in *t*



Allowing for Nonlinearity

(3) $y_{j,t+i} = \alpha_j^i + \gamma_t^i + \beta^i f(F_{j,t}) + \sum_{k=1}^{4} \varphi_k^i f(F_{j,t-k}) + \sum_{k=1}^{4} \theta_k^i y_{j,t-k} + e_{j,t}^i$

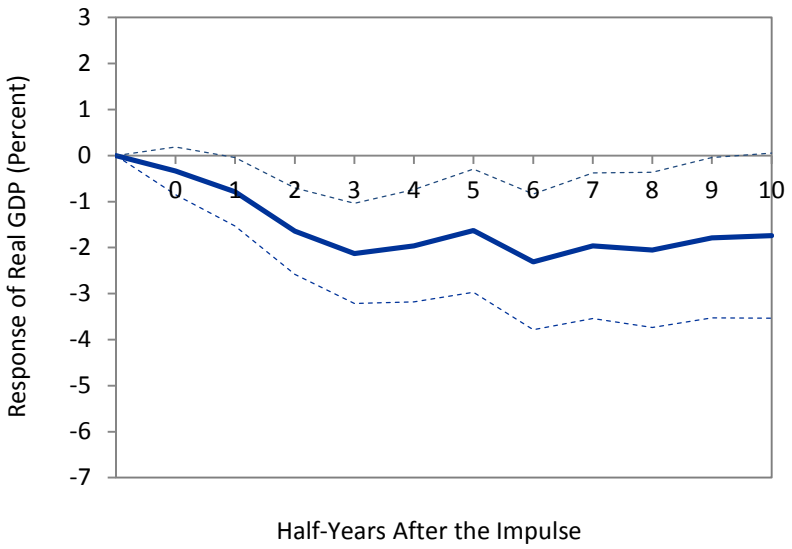
- We try the quadratic case: $f(F) = F + bF^2$
- The estimate of b is -0.025 (s.e = 0.017).

Results Using Alternative Crisis Chronologies

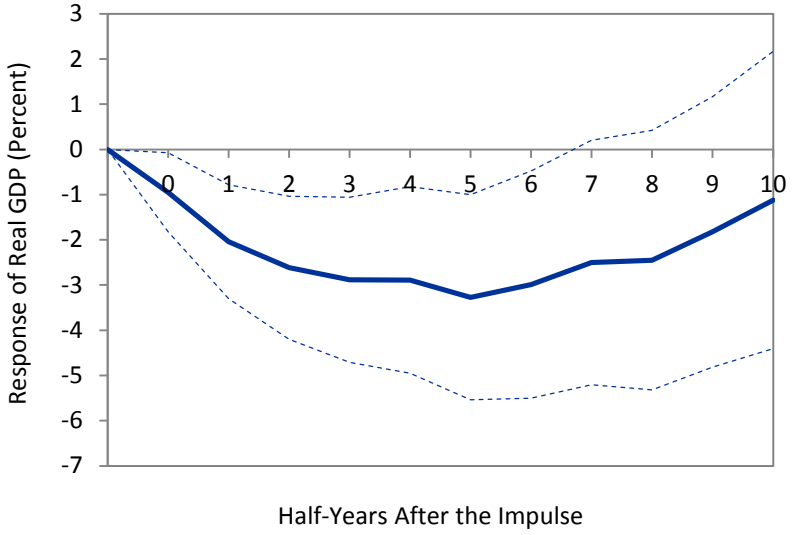
- Run our same regressions using the Reinhart and Rogoff crisis series and the IMF series.
- Look only at the same sample of advanced countries in the post-1967 period.

Figure 7
Impulse Response Functions, GDP to Crisis
Other Chronologies, Full Sample

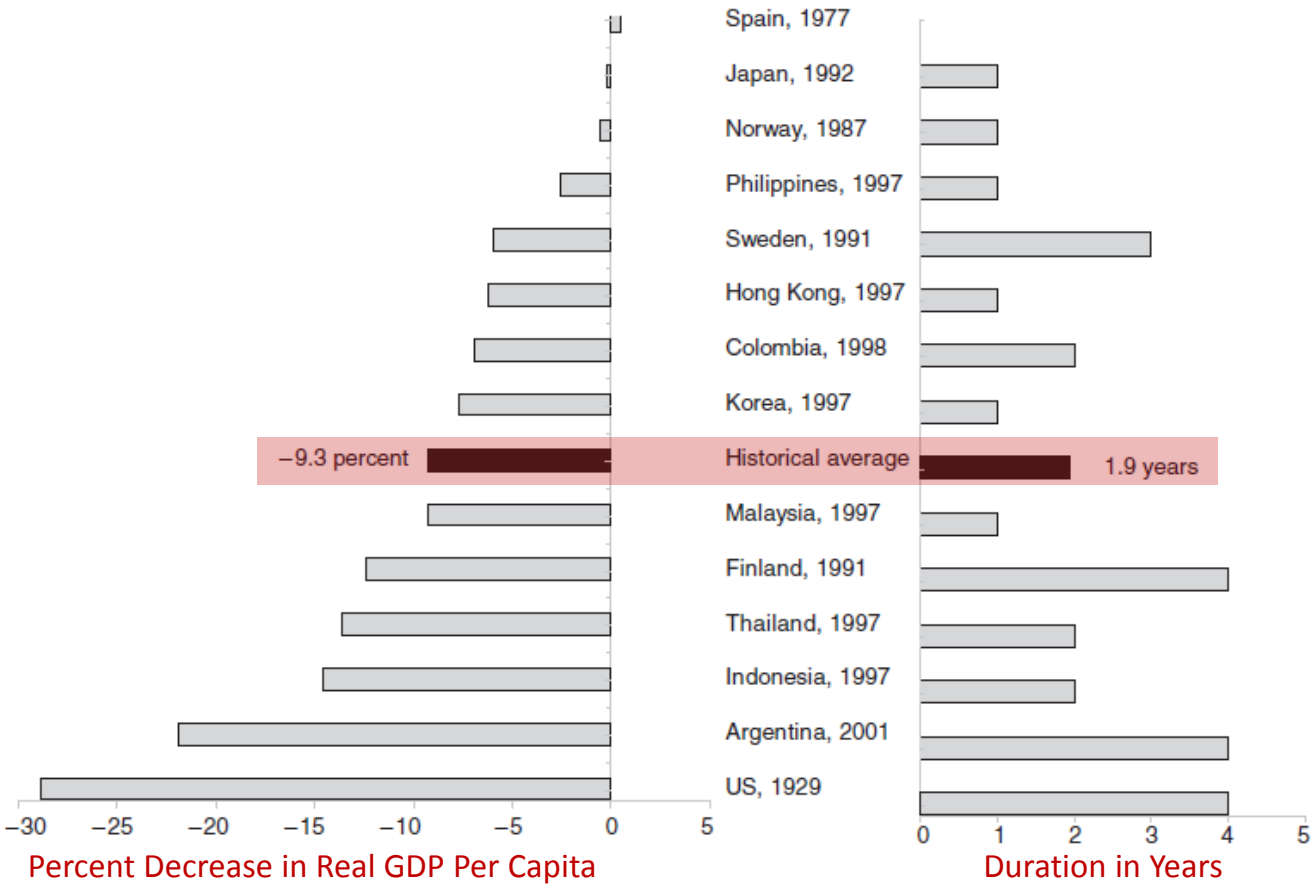
a. Reinhart and Rogoff



b. IMF



Reinhart and Rogoff's Evidence on The Aftermath of Financial Crises



Source: Reinhart and Rogoff, "The Aftermath of Financial Crises"

Analyzing the Variation Across Episodes

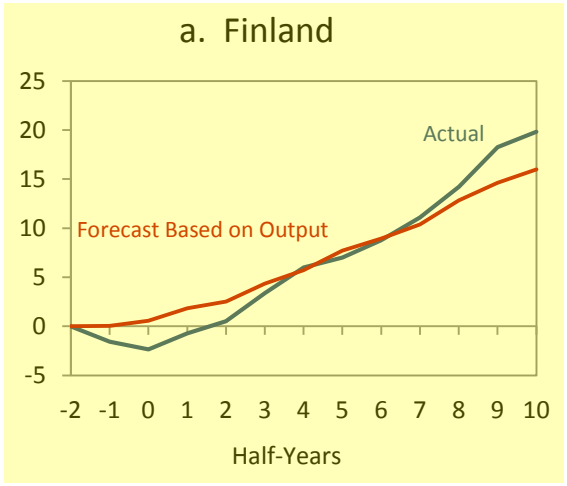
- Look at every episode where distress hits a 7 (a moderate crisis).
- Compare actual behavior of GDP with a forecast based just on the lagged values of GDP and fixed effects.

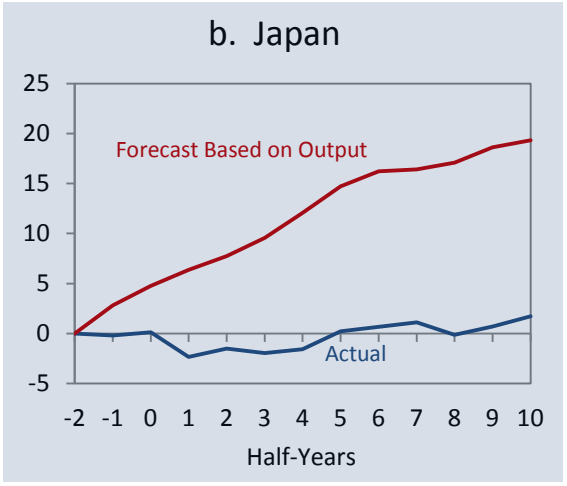
Baseline GDP Forecast

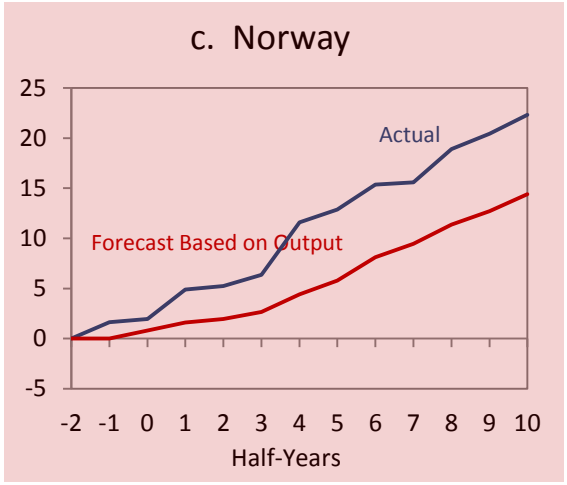
(4) $$y_{j,t+i} = \alpha_j^i + \gamma_t^i + \sum_{k=1}^{4} \theta_k^i \, y_{j,t-k} + e_{j,t}^i,$$

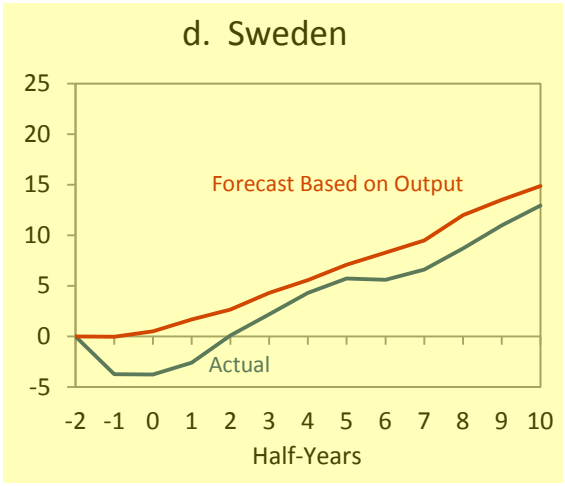
- Estimate this relationship for *i* = 0 to 11.
- Form the forecasts by taking the relevant fitted values for the particular country from the sequence of regressions.
- Use actual GDP data only up through a year before the acute financial distress.

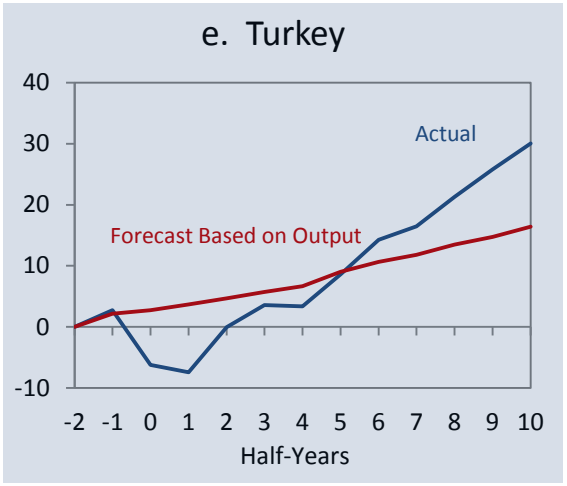
Forecasted and Actual GDP after Crises

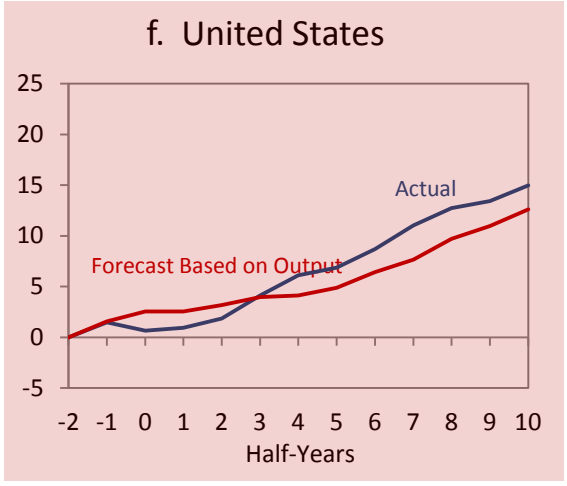












Note: variables are expressed as an index=0 two half-years before the crisis.

Explaining the Variation Across Episodes

- How much of the variation across episodes can we explain with the variation in the severity and persistence of distress?

- Add the actual evolution of distress (up through the horizon of the forecast) to the forecasting equation.

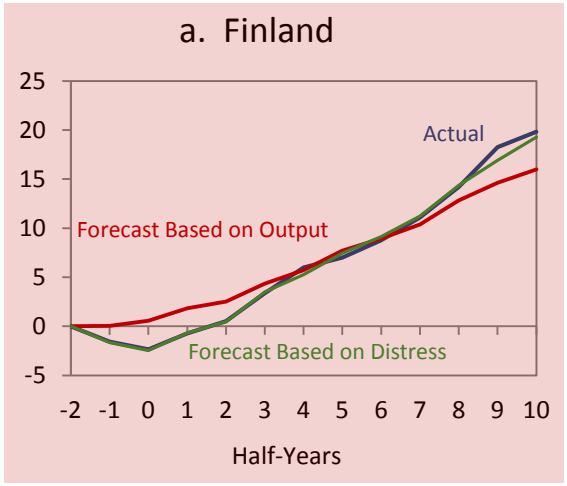
- Is the expanded forecast closer to actual output than the univariate forecast?

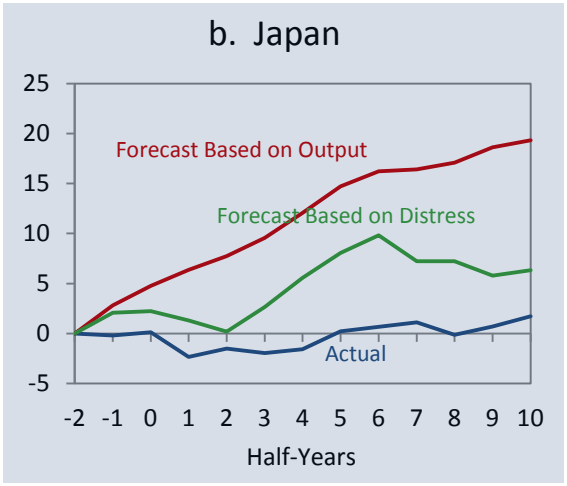
GDP Forecast
Including Actual Evolution of Distress

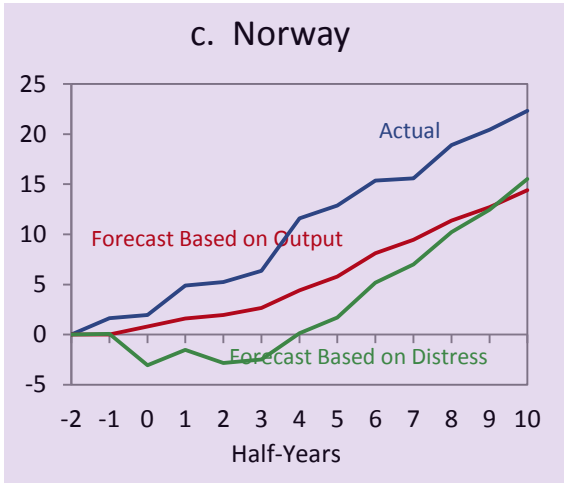
(5) $$y_{j,t+i} = \alpha_j^i + \gamma_t^i + \sum_{k=-4}^{i} \varphi_k^i F_{j,t+k} + \sum_{k=1}^{4} \theta_k^i y_{j,t-k} + e_{j,t}^i.$$

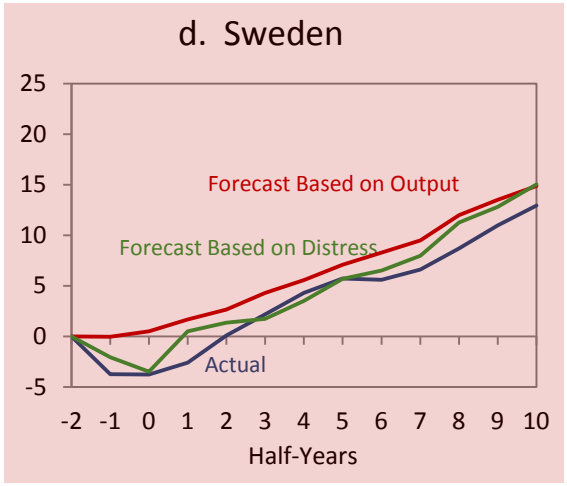
- Estimate this relationship for *i* = 0 to 11.
- Include *F* up through the horizon of the output variable.
- Only include output up through a year before the acute distress.
- Form the forecast by taking the relevant fitted values from the sequence of regressions.

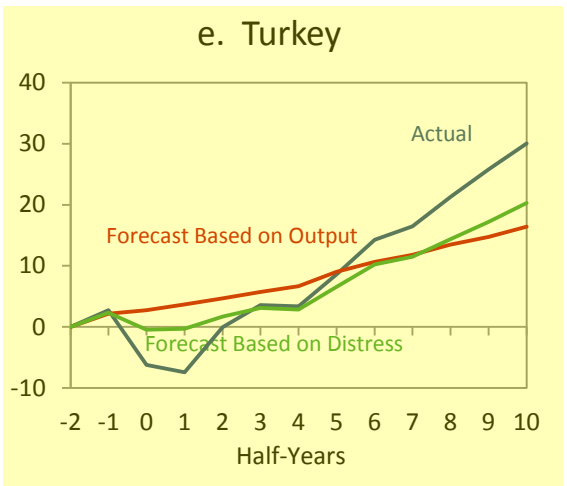
Forecasted and Actual GDP after Crises

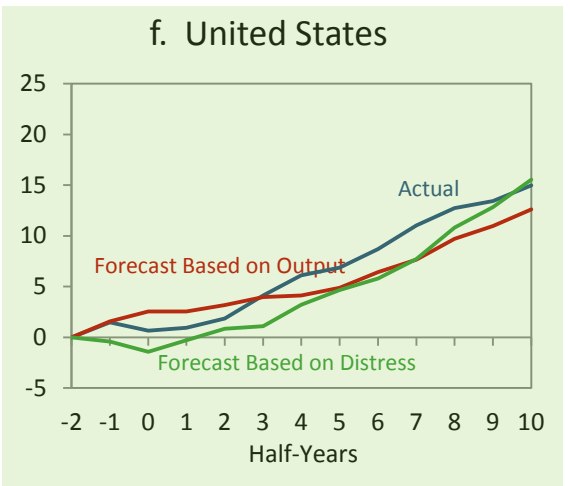












Note: variables are expressed as an index=0 two half-year before the crisis.

Conclusions

- Hope the new measure of financial distress is useful.
- Much work remains to be done on the impact of financial crises.
- Some of the most promising research looks at micro, cross-section evidence.