EUROPEAN CENTRAL BANK

EUROSYSTEM

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Investment strategies of euro area insurers and pension funds (ICPFs): Pro- or counter-cyclical?

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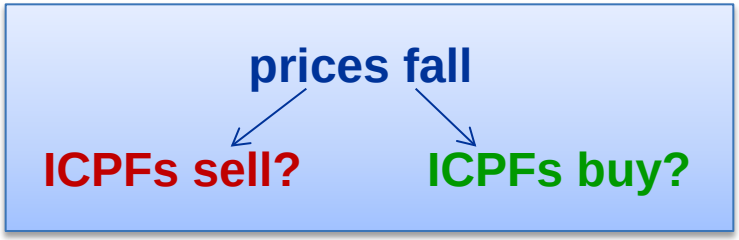
Research question

Is ICPF investment behaviour pro- or counter-cyclical?



Timmer (2018)
German ICPFs, Security Holdings Statistics, 2005-2014, quarterly data

→ ICPFs respond ***counter-cyclically*** to price changes

Similar results: De Haan and Kakes (2010), Becker and Ivashina (2015)

Bijlsma and Vermeulen (2016)
Dutch ICs, Security Holdings Statistics, 2006-2013, quarterly data

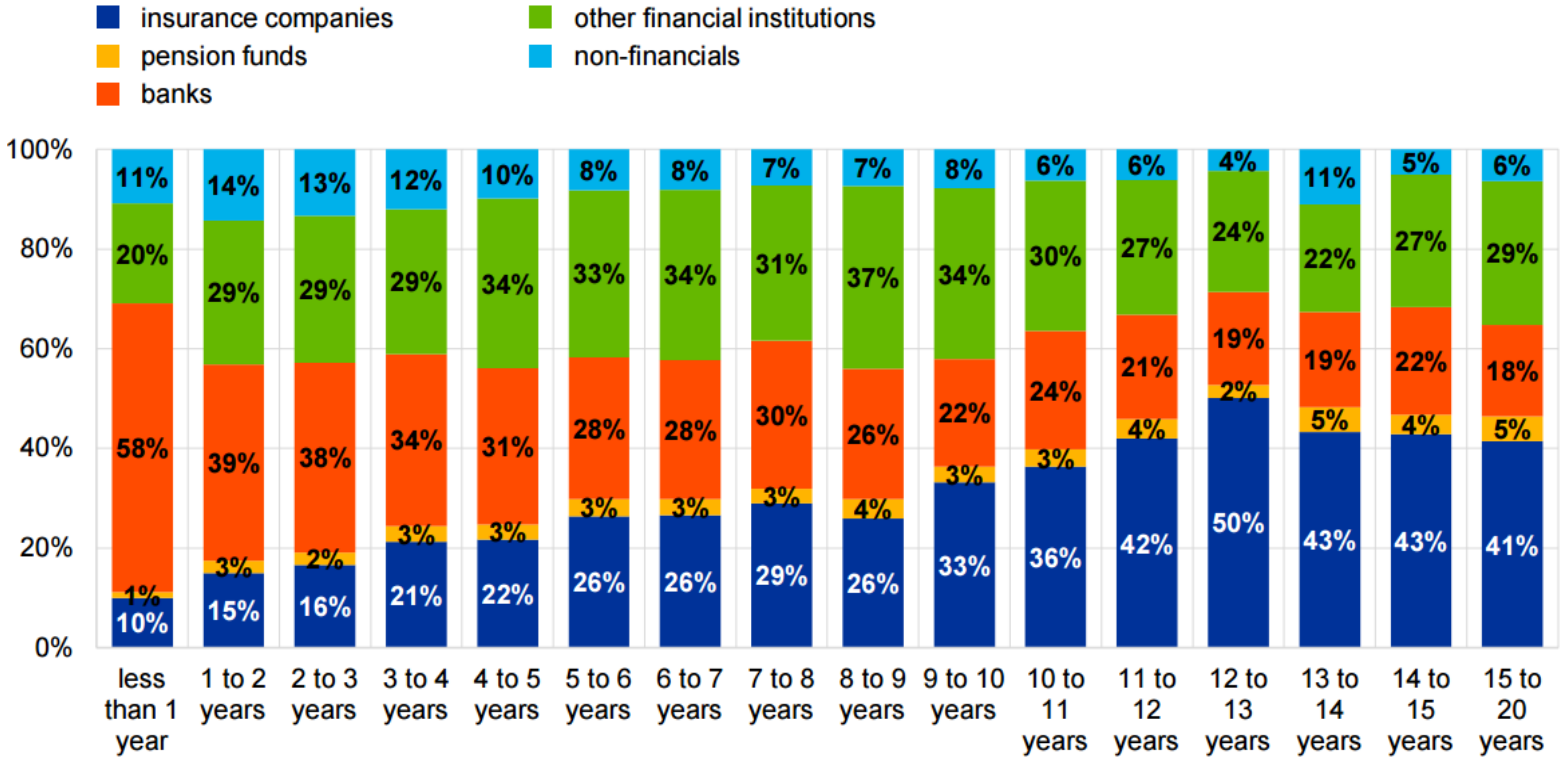
→ ICs acted ***pro-cyclically*** during the sovereign debt crisis

Similar results: Impavido and Tower (2009), BoE (2014), Duijm and Bisschop (2018)

Why is this question important?

→ ICPFs are important long-term investors

Euro area holdings of debt securities broken down by residual maturity and holder sector
(Q3 2016; percentages of total holdings of securities)



Source: ECB Securities Holdings Statistics and authors' calculations.

Main contribution

New insight: The underlying drivers of a price change (rather than just the direction of the change) **are important determinants of ICPF investment behaviour**

Why?

Because (bond) prices can change due to changes in **risk-free rate** or **risk premia** …

…and these have different effects on **ICPFs' equity** …

…and thus also different effects on **ICPFs' investment behaviour**

We predict that ICPFs act

→ **Pro-cyclically** when prices change due to **risk premia**

→ **Counter-cyclically** when prices change due to **risk-free rate**

…and we confirm these predictions empirically

Modelling Framework: ICPF equity valuation

→ Model the market values of assets *A* and liabilities *L* as zero-coupon bonds with face value B_A and B_L and maturity D_A and D_L (under a market-consistent regulatory regime)

$$E = A - L = \frac{B_A}{(1+r+p)^{D_A}} - \frac{B_L}{(1+r)^{D_L}}$$

Sensitivity to a change in risk-free rate

$$\frac{\partial E}{\partial r} > 0 \Leftrightarrow \frac{D_L}{D_A} > \frac{A}{L}\frac{1+r}{1+r+p}$$

Negative duration gap!

(specific for ICPFs)

Prediction 1a: The value of equity often **increases** with an increase in the risk-free rate

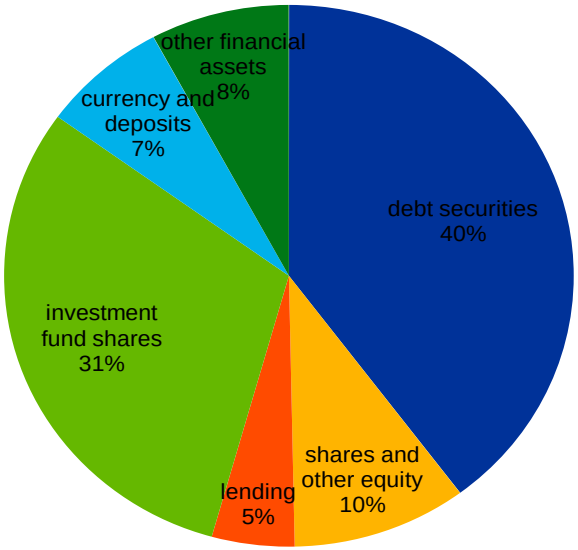
Sensitivity to a change in risk premium

$$\frac{\partial E}{\partial p} < 0$$

Prediction 2a: The value of equity **decreases** with an increase in risk premium

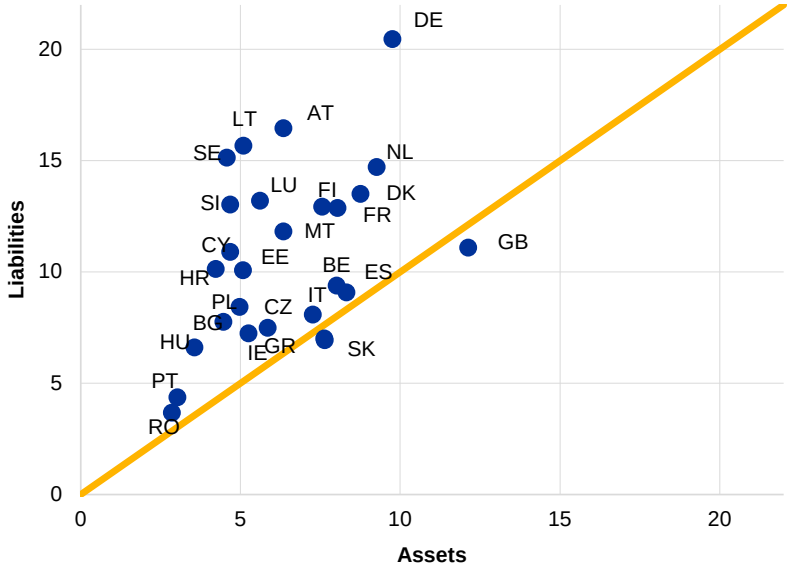
Realistic framework for euro area ICPFs?

Financial assets of euro area ICPFs (2016 Q4)



Source: ECB (euro area accounts) and authors' calculations.

Duration of assets and liabilities of EEA insurers (EIOPA's 2014 stress test)



Source: EIOPA insurance stress test (2014), Figure 78.

Modelling Framework: ICPF response to Δ in equity

→ **May shocks to equity propagate to asset portfolios? If so, how?**

After a negative equity shock, ICPFs have several ways to restore financial position:

- Act on equity: raise fresh capital, generate capital through retained earnings
- Act on liabilities: underwriting less business, lower profit sharing (life insurance)
- **Act on assets: sell (risky) assets**

→ **Van Binsbergen and Brandt (2016):** asset-liability management investors (such as ICPFs) decrease the riskiness of their portfolio in response to a negative shock to equity

→ **Deleveraging model:** banks sell (buy) assets when they experience a negative (positive) shock to their equity (Greenwood et al., 2015; Eisenbach et al., 2015 for banks)

Prediction 1a: The value of equity often **increases** with an increase in the risk-free rate

Prediction 1b: Insurers often **buy** bonds, when their prices are falling due to an increase in the risk-free rate of return (counter-cyclical)

Prediction 2a: The value of equity **decreases** with an increase in risk premium

Prediction 2b: Insurers **sell** bonds, when their prices are falling due to an increase in risk premium (pro-cyclical)

Empirical specification

We estimate the following empirical specification:

$$\log(h_{i,j,t}) = \alpha * r_{i,t-1} + \beta * p_{i,t-1} + controls$$

i…security
j…holding country
t…quarter

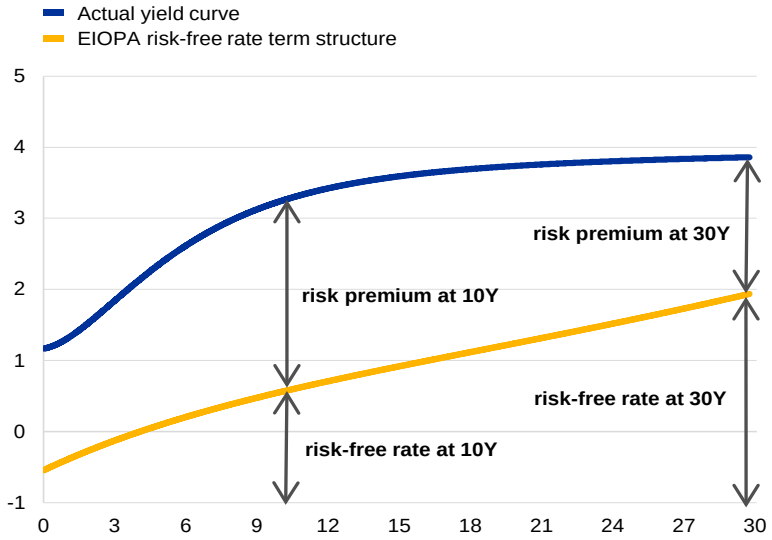
and expect: $\alpha > 0$ $\beta < 0$

Prediction 1b: Insurers often **buy** bonds, when their prices are falling due to an **increase in the risk-free** rate of return

Prediction 2b: Insurers **sell** bonds, when their prices are falling due to an **increase in risk premium**

Data

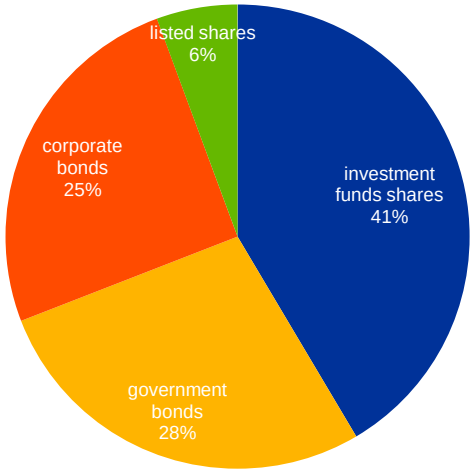
- → $h_{i,j,t}$ …holding of (government) bond ***i*** by ICPFs in euro area country ***j*** (from SHSS)
- → ***r*** …proxied by risk-free interest rate term structures published by EIOPA
- → ***p*** …calculated as a **spread** between yield-to-maturity (from CSDB) and r



Dependent variable: holdings of government bonds

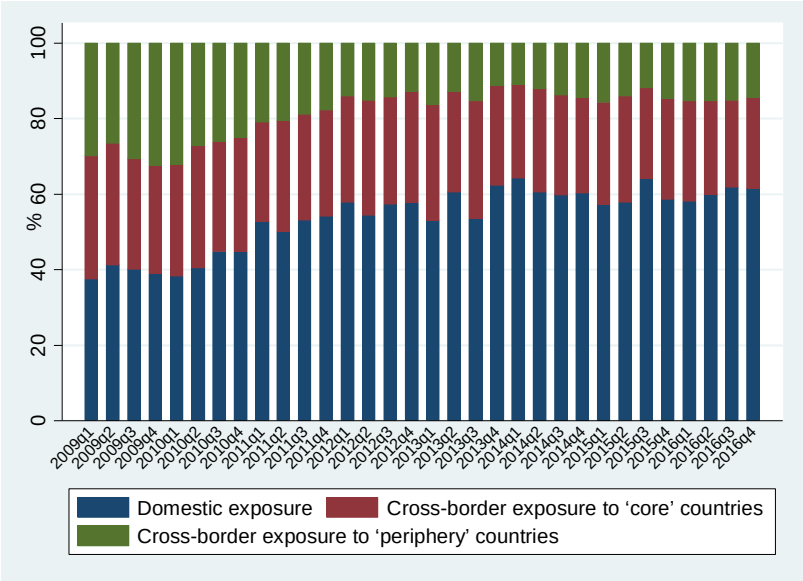
- → Bijlsma and Vermeulen (2015) find the largest (pro-cyclical) changes in the portfolio of gov. bonds
- → Euro area ICPFs hold around 21% of debt securities issued by euro area sovereigns
- → Government bonds represent around 28% of ICPFs' debt securities holdings
- → Period: 2009 Q1 – 2016 Q4 (i.e. use of "experimental" SHS to cover sovereign debt crisis)

Euro area ICPFs' securities holdings
(Q4 2016; percentages)



Source: ECB (SHSS) and authors' calculations.

Euro area ICPFs' holdings of government bonds, broken down by issuer type



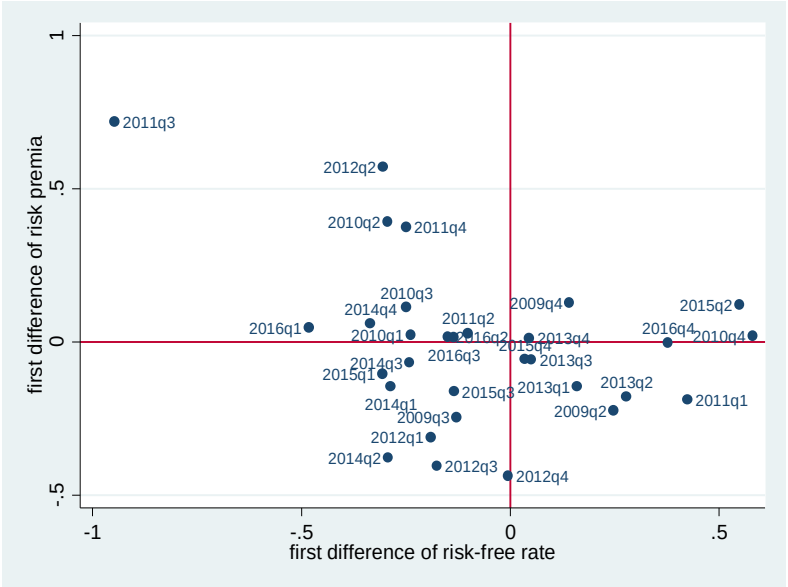
Source: ECB (SHSS) and authors' calculations.

Explanatory variables of interest

Average risk-free rate and risk premia over time

Note: The average is weighted by holdings in our sample.
Source: ECB (SHS and CSDB) and authors' calculations.

First differences of average risk-free rate (x-axis) and risk premia (y-axis)



Note: The average is weighted by holdings in our sample.
Source: ECB (SHS and CSDB) and authors' calculations.

Table 1: Baseline model

	(1)	(2)	(3)	(4)	(5)	(6)
Dependent Variable	Log Holdings					
Risk premia *(lag)*	-0.011***	-0.012***	-0.011***	-0.012***	-0.013***	-0.013***
	(0.00)	(0.00)	(0.00)	(0.00)	(0.00)	(0.00)
Risk-free rate *(lag)*	0.014***	0.015***	0.020***	0.025***	0.024***	0.025***
	(0.00)	(0.00)	(0.00)	(0.00)	(0.00)	(0.00)
Log Holdings *(lag)*	0.67***	0.67***	0.70***	0.69***	0.69***	0.69***
	(0.00)	(0.00)	(0.00)	(0.00)	(0.00)	(0.00)
Log Residual maturity		0.085***	0.090***	0.091***	0.090***	0.090***
		(0.00)	(0.00)	(0.00)	(0.00)	(0.00)
ECAI downgrade *(lag)*			-0.072***	-0.090***	-0.091***	-0.090***
			(0.00)	(0.00)	(0.00)	(0.00)
Debt/GDP *(lag)*				-0.0020***	-0.0020***	-0.0020***
				(0.00)	(0.00)	(0.00)
Log PSPP volume *(lag)*					-0.0028***	-0.0026***
					(0.00)	(0.00)
Log VSTOXX *(lag)*						-0.016
						(0.22)
Security-holder country FE	Y	Y	Y	Y	Y	Y
Year FE	Y	Y	Y	Y	Y	Y
Observations	229,602	229,602	205,832	172,009	172,009	172,009
R-squared	0.960	0.960	0.964	0.965	0.965	0.965

Table 2: Reverse causality (IV regressions)

	(1)	(2)	(3)	(4)
Second stage Dependent Variable		Log Holdings		
Risk premia *(lag)*	-0.013***	-0.012***	-0.045***	-0.046***
	(0.00)	(0.00)	(0.00)	(0.00)
Risk-free rate *(lag)*	0.025***	0.030***	0.019***	0.018***
	(0.00)	(0.00)	(0.00)	(0.01)
First stage				
Instrument for risk-free rate				
US risk-free interest rate *(lag)*		0.692***		0.705***
		(0.00)		(0.00)
Instrument for risk premia				
Issuer country inflation rate *(lag 2)*			0.232***	0.220***
			(0.00)	(0.00)
Security – holder country FE	Y	Y	Y	Y
Year FE	Y	Y	Y	Y
Other controls	Y	Y	Y	Y
Observations	172,009	169,513	169,374	169,374
R-squared	0.965	0.963	0.963	0.963

Table 3: Domestic vs. non-domestic holdings

Sample	(1) Full	(2) Non-domestic exposures	(3) Domestic exposures	(4) Domestic exp., core countries	(5) Domestic exp., periphery c.
Dependent variable			Log holdings		
Risk premia *(lag)*	-0.013***	-0.013***	0.0014	0.0022	0.0047
	(0.00)	(0.00)	(0.68)	(0.58)	(0.37)
Risk-free rate *(lag)*	0.025***	0.024***	0.026***	-0.0078	0.068***
	(0.00)	(0.00)	(0.01)	(0.39)	(0.00)
Log Holdings *(lag)*	0.69***	0.69***	0.70***	0.70***	0.66***
	(0.00)	(0.00)	(0.00)	(0.00)	(0.00)
Log Residual maturity	0.090***	0.091***	0.092***	0.055***	0.16***
	(0.00)	(0.00)	(0.00)	(0.00)	(0.00)
ECAI downgrade *(lag)*	-0.090***	-0.090***	-0.090***	-0.018	-0.10***
	(0.00)	(0.00)	(0.00)	(0.52)	(0.00)
Debt/GDP *(lag)*	-0.0020***	-0.0030***	0.0083***	0.0011	0.0090***
	(0.00)	(0.00)	(0.00)	(0.54)	(0.00)
Log PSPP volume *(lag)*	-0.0026***	-0.0030***	-0.0052***	-0.0037**	-0.0041**
	(0.00)	(0.00)	(0.00)	(0.04)	(0.03)
Log VSTOXX *(lag)*	-0.016	-0.027*	0.10***	0.067*	0.12***
	(0.22)	(0.07)	(0.00)	(0.05)	(0.00)
Security – holder c. FE	Y	Y	Y	Y	Y
Year FE	Y	Y	Y	Y	Y
Observations	172,009	153,673	18,336	11,030	7,306
R-squared	0.965	0.955	0.989	0.992	0.975

Table 4: The effect of transitionals under Solvency II

Sample	(1) Full	(2) Countries with large transitionals	(3) Countries with less/no transitionals	(4) Full
Dependent variable			Log holdings	
Risk premia *(lag)*	-0.013***	-0.012***	-0.014***	-0.015***
	(0.00)	(0.00)	(0.00)	(0.00)
Risk-free rate *(lag)*	0.024***	0.014	0.027***	0.024***
	(0.00)	(0.12)	(0.00)	(0.00)
Log Holdings *(lag)*	0.69***	0.68***	0.69***	0.69***
	(0.00)	(0.00)	(0.00)	(0.00)
Log Residual maturity	0.091***	0.074***	0.099***	0.091***
	(0.00)	(0.00)	(0.00)	(0.00)
ECAI downgrade *(lag)*	-0.090***	-0.053***	-0.11***	-0.091***
	(0.00)	(0.00)	(0.00)	(0.00)
Debt/GDP *(lag)*	-0.0030***	-0.000080	-0.0041***	-0.0030***
	(0.00)	(0.92)	(0.00)	(0.00)
Log PSPP volume *(lag)*	-0.0030***	-0.0012	-0.0029***	-0.0030***
	(0.00)	(0.53)	(0.00)	(0.00)
Log VSTOXX *(lag)*	-0.027*	0.0084	-0.041**	-0.027*
	(0.07)	(0.78)	(0.01)	(0.07)
Risk-premia *(lag)* * Transitional dummy				0.0069**
				(0.04)
Security-holder c. FE	Y	Y	Y	Y
Year FE	Y	Y	Y	Y
Observations	153,673	38,745	114,928	153,673
R-squared	0.955	0.945	0.958	0.955

Robustness checks

- **Different proxies for the risk-free rate**

  → Overnight index swap (OIS) rate, 10-year German government bond yield curves

- **Different empirical specifications**

  →FE: security, issuer country, quarter

  →alternative dependent variables: difference in log holdings, buy/sell indicator (-1,0,1)

- **Different samples**

  → pre- and post-OMT announcement

  → exclusion of issuer countries with “fundamental” risk (i.e. programme countries)

  → exclusion of the period, when PSPP was in place

  → exclusion of the period, when SHS data were only “experimental”

  → pre- and post-SHS requirement of direct reporting by insurance corporations (as of 2016 Q1)

  → only securities outstanding over the whole period

- Alternative type of asset: **corporate bonds** (instead of sovereign bonds)

Conclusions

Is the investment behaviour of ICPF pro- or counter-cyclical?

→ ICPFs act **counter-cyclically** if the price changes due to a change in risk-free rate,

i.e. buying (selling) bonds if the risk-free rate increases (decreases) …*Prediction 1* ✓

→ ICPFs act **pro-cyclically** if the price changes due to a change in **risk premia,**

i.e. selling (buying) bonds whose quality deteriorates (improves)….*Prediction 2* ✓

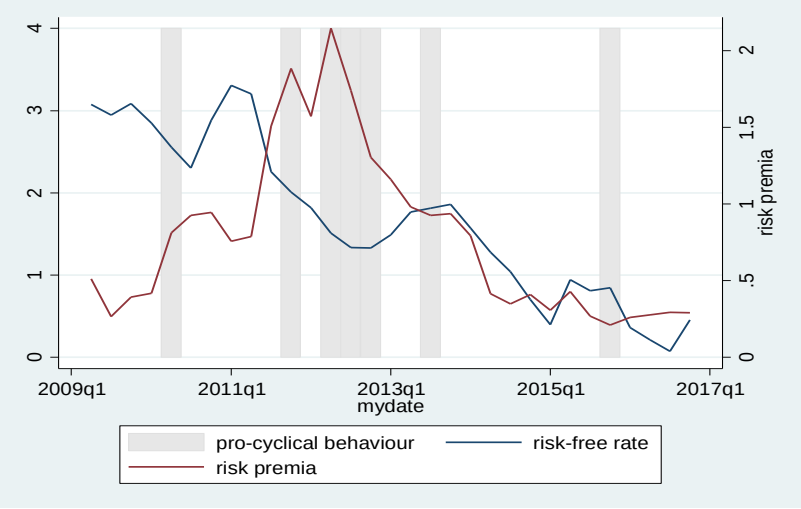
Practical implications:

→ Overall effect depends on the relative size of the two factors

→ counter-cyclical behaviour during calm periods

→ pro-cyclical behaviour in crisis periods, when risk-premia volatility is high

ICPF pro-/counter-cyclicality over time (using average risk-free rate and risk premia as examples)



What are the implications for financial stability?

→ To the extent that ICPFs act pro-cyclically they can amplify asset price volatility and decrease the resilience of the financial system in periods of market distress

→ Importance of considering/developing **macro-prudential measures beyond banking**

→ Need to closely monitor ICPFs' vulnerability to credit risk and **recent "search for yield"**

THANK YOU FOR YOUR ATTENTION

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