The Impact of Banking Sector Stability on the Real Economy

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Motivation

- Increased incidence of crisis
- Research:
  - Links between banking sector and long-term growth
  - Quantifying costs of crises

Findings

- The degree of development and openness of the banking sector is important for long term economic growth
- Banking crises coincide with, or precede, substantial economic slowdowns

Main questions addressed

- Does banking sector stability have an impact on real output growth? …
- … and on inflation?
- Can banking sector stability indicators help improve output and inflation forecasts?

Innovations of the paper

- Use a continuous index of banking sector stability instead of binary indicator
- Use a panel VAR to capture two-way effect *(output growth & banking sector stability)*
- Allow output variance to be dependant on banking sector stability to assess its impact on output uncertainty

Conclusions

- Banking sector stability has an impact on GDP growth …
- … and uncertainty about future GDP growth
- Banking sector stability indicators seem to improve output growth forecasts
- No significant impact on inflation

Definitions

- ***In*stability:**

  Probability that the banking sector becomes insolvent within the next quarter

- Insolvency:

  Banking sector is insolvent if, at the end of the quarter, the market value of its total assets is not sufficient to repay its total debt

Assumptions

- The assets of the banking sector follows a Brownian motion

$$dA_t = \mu A_t dt + \sigma_t A_t dw$$

- The debt grows at a continuously compounded growth rate

$$D_{t+1} = D_t e^r$$

Merton's model

- Equity is equivalent to a call option on its assets

$$\max\left(A_{t+1} - D_{t+1}, 0\right)$$

- Using Black-Scholes formula we can obtain the probability of exercising the option (A>D)
- and the probability of *not* exercising the option (A<D) = DD

Duan's method

- There is a one-to-one mapping between the observable equity and the unobservable asset

$\Rightarrow$ The unknown parameters can be estimated by maximum log likelihood method

Data

- Sample : 1980 to 2008
- Quarterly data
- 521 banks in 18 OECD countries
- Linear interpolation for transforming annual debt data to quarterly data
- Quarterly market value of equity is the minimum observed during the quarter

Impact of Banking Sector Stability on Real Economy

FIG. 1. ESTIMATED DISTANCE-TO-DEFAULTS

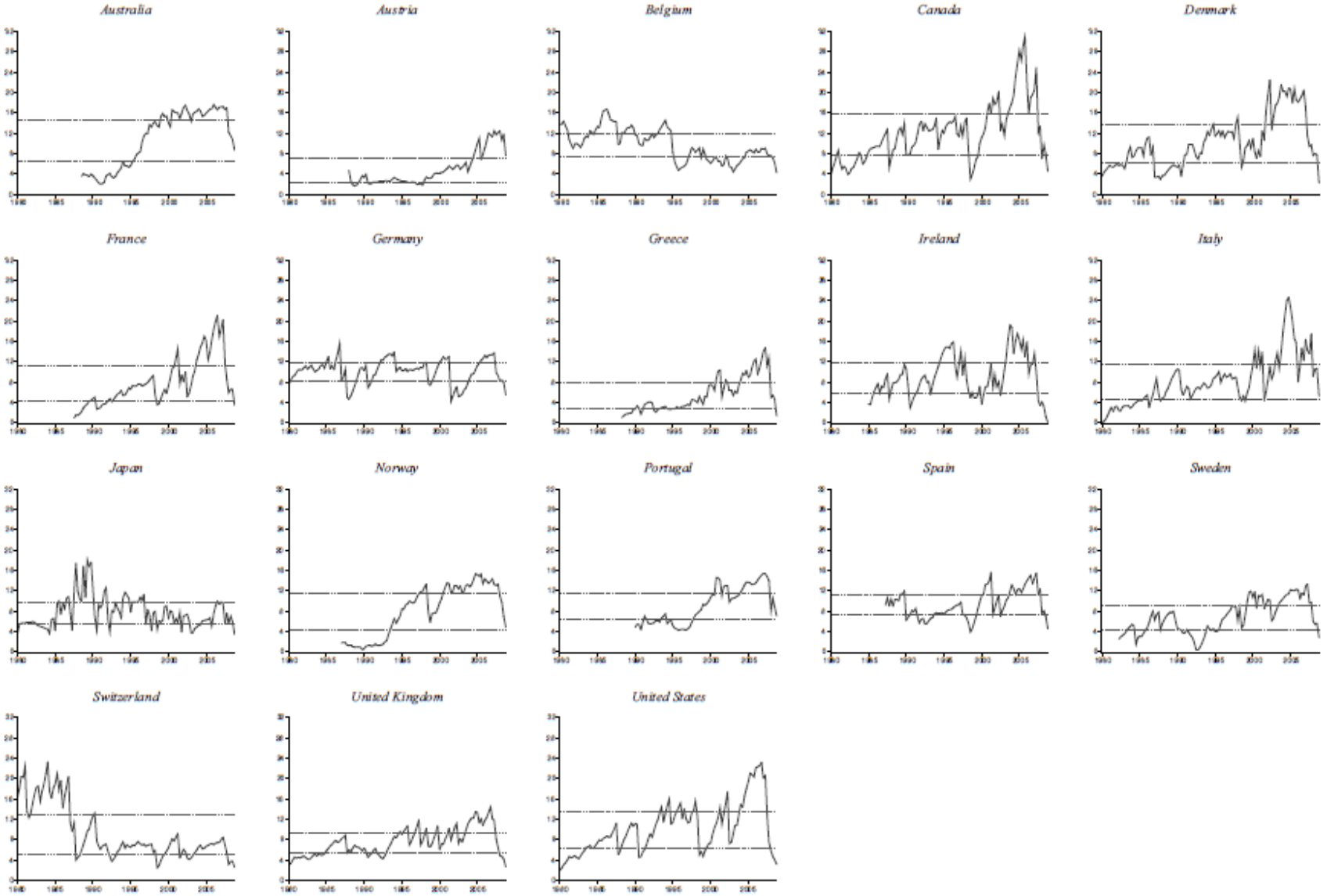

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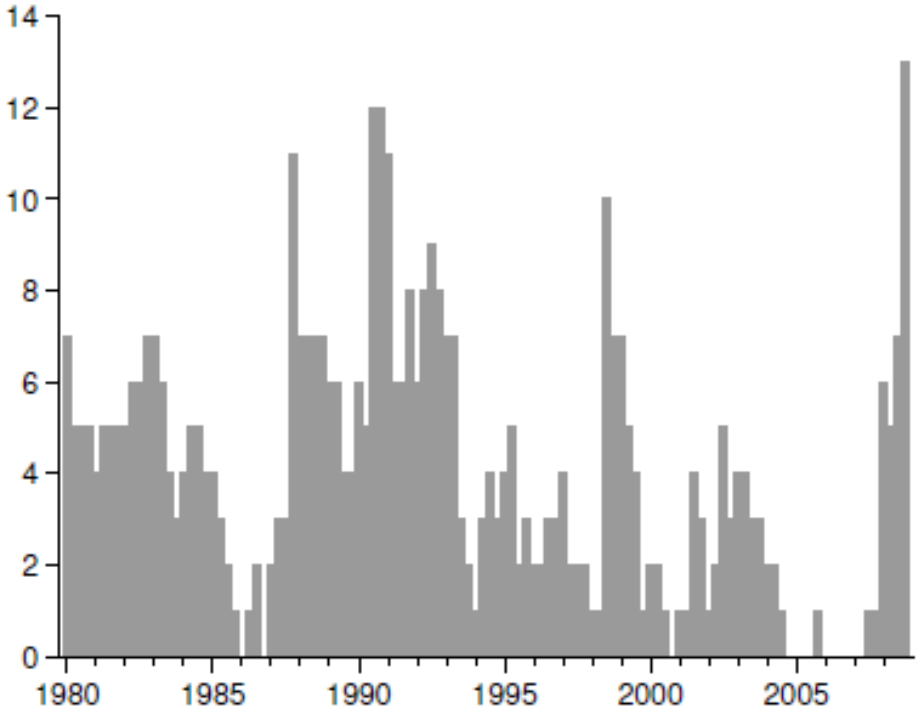
FIG. 2. NUMBER OF COUNTRIES WITH WEAK BANKING SECTOR



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Unbalanced Panel VAR with state dependant variance

- Panel VAR equation

$$y_{it} = Ay_{it-1} + Bx_{it} + \mu_i + H_{it}^{1/2}\varepsilon_{it}$$

- Variance equation

$$\sigma_{itn}^2 = \exp(\alpha_{in} + \alpha_n z_{it-1})$$

- Estimated with maximum log likelihood

TABLE 1
LINEAR IMPACT OF BANKING SECTOR STABILITY ON REAL OUTPUT GROWTH

	Level		Variance	
	GDP_t	DD_t	$log(\sigma^2_{GDP_t})$	$log(\sigma^2_{DD_t})$
GDP_{t-1}	0.2035**	2.2104**	-16.2861**	-3.7156
GDP_{t-2}	0.1982**	0.1754	-6.8144	11.0961**
DD_{t-1}	0.0011**	0.9671**	-0.3239**	0.6499**
DD_{t-2}	-0.0010**	-0.0093	0.0060	0.3483**
Oil_t	0.0006	-0.0495		
Oil_{t-1}	-0.0020**	-0.0397		
Oil_{t-2}	-0.0011	-0.0526*		

*(**) indicates that the coefficient at significant at the 5% (1%) level. Level: estimated coefficients of equation (8) with GDP growth and banking sector's distance-to-default as endogenous variables and oil price yield as exogenous variable. Variance: estimated coefficients for equation (12) with GDP growth and banking sector's distance-to-default as independent variables.

Banking sector stability on output growth

- Two-way relationship
- Higher output growth followed by greater banking sector stability
- Banking sector stability induces growth in subsequent periods

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Variances

- Levels have impact on own variance
- Higher output growth = lower output variance

- Variance in DD increases when DD is high

Unstable banking sector more likely to be followed by more instability

Variances

- Stable banking sector reduces uncertainty about future output growth

Stable banking sector more likely to be followed by high output growth than an unstable banking sector is to be followed by low output growth

Table 2
Linear impact of banking sector stability on inflation

	Level		Variance	
	$Inflation_t$	DD_t	$log(\sigma^2_{Infl_t})$	$log(\sigma^2_{DD_t})$
$Inflation_{t-1}$	1.0458**	0.0007	0.0623	0.1427**
$Inflation_{t-2}$	-0.1237**	-0.0080	0.1143*	-0.1910**
DD_{t-1}	-0.0487	0.9765**	0.2286**	0.5770**
DD_{t-2}	0.0330	-0.0254	-0.2172**	0.3480**
Oil_t	0.5015**	-0.0428		
Oil_{t-1}	0.1309*	-0.0097		
Oil_{t-2}	0.3227**	-0.0280		

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Table 3

Non linear impact of banking sector stability on real output growth

	Level		Variance	
	GDP_t	DD_t	$log(\sigma^2_{GDP_t})$	$log(\sigma^2_{DD_t})$
GDP_{t-1}	0.1969**	4.0539**	-17.0826**	-2.2483
GDP_{t-2}	0.2115**	3.2440**	-8.3040*	7.0877
$D_{1,t-1}$	-0.0019**	-0.6422**	0.1445	-0.3709**
$D_{1,t-2}$	0.0016**	-0.3758**	0.3846**	-1.2010**
$D_{2,t-1}$	0.0008	1.1228**	-0.2373	0.3551**
$D_{2,t-2}$	-0.0004	0.4656**	-0.3045*	0.1747**
Oil_t	0.0007	-0.0209		
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Non linear impact

- Linear links are driven predominantly by unstable periods rather than a smooth and continous link between banking sector and the real economy

TABLE 4
NON LINEAR IMPACT OF BANKING SECTOR STABILITY ON INFLATION

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	$Inflation_t$	DD_t	$log(\sigma^2_{Infl_t})$	$log(\sigma^2_{DD_t})$
$Inflation_{t-1}$	1.0497**	-0.0173	0.0654	0.0386
$Inflation_{t-2}$	-0.1259**	0.0043	0.1034	-0.0815
$D_{1,t-1}$	-0.0757	-0.6516**	0.2017	-0.3533**
$D_{1,t-2}$	0.0985*	-0.3387**	-0.0224	-1.0098**
$D_{2,t-1}$	-0.0485	1.1281**	-0.0161	0.2686*
$D_{2,t-2}$	0.0427	0.4536**	0.0456	0.2236
Oil_t	0.5162**	-0.0189		
Oil_{t-1}	0.1336*	0.0421		
Oil_{t-2}	0.3342**	0.0847		

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LINEAR IMPACT OF BANKING SECTOR STABILITY ON REAL OUTPUT GROWTH : EXTENDED SAMPLE

	Level		Variance	
	GDP_t	DD_t	$log(\sigma^2_{GDP_t})$	$log(\sigma^2_{DD_t})$
GDP_{t-1}	0.2313**	2.2489	-12.5079*	-14.8445**
GDP_{t-2}	0.2032**	-0.9067	-9.5655	0.3829
DD_{t-1}	0.0008**	0.8984**	-0.2344**	0.6176**
DD_{t-2}	-0.0008*	-0.0081	-0.0304	0.3826**
Oil_t	0.0011	0.1029*		
Oil_{t-1}	-0.0011	-0.0155		
Oil_{t-2}	-0.0007	0.0074		
$\Delta M2_{t-1}$	0.0136*	0.3182		
$STIR_{t-1}$	-0.0003**	-0.0200**		
ΔC_{t-1}	0.0848*	0.9168		
ΔK_{t-1}	-0.0000**	-0.0000**		

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Stability and Fed forecasts

- Forecasts made by Fed
- Five-year delay $\Rightarrow$ sample 1980Q1-2001Q4
- Forecasts based on econometric models and judgment

TABLE 7
ESTIMATION: DISTANCE TO DEFAULT AND FED FORECAST ERRORS

Dependent variable:	*one-period ahead forecast*	*two-period ahead forecast*	*three-period ahead forecast*	*four-period ahead forecast*
LINEAR ESTIMATIONS				
distance to default	0.19	0.18**	0.12**	0.12*
NON LINEAR ESTIMATIONS				
D_1	-0.10	-0.23**	-0.24**	-0.26
D_2	0.21	0.12	0.18	0.28

Note: *(**) denotes significance at the 5% (1%) level. Forecast errors are calculated as the difference between actual and predicted GDP growth. D_1 and D_2 are dummies capturing periods of instability and stability respectively.

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