Financial Intermediation, Asset Prices, and Macroeconomic Dynamics

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Background

- Recent financial crisis suggests that balance sheet adjustments of market based intermediaries amplify asset price movements.
- Market based financial intermediaries manage balance sheets actively, they maximize return on equity subject to constraints (VaR, credit rating, haircuts,...).
- Extent to which constraints are binding affects intermediaries' allocation of funds into risky assets ("risk appetite").

  $\Rightarrow$ Risk appetite enters the pricing kernel.
- We use balance sheet growth of financial intermediaries as proxies for risk appetite and study their impact on risk premia and macro aggregates.

Questions we address

- To what extent are risk premia driven by balance sheet dynamics of financial intermediaries?
- Which type of institutions matter most?
  - Banks?
  - Security Brokers and Dealers?
  - Other institutions?
- What are the implications for macroeconomic dynamics?

$\longrightarrow$ Do balance sheet variables also predict macroeconomic aggregates?

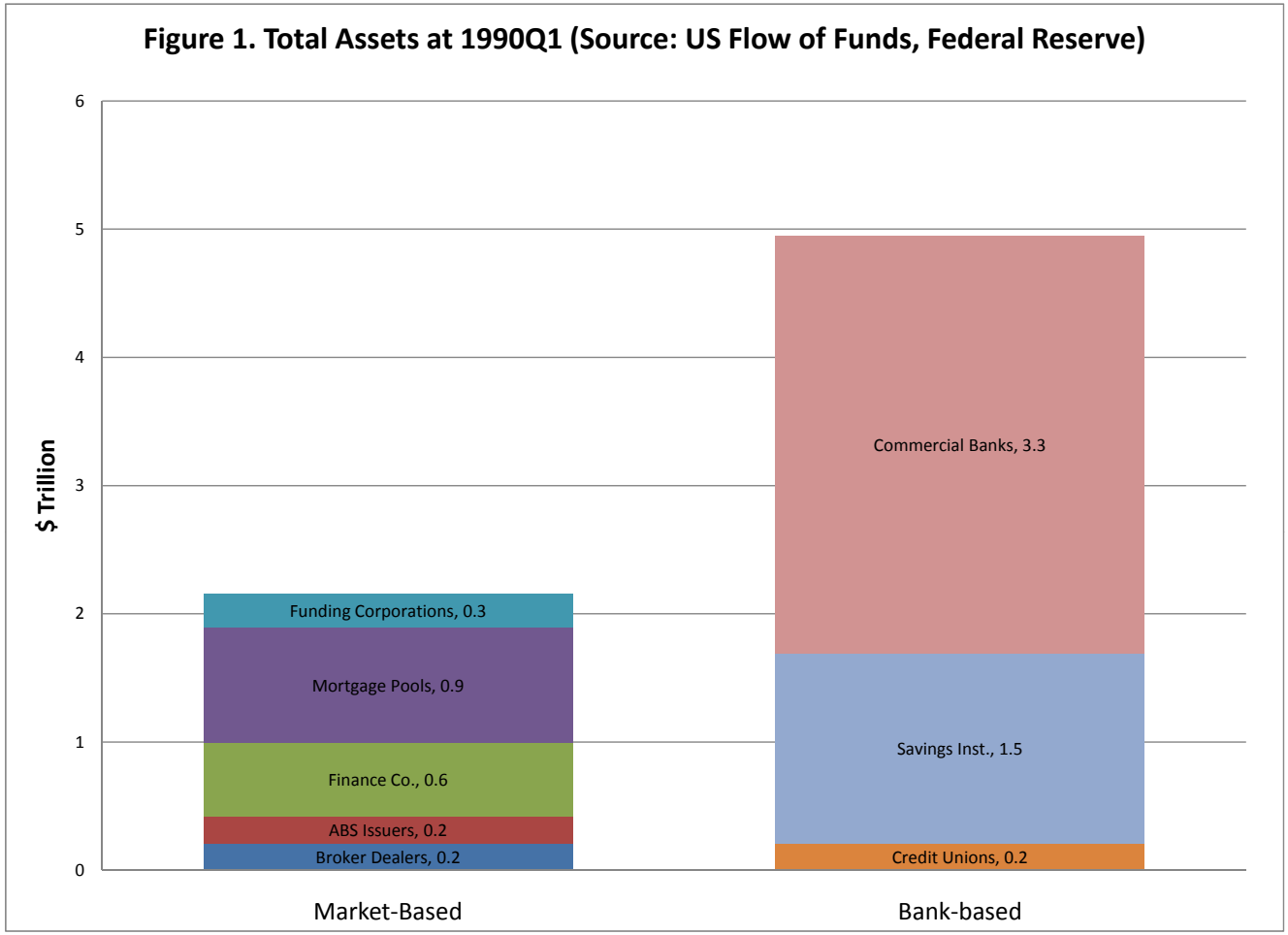
What We Do

- We estimate predictive regressions of quarterly excess returns for three asset classes: equities, corporate bonds, Treasuries.
- We use lagged leverage growth and lagged growth of total financial assets for various types of financial institutions as predictors, in addition to a comprehensive set of macro variables and benchmark return forecasting factors.
- We employ subset selection methods to identify the best return predictor variables.
- We assess whether the balance sheet variables that predict excess returns also forecast macroeconomic activity.

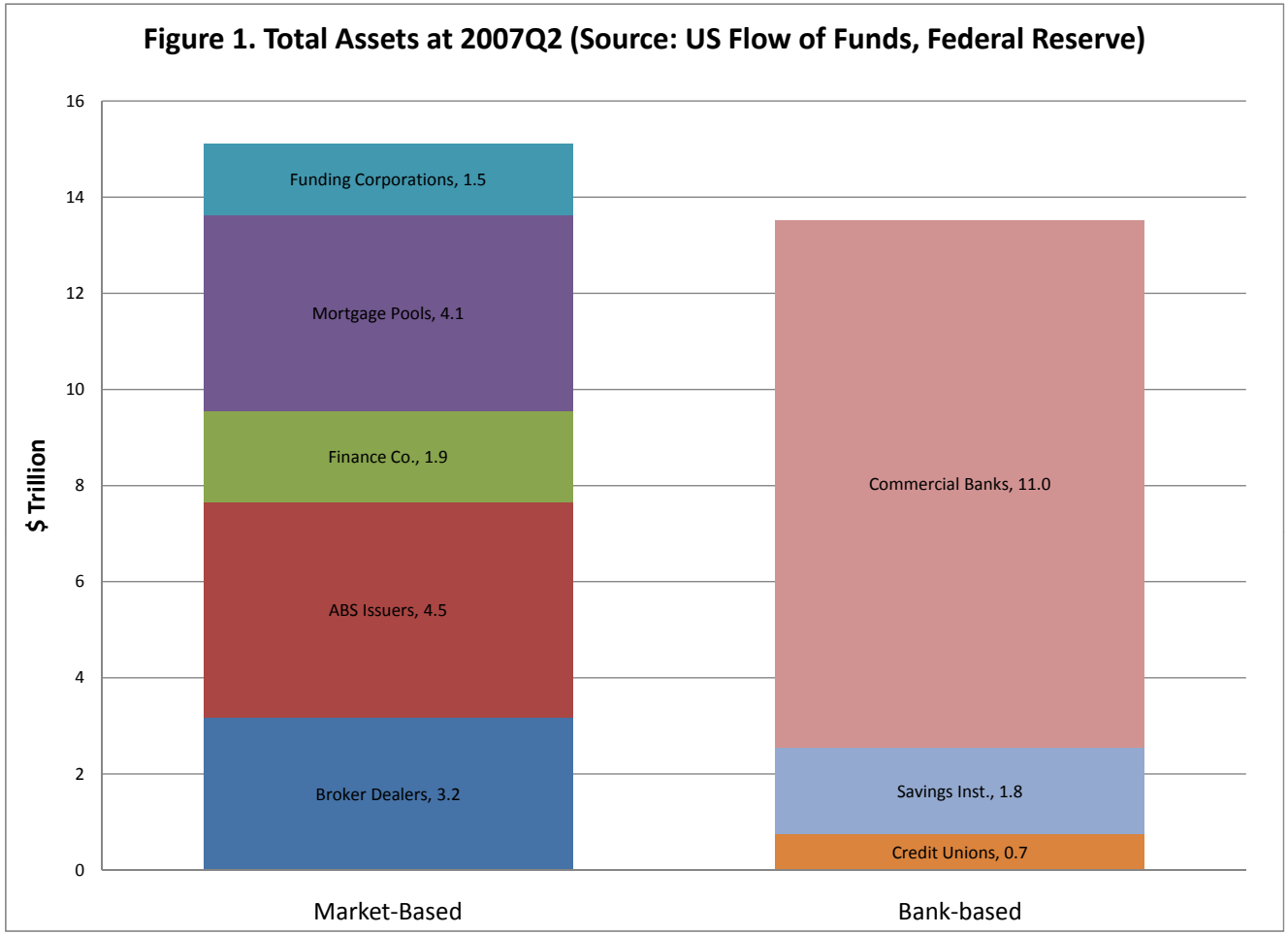
Preview of Results

- High leverage growth of Security Brokers and Dealers predicts low future equity and corporate bond returns.
- High asset growth of Shadow Banks predicts low future corporate bond and Treasury returns.
- For all assets, balance sheet variables provide significant predictive power beyond macro variables and the usual return forecasting variables.
- These balance sheet aggregates also predict real economic activity and inflation.

Bank Based vs Market Based Financial System - 1990



Bank Based vs Market Based Financial System - 2007



Data

- Quarterly Data.
- Sample period: 1986Q1 - 2009Q2.
- Equity Portfolios: Momentum and value sorts and Fama-French size and book-to-market sorts.
- Corporate Bond Returns: by industry and rating.
- Constant maturity Treasury returns.
- Macroeconomic variables: GDP and PCE components.
- Balance sheet growth variables: Flow of Funds Accounts.
- Common Return Predictor Variables for stocks and bonds.

Data - Balance Sheet Variables

- We consider quarterly and annual growth rates of total financial assets for

FINBANK		Banks
	CB	Commercial banks
	SI	Savings institutions
	CU	Credit unions
FINPI		Pension Funds and Insurances
	PCIC	Property-casualty insurance companies
	LIC	Life insurance companies
	PPF	Private pension funds
	SLGERF	State & local govt employee retirement funds
	FGRF	Federal government retirement funds
FINMF		Mutual Funds
	MMMF	Money market mutual funds
	MF	Mutual funds
	CEF	Closed-end funds and exchange-traded funds
SHADBNK		Shadow Banks
	MORTPOOL	Agency- and GSE-backed mortgage pools
	ABS	Issuers of asset-backed securities
	FINCO	Finance Companies
	FUNDCORP	Funding corporations
SBRDLR		Security brokers and dealers

- We also consider quarterly and annual leverage growth for CB, CU, SHADBNK, and SBRDLR.

Data - Macroeconomic Variables

We use quarterly and annual growth rates of the components of GDP and PCE inflation as additional predictors.

Mnemonic	Description
GDP	Real Gross Domestic Product
C	Real Personal Consumption Expenditures
CD	Real Personal Consumption Expenditures: Durable Goods
CN	Real Personal Consumption Expenditures: Nondurable Goods
CS	Real Personal Consumption Expenditures: Services
I	Real Gross Private Domestic Investment
F	Real Private Fixed Investment
FN	Real Private Nonresidential Fixed Investment
FR	Real Private Residential Investment
XNET	Real Net Exports of Goods & Services
G	Real Government Consumption Expenditures & Gross Investment
JC	Personal Consumption Expenditures
JCXFE	PCE less Food & Energy
JCXEG	PCE Excluding Energy Goods & Services
JCD	PCE Durable Goods
JCN	PCE Nondurable Goods
JCS	PCE Services

Data - Benchmark Return Forecasting Variables

We also consider a variety of benchmark return forecasting factors.

Mnemonic	Description
CAY	Log consumption wealth ratio
MKT	Fama French Excess Return on Equity Market Portfolio
SMB	Fama French Size Factor
HML	Fama French Value Factor
DPRATIO	Market Dividend Price Ratio
TERM	Term Spread (10year-3month)
DEF	Default Spread (Moody's Baa-Aaa)
RREL	3-month TBill minus its 4quarter moving average
CP	Cochrane Piazzesi Factor

Returns: Equity Portfolios

Mnemonic	Description
MKT	Fama French Market Portfolio
D1M1	Low Dividend Low Momentum Portfolio
D1M5	Low Dividend High Momentum Portfolio
D5M1	High Dividend Low Momentum Portfolio
D5M5	High Dividend High Momentum Portfolio
FF11	Small Size Low Value Portfolio
FF15	Small Size High Value Portfolio
FF51	Large Size Low Value Portfolio
FF55	Large Size High Value Portfolio

Returns: Bonds

Mnemonic	Description
	Corporate Bond Returns
IGI	Investment Grade Industrials
IGU	Investment Grade Utilities
IGF	Investment Grade Financials
Aaa	Aaa Rated
Aa	Aa Rated
A	A Rated
Baa	Baa Rated
	Treasury Returns
CMT1	1-year Constant Maturity Treasury Return
CMT2	2-year Constant Maturity Treasury Return
CMT5	5-year ...
CMT7	7-year ...
CMT10	10-year ...
CMT20	20-year ...
CMT30	30-year ...

Predictive Return Regressions

- We estimate univariate regressions

$$Rx_{t+1}^{(n)} = \alpha + \beta Z_t + \epsilon_{t+1}^{(n)}$$

  where Z is a set of k predictor variables.

- For each excess return $Rx^{(n)}$, we use a subset selection method ("LAR") to find the best predictors among

  1. All macro and benchmark return predictor variables.
  2. All balance sheet growth indicators.
  3. A combination of the two.

Subset Selection via Least Angle Regression ("LAR")

- LAR (Efron, Hastie, Johnstone, Tibshirani (2004)) is a recent regression algorithm for high-dimensional data.
- Allows selection of best among a large set of potential predictors in linear regression.
- Computationally as efficient as OLS.
- Generalization of "LASSO" and "Forward Stepwise Regression".
- We use the LAR procedure to identify subsets of best predictors for the predictive return regressions.

Subset Selection of Return Predictors

	Mkt	FF11	FF15	FF51	FF55
			Macro and Relative Pricing Factors		
1st	qG	HML	qJCXEG	HML	qG
2nd	HML	qJCXEG	qCN	CAY	qCN
3rd	qCN	qG	yFR	SMB	RREL
4th	yFR	yJCS	qG	qCD	yJCN
5th	SMB	MKT	yJCS	yJCN	yFR
			Balance Sheet		
1st	ySBRDLR:levg	ySBRDLR:levg	ySBRDLR:levg	ySBRDLR:levg	yMMMF:agw
2nd	yMORTPOOL:agw	yFINMF:agw	yMMMF:agw	yFGRF:agw	yMORTPOOL:agw
3rd	yMMMF:agw	yPPF:agw	qCEF:agw	yCB:levg	qCEF:agw
4th	yFGRF:agw	yMORTPOOL:agw	ySHADBNK:agw	qFINCO:agw	ySBRDLR:levg
5th	qABS:agw	qSBRDLR:levg	qREIT:agw	qMMMF:agw	yCU:levg
			All		
1st	ySBRDLR:levg	HML	ySBRDLR:levg	HML	qG
2nd	qG	ySBRDLR:levg	qJCXEG	CAY	yMMMF:agw
3rd	HML	yFINMF:agw	yMMMF:agw	ySBRDLR:levg	yMORTPOOL:agw
4th	CAY	qJCXEG	qCEF:agw	SMB	qCEF:agw
5th	qCN	qPPF:agw	qG	qABS:agw	ySBRDLR:levg

Subset Selection of Return Predictors

	D1M1	D1M5	D5M1	D5M5	IGI
			Macro and Relative Pricing Factors		
1st	qG	qGDP	qCN	yJCN	qCS
2nd	SMB	HML	SMB	qCN	TERM
3rd	CP	yCD	qG	CAY	MKT
4th	yJCS	yCN	DPRATIO	yJCS	CP
5th	qCD	yFR	qCD	DEF	yCD
			Balance Sheet		
1st	ySBRDLR:levg	yABS:agw	ySBRDLR:levg	qCB:levg	qSHADBNK:agw
2nd	qFINBANK:agw	ySLGERF:agw	qCEF:agw	qABS:agw	ySBRDLR:levg
3rd	qMMMF:agw	qFINMF:agw	qSI:agw	qCEF:agw	yFINMF:agw
4th	qPPF:agw	yFGRF:agw	qABS:agw	yREIT:agw	qPPF:agw
5th	yMORTPOOL:agw	ySBRDLR:levg	yFGRF:agw	ySHADBNK:agw	qSI:agw
			All		
1st	qG	yABS:agw	qCN	qCB:levg	qSHADBNK:agw
2nd	SMB	qGDP	SMB	qABS:agw	ySBRDLR:levg
3rd	ySBRDLR:levg	HML	ySBRDLR:levg	qCEF:agw	yFINMF:agw
4th	CP	ySLGERF:agw	qG	yREIT:agw	MKT
5th	qFINBANK:agw	yCD	DPRATIO	CAY	qCS

Subset Selection of Return Predictors

	IGU	IGF	Aaa	Aa	A
			Macro and Relative Pricing Factors		
1st	yCD	yFN	CP	CP	CP
2nd	qJCN	CP	HML	qCS	qCS
3rd	TERM	qFN	qCS	HML	HML
4th	CP	qCS	yJC	qJCD	yFN
5th	qCS	HML	qJCD	MKT	MKT
			Balance Sheet		
1st	qSHADBNK:agw	qSHADBNK:agw	qSHADBNK:agw	qSHADBNK:agw	qSHADBNK:agw
2nd	ySBRDLR:levg	ySBRDLR:levg	qCU:levg	qSI:agw	ySBRDLR:levg
3rd	qSBRDLR:levg	yFINMF:agw	qSI:agw	ySBRDLR:levg	yFINMF:agw
4th	qCB:levg	qSI:agw	qCB:levg	qFINMF:agw	qSI:agw
5th	qSI:agw	yMMMF:agw	ySBRDLR:levg	qPPF:agw	qFINMF:agw
			All		
1st	qSHADBNK:agw	qSHADBNK:agw	qSHADBNK:agw	qSHADBNK:agw	qSHADBNK:agw
2nd	ySBRDLR:levg	yFN	qCU:levg	CP	ySBRDLR:levg
3rd	qSBRDLR:levg	ySBRDLR:levg	CP	qSI:agw	CP
4th	qCB:levg	CP	qSI:agw	HML	yFINMF:agw
5th	yCD	qSI:agw	HML	ySBRDLR:levg	qSI:agw

Subset Selection of Return Predictors

	Baa	CMT1	CMT2	CMT5	CMT7
			Macro and Relative Pricing Factors		
1st	yFN	qCS	qCS	HML	HML
2nd	qJCN	CP	CP	CP	CP
3rd	qCS	yXNET	HML	qCS	qCS
4th	TERM	qJCS	yFR	yJCN	yJCN
5th	CAY	yFR	qJCD	yFR	yFR
			Balance Sheet		
1st	qSHADBNK:agw	qSI:agw	qSI:agw	qSHADBNK:agw	qSHADBNK:agw
2nd	ySBRDLR:levg	qSHADBNK:agw	qSHADBNK:agw	qSI:agw	qSI:agw
3rd	yFINMF:agw	yMORTPOOL:agw	yMORTPOOL:agw	qCU:levg	qCU:levg
4th	qSBRDLR:levg	qMORTPOOL:agw	qREIT:agw	qCB:levg	qCEF:agw
5th	ySI:agw	qCB:levg	qCB:levg	yMORTPOOL:agw	qCB:levg
			All		
1st	qSHADBNK:agw	qSI:agw	qSI:agw	qSHADBNK:agw	qSHADBNK:agw
2nd	ySBRDLR:levg	qCS	qSHADBNK:agw	qSI:agw	qSI:agw
3rd	yFINMF:agw	qSHADBNK:agw	qCS	qCU:levg	qCU:levg
4th	qJCN	yMORTPOOL:agw	CP	HML	HML
5th	yFN	qMORTPOOL:agw	HML	CP	yJCN

Predictive Return Regression - Equity Market Portfolio

	(1)	(2)	(3)	(4)	(5)	(6)	(7)
MKT (lag)	-0.0402 (-0.501)	-0.0206 (-0.205)	-0.0445 (-0.490)	-0.0176 (-0.169)	-0.00891 (-0.0902)	-0.0549 (-0.596)	-0.141 (-1.892)
RREL	1.308 (1.453)						-0.529 (-0.520)
TERM		-0.131 (-0.211)					-1.094 (-1.243)
DEF			-1.867 (-0.870)				-5.628 (-1.792)
DPRATIO				-3.128 (-1.441)			-5.075 (-1.341)
cay					68.64 (1.890)		31.71 (0.542)
ySBRDLR:levg						**-0.0814** (-2.721)	**-0.116** (-3.490)
$\bar{R}^2$	-0.001	-0.022	-0.015	-0.005	-0.000	0.055	0.088

We find qualitatively similar results for the other equity portfolios.

Large Size High Value Portfolio (FF55)

	(1)	(2)	(3)	(4)	(5)	(6)	(7)
FF55 (lag)	0.0377	0.0706	0.0382	0.0717	0.0800	0.0804	-0.0508
	(0.562)	(0.912)	(0.523)	(0.845)	(0.984)	(0.987)	(-0.744)
RREL	1.961						0.136
	(1.816)						(0.137)
TERM		-0.260					-0.931
		(-0.330)					(-0.836)
DEF			-2.271				-6.464
			(-0.868)				(-1.610)
DPRATIO				**-3.967**			**-8.568**
				(-1.976)			(-2.458)
cay					45.30		-39.60
					(1.123)		(-0.662)
ySBRDLR:levg						**-0.0700**	**-0.0914**
						(-2.058)	(-3.084)
$\bar{R}^2$	0.025	-0.016	-0.008	0.008	-0.008	0.037	0.079

We find qualitatively similar results for the other equity portfolios.

Investment Grade Financial Bonds

	(1)	(2)	(3)	(4)	(5)	(6)
IGF (lag)	-0.288	-0.277	-0.290	-0.325	-0.225	-0.249
	(-1.332)	(-1.280)	(-1.326)	(-1.319)	(-1.615)	(-1.712)
TERM	0.416					**-0.968**
	(1.803)					(-3.615)
DEF		0.515				**1.314**
		(0.584)				(2.097)
CP			**0.499**			**0.773**
			(4.470)			(5.183)
ySBRDLR:levg				-0.0265		**-0.0329**
				(-1.661)		(-3.037)
qSHADBNKagw					**-1.512**	**-1.848**
					(-4.644)	(-6.620)
$\bar{R}^2$	0.066	0.048	0.102	0.103	0.215	0.347

We find qualitatively very similar results for the other corporate bond returns.

Baa Corporate Bonds (BAA)

	(1)	(2)	(3)	(4)	(5)	(6)
BAA (lag)	0.116	0.154	0.115	0.0621	0.0950	0.0211
	(1.012)	(1.200)	(1.085)	(0.626)	(0.940)	(0.254
TERM	**0.520**					**-0.615**
	(3.096)					(-4.060
DEF		**1.679**				**1.765**
		(2.012)				(3.400
CP			0.282			**0.471**
			(1.376)			(3.435
ySBRDLR_levg				**-0.0333**		**-0.037**
				(-2.464)		(-3.672
qSHADBNKagw					**-1.325**	**-1.628**
					(-4.360)	(-6.843
$\bar{R}^2$	0.037	0.048	0.017	0.116	0.170	0.368

We find qualitatively very similar results for the other corporate

2-year Treasury (CMT2)

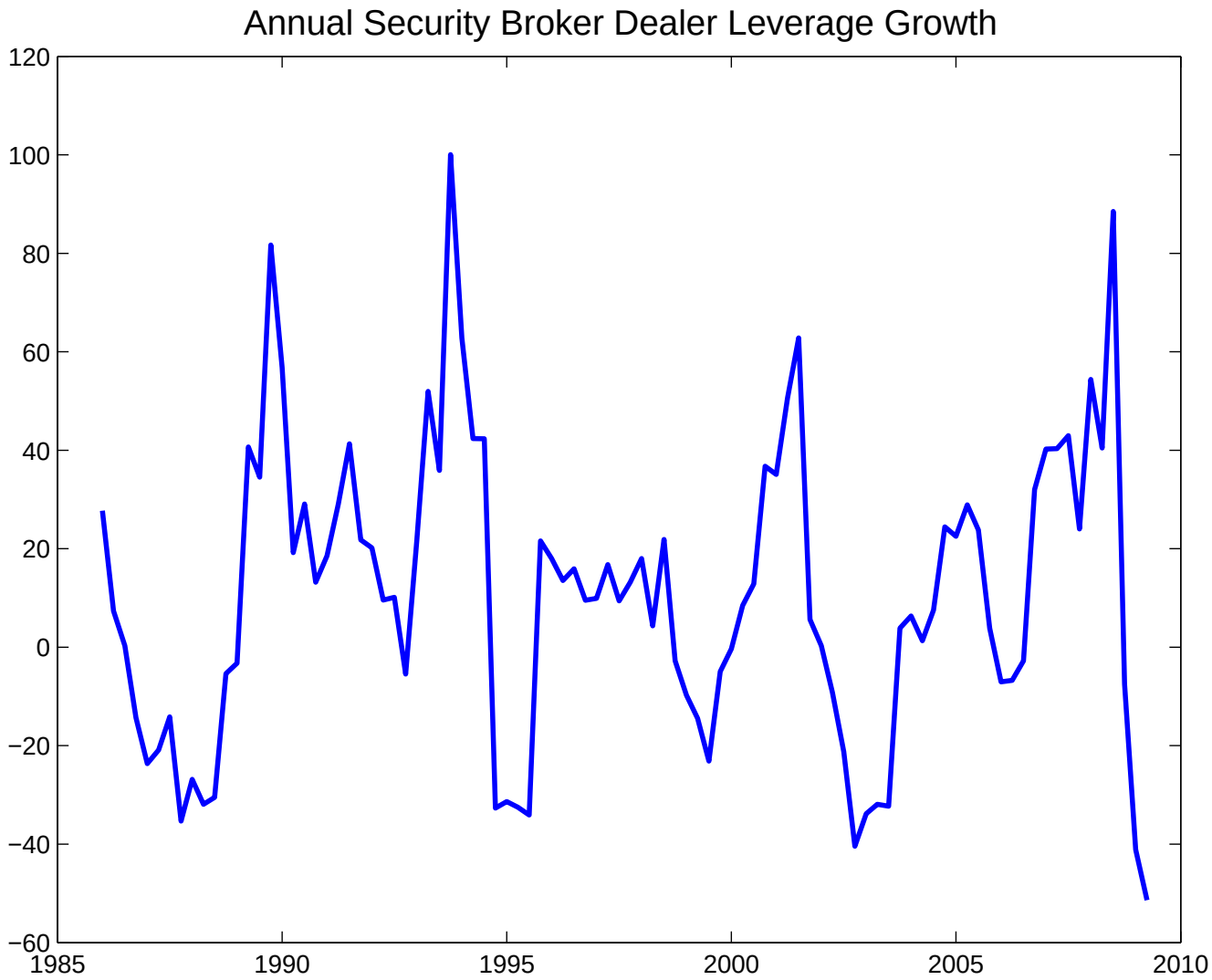
	(1)	(2)	(3)	(4)	(5)
CMT2 (lag)	0.0334	0.0325	0.0519	0.0315	0.0353
	(0.468)	(0.461)	(0.741)	(0.483)	(0.482)
TERM	0.0441				**-0.439**
	(0.437)				(-2.919)
DEF		0.0301			0.659
		(0.155)			(1.647)
CP			**0.184**		**0.353**
			(2.142)		(2.942)
qSHADBNKagw				**-0.469**	**-0.562**
				(-3.523)	(-3.853)
$\bar{R}^2$	-0.019	-0.021	0.031	0.081	0.173

10-year Treasury

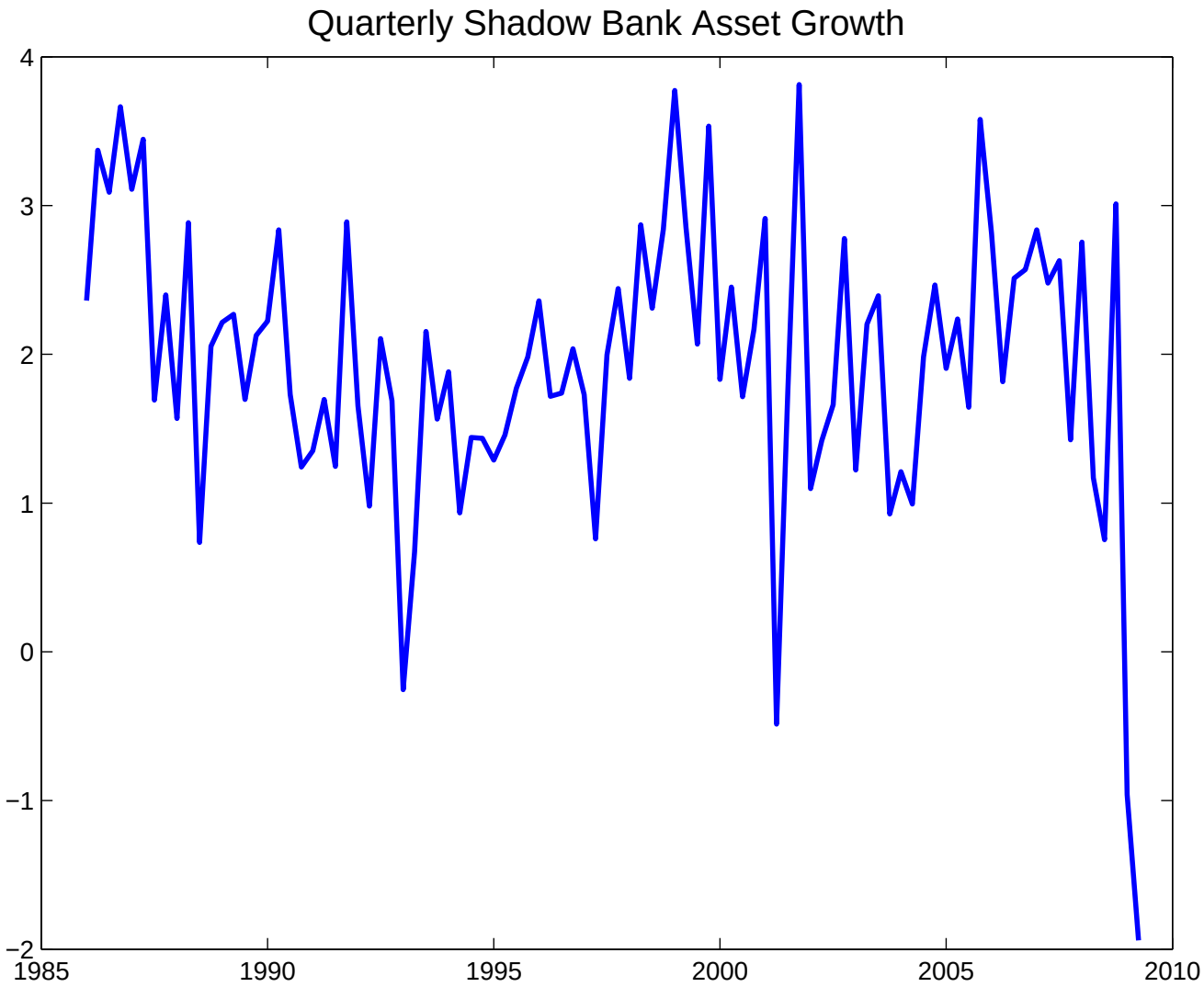
	(1)	(2)	(3)	(4)	(5)
CMT10 (lag)	-0.0202	-0.00268	0.0204	-0.0385	0.00451
	(-0.244)	(-0.0320)	(0.245)	(-0.505)	(0.0500)
TERM	0.467				-0.379
	(1.793)				(-0.799)
DEF		-1.029			-0.345
		(-1.596)			(-0.265)
CP			**0.556**		0.529
			(2.551)		(1.451)
qSHADBNKagw				**-1.678**	**-1.696**
				(-3.795)	(-3.799)
$\bar{R}^2$	-0.003	-0.011	0.027	0.119	0.136

We find qualitatively very similar results for the other Treasury returns.

Annual Security Broker and Dealer Leverage Growth



Quarterly Shadow Bank Asset Growth (Asset Weighted)



Robustness Checks

1. Adjusting for Stambaugh bias does not affect the results.

2. Are these results driven by the financial crisis?

$\Rightarrow$ We perform a subsample analysis excluding data post 2007Q2.

3. Do the results persist if we use alternative measures of financial intermediary balance sheet expansion?

$\Rightarrow$ We proxy for intermediary balance sheet growth using aggregate growth of the ABCP and Repo market.

Subsample Regression : Equity Market Portfolio

We exclude the financial crisis period and reestimate the regressions using data from 1986Q1 to 2007Q2. Results remain qualitatively the same.

	(1)	(2)	(3)	(4)	(5)	(6)	(7)
MKT (lag)	-0.117	-0.117	-0.117	**-0.122**	-0.107	**-0.139**	**-0.180**
	(-1.715)	(-1.674)	(-1.732)	(-2.015)	(-1.593)	(-2.044)	(-2.719)
RREL	0.390						-1.337
	(0.494)						(-1.061)
TERM		-0.0964					-0.972
		(-0.135)					(-1.205)
DEF			-1.804				-9.613
			(-0.492)				(-1.367)
DPRATIO				-2.921			-6.632
				(-1.131)			(-1.190)
cay					58.94		-14.82
					(1.471)		(-0.189)
ySBRDLR:levg						**-0.0494**	**-0.0933**
						(-2.386)	(-3.221)
$\bar{R}^2$	-0.008	-0.010	-0.007	0.007	0.008	0.019	0.031

Subsample Regression : Baa Rated Corporate Bonds

	(1)	(2)	(3)	(4)	(5)	(6)
BAA (lag)	0.0588	0.0751	0.0873	0.0540	0.0413	0.0149
	(0.509)	(0.695)	(0.793)	(0.529)	(0.422)	(0.177)
TERM	**0.511**					**-0.585**
	(2.819)					(-2.782)
DEF		0.631				0.779
		(0.638)				(1.014)
CP			**0.516**			**0.608**
			(3.614)			(3.064)
ySBRDLR:levg				-0.0231		**-0.0339**
				(-1.843)		(-3.229)
qSHADBNKagw					**-1.226**	**-1.579**
					(-4.823)	(-5.624)
$\bar{R}^2$	0.038	-0.014	0.063	0.052	0.153	0.306

Subsample Regression : 10-year Treasury

	(1)	(2)	(3)	(4)	(5)
CMT10 (lag)	-0.0187	-0.0168	-0.00219	-0.0837	-0.0694
	(-0.200)	(-0.184)	(-0.0234)	(-1.031)	(-0.885)
TERM	**0.618**				**-0.803**
	(2.421)				(-2.178)
DEF		-0.894			0.867
		(-0.523)			(0.441)
CP			**0.830**		**0.967**
			(4.753)		(4.017)
qSHADBNKagw				**-2.086**	**-2.193**
				(-6.374)	(-5.933)
$\bar{R}^2$	0.013	-0.021	0.070	0.186	0.237

Alternative Measures of Balance Sheet Expansion

- Balance sheet expansions reflected on both asset and liability side.
- Market based financial intermediaries typically finance their activities in short-term funding markets such as the Commercial Paper and the repo market.
- We have data on the growth of these markets since 1990. Are these equally good return predictor variables?
- We estimate predictive regressions of monthly excess returns using the benchmark return predictor variables as well as monthly repo and ABCP growth.

Equity Market Portfolio

	(1)	(2)	(3)	(4)	(5)	(6)	(7)
MKT	0.134	0.140	0.133	0.141	0.133	0.139	0.121
	(1.656)	(1.616)	(1.603)	(1.534)	(1.498)	(1.641)	(1.410)
RREL	0.422						0.333
	(1.661)						(1.060)
TERM		-0.0697					-0.182
		(-0.327)					(-0.699)
DEF			-0.580				-0.441
			(-0.855)				(-0.655)
DPRATIO				-1.346			**-2.078**
				(-1.781)			(-2.695)
ABCP					0.0949		0.0629
					(0.840)		(0.518)
REPO						0.0306	0.0287
						(0.570)	(0.532)
$\bar{R}^2$	0.018	0.012	0.015	0.021	0.014	0.012	0.016

Investment Grade Financial Bonds

	(1)	(2)	(3)	(4)	(5)	(6)
IGF	**0.208**	**0.208**	**0.218**	**0.219**	**0.211**	**0.214**
	(4.103)	(4.596)	(4.550)	(4.354)	(4.695)	(4.914)
TERM	**0.174**					0.0128
	(2.478)					(0.0949)
DEF		0.368				0.289
		(1.562)				(0.811)
CP			0.0825			0.125
			(1.058)			(1.294)
ABCP				**-0.0731**		**-0.0536**
				(-2.984)		(-2.107)
REPO					**-0.0546**	**-0.0550**
					(-2.509)	(-2.864)
$\bar{R}^2$	0.052	0.047	0.044	0.047	0.059	0.069

10 year Treasury

	(1)	(2)	(3)	(4)	(5)	(6)
CMT10	0.0578	0.0588	0.0733	0.0872	0.0660	**0.115**
	(1.088)	(1.134)	(1.309)	(1.712)	(1.285)	(2.295)
TERM	**0.191**					0.0387
	(2.119)					(0.201)
DEF		0.0833				-0.432
		(0.359)				(-0.999)
CP			0.0920			0.0780
			(0.759)			(0.442)
ABCP				**-0.202**		**-0.228**
				(-3.702)		(-4.167)
REPO					**-0.0617**	**-0.0792**
					(-2.558)	(-3.313)
$\bar{R}^2$	0.007	-0.005	0.000	0.047	0.013	0.066

Macroeconomic Interpretation

- **Balance sheet expansions** of market based financial intermediaries **predict lower risk premia**.
- When risk premia are low, spreads are tight $\Rightarrow$ This may stimulate macroeconomic activity.
- **Balance sheet contractions** will lead to an **increase in spreads** which in turn may have a contractionary impact on macroeconomic activity.

$\Rightarrow$ Balance sheet dynamics of financial intermediaries may have a direct effect on macroeconomic activity.

Forecasting Macroeconomic Aggregates

- Do the balance sheet variables also predict Macro aggregates?
- Yes. We show that balance sheets forecast both real growth and inflation, controlling for lagged macro variables, Fed Funds rate, and spreads.
- These results make the connection between financial intermediaries, asset prices, and macroeconomic dynamics.
- Provide a framework for preemptive macroeconomic policy.

Real GDP Growth: 1 Quarter Ahead

	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)
GDP (lag)	**0.43**	**0.22**	**0.42**	**0.41**	0.12	0.12	**0.40**	0.06
	(2.66)	(2.08)	(2.61)	(2.57)	(0.85)	(0.89)	(2.48)	(0.45)
FFR	0.05	-0.03	0.05	0.01	0.04	0.05	0.03	0.04
	(0.37)	(-0.21)	(0.38)	(0.09)	(0.35)	(0.32)	(0.21)	(0.34)
TERM	0.06				0.23	0.48		0.39
	(0.37)				(1.18)	(1.85)		(1.66)
DEF		**-2.38**			**-3.18**	**-3.00**		**-3.47**
		(-3.71)			(-3.70)	(-4.30)		(-4.43)
ySBRDLR:levg			-0.01		-0.02		-0.01	-0.02
			(-1.20)		(-1.50)		(-1.07)	(-1.34)
qSHADBNK:agw				0.25		0.58	0.20	0.50
				(0.97)		(1.86)	(0.78)	(1.55)
$\bar{R}^2$	0.16	0.25	0.17	0.17	0.30	0.28	0.17	0.32

Consumption Growth

	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)
C (lag)	0.28	0.14	0.27	0.25	0.02	-0.00	0.24	-0.06
	(1.88)	(1.68)	(1.80)	(1.60)	(0.20)	(-0.00)	(1.51)	(-0.55)
FFR	0.30	0.21	0.26	0.18	**0.33**	**0.33**	0.21	**0.34**
	(1.82)	(1.58)	(1.87)	(1.43)	(2.30)	(2.27)	(1.58)	(2.65)
TERM	0.22				0.31	**0.70**		**0.59**
	(1.20)				(1.87)	(3.39)		(3.42)
DEF		**-1.80**			**-2.72**	**-2.60**		**-3.11**
		(-2.69)			(-2.78)	(-3.94)		(-3.83)
ySBRDLR:levg			-0.02		-0.02		-0.01	-0.02
			(-1.34)		(-1.45)		(-1.18)	(-1.30)
qSHADBNK:agw				**0.68**		**1.02**	**0.61**	**0.92**
				(2.61)		(3.42)	(2.52)	(3.07)
$\bar{R}^2$	0.14	0.18	0.17	0.18	0.26	0.29	0.20	0.33

Durable Consumption Growth

	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)
CD (lag)	-0.04	-0.14	-0.05	-0.06	-0.16	-0.17	-0.07	-0.19
	(-0.37)	(-1.36)	(-0.44)	(-0.53)	(-1.75)	(-1.59)	(-0.59)	(-1.95)
FFR	-0.15	-0.40	-0.04	-0.25	-0.43	-0.46	-0.24	-0.50
	(-0.18)	(-0.66)	(-0.05)	(-0.41)	(-0.65)	(-0.72)	(-0.38)	(-0.84)
TERM	-0.33				-0.12	0.77		0.54
	(-0.35)				(-0.15)	(0.94)		(0.68)
DEF		**-7.99**			**-8.96**	**-8.76**		**-9.40**
		(-3.11)			(-3.36)	(-3.09)		(-3.44)
ySBRDLR:levg			-0.02		-0.05		-0.01	-0.04
			(-0.45)		(-0.99)		(-0.26)	(-0.76)
qSHADBNK:agw				2.02		**2.54**	1.97	**2.33**
				(1.62)		(2.23)	(1.70)	(2.14)
$\bar{R}^2$	-0.03	0.05	-0.03	-0.00	0.04	0.07	-0.01	0.07

Investment Growth

	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)
I (lag)	0.31	-0.01	0.32	0.32	-0.11	-0.14	0.32	-0.15
	(1.63)	(-0.10)	(1.73)	(1.73)	(-1.05)	(-1.30)	(1.70)	(-1.40)
FFR	0.14	-1.10	-0.22	-0.26	-0.19	-0.18	-0.22	-0.24
	(0.15)	(-1.64)	(-0.24)	(-0.25)	(-0.32)	(-0.26)	(-0.22)	(-0.41)
TERM	1.33				**3.54**	**4.65**		**4.28**
	(1.35)				(3.41)	(4.20)		(4.77)
DEF		**-22.32**			**-27.00**	**-26.95**		**-27.98**
		(-3.86)			(-4.89)	(-5.87)		(-5.80)
ySBRDLR:levg			-0.02		-0.07		-0.02	-0.06
			(-0.47)		(-1.19)		(-0.46)	(-0.98)
qSHADBNK:agw				0.12		**2.59**	0.00	2.20
				(0.08)		(2.11)	(0.00)	(1.48)
$\bar{R}^2$	0.08	0.32	0.07	0.07	0.38	0.38	0.06	0.39

PCE Inflation

	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)
PCE (lag)	**0.30**	**0.33**	**0.34**	**0.34**	**0.32**	**0.32**	**0.36**	**0.33**
	(3.13)	(2.61)	(3.68)	(3.23)	(3.20)	(3.03)	(3.95)	(3.56)
FFR	**0.22**	0.17	0.17	0.13	**0.21**	**0.20**	0.14	**0.19**
	(2.18)	(1.88)	(1.88)	(1.47)	(2.29)	(2.16)	(1.58)	(2.19)
TERM	0.16				0.11	**0.24**		0.20
	(1.37)				(1.16)	(2.39)		(1.80)
DEF		0.13			-0.04	0.01		-0.06
		(0.26)			(-0.08)	(0.02)		(-0.14)
ySBRDLR:levg			-0.01		-0.01		-0.01	-0.01
			(-1.14)		(-0.94)		(-1.00)	(-0.72)
qSHADBNK:agw				**0.28**		**0.34**	**0.24**	**0.30**
				(2.79)		(3.62)	(2.67)	(3.15)
$\bar{R}^2$	0.20	0.19	0.22	0.22	0.20	0.22	0.22	0.22

Related Literature

- Adrian and Shin (2008): Growth of repos on dealer balance sheets predicts innovations in the VIX.
- Adrian, Etula, Shin (2009): Aggregate ABCP and repo growth predicts FX returns.
- Etula (2009): Changes in broker dealer asset share predict commodity returns.
- Longstaff and Wang (2008): Aggregate credit in exchange economy with heterogeneous agents predicts stock returns.
- Danielsson, Shin, Zigrand (2009): Risk-neutral investors operating under VaR constraint have time-varying effective risk aversion which depends on tightness of the constraint.

A Simple Static Model to Fix Ideas

Following Danielsson, Shin, Zigrand (2009) and Etula (2009), let

Assets	Liabilities
w_t	$e_t = 1$
	$w_t - 1$

represent a stylized balance sheet of a firm in period t. This firm has leverage of w_t.

Let R_{t+1} denote the return on the risky asset and r_t the risk-free rate that the firm pays on its liabilities.

Assume the firm maximizes its return on equity R^e_{t+1} subject to the value-at-risk constraint $VaR_t \leq 1$ where $VaR_t = \alpha\sqrt{Var_t(R^e_{t+1})}$.

A Simple Static Model - ctd.

The ROE is given by $R^e_{t+1} = w_t R_{t+1} - (w_t - 1) r_t$.

The Lagrangian is

$$L_t = w_t E_t \left[R_{t+1}\right] - \left(w_t - 1\right) r_t - \lambda_t \left(\sqrt{Var_t(R^e_{t+1})} - \frac{1}{\alpha} \right).$$

The FOC for w_t is

$$E_t[R_{t+1}] - r_t - \lambda_t \left(Var_t(R^e_{t+1})^{-1/2} \, w_t \, Var_t(R_{t+1}) \right) = 0.$$

As the firm is risk neutral, the constraint will always bind. Hence, $VaR_t = 1$ and therefore $\sqrt{Var_t(R^e_{t+1})} = \frac{1}{\alpha}$.

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We then find

$$w_t = \frac{1}{\alpha \lambda_t} \frac{(E_t[R_{t+1}] - r_t)}{Var_t(R_{t+1})}.$$

This is identical to the standard mean variance choice but with the Lagrange multiplier λ_t replacing the risk aversion parameter.

Hence, with a VaR constraint risk-neutral firms behave like risk-averse agents, and their risk aversion shifts around according to the tightness of the constraint.

$\frac{1}{\alpha \lambda_t}$ measures their "risk appetite".

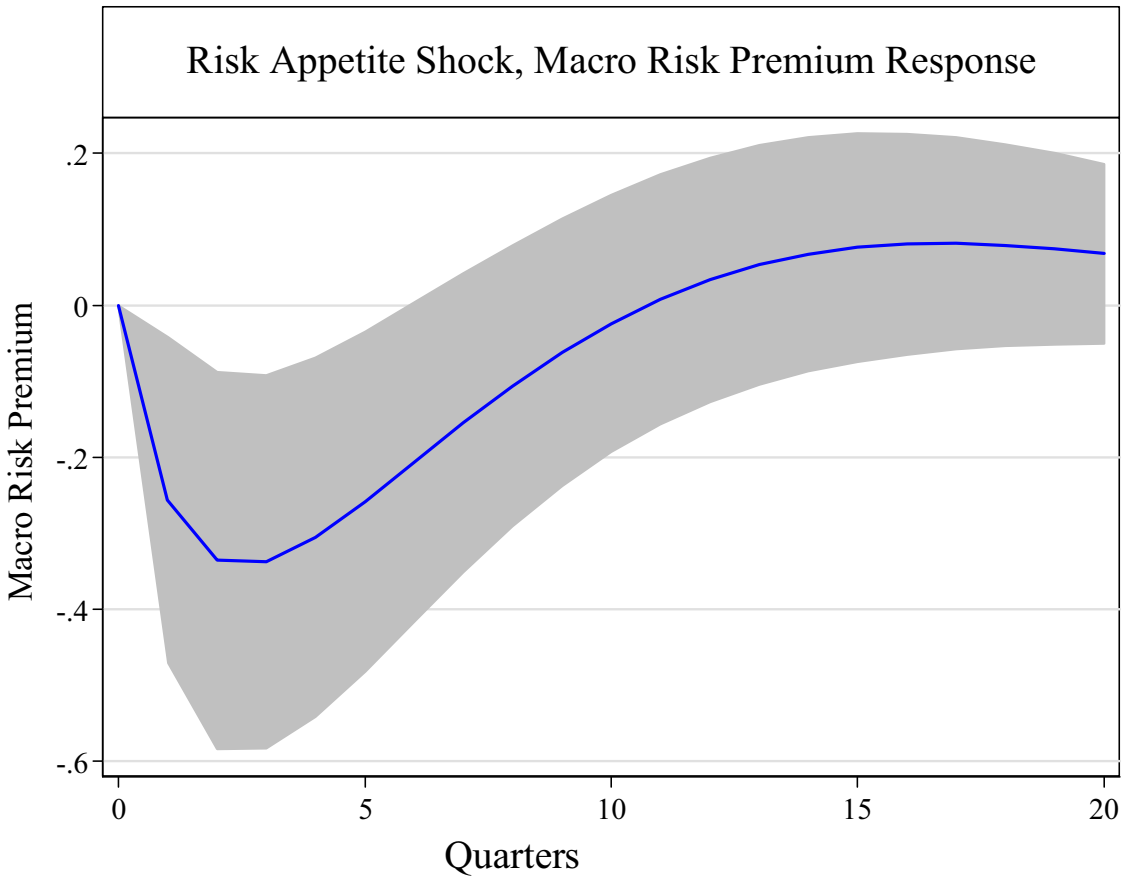
Summary

- We document that Balance sheet growth of market based financial intermediaries predicts excess returns on a large cross-section of assets.
- An increase in Security Broker Dealer Leverage growth predicts lower future equity returns and lower future corporate bond returns.
- An increase in Shadow Bank Asset growth predicts lower future corporate and government bond returns.
- We document that these balance sheet variables also forecast real economic activity and inflation.

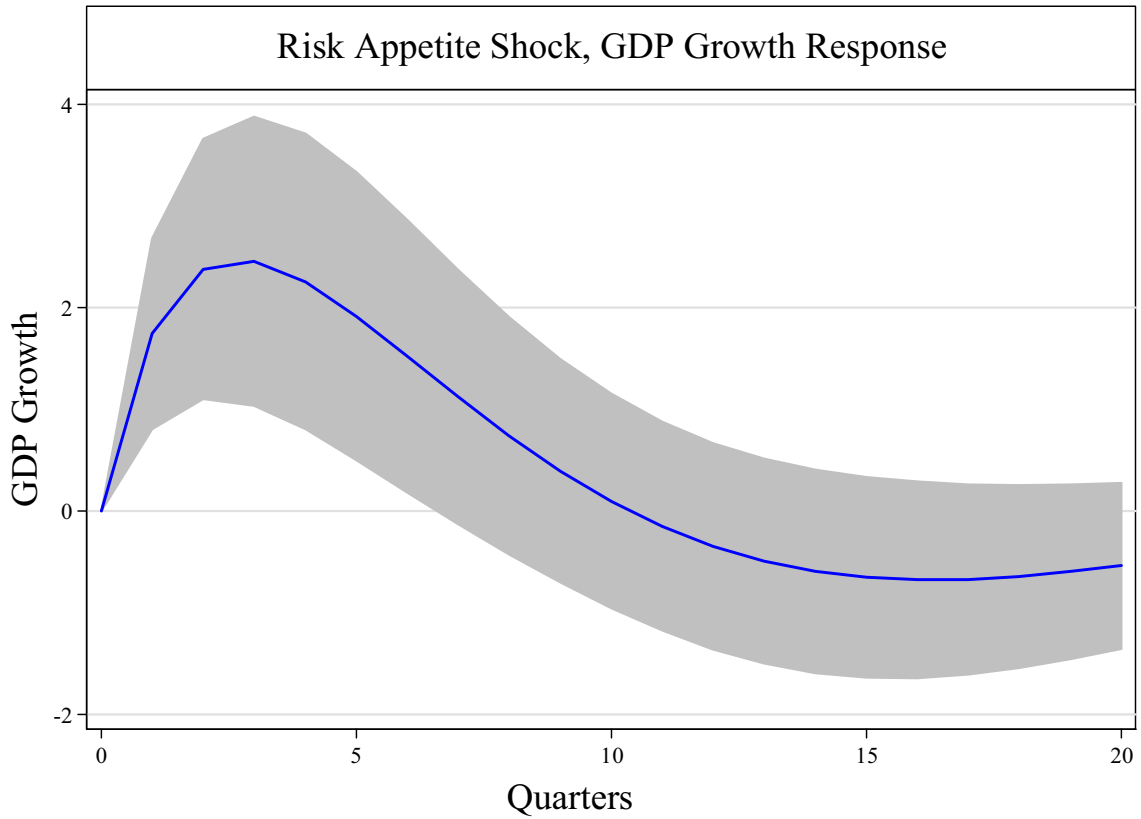
A Simple VAR Analysis

- We decompose GDP growth into a component that is explained by term and credit spreads and into a residual. We label the first *Macro risk premium*.
- We show that lagged Security Broker Dealer and Shadow Bank balance sheet growth predict changes in the Macro Risk Premium. We label the linear combination of the balance sheet variables that predicts the Macro risk premium the *Risk appetite factor*.
- We estimate a VAR with the following variables: GDP growth, PCE inflation, Fed Funds rate, Macro risk premium, Risk appetite. We use a recursive identification to estimate impulse response functions to risk appetite shocks and monetary policy shocks.

Impulse Responses



Impulse Responses - ctd.



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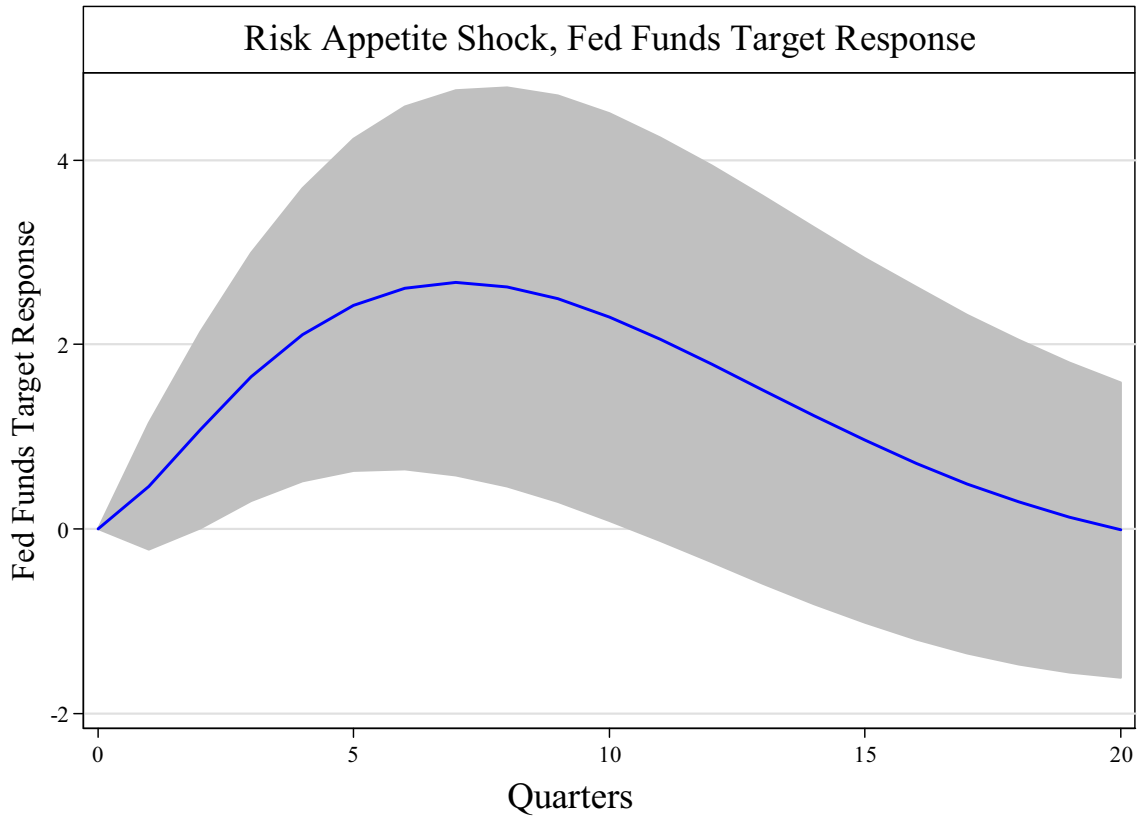

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