

Unconventional Monetary Policy, Bank Lending, and Security Holdings: The Yield-Induced Portfolio Rebalancing Channel

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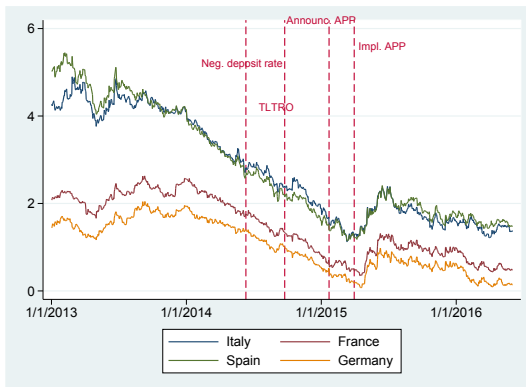
Deutsche Bundesbank

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Motivation

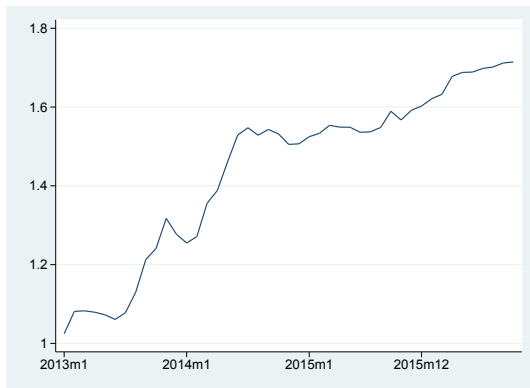
Figure 1: 10-Year Government Bond Yields



Expectation, announcement and implementation of unconventional monetary policy drives bond yields

Motivation

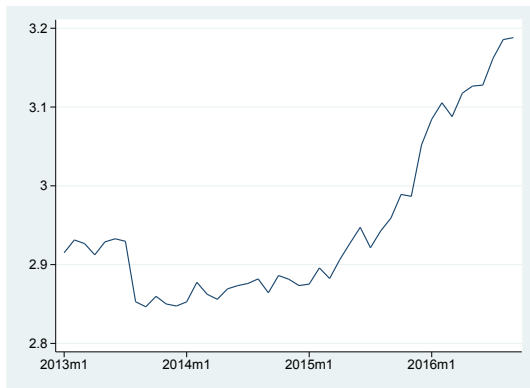
Figure 2: Spread: Loan Rates vs. Yields on Securities Held



Interest rate spread increases over time

Motivation

Figure 3: Ratio: Loans to Non-Financial Sector over Outstanding Stock of Securities



Outstanding credit volume increases in relation to securities held

This Paper

- Research question:
 - ▶ Do banks have a yield-induced rebalancing motive towards more credit provision?
- Identification strategy: (Diff in diff)
 - ▶ Exploit cross-sectional heterogeneity in impact of monetary policy on yields of banks' security holdings (Albertazzi, Becker, Boucinha, 2016)
 - ▶ Exploit banks *ex-ante* maturity structure (e.g. Almeida, Campello, Laranjeira, Weisbenner, 2012; Tischer 2018)
- Data:
 - ▶ Security holdings statistics, bank-level balance sheet data, interest rate statistics, bank-specific TLTRO uptakes of German banks
- Main findings:
 - ▶ Banks with a larger yield decline of their securities portfolio...
 - ...decrease **security holdings**...
 - ...especially those with highest drop in yield, and...
 - ...increase **loan provision**...
 - ...especially if holding many **maturing securities**.

Hypotheses and Identification

- **Hypothesis 1** (Credit): Given the change in the relative price between credit and securities, banks with a higher average yield decline of their securities portfolio increase their credit provision more strongly, and...
- **Hypothesis 2** (Securities): ...reduce their overall securities holdings more intensely, especially the securities with high gains (thus, realizing gains).

Hypothesis 1 and Hypothesis 2 → **Yield-Induced Portfolio Rebalancing**

Hypotheses and Identification

Exploit:

- Cross-sectional heterogeneity in (unconventional monetary policy-induced) yield decline between 2014m1 and 2015m6 of securities held by banks in 2014m1 (Albertazzi, Becker, Boucinha, 2016)
- *Ex-ante* variation in securities maturity structure: Assets held in 2014m1 maturing between 2014m1 and 2015m6 (e.g. Almeida, Campello, Laranjeira, Weisbenner, 2012; Tischer, 2018)
- Granularity of securities register (*security-month-bank level*): to account for unobserved time-varying heterogeneity across securities and banks (e.g. Abbassi, Iyer, Peydró, Tous, 2016)

Table 1: Securities held in 2014m1

Still held in 2015m6	Maturing before 2015m6	Sold
62.0%	22.5%	15.5%

Contribution to Literature

Effectiveness of QE

- ① **Asset prices:** Altavilla, Carboni, Motto (2015), Krishnamurthy and Vissing-Jorgensen (2013), Krishnamurthy, Nagel, Vissing-Jorgensen (2014), Joyce and Tong (2012)
- ② **Bank- or investor-level:**
 - ▶ "Reserve-induced channel": Kandrak and Schlusche (2016), Christensen and Krogstrup (2016)
 - ▶ "Liquidity channel": Butt et al. (2014), Rodnyansky and Darmouni (2017)
 - ▶ "Equity channel": Rodnyansky and Darmouni (2017), Koetter, Podlich, Wedow (2017)
 - ▶ "Search-for yield": Albertazzi, Becker, Boucinha (2016); Peydró, Polo, Sette (2017)
- ③ **Time-series evidence:** Weale and Wieladek (2016), Gambacorta, Hofmann, Peersman (2014), Lewis and Roth (2017)

Security holdings statistics and CSDB

- Nominal security holdings of German banks (own holdings) on ISIN-level
- Security specific information (yield, price, issuer sector, maturity)

Interest rate statistics

- Credit volume (newly issued loans/outstanding stock)

Balance sheet and P&L data

- Controls: log(assets), equity-ratio, reserve-ratio, deposit-ratio, interbank-ratio, net interest margin, return on assets

Monetary policy refinancing operations:

- Bank-specific TLTRO-uptakes (% of total assets)

-
- Sample of 204 banks, approx. 70% of outstanding credit in Germany
 - Time period: Monthly 2013m1 until 2015m12

MP shock:

- Banks' own fixed income security holdings 2014m1
- Yield-drop of each security between 2014m1 and 2015m6
- Exclude maturing securities (pull-to-par effect)
- Weighted by nominal amount held

Table 2: Summary Statistics (excerpt)

	Mean	p25	p50	p75
MP shock	0.627	0.468	0.615	0.791
Total securities / Assets	0.186	0.098	0.171	0.238
Maturing securities / Assets	0.038	0.015	0.028	0.047

Estimated Equations - Credit Analysis

Collapsed credit regression (Model 1):

$$\Delta \text{Log}(\text{loans})_i = \beta_0 + \beta_1 \text{MP shock}_i + X_i' \beta_2 + \text{Banktype FE} + u_i \quad (1)$$

Panel credit regression (Model 2):

$$\text{Log}(\text{loans})_{i,t} = \gamma_i + \gamma_t + \alpha_1 (\text{MP shock}_i * \text{POST}_t) + X_{i,t}' \alpha_2 + u_{i,t}, \quad (2)$$

- $\Delta \text{Log}(\text{loans})_i$: growth of newly issued loans/credit stock of bank i : (after-before shock) 2013 until 2015
- $\text{POST}_t = 1$: after 2015m1
- $X_{i,t}$: log(assets), equity-ratio, reserve-ratio, deposit-ratio, interbank-ratio, net interest margin, return on assets, **TLTRO-ratio**
- *Banktype FE*: e.g. saving banks, cooperative banks, big commercial banks
- γ_i, γ_t : bank and time fixed effects
- Standard errors clustered at bank and time level (model 2)

$$H_0 : \beta_1 > 0, \alpha_1 > 0$$

Estimated Equations - Security Analysis

Security-level regression:

$$\begin{aligned} \text{Log}(\text{security holdings})_{j,i,t} = & \beta_1 (\text{MP shock}_i * \text{POST}_t * \text{High-yield-decline}_j) \\ & + \beta_2 (\text{MP shock}_i * \text{POST}_t) \\ & + \beta_3 (\text{POST}_t * \text{High-yield-decline}_j) \\ & + \beta_4 (\text{MP shock}_i * \text{High-yield-decline}_j) \\ & + X'_{i,t} \beta_5 + \gamma_j + \gamma_i + \gamma_t + \gamma_{j,t} + \gamma_{i,t} + u_{j,i,t}, \end{aligned} \quad (3)$$

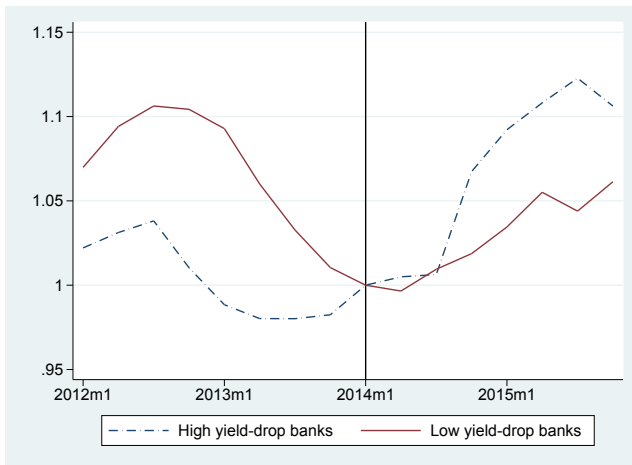
- $\text{Log}(\text{security holdings})_{j,i,t}$: Nominal holdings of security j of bank i at time t
- $\text{POST}_t = 1$: after 2015m1
- $X_{i,t}$: see above
- $\text{High-yield-decline}_j = 1$: above 90th percentile of drop in yield
- $\gamma_{j,t}, \gamma_{i,t}$: Security-time fixed effects, Bank-time fixed effects
- Standard errors clustered at security, bank, and time level

$$H_0 : \beta_1 < 0, \beta_2 < 0$$

Results: Credit Analysis

Descriptive Evidence

Evolution of Newly Issued Credit



Exogeneity of MP Shock

Propensity Score Weighting

	Probit: MP Dummy (50th-percentile)	
	(1)	(2)
	Pre-matching	Post-matching
log(Assets)	0.101 (0.105)	0.122 (0.112)
Equity-Ratio	-3.490 (4.073)	6.373 (4.871)
Reserve-Ratio	-4.157 (5.918)	-1.015 (5.796)
Deposit-Ratio	0.030 (0.699)	0.952 (0.839)
Interbank-Ratio	-0.969 (0.671)	-0.655 (0.809)
ROA	15.936 (14.594)	24.198 (18.420)
Net Interest Margin	-12.985 (13.605)	-19.483 (25.226)
Observations	204	204
p-value	0.129	0.726

Results

Baseline Regressions

	Model 1: $\Delta \text{Log} (\text{loans})$		Model 2: $\text{Log} (\text{loans})$	
	(1)	(2)	(3)	(4)
MP shock	0.216*** (0.057)	0.177*** (0.043)		
MP shock * Post			0.116*** (0.042)	0.130*** (0.040)
Matching	pre-	post-	pre-	post-
Controls	YES	YES	YES	YES
Bank-type FE	YES	YES	-	-
Bank FE	-	-	YES	YES
Month FE	-	-	YES	YES
Two-way clustered S.E.	-	-	YES	YES
Observations	204	204	7,173	7,173
R-squared	0.180	0.184	0.930	0.930

Results

Reinvestment Decisions

	Model 1: $\Delta \text{Log} (\text{loans})$		Model 2: $\text{Log} (\text{loans})$	
	(1)	(2)	(3)	(4)
MP shock	0.216*** (0.057)	0.110* (0.064)		
MP shock * Maturing		4.308** (1.902)		
MP shock * Post			0.116*** (0.042)	0.084** (0.038)
MP shock * Post * Maturing				1.404* (0.737)
Controls	YES	YES	YES	YES
Bank-type FE	YES	YES	-	-
Bank FEs	-	-	YES	YES
Month FEs	-	-	YES	YES
Two-way clustered S.E.	-	-	YES	YES
Observations	204	204	7,173	7,173
R-squared	0.180	0.202	0.930	0.930

Results

Contaminating Events: TLTROs

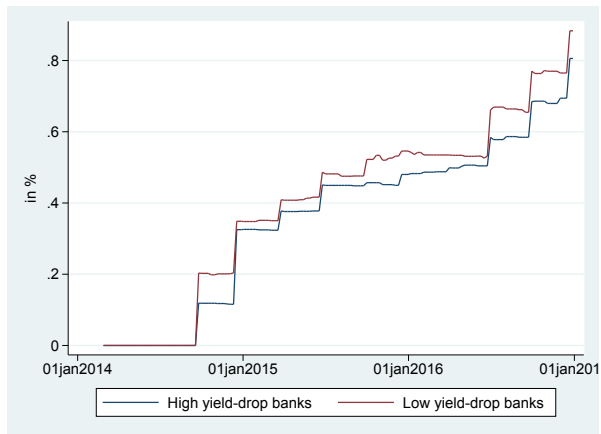


Figure 4: TLTRO-uptake (in % of assets)

Results

Contaminating Events: TLTROs

	Model 2: <i>Log (loans)</i>	
	(1)	(2)
MP shock * Post	0.115*** (0.043)	0.081* (0.040)
MP shock * Post * Maturing		1.424* (0.738)
TLTRO-Ratio	0.005 (0.017)	0.008 (0.017)
Controls	YES	YES
Bank FEs	YES	YES
Month FEs	YES	YES
Two-way clustered S.E.	YES	YES
Observations	7,173	7,173
R-squared	0.930	0.930

Results: Security Analysis

Results

Security Analysis - Unconditional Evidence

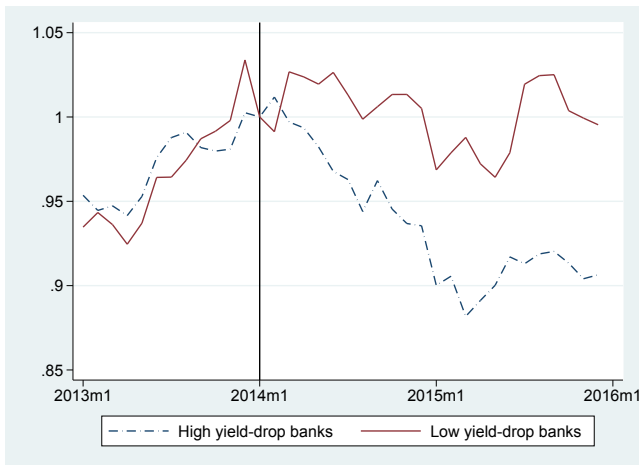


Figure 5: Evolution of Total Security Holdings

Results

Security Analysis - Unconditional Evidence

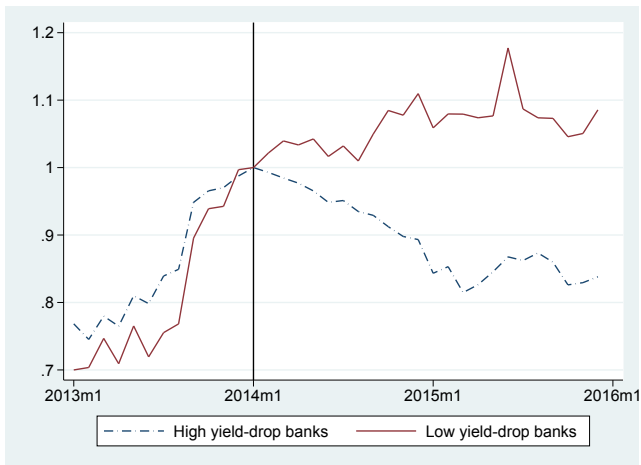


Figure 6: Evolution of Security Holdings with High Yield Decline

Results

Security Analysis - Baseline Regressions

	Dependent variable: Log(security holdings)				
	(1)	(2)	(3)	(4)	(5)
MP shock*Post	-0.133** (0.049)	-0.124** (0.048)	-0.123** (0.048)		
MP shock*High-yield-decline			0.439*** (0.152)	0.447*** (0.149)	0.460*** (0.155)
Post*High-yield-decline			0.141** (0.057)	0.162*** (0.035)	
MP shock*Post*High-yield-decline			-0.148*** (0.047)	-0.162*** (0.022)	-0.169** (0.070)
Controls	YES	YES	YES	-	-
Security FE	YES	-	YES	YES	-
Bank FE	YES	YES	YES	-	-
Time FE	YES	-	YES	-	-
Security*Time FE	NO	YES	NO	NO	YES
Bank*Time FE	NO	NO	NO	YES	YES
Observations	1,463,750	1,003,450	1,463,750	1,463,714	1,003,410
R-squared	0.754	0.519	0.754	0.756	0.524

Results

Security Analysis - Issuer Sectors

	Dependent variable: Log(security holdings)			
	(1)	(2)	(3)	(4)
	All	Corporates	Government	Other
MP shock*Post	-0.124** (0.048)	-0.315** (0.116)	-0.143* (0.084)	-0.061* (0.035)
Controls	YES	YES	YES	YES
Security FE	-	-	-	-
Bank FE	YES	YES	YES	YES
Time FE	-	-	-	-
Security*Time FE	YES	YES	YES	YES
Bank*Time FE	NO	NO	NO	NO
Observations	1,003,450	87,009	286,918	629,520
R-squared	0.519	0.564	0.471	0.533

Robustness Checks

- Falsification
- Alternative dependent variable: credit stock
- Price-based MP shock
- Dummy (MP shock $>$ p50)
- Weighted MP shock
- Winsorization
- Different level of clustering

Conclusion

- Document stylized facts: spread between loan rates and security yields increased; credit increased in relation to nominal security holdings
- Do banks have a yield-induced rebalancing motive towards credit?
 - ▶ Exploit cross-sectional heterogeneity in MP-induced yield decline, banks ex-ante maturity structure, and granularity of securities register to answer question
- Banks with a larger yield decline of their securities portfolio...
 - ...decrease **security holdings** (Hypothesis 2), especially...
 - ...securities with highest drop in yield, thus, **realizing gains**, and...
 - ...increase **loan provision** (Hypothesis 1),...
 - ...especially if holding many **maturing securities**.
- Important to keep track of financial market impact of monetary policy