Credit Market Shocks and Economic Fluctuations: Evidence from Corporate Asset Markets

Comments Prepared for Bank of Finland Workshop on Financial Markets in Dynamic General Equilibrium

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Overview of Issues

- Financial frictions
- Heterogeneity and Incomplete Markets
- Optimal Policy

Some new evidence from Corporate Bond Prices

- Reduced form approach
- Predictive Content
- Variance Decompositions

Summary

Financial Frictions I:

- Source of frictions:
  - Firms
  - Households
  - Banks
- Source of fluctuations:
  - Are real-side disturbances amplified by financial frictions?
  - Do financial markets provide a distinct source of fluctuations?
  - Do nominal rigidities in financial contracts matter?
- Supply vs Demand:
  - Chari, Kehoe, McGrattan – TFP and labor wedge are important.
  - Can financial frictions provide a quantitatively important source of fluctuations in total factor productivity?

Financial Frictions II:

- Form of contracts:
  - BGG is embarrasingly simple.
  - Collateral constraints are even more so.
  - Can we incorporate richer contracting structures into DSGE? Perhaps yes, if we can reduce complexity on another dimension such as the wealth distribution.
- Has there been structural change over time?
  - Increased market participation.
  - Improvements in efficiency of contracts.
  - The Peltzman effect – does better contract enforcement imply higher leverage?

The Great Moderation:

- Can we explain volatility reduction in aggregate without appealing to financial shocks as being the primary source of fluctuations?
- Micro vs macro – reduced volatility at the aggregate level is coincident with increased volatility at firm and household level. Are these consistent with financial-based theories of Great Moderation?

Market Incompleteness and Heterogeneity:

- Heterogeneity in wealth owing to incomplete insurance has potentially important implications for welfare and conduct of policy.
- This conference suggests that heterogeneity in wealth provides a fruitful approach to modeling asset prices and an avenue for introducing financial frictions into consumer behavior.
  - Can we model the source of such heterogeneity in a convincing fashion (move away from patient vs impatient)?
- Market incompleteness and heterogeneity in information may provide additional dynamics even without financial frictions.
- Market incompleteness and informational issues likely stem from the same types of moral hazard and asymmetric information issues that generate financial frictions. How do these things interact?

Optimal Monetary Policy:

- Usual policy issues:
  - Pricing frictions imply countercyclical tax through markups.
  - Financial frictions imply countercyclical tax on the relative price of consumption to investment goods through the external finance premium.
  - Under what conditions is there a tradeoff between these two frictions?
  - For any given model, we know how to address these issues.
- Should the prevalence of nominal contracts be an important motivation for the conduct of monetary policy?
  - How relevant are nominal contracts in today's financial environment?
  - Is monetary policy the best way to provide insurance between borrowers and lenders?
  - Without modeling source of nominal rigidity it is hard to draw policy conclusions that are imune to Lucas Critique. Obvious analogy: fixed exchange rate policy encourages agents to take on dollar-denominated debt.

Financial Regulatory Policy.

- We need a good model of banking to study this.
  - Banks specialize in gathering private information about borrowers.
  - Asset quality of banks (loans) is therefore opaque and subject to similar informational asymmetries as firms.
  - Relatively straightforward to incorporate a BGG style financial accelerator that is specific to the banking sector to model this mechanism.
- Issues not addressed by this approach:
  - Liquidity.
  - Counterparty risk?
- Bank Capital Channel:
  - Nonlinearities owing to occasionally binding constraints and incentives to gamble for resurrection.
  - Basel II and procyclicality of bank balance sheets.

Model Identification and Estimation:

- Current generation of DSGE models do an admirable job of embedding frictions and taking models to data.
- How do we map model concepts to data?
  - What is net worth?
  - What are financial institutions?
  - How do we measure premiums on external finance?
- How do we identify financial frictions from other sources of amplification?
  - Need to incorporate richer data that identify linkages between asset prices (bond yield spreads, household borrowing rates, credit default swaps etc..) and real variables such as income, consumption and investment.

Reduced form approach: (Gilchrist, Yankov and Zakrajsek (2008)).

- To identify disruptions in credit markets, research on the role of asset prices in economic fluctuations has focused on the information content of corporate credit spread indices.
- We reexamine this evidence using a broad array of corporate bond spreads constructed directly from the secondary bond prices on outstanding senior unsecured debt for a large panel of nonfinancial firms.
- Advantage: construct matched portfolios of equity returns, which allows us to examine the information content of corporate bond spreads that is orthogonal to the information contained in stock prices for the same class of borrowers, as well as in macroeconomic variables measuring economic activity, prices, risk-free interest rates, and other financial asset indicators.

Motivation:

- Recent deterioration in the functioning of markets for securitized credit and the ensuing slowdown in economic growth suggest that disruptions in financial markets have important macroeconomic consequences.
- Research on the role of asset prices in cyclical fluctuations has stressed the information content of credit spreads for the state of the economy and risks to the economic outlook.
- Financial accelerator: The predictive content of corporate credit spreads likely reflects disruptions in the supply of credit stemming from the worsening in the quality of corporate balance sheets or from the deterioration in the health of financial intermediaries that supply credit.
- As conditions in credit markets deteriorate, spreads widen as lenders seek compensation for increased risk of default. Under such circumstances, movements in credit spreads may provide information about the importance of credit-supply shocks in determining the amplitude and persistence of business cycle fluctuations.

Data:

- Monthly data on prices of senior unsecured corporate debt traded in the secondary market over the 1990–2007 period, issued by nearly 1,000 U.S. nonfinancial corporations.
- Construct "portfolios" that assign each bond outstanding to a specific category determined by the issuer's ex-ante expected probability of default and the bond's term to maturity.
- Rely on the monthly firm-specific expected default frequencies (EDFs) constructed by the Moody's/KMV corporation to construct our default-risk based portfolios.
- Construct matched portfolios of equity returns corresponding to firms in the different credit-risk categories.

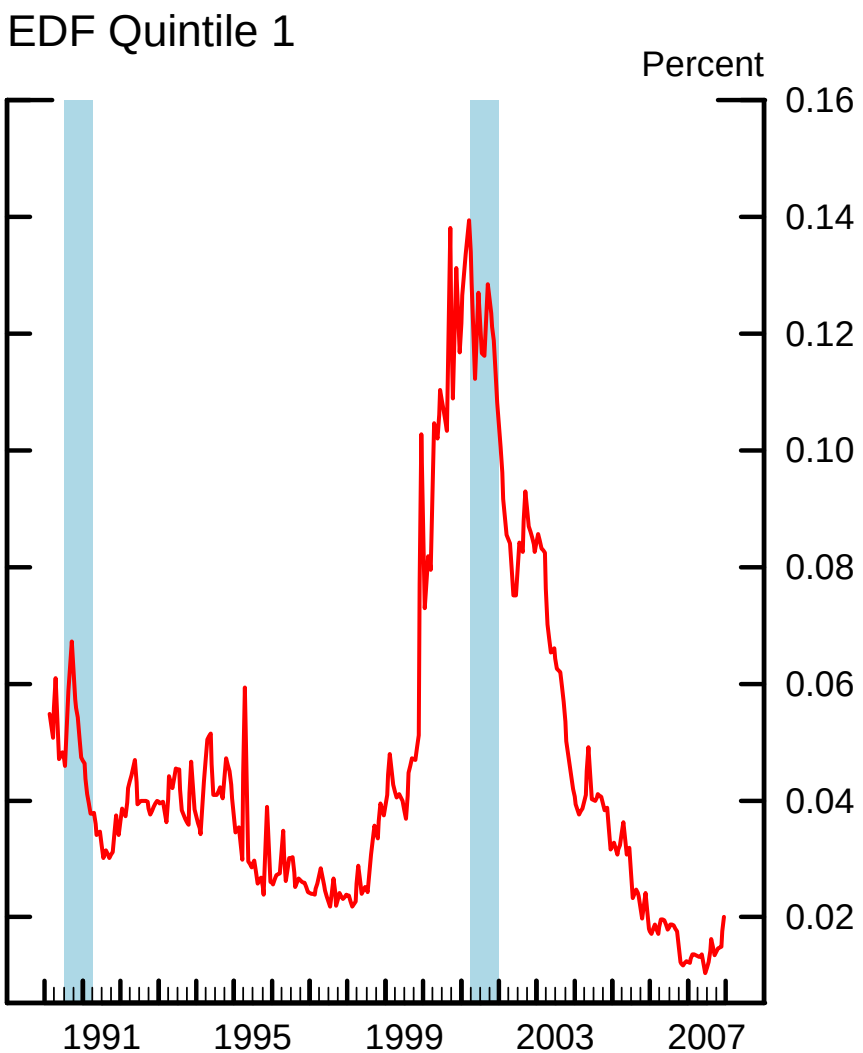
Bond Characteristics

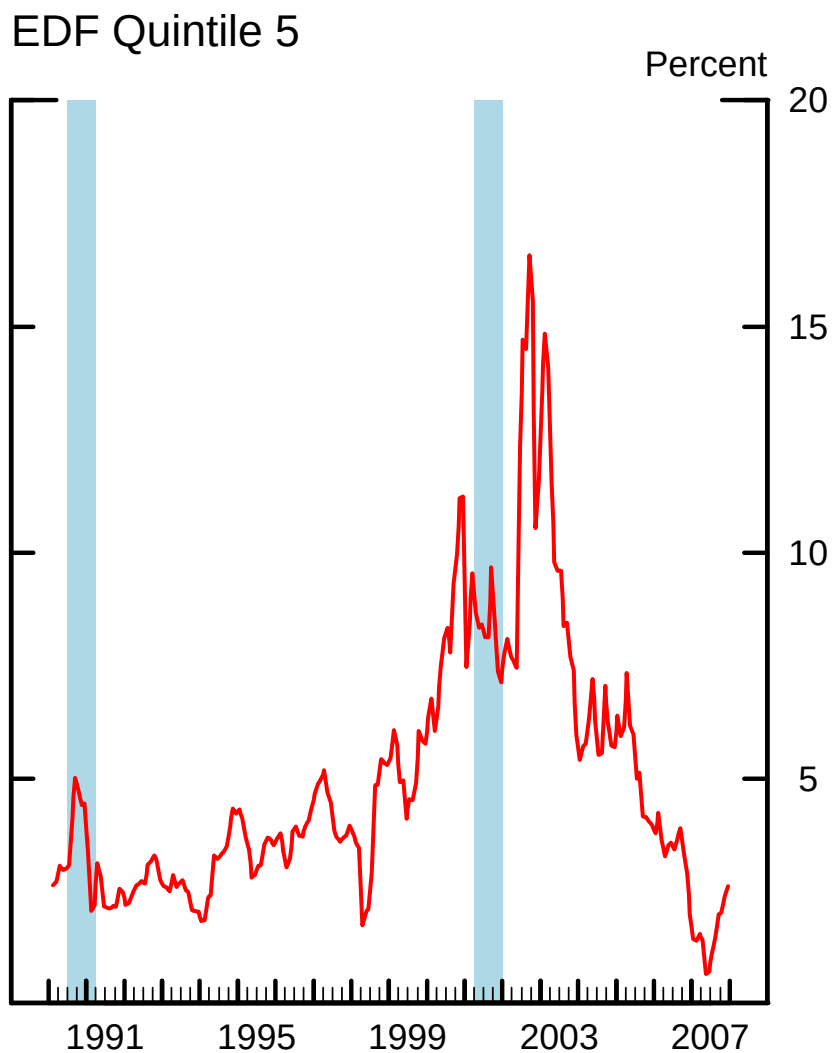
Bond Characteristic	Mean	SD	Min	P50	Max
# of bonds per firm/month	3.51	4.10	1.00	2.00	57.0
Mkt. Value of Issue	307.9	309.3	1.11	233.6	6,658
Maturity at Issue (years)	13.8	9.4	1.0	10.0	50.0
Term to Maturity (years)	11.2	8.6	0.01	7.87	30.0
Duration (years)	6.17	3.18	0.00	5.61	26.4
S&P Credit Rating	-	-	D	BBB1	AAA
Coupon Rate (pct.)	7.56	2.02	0.00	7.38	16.5
Nominal Effective Yield (pct.)	7.54	2.94	1.47	7.17	57.4
Credit Spread (bps.)	186	277	10	111	4,995

Data Dimensions

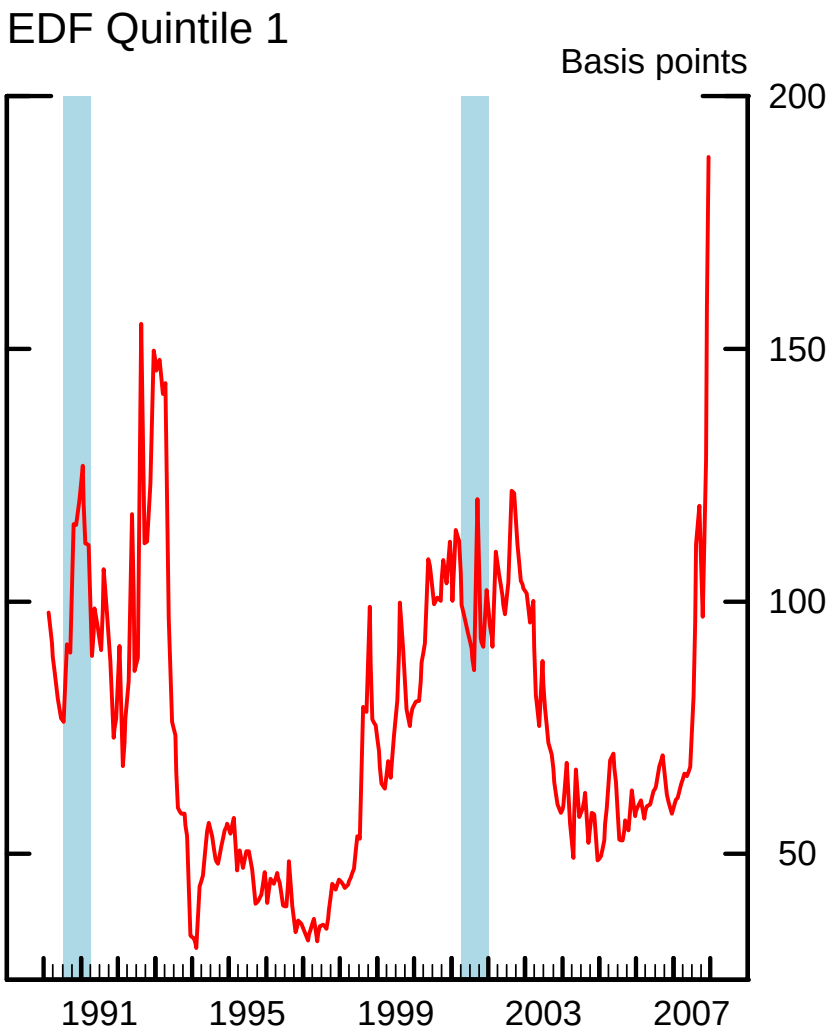
Total Obs. $= 282,227$ Bonds $= 5,321$ Firms $= 944$
Min. Tenure $= 1$ Median Tenure $= 45$ Max. Tenure $= 215$

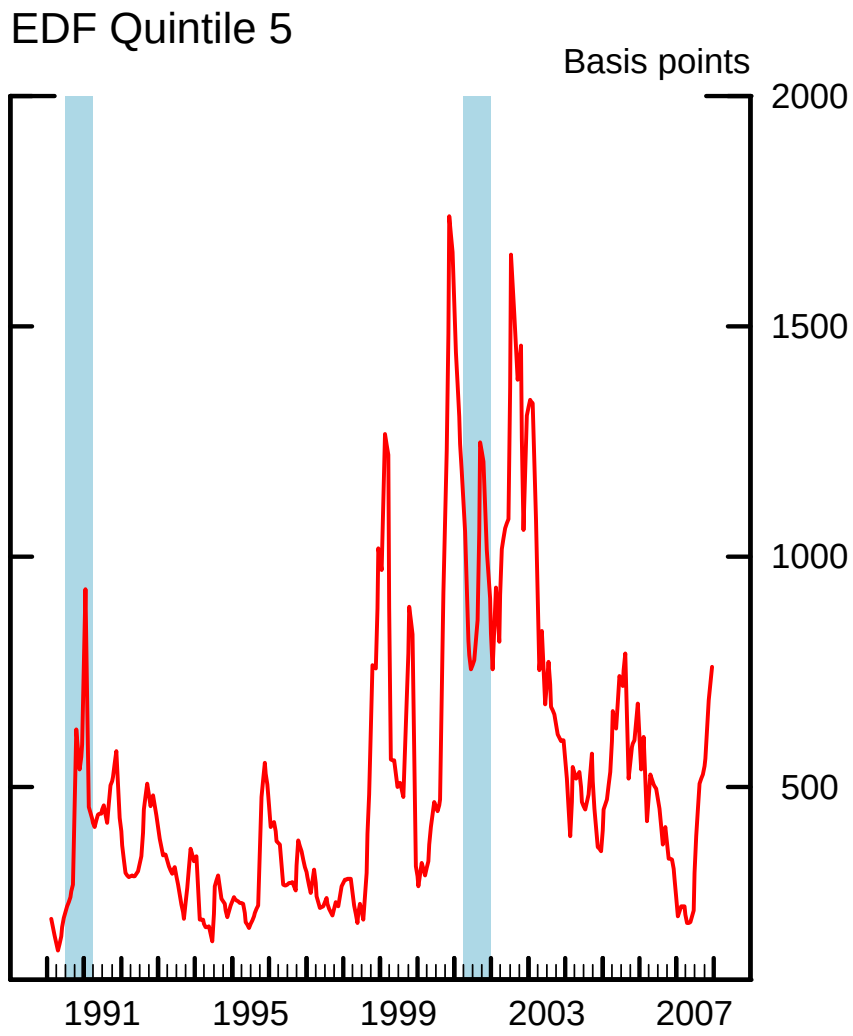
Expected Year-Ahead Default Risk by EDF Quintile



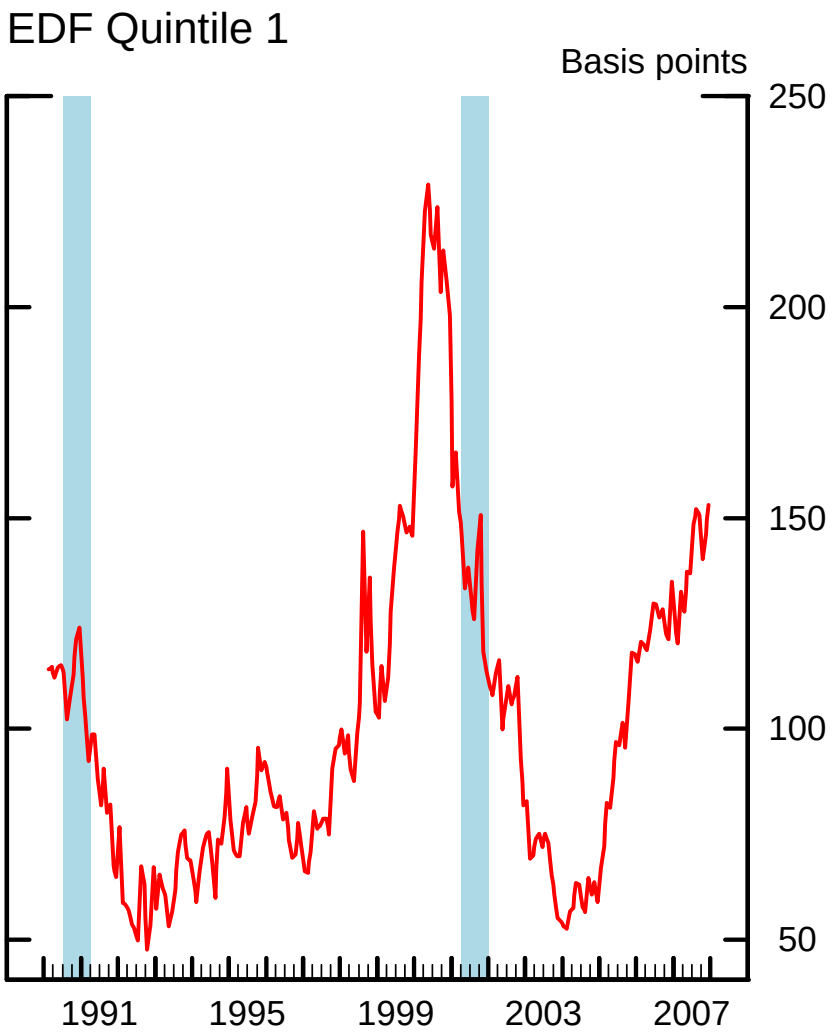


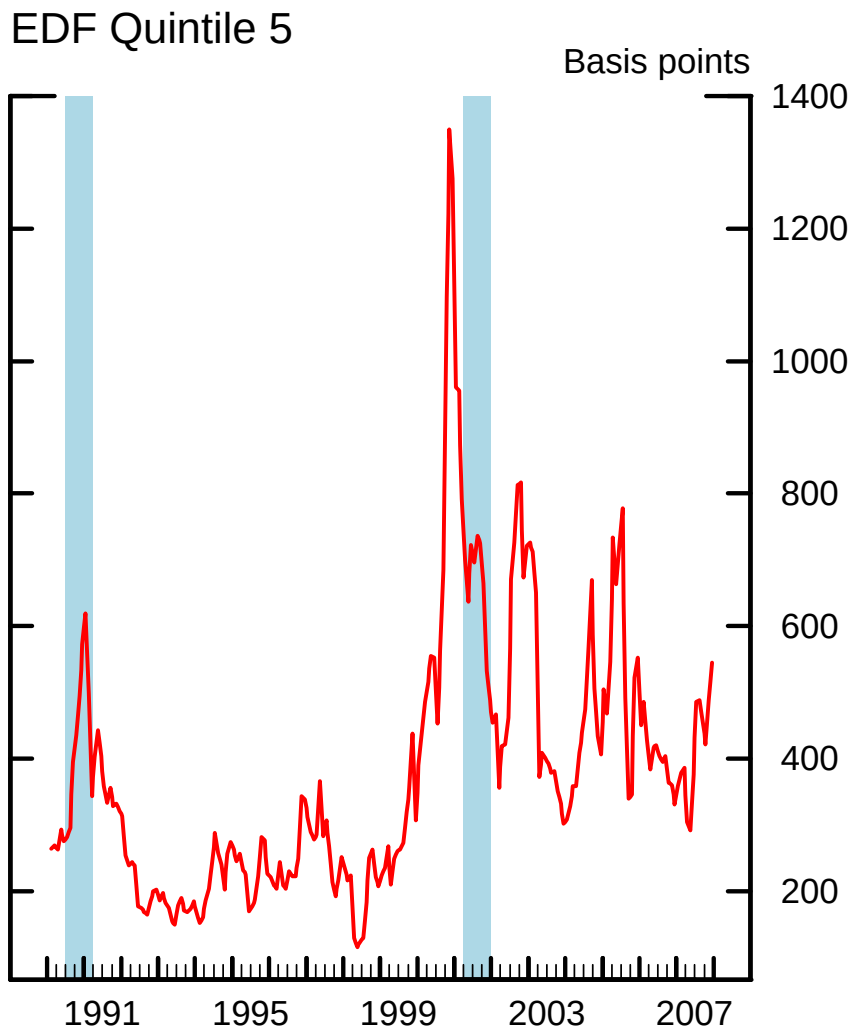
Short Maturity Credit Spreads by EDF Quintile



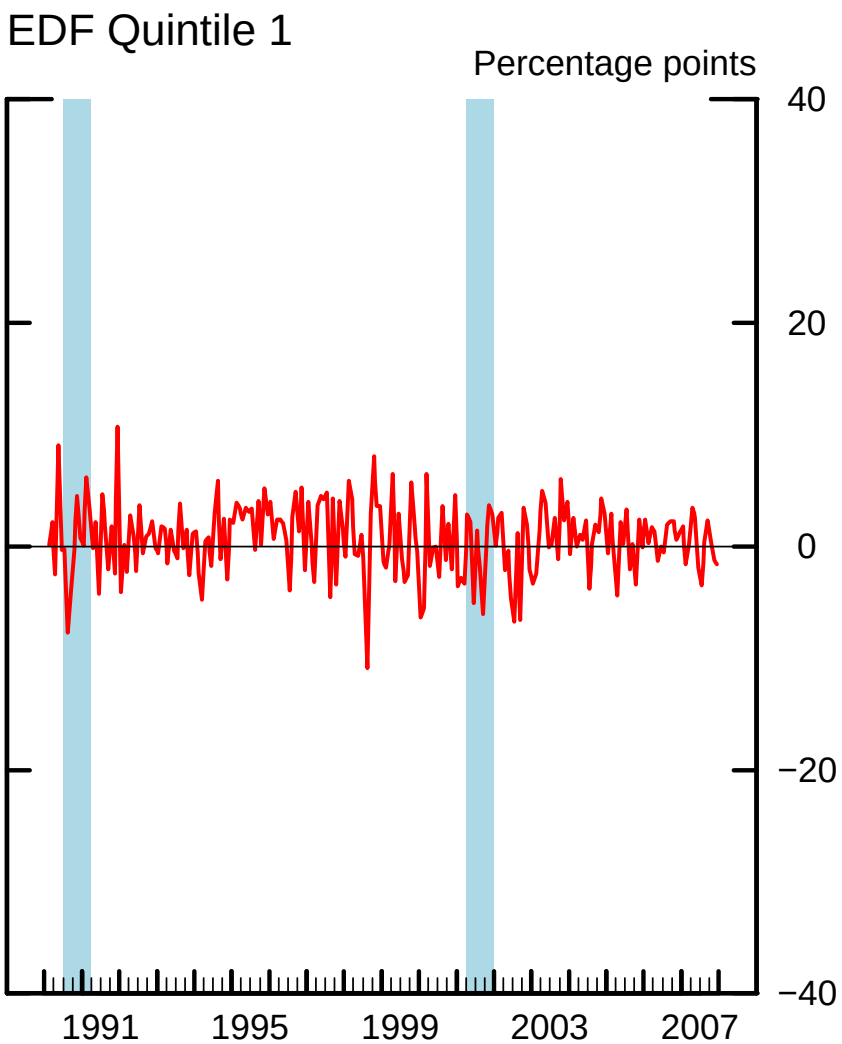


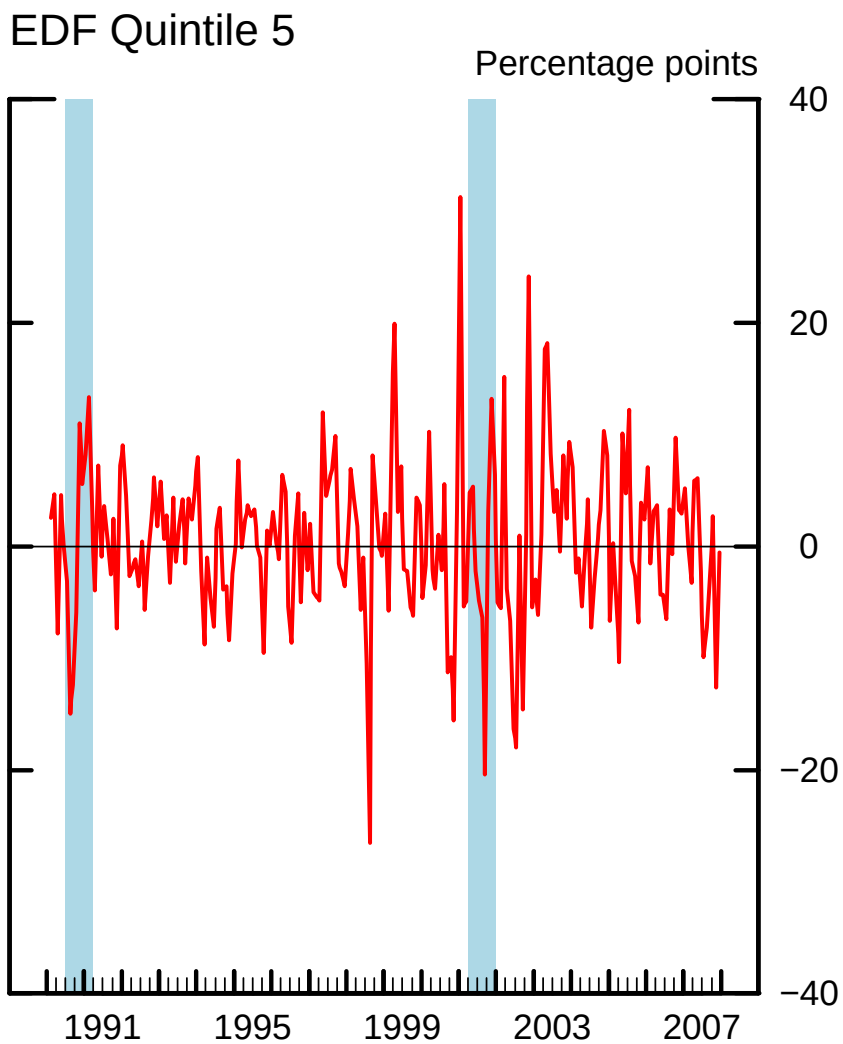
Very Long Maturity Credit Spreads by EDF Quintile





Excess Equity Returns by EDF Quintile





Financial Indicators and Economic Activity

- Forecast regressions:

$$\nabla^h \mathrm{EMP}_{t+h} = \alpha_1 + \sum_{i=0}^{11} \beta_{11,i} \nabla^h \mathrm{IP}_{t-i} + \sum_{i=0}^{11} \beta_{12,i} \nabla^h \mathrm{EMP}_{t-i} + \gamma_{11} Z_t^1 + \gamma_{12} Z_t^2 + \zeta$$

$$\nabla^h \mathrm{IP}_{t+h} = \alpha_2 + \sum_{i=0}^{11} \beta_{21,i} \nabla^h \mathrm{IP}_{t-i} + \sum_{i=0}^{11} \beta_{22,i} \nabla^h \mathrm{EMP}_{t-i} + \gamma_{21} Z_t^1 + \gamma_{22} Z_t^2 + \eta$$

- Z_t denotes a vector of financial indicators in month t.

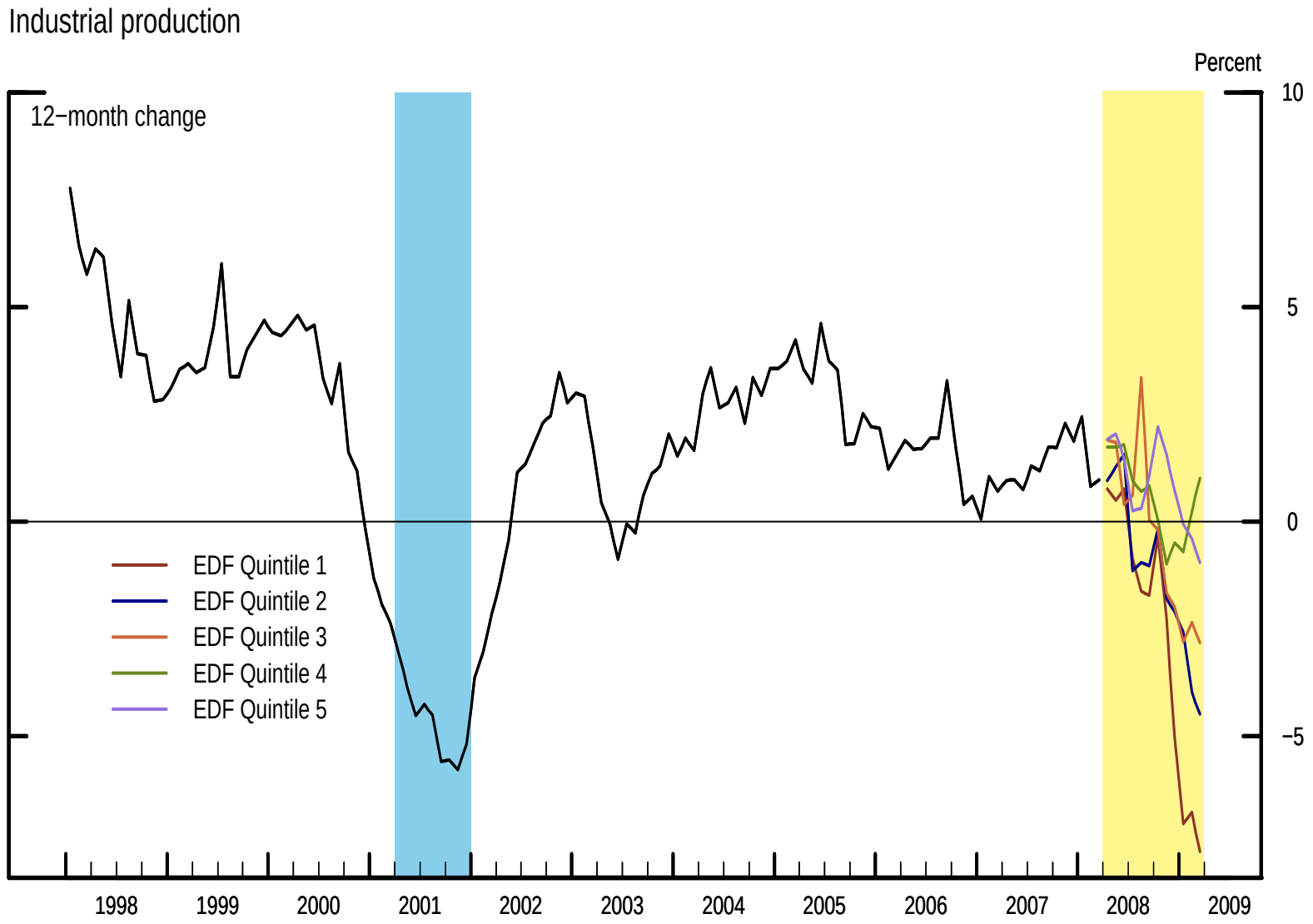
Long-Run Forecast Horizons

	Forecast Horizon $h = 12$ (months)					
	Nonfarm Employment (EP)			Industrial Production (IP)		
Credit Spreads	$\Pr > W_1$	$\Pr > W_2$	Adj. R^2	$\Pr > W_1$	$\Pr > W_2$	Adj. R^2
Standard	0.000	-	0.703	0.014	-	0.305
EDF-Q1	-	0.000	0.719	-	0.000	0.578
EDF-Q2	-	0.000	0.756	-	0.000	0.604
EDF-Q3	-	0.000	0.762	-	0.000	0.541
EDF-Q4	-	0.000	0.686	-	0.000	0.373
EDF-Q5	-	0.000	0.721	-	0.000	0.386
Standard & EDF-Q1	0.000	0.013	0.832	0.177	0.000	0.638
Standard & EDF-Q2	0.002	0.000	0.817	0.393	0.000	0.638
Standard & EDF-Q3	0.000	0.000	0.827	0.000	0.000	0.656
Standard & EDF-Q4	0.000	0.000	0.808	0.082	0.000	0.520
Standard & EDF-Q5	0.000	0.000	0.817	0.048	0.000	0.516
Memo: None	-	-	0.523	-	-	0.014

Long-Run Forecast Horizons

	Forecast Horizon $h = 12$ (months)					
	Nonfarm Employment (EP)			Industrial Production (IP)		
Credit Spreads	RMSFE	Ratio	$\Pr > \lvert S \rvert$	RMSFE	Ratio	$\Pr > \lvert S \rvert$
Standard	1.574	-	-	3.186	-	-
EDF-Q1	1.113	0.500	0.113	2.110	0.439	0.004
EDF-Q2	1.188	0.569	0.177	2.157	0.458	0.007
EDF-Q3	1.578	1.005	0.988	2.064	0.419	0.000
EDF-Q4	1.952	1.538	0.269	2.623	0.678	0.152
EDF-Q5	1.455	0.854	0.651	2.549	0.640	0.147
Standard & EDF-Q1	1.161	0.544	-	2.189	0.472	-
Standard & EDF-Q2	1.097	0.486	-	2.666	0.506	-
Standard & EDF-Q3	1.127	0.512	-	2.172	0.465	-
Standard & EDF-Q4	1.382	0.771	-	2.565	0.648	-
Standard & EDF-Q5	1.273	0.654	-	2.785	0.764	-
Memo: None	1.645	-	-	3.143	-	-

The Near-Term Outlook



Factor-Augmented VAR Analysis

- FAVAR specification consists a state-space equation:

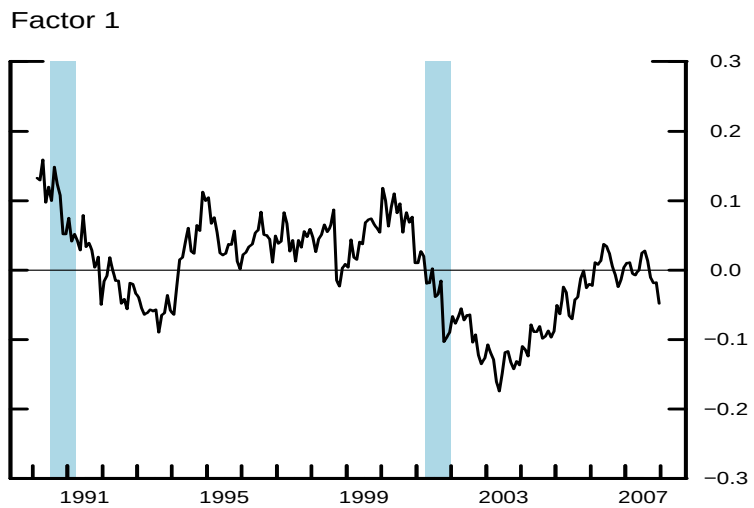
$$\begin{bmatrix} F_{1t} \\ F_{2t} \end{bmatrix} = \Phi(L) \begin{bmatrix} F_{1,t-1} \\ F_{2,t-1} \end{bmatrix} + \epsilon_t; \tag{3}$$

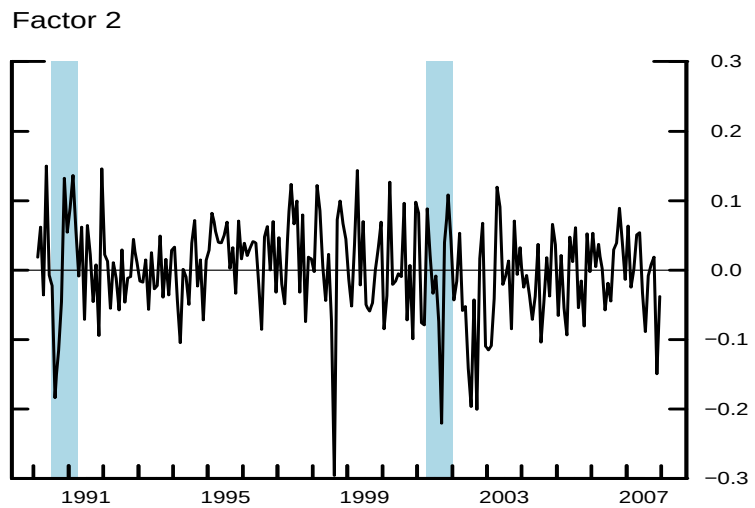
- Observation equation:

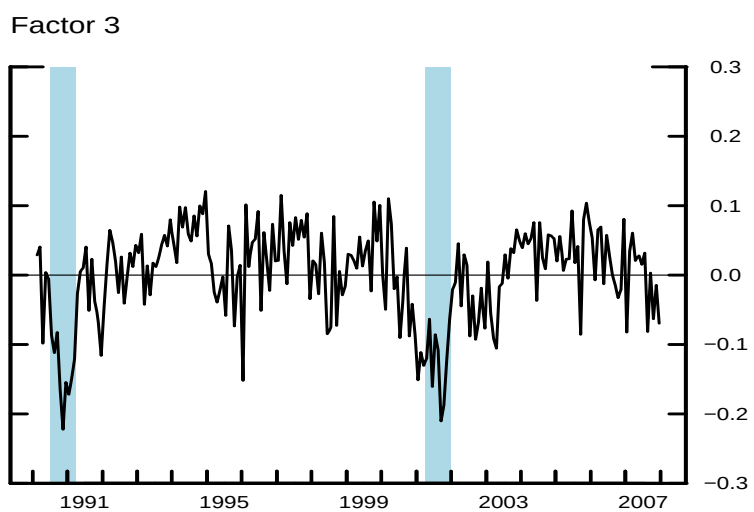
$$\begin{bmatrix} X_{1t} \\ X_{2t} \end{bmatrix} = \Lambda_1 F'_{1t} + \Lambda_2 F'_{2t} + \nu_t. \tag{4}$$

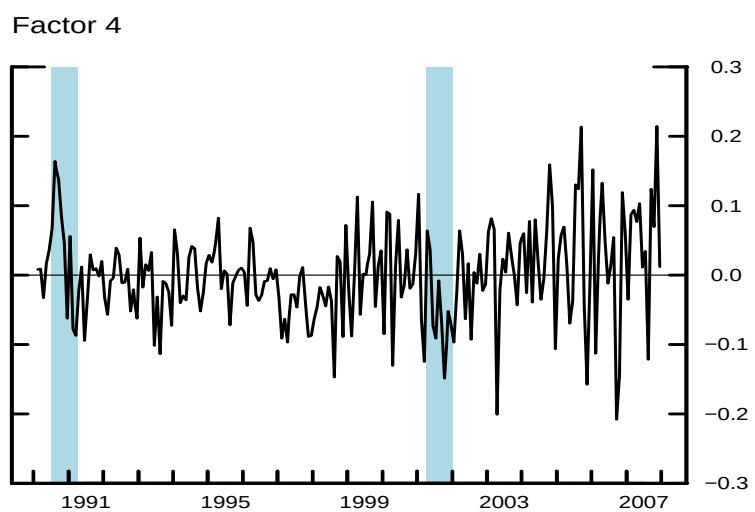
- Observables and factors are be divided into two groups:
  - The first group consists of factors related to the real, nominal and the financial side of the economy.
  - The second group represents factors pertaining only to the corporate bonds market—the so-called credit market factors.

Macroeconomic Factors

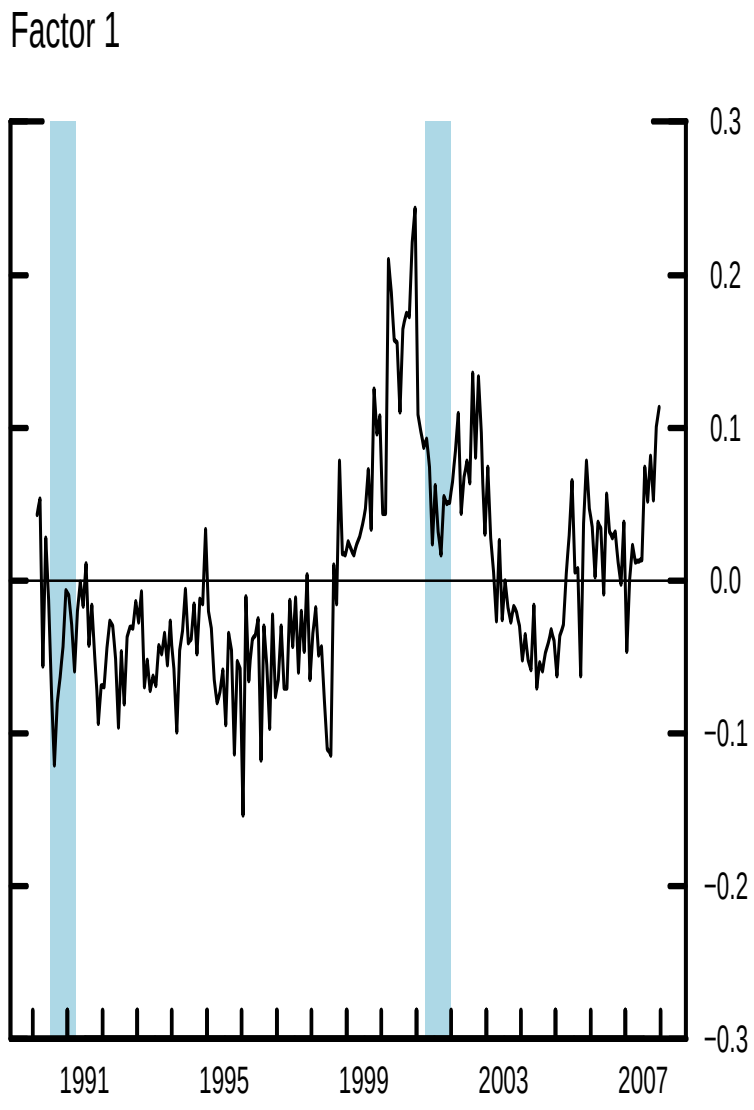


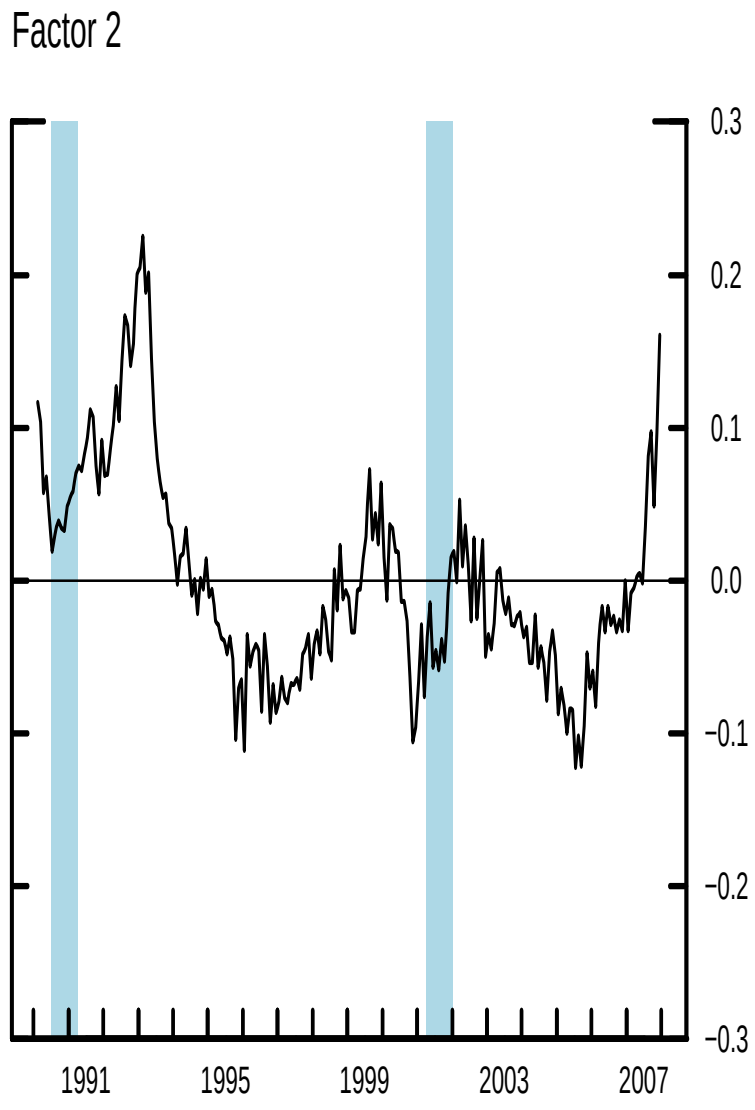






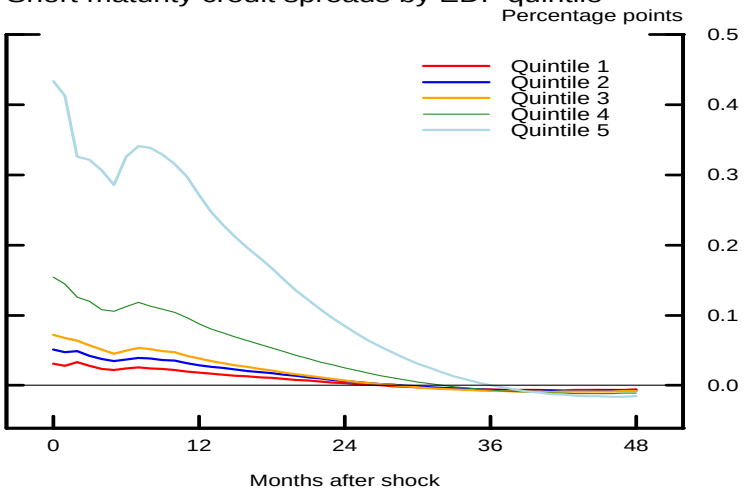
Credit Market Factors: Corporate Bond Market





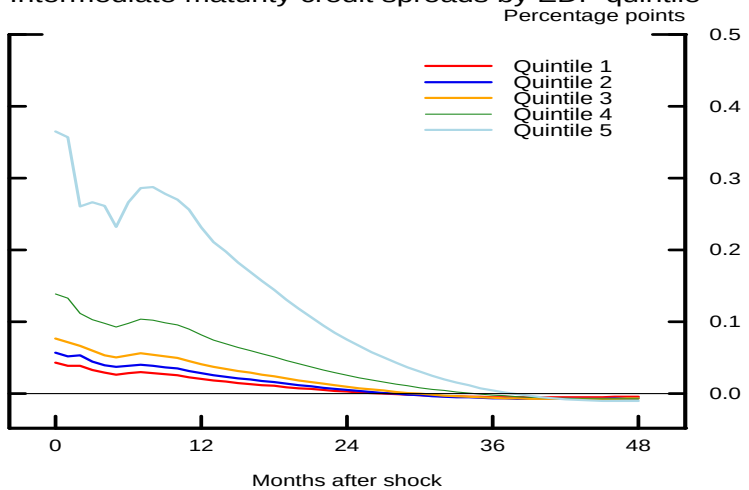
Response of Bond Spreads to Credit Market Shock

Short maturity credit spreads by EDF quintile*



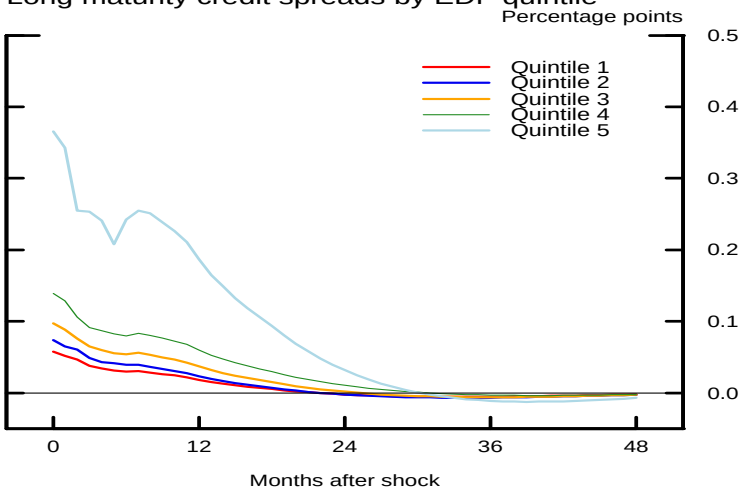
* Bonds with term to maturity under 3 years.

Intermediate maturity credit spreads by EDF quintile*



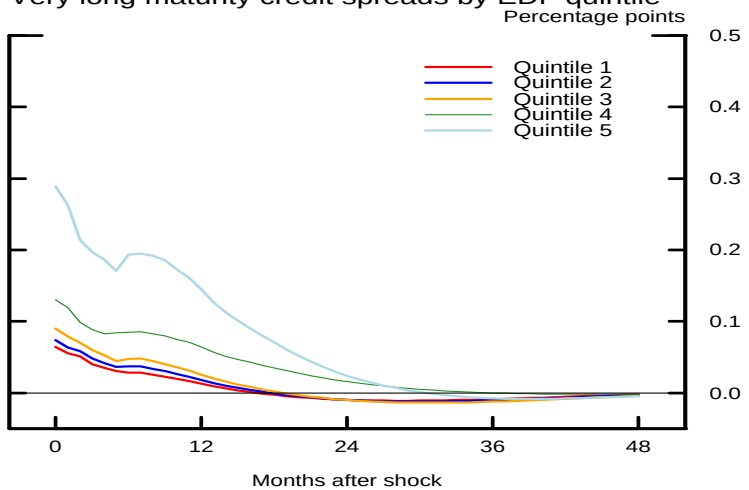
* Bonds with term to maturity 3–7 years.

Long maturity credit spreads by EDF quintile*



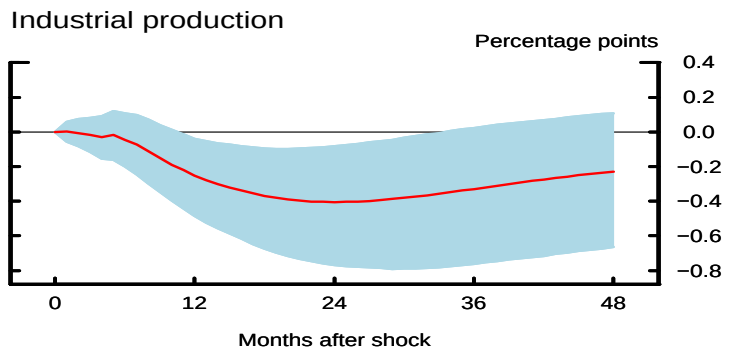
* Bonds with term to maturity 7–15 years.

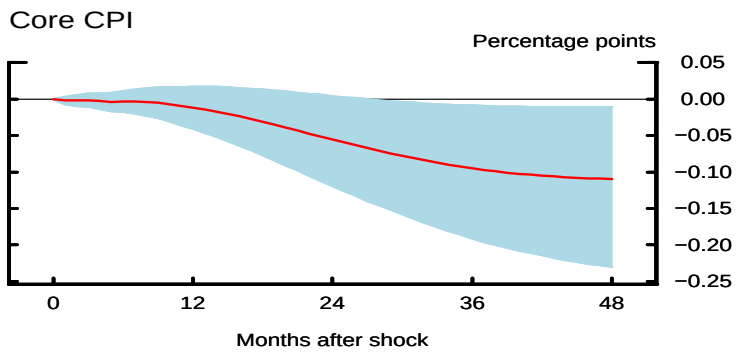
Very long maturity credit spreads by EDF quintile*

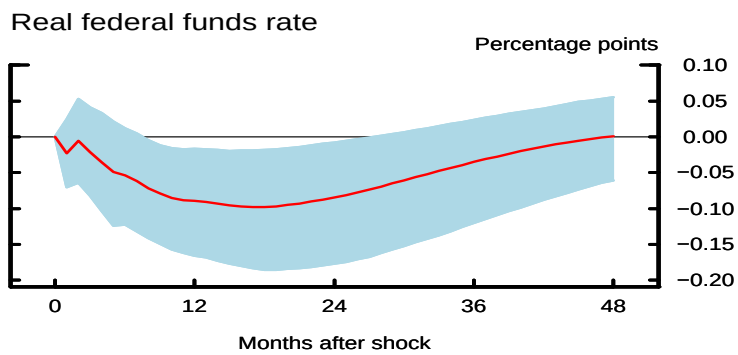


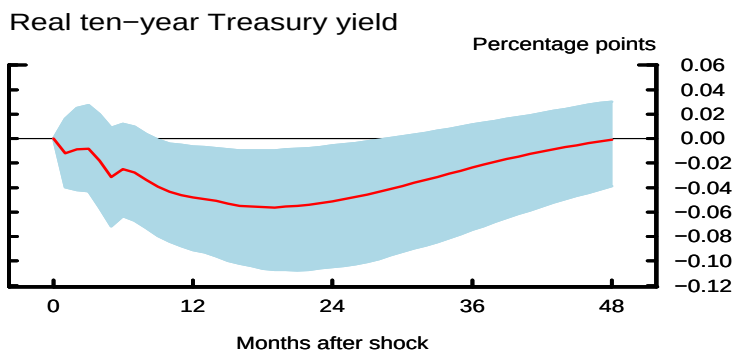
* Bonds with term to maturity above 15 years.

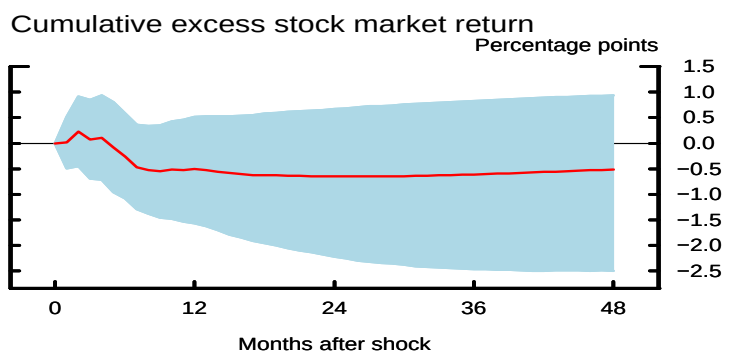
Response of Selected Variables to Credit Market Shock

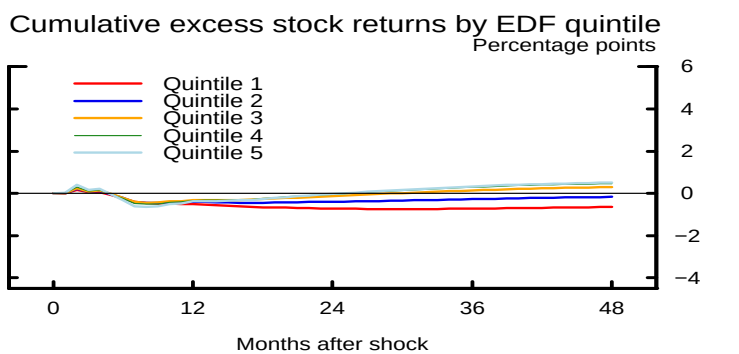




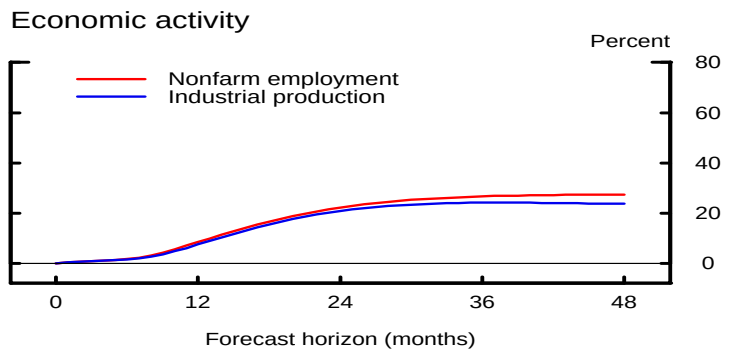


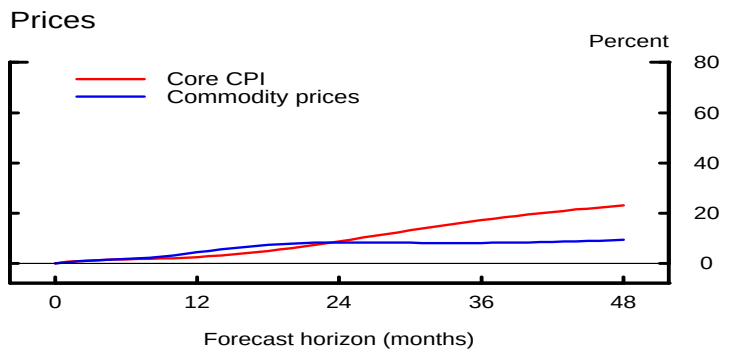


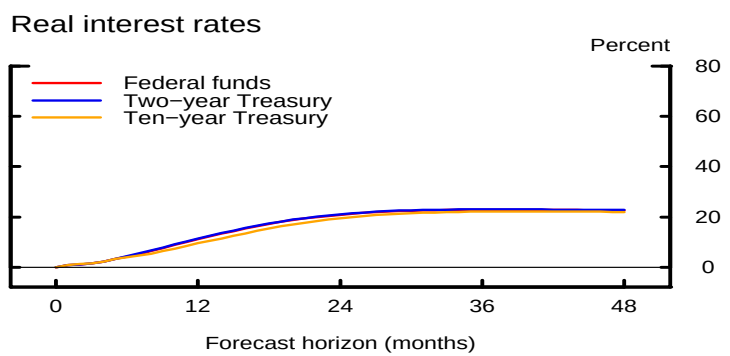


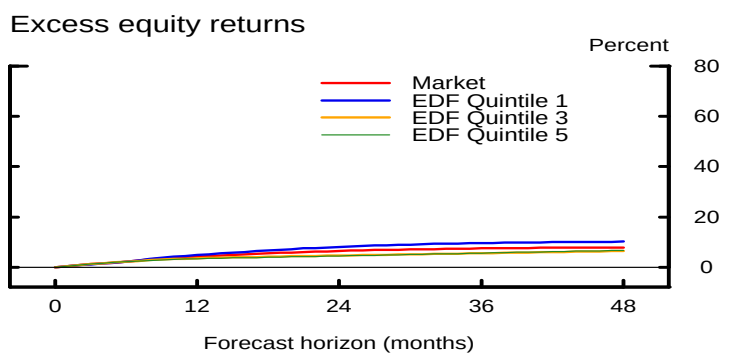


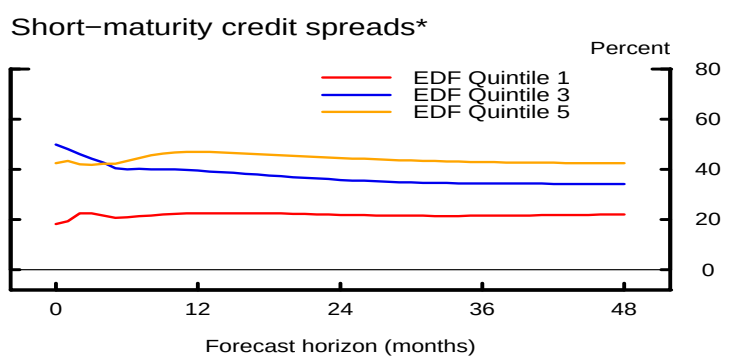
Forecast Error Variance Decomposition

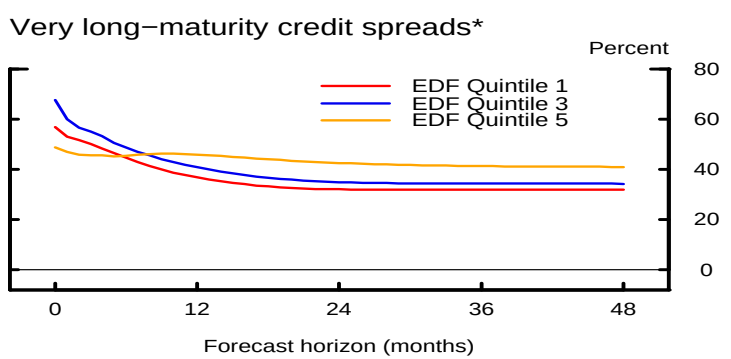




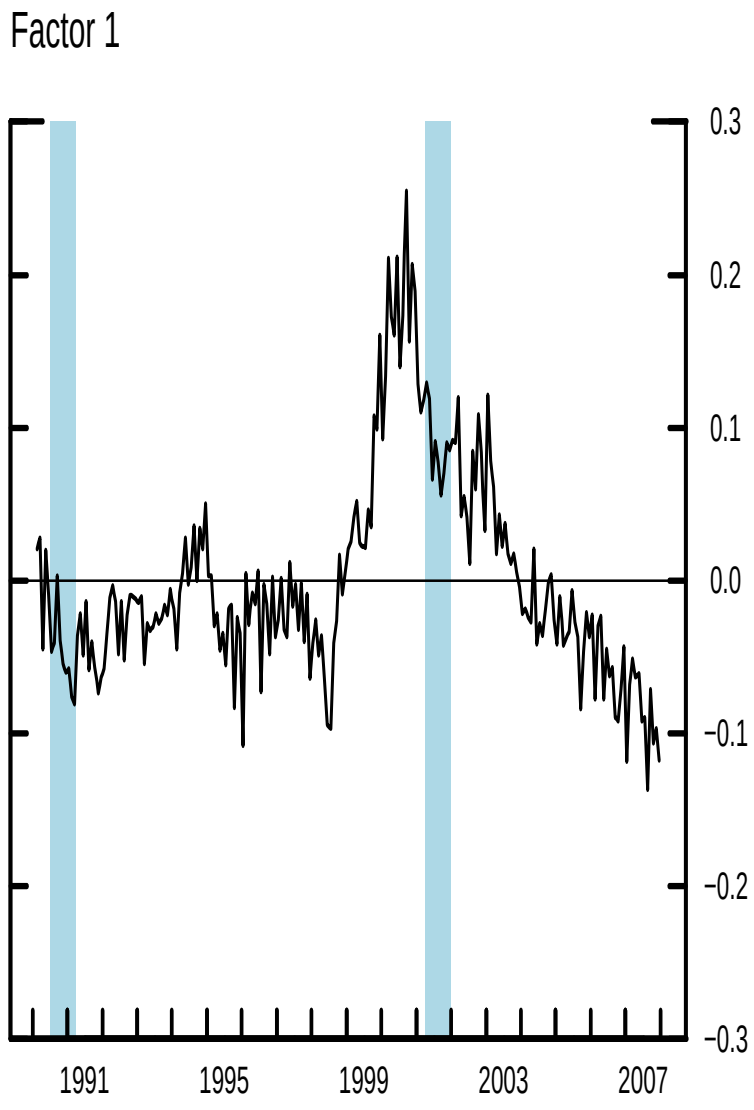


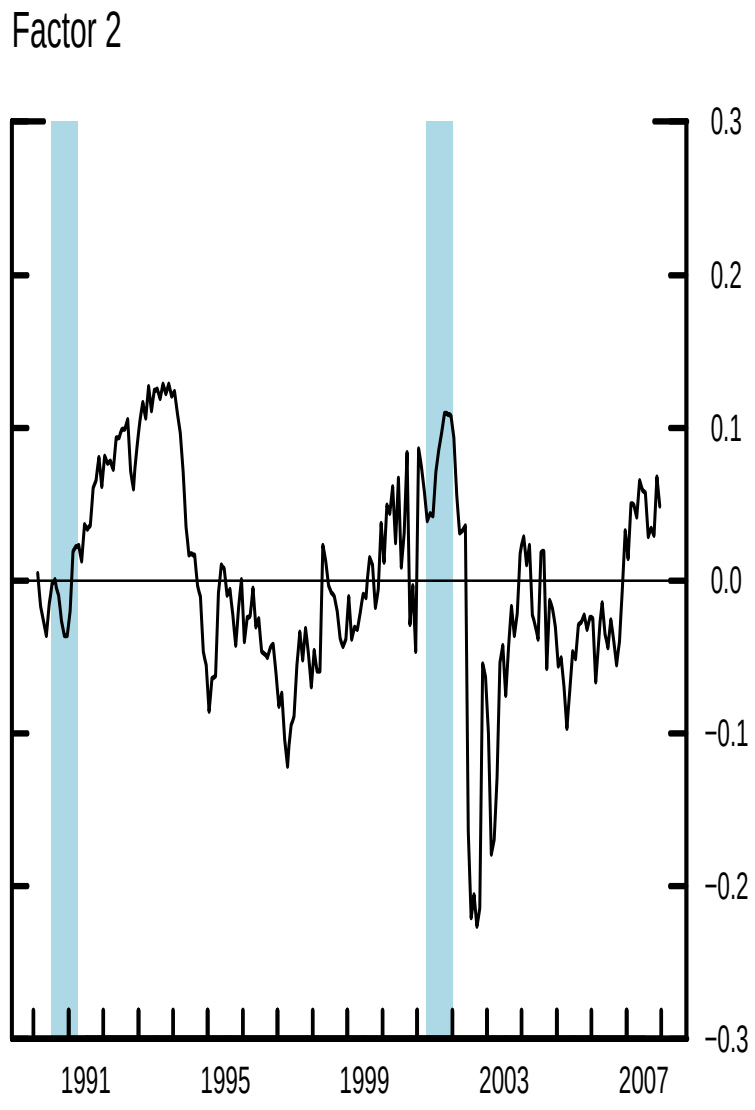




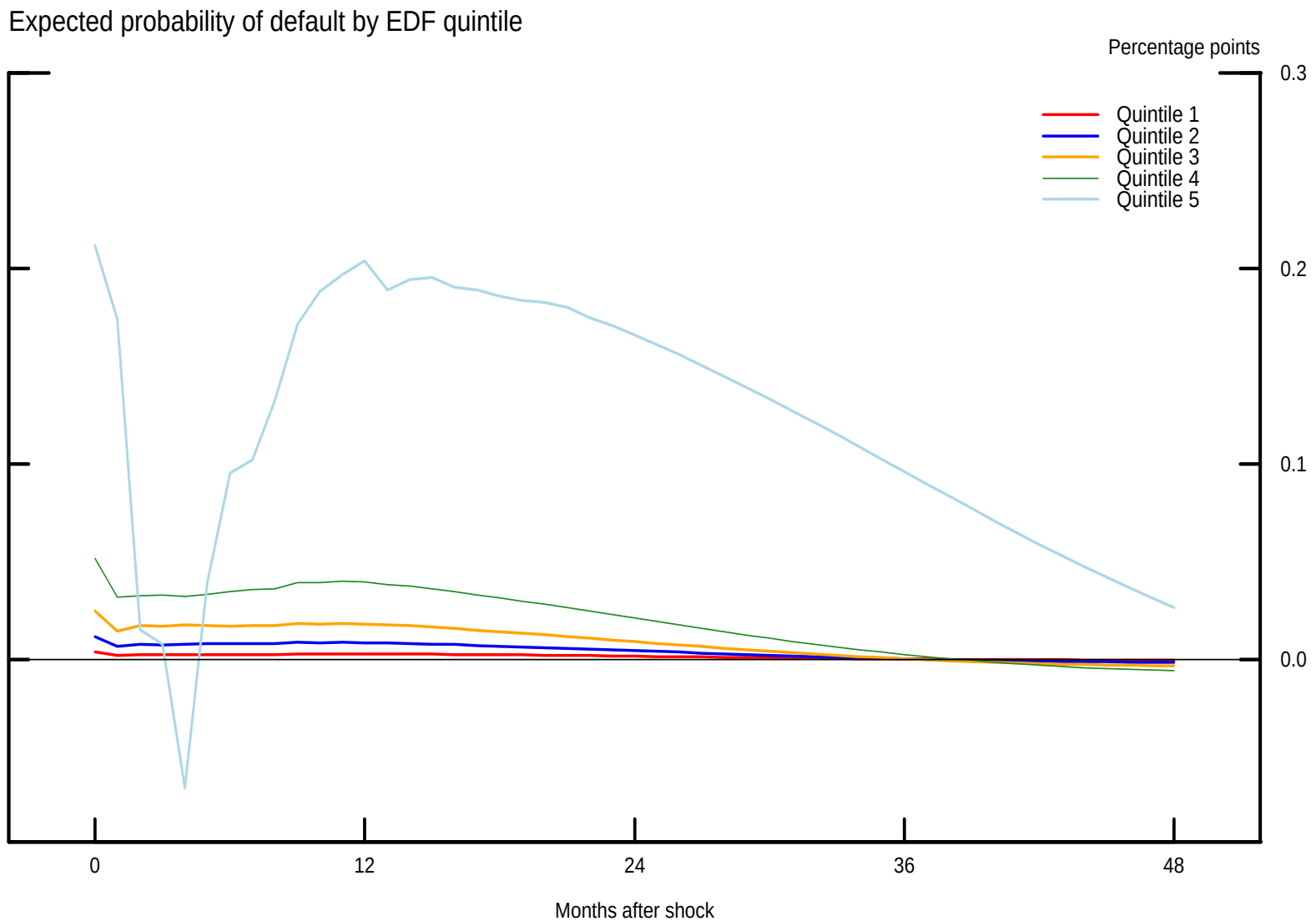


Credit Market Factors: Equity Market



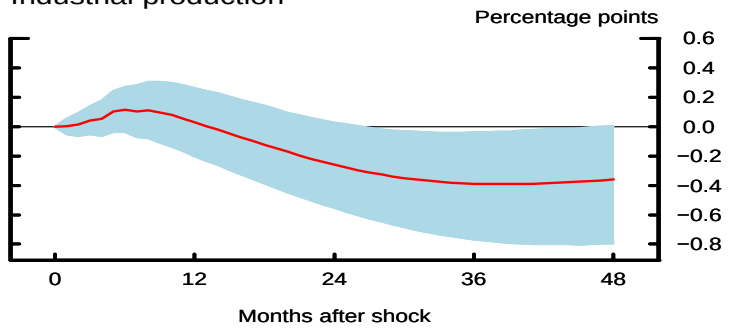


Response of EDFs to Credit Market Shock

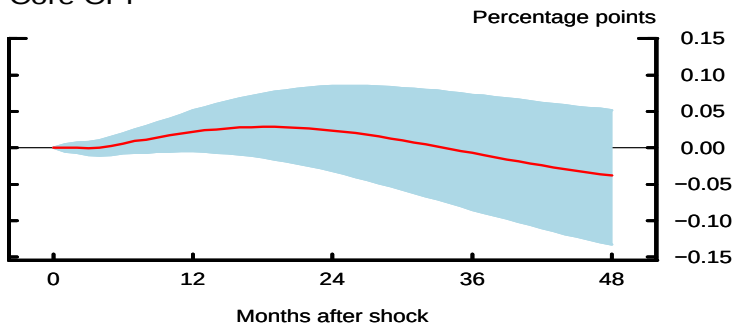


Response of Selected Variables to Credit Market Shock

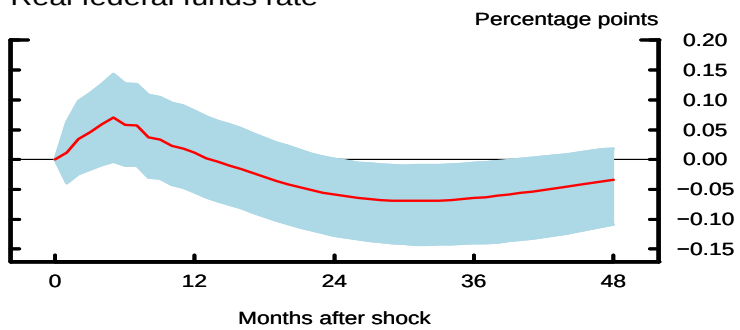
Industrial production



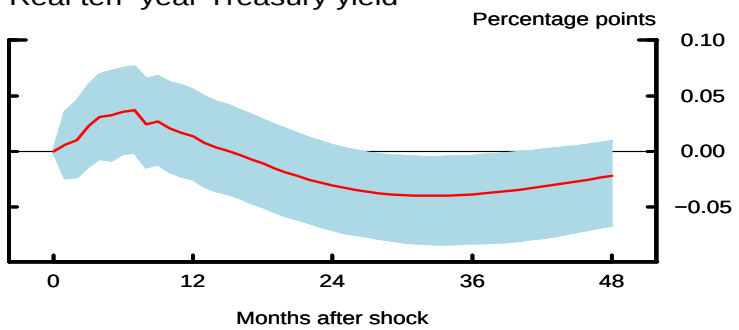
Core CPI



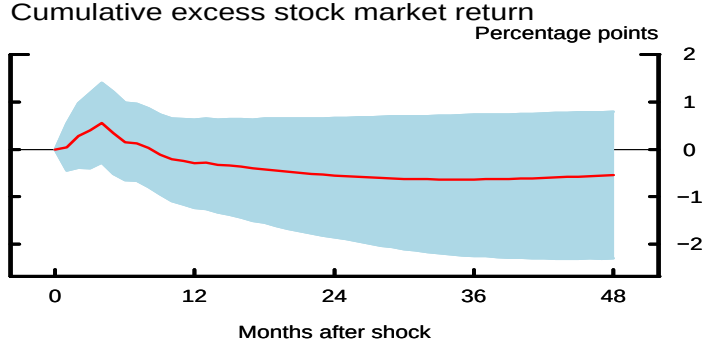
Real federal funds rate



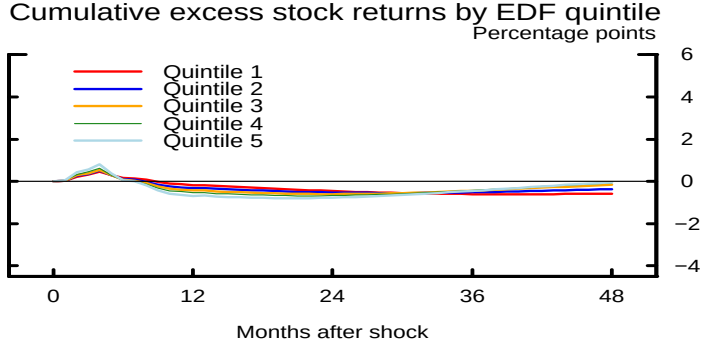
Real ten−year Treasury yield



Cumulative excess stock market return



Cumulative excess stock returns by EDF quintile



Predictive content:

- Corporate bond spreads contain substantial predictive power for various monthly measures of economic activity.
- Outperform—especially at longer horizons—single indexes such as the widely-used junk bond spread.
- The information content of corporate bond spreads varies systematically across the maturity spectrum, with longer-maturity spreads being more accurate at longer forecast horizons.
- Much of the predictive power of bond spreads for economic activity is embedded in securities issued by intermediate-risk rather than high-risk firms.

FAVAR Analysis:

- Unexpected increases in corporate bond spreads cause large and persistent contractions in economic activity.
- Shocks emanating from the corporate bond market account for about 20 percent of the variance in economic activity at the two- to four-year horizon.
- Overall, our results imply that credit market shocks have contributed significantly to business cycle fluctuations during the 1990–2007 period.

Summary:

- Lots of progress in terms of incorporating and estimating financial-real linkages in DSGE models.
- Reduced form and model-based estimation imply important role for financial factors in determining real outcomes.
- Identification strategies are still questionable however and hence likely subject to Lucas Critique. Incorporating richer array of asset pricing data will help address this issue.
- We also need to work on building richer models of financial frictions to improve our understanding of the determinants risk and return for both households and firms.