The Network Origins of Financial Cycles*

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Abstract

We use proprietary European holdings data to show that common ownership is informative for how shocks transmit between securities. Holder-base overlap predicts cross-sectional variation in abnormal excess yield changes, conditional on a rich set of bond characteristics. We provide evidence consistent with a causal interpretation by exploiting a major fiscal surprise from Germany in 2025. We show that non-German sovereign bonds with greater pre-existing holder-base overlap with German Bunds experience larger abnormal excess-yield spillovers over a tight event window. Motivated by this, we construct pairwise measures of holder-base overlap and characterize the resulting network of the European sovereign bond market. We then calibrate a common-ownership network to the German event study and find that security-interconnectedness amplifies aggregate volatility from security-specific shocks by roughly 2.5 to 4 times relative to a disconnected market.

Keywords: Common ownership; sovereign bonds; financial networks; yield comovement.

JEL-Codes: G12, D85, E44, G15

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1 Introduction

Asset prices exhibit substantial co-movement across securities, markets, and countries - a phenomenon often referred to as financial cycles. Existing work shows that this effect is driven by common macroeconomic and monetary-policy shocks (Miranda-Agrippino and Rey, 2020; Boehm and Kroner, 2026). Another explanation for common movements is related to fluctuations in the net worth and risk-bearing capacity of financial intermediaries (He and Krishnamurthy, 2013; Brunnermeier and Sannikov, 2014; Coimbra and Rey, 2024). Yet common variation in asset prices need not originate exclusively from the aggregate state of the economy. Previous work has shown that financial assets held by common investors exhibit excess return co-movements (Greenwood and Thesmar, 2011; Antón and Polk, 2014). In this paper, we ask whether this mechanism can have aggregate implications: can shocks originating at the level of individual securities or issuers propagate through the network of common ownership and contribute to aggregate financial fluctuations?

The central idea parallels work on the microeconomic origins of aggregate fluctuations in the real economy. Idiosyncratic shocks may not necessarily diversify away because economic activity is concentrated among a small number of large firms (Gabaix, 2011), and their effects may be amplified or propagated through asymmetric input-output linkages (Acemoglu et al., 2012; Carvalho, 2014). We develop an analogous argument for financial markets. Securities are connected not because they transact directly with one another, because they are held by common investors (Antón and Polk, 2014; Greenwood and Thesmar, 2011). If a shock affects one security, investors exposed to that security may adjust other positions in their portfolios, transmitting price pressure to assets with no direct fundamental exposure to the initial shock.[1] Whether such initially localized shocks remain localized or acquire aggregate consequences therefore depends in part on the structure of the ownership network.

We study this mechanism using proprietary ECB Security Holdings Statistics by Sector

[1] When a security-level shock reduces investor wealth, triggers redemptions, or tightens a balance-sheet or regulatory constraint, affected investors may liquidate other portfolio positions, transmitting price pressure to securities with no direct fundamental exposure to the initial shock (see e.g. Coval and Stafford (2007); Lou (2012); Greenwood et al. (2015)).

(SHSS) for sovereign bonds issued by Germany, France, Italy, Spain, and the Netherlands. For each pair of securities, we construct a measure of *holder-base overlap*: the share of the two bonds held by investor-types that are invested in both securities. This pairwise measure provides an observable proxy for the strength of the ownership link between two bonds and allows one to test whether bonds that have a large holder-base overlap also exhibit larger co-movements in yield changes, paralleling adjacent findings for equities (Antón and Polk, 2014).

A central empirical challenge is that such holder-base overlap linkages are endogenous. Investors may hold similar securities precisely because they are exposed to similar fundamentals, so a positive correlation between common ownership and yields does not by itself identify shock transmission. We address this challenge in two steps. First, we study whether holder-base overlap predicts subsequent co-movement in changes in *abnormal excess yields*. For each sovereign bond, we measure its yield relative to the issuer-specific yield curve and residualize this spread with respect to observable bond characteristics. This allows us to remove much of the common variation associated with issuer- and maturity-specific fundamentals. Second, we exploit the unexpected German fiscal announcement of March 2025 as a quasi-experimental setting. The announcement generated an unusually large increase in German Bund yields, allowing us to ask whether non-German sovereign bonds that were more strongly connected to Bunds through their pre-existing holder bases experienced larger spillovers in abnormal excess yields over a tight event window.

We find that holder-base overlap is statistically and economically informative for subsequent abnormal excess-yield co-movement. A one-unit increase in holder-base overlap is associated with a 0.016 increase in the subsequent correlation of abnormal excess-yield changes. The relationship varies substantially across investor sectors: it is particularly pronounced for common ownership through banks and insurance companies, while retail and pension-fund connections play a more limited role. The German fiscal episode provides complementary evidence consistent with a transmission interpretation. Following the announcement, non-German sovereign bonds with greater pre-existing holder-base overlap with German Bunds experienced larger increases in abnormal excess yields. Following a one-percentage-point increase in Bund yields, the abnormal excess-yield response is approximately two basis points larger for a non-German bond with a one-unit higher holder-base overlap, all else equal. The effect is substantially stronger for common ownership through banks.

Having established that holder-base overlap is informative for bilateral shock transmission, we turn to its aggregate implications. We represent the European sovereign bond market as a weighted network in which securities are nodes and holder-base overlap determines the strength of the links between them. We embed this network in a simple linear propagation system in which security-specific shocks transmit directly to connected securities and, through higher-order network paths, to the rest of the market. This representation gives rise to a network multiplier analogous to the Leontief inverse in the production-network literature. It also makes clear that the aggregate importance of a security-specific shock depends not only on the size of the security itself, but on its direct and indirect position in the ownership network.

We discipline the strength of propagation in this network using the German fiscal episode. Specifically, we choose the propagation parameter such that the model reproduces the empirical relationship between holder-base overlap and the transmission of German yield shocks observed in the event study. We then use the calibrated network to assess how much security-specific shocks contribute to aggregate excess-yield volatility relative to a counterfactual market in which securities are disconnected. Across the network cross-sections in our sample, the resulting measure of aggregate volatility is approximately 2.5 to 4 times larger than the corresponding disconnected benchmark. Amplification of aggregate volatility is rising throughout the sample period, reaching a multiplier of 3.99 in 2026. While this calibration is intended as an illustrative quantitative exercise rather than a structural estimate of the contribution of common ownership to observed financial volatility, it suggests that ownership links can substantially weaken the diversification of security-specific shocks.

Related Literature. Our work is related to the literature on asset-price co-movement in excess of that implied by economic fundamentals. Bekaert et al. (2005) study such excess correlation in the context of international contagion, while Barberis and Shleifer (2003) and Barberis et al. (2005) emphasize that institutional features and investor demand can generate co-movement beyond fundamentals. We take a similar perspective at the level of individual sovereign bonds. By measuring yield movements relative to issuer-specific yield curves and observable bond characteristics, we isolate abnormal yield variation and ask whether it is systematically related to common ownership.

Most directly, our paper builds on Greenwood and Thesmar (2011) and Antón and Polk (2014). Greenwood and Thesmar (2011) show that correlated trading needs of mutual funds can generate fragility and co-movement, while Antón and Polk (2014) connect pairs of stocks through common mutual fund ownership and show that greater overlap predicts subsequent abnormal return correlation. We closely follow their pairwise approach, but extend it in three directions. First, we study sovereign bonds rather than equities and exploit multiple bonds per issuer to remove issuer-level yield-curve movements. Second, our holdings data cover a broad set of investor sectors, allowing us to study whether common ownership through banks, insurers, investment funds, or pension funds has different implications for co-movement. Third, we use these pairwise ownership links to construct a security-level network and study their aggregate implications.

Our mechanism is also related to work on flow-driven price pressure and overlapping portfolios. Coval and Stafford (2007) and Lou (2012) show that investor flows and forced trading can move asset prices away from fundamentals, while models of overlapping portfolios emphasize how common exposures can transmit shocks across financial institutions (Elliott et al. (2014); Caccioli et al. (2015); Greenwood et al. (2015)). Our perspective differs in the projection of the network. Rather than connecting institutions through the assets they jointly hold, we connect securities through their common investors. The resulting object allows us to ask which securities are important for shock transmission and whether a localized bond- or issuer-level shock can propagate to otherwise fundamentally unrelated securities.

This also connects our paper to the intermediary asset-pricing literature. In He and Krishnamurthy (2013), Brunnermeier and Sannikov (2014), and Coimbra and Rey (2024), fluctuations in intermediary net worth and risk-bearing capacity generate common variation in asset prices. Our evidence on heterogeneity across investor sectors is closely related to this mechanism. However, rather than starting from a common shock to intermediary balance sheets, we ask whether the ownership network can transform an initially idiosyncratic asset-level shock into broader financial co-movement.

Finally, our paper relates to the literature on the microeconomic origins of aggregate fluctuations. Gabaix (2011) shows that idiosyncratic shocks need not diversify away when economic activity is sufficiently concentrated, while Acemoglu et al. (2012) show that asymmetric network linkages can propagate microeconomic shocks into aggregate fluctuations. We apply this logic to financial markets. Securities are connected through the portfolios of common investors, so the aggregate importance of a security-level shock may depend not only on the security's size but also on its position in the ownership network. In this sense, our paper provides a financial-market counterpart to the network origins of aggregate fluctuations: common movements in asset prices may reflect not only common macroeconomic or monetary shocks, but also the propagation and aggregation of initially localized shocks through the structure of financial ownership.

Outline. The paper proceeds as follows. Section 2 describes the data, our measures of holder-base overlap and abnormal excess yields, and the empirical methodology. Section 3 documents that greater holder-base overlap predicts stronger subsequent co-movement in abnormal excess yield changes and studies how this relationship varies across investor sectors. Section 4 uses the unexpected announcement of Germany's €500 billion fiscal package in March 2025 to examine whether pre-existing ownership links predict the transmission of an identifiable issuer-level shock. Section 5 turns to the aggregate implications of these pairwise connections. It represents the European sovereign bond market as a network of common ownership, illustrates how network structure can determine whether idiosyncratic shocks remain localized or propagate more broadly, and characterizes the determinants of connectedness across securities.

2 Data and Methodology

Throughout this section, we closely follow Antón and Polk (2014) in estimating the relationship between a measure of holder-base overlap and the correlation between excess yield changes across security pairs.

2.1 Data and Sample

Daily data on bond yields as of 17:00 CET each trading day is derived from MTS daily. We restrict our analysis to sovereign bonds issued by the central government in the five biggest European economies: Germany, France, Italy, Spain, and the Netherlands. We further only consider bonds with fixed coupon payment schedules and no call option. We restrict our study to this subset of bonds from major economies as the large number of fixed-coupon and non-callable bonds per each issuer allows us to derive excess yields relative to the issuer specific yield curves. Limiting the sample in this way also keeps it relatively homogeneous and ensures that the patterns that we find are not driven by illiquid securities of small issue amount.

Data on security holdings comes from the proprietary ECB Security Holdings Statistics by Sector (SHSS) database at the quarterly level. Quarterly values describe holdings at the end of that quarter. A detailed summary of the database is given by Rousovãi and Caloca (2015). For every security, we observe the nominal quantities held by investors at the sector-by-country level. We observe 19 distinct holder-sectors from 24 distinct holder-countries in our sample which would give a potential of 456 unique holder entities. Throughout our sample we observe a varying number of active holder entities with positive net holdings, which mostly hovers around the low two-hundreds (Table 1, Panel A). One advantage of the SHSS database is that it provides a comprehensive breakdown of security holdings, while previous work such as Antón and Polk (2014) has chiefly focused on singular holder sectors such as mutual funds only. The SHSS database allows for a broader study of the role of holder-base overlap for excess yield co-movements, as well as a heterogeneity analysis for whether the role of holder-base overlap varies with the holder sector that it arises from. Lastly, we also derive data on observable bond characteristics by merging the SHSS and the ECB Securities Database (CSDB). Our sample covers a ten year period from 2016 until 2026.

2.2 Measuring holder-base overlap

For the universe of securities $\mathcal{S}$ in our sample, we calculate the pair-wise overlap of the holder-base at the end of each quarter. We follow Antón and Polk (2014) in measuring holder-base overlap between two securities $i, j \in \mathcal{S}$ as the total value of the bonds' nominal values held by their $\mathcal{H}_{i,j,t}$ common holders, scaled by the combined nominal values of both bonds:

$$FCAP_{i,j,t} = \frac{\sum_{h \in \mathcal{H}_{i,j,t}} \left(S^h_{i,t} + S^h_{j,t} \right)}{S_{i,t} + S_{j,t}}. \tag{1}$$

Here, $S^h_{i,t}$ is the nominal value of bond i held by holder h at quarter t, and $S_{i,t}$ is the total nominal value of bond i at quarter t. Common holders $\mathcal{H}_{i,j,t}$ are those holders that have a positive nominal holding in both bond i and bond j at the end of quarter t.

We further define a holder-sector specific measure of holder-base overlap. We measure the sector-specific holder-base overlap between two securities $i, j \in \mathcal{S}$ as the total value of bonds' nominal values held by their $\mathcal{H}^s_{i,j,t}$ common holders from holder sector s, scaled by their combined values of both bonds:

$$FCAP^s_{i,j,t} = \frac{\sum_{h \in \mathcal{H}^s_{i,j,t}} \left(S^h_{i,t} + S^h_{j,t} \right)}{S_{i,t} + S_{j,t}}, \tag{2}$$

where common holders $\mathcal{H}^s_{i,j,t}$ are those holders from holder sector s that have a positive nominal holding in both bond i and bond j at the end of qarter t. For both $FCAP_{i,j,t}$ and $FCAP^s_{i,j,t}$, we also follow Antón and Polk (2014) in computing normalized, rank-transformed measures of holder-base overlap, which we denote by $FCAP^{*}_{i,j,t}$ and $FCAP^{s,*}_{i,j,t}$. These rank transformed measures preserve the ordering of the original pairwise holder-base overlap measure each quarter, but are standardized to exhibit a zero mean and unit standard variance.[2]

Our empirical identification relies predominantly on cross-sectional differences in holder-base overlap. One advantage of rank transforming $FCAP$ and $FCAP^{s}$, is that it makes them more comparable across cross sections. This normalization limits the extent to which observations from periods where a certain sector may be substantially larger receive disproportionate weight in the analysis. At the same time, changes over time in the size and composition of different holder sectors may provide an additional source of variation for estimating the relationship between holder-base overlap and excess co-movement. This is why we study dynamics over time, and present results for both $FCAP$ as well as rank transformed measures thereof.

2.3 Modeling Cross-Sectional Variation in Co-movement

We estimate cross-sectional regressions forecasting the within-month realized correlation ($\rho_{i,j,t+1}$) of each security-pair's daily change in abnormal excess yields with $FCAP_{i,j,t}$ or $FCAP^{s}_{i,j,t}$ and pairwise controls for other observable bond characteristics $\mathbf{X}_{i,j,t}$:

$$\rho_{i,j,t+1} = \alpha + \beta_f * \widetilde{FCAP}_{i,j,t} \ + \ \mathbf{X}'_{i,j,t}\gamma + \varepsilon_{i,j,t}. \tag{3}$$

Here $\rho_{i,j,t+1}$ is the realized correlation of the daily changes in abnormal excess yields ($\Delta\hat{u}$) for securities i and j over the month following quarter t. $\widetilde{FCAP}_{i,j,t}$ can stand for the sector specific holder-base overlap ($FCAP^{s}_{i,j,t}$), the overall holder-base overlap ($FCAP_{i,j,t}$), as well as the normalized rank-transformed form of both. We calculate the Newey and West (1987) standard errors to take into account autocorrelation in the time series of estimates out to four lags.

[2] Rank transforming $FCAP^{s,*}_{i,j,t}$ preserves the ordering of holder-base overlap within each quarter and within each holder sector. It also makes holder-base overlap measures from sector of different sizes more comparable.

2.4 Controls

The central empirical challenge in such an exercise is that holder-base overlap is endogenous. Investors may choose to hold securities with similar fundamental exposures precisely because these securities are expected to move together. A positive relationship between common ownership and raw yield correlation would therefore not by itself imply that the investor network generates additional co-movement.

In a first step, we partly address this concern by studying correlation of the change in abnormal excess yields instead of just the yields. To do so, for each sovereign bond, we first calculate the yield spread ($YS_{i,t}$) of that bond relative to its issuer's country yield curve:

$$YS_{i,t} = y_{i,t}^{c} - y_{t}^{c}(\tau_{i,t}) \tag{4}$$

where $y_{i,t}^{c}$ is the yield of sovereign bond i issued by country c at day t, while $y_{t}^{c}(\tau_{i,t})$ is the yield curve of country c at date t for the maturity $\tau_{i,t}$ that matches the maturity of bond i on that day. To do so, we estimate issuer specific yield curves, by fitting a spline through all fixed-coupon and non-callable sovereign bonds outstanding at different maturities. We do so for all five sovereign issuers in our sample and re-estimate yield curves from the daily cross section of outstanding bonds. Such excess yields can for example arise due to liquidity shocks in individual ISINs that make bonds temporarily trade at a discount or premium.

We use these yield spreads to estimate abnormal yield spreads that can't be explained by any time-invariant observable characteristics of the bond. Namely, we estimate

$$YS_{i,t} = \alpha_t + X_{i,t}'\gamma + u_{i,t}, \tag{5}$$

where $X_{i,t}$ contains observable bond characteristics. The residual $\hat{u}_{i,t}$ captures the abnormal yield spread of bond i on day t. For every month following an end of quarter observation in the holder-base overlap, we can now compute the subsequent within-month realized correlation ($\rho_{i,j,t+1}$) of each security-pair's daily change in abnormal excess yields $\hat{u}_{i,t}$.

3 Results

Table 1 reports summary statistics for the holding structure of the securities in our sample between 2016 and 2026. Panel A summarizes the average number of securities, security pairs, and active country-sector holders at the start of each year. Here, if n is the number of securities in a given year, mechanically, the number of security pairs corresponds to $(n(n-1)/2)$. The number of securities and security pairs is fairly stable over our sample period, but weakly increases as time goes on. Similarly, the number of active country-sector holders remains relatively stable over time with the exception of an episode in 2017 and 2018 where it temporarily drops.[3]

Table 1, Panel B summarizes the holder-security structure in our sample. It outlines the distribution of the number of securities held by holder-segment, as well as the distribution of holder-segments invested in the average security. The median holder-segment is invested in 47.3 securities. Conversely the median security in our sample is in part owned by an average of 58.1 holder-segments. As shown in the table, both of these metrics increase from the earlier (2016 to 2020) to the later (2021 to 2026) part of our sample. Median securities per holder go up from 42.6 to 51.7, while median holder-segments per security go up from 48.8 to 66.5. These trends are in line with the trend growth in securities and active holder-segments in our sample over time.

Lastly, table 1, Panel C summarizes the holder-base overlap ($FCAP$) as well as the sector specific holder-base overlaps ($FCAP^s$) in the earlier and later part of our sample. We summarize sector specific holder-base overlap for the quantitatively most relevant sectors that account for most of the $FCAP$ decomposition. These are banks, insurance firms, investment funds, and pension funds. Figures reflect the distribution of the average security-security holder-base overlap over the respective period. Panel C. confirms that the increase in securities per holder and holders per security is not only driven by a rise in overall holder-segments and securities, but also by an increase in holder-base overlap for the average security-pair.

[3] Results are robust to dropping observations prior to 2019 as reported in table 2, Panel C.

TABLE 1: DESCRIPTIVE STATISTICS

Panel A: Number of equities, equity-pairs, and holder types			
Year	Securities	Pairs	Holders
2016	328	53,628	219
2017	302	45,451	79
2018	295	43,365	78
2019	297	43,956	216
2020	319	50,721	215
2021	330	54,285	217
2022	341	57,970	207
2023	338	56,953	222
2024	333	55,278	236
2025	328	53,628	244
2026	334	55,611	247

Panel B: Holder-Security Mapping						
Variable	Period	Mean	Median	SD	Min	Max
# securities per holder	2016 - 2020	77.7	42.6	84.4	1	281
	2021 - 2026	91.4	51.7	98.4	1	319
	2016 - 2026	84.9	47.3	91.7	1	301
# holders per security	2016 - 2020	41.8	48.8	21.1	1	80
	2021 - 2026	62.0	66.5	23.8	1	112
	2016 - 2026	52.4	58.1	22.5	1	97

Panel C: Distribution of Holder-Base Overlap								
			Percentiles					
Period	Mean	SD	0%	25%	50%	75%	99%	100%
Holder-Base Overlap ($FCAP_{i,j,t}$)								
2016 - 2020	0.582	0.342	0.000	0.260	0.691	0.891	0.992	1.000
2021 - 2026	0.653	0.290	0.000	0.496	0.748	0.885	0.983	1.000
Bank Holder-Base Overlap ($FCAP^{Bank}_{i,j,t}$)								
2016 - 2020	0.148	0.165	0.000	0.006	0.085	0.247	0.609	1.000
2021 - 2026	0.164	0.157	0.000	0.029	0.119	0.261	0.605	1.000
Insurance Company Holder-Base Overlap ($FCAP^{IC}_{i,j,t}$)								
2016 - 2020	0.189	0.181	0.000	0.024	0.140	0.311	0.680	1.000
2021 - 2026	0.190	0.167	0.000	0.056	0.140	0.299	0.656	0.999
Investment Fund Holder-Base Overlap ($FCAP^{IF}_{i,j,t}$)								
2016 - 2020	0.123	0.102	0.000	0.038	0.111	0.185	0.422	0.989
2021 - 2026	0.161	0.091	0.000	0.103	0.159	0.218	0.393	0.986
Pension Fund Holder-Base Overlap ($FCAP^{PF}_{i,j,t}$)								
2016 - 2020	0.061	0.100	0.000	0.001	0.021	0.067	0.477	1.000
2021 - 2026	0.054	0.087	0.000	0.008	0.020	0.056	0.428	1.000

Note: The table reports summary statistics for the holding structure of all fixed-coupon non-callable sovereign bonds issued by the central governments of the five largest European economies: Germany, France, Italy, Spain, and the Netherlands between 2016 and 2026. In panel A, annual values correspond to the start of each year.

Between the earlier part of the sample (2016 to 2020) and the later part of the sample (2021 to 2026), the average holder-base-overlap between two securities increases from 0.582 to 0.653. The same trend holds for holder-base overlap stemming from banks, insurance companies, and investment funds. Security pairs see a minor reduction in their holder-base overlap stemming from pension funds which decreases from 0.061 to 0.054 between the earlier and later half of our sample.

Results on Realized Correlation. Table 2 reports the results from equation (3) for different measures of holder-base overlap, as well as different subperiods of our sample. Panel A reports findings for overall holder-base overlap in the first column (ALL) as well as for holder-sector specific holder-base overlaps in columns two through six. Estimates of $\widehat{FCAP}$ indicate the association between a higher holder-base overlap with the correlation of abnormal excess yield changes in the following month. We find that $FCAP$ is highly statistically significant in predicting future correlations in abnormal excess yield changes of our security pairings. The effect is economically significant as well. A one unit increase in $FCAP$ is associated with a 0.016 increase in the correlation.

We repeat the same exercise for a number of holder-sector specific measures of $FCAP^s$. We do so for holder base overlap from banks, insurance companies, investment funds, retail investors, and pension funds respectively. We find heterogeneity for how holder-base overlap shapes future excess return correlations. On one hand, holder-base overlap stemming from bank holdings, insurance holdings, and investment fund holdings amplify future correlation in abnormal excess yield changes with statistically significant coefficients of 0.016, 0.017, and 0.009. On the other hand, holder-base overlap in retail investors has no significant effect on the correlation and holder-base overlap stemming from pension funds even dampens the excess correlation indicated by a statistically significantly negative coefficient of -0.017.

Table 2, Panel B now reports findings for rank-normalized holder-base overlap. The size of the coefficient changes, as the distribution of $FCAP$ is scaled up, but the core intuition from Panel A remains intact. On aggregate, holder-base overlap remains significant. More gran-

TABLE 2: REGRESSION RESULTS

Panel A: Full Sample (2016 to 2026) Holder-Base Overlap						
	Dependent Variable: Correlation in Abnormal Excess Yield Changes					
	ALL	Bank	Insurance	Investment	Retail	Pension
Constant	-0.010***	-0.000	0.000	0.000	0.002***	0.004***
	(0.001)	(0.001)	(0.001)	(0.001)	(0.001)	(0.001)
$\widetilde{FCAP}$	0.016***	0.017***	0.009***	0.013**	0.002	-0.017***
	(0.002)	(0.003)	(0.002)	(0.005)	(0.005)	(0.004)
Observations	1,525,166	1,525,166	1,525,166	1,525,166	1,525,166	1,525,166
Pair controls	YES	YES	YES	YES	YES	YES
R^2	6.51e-5	4.77e-5	1.9e-5	9.75e-6	7.03e-8	2.54e-5
Panel B: Full Sample (2016 to 2026) Rank-Normalized Holder-Base Overlap						
	Dependent Variable: Correlation in Abnormal Excess Yield Changes					
	ALL	Bank	Insurance	Investment	Retail	Pension
Constant	0.0006*	0.0022***	0.0009***	0.0026***	0.0022***	0.0022***
	(0.0003)	(0.0004)	(0.0005)	(0.0004)	(0.0004)	(0.0004)
$\widetilde{FCAP}^*$	0.004***	0.003***	0.003***	-0.001	0.000	0.000
	(0.0005)	(0.0004)	(0.0005)	(0.0005)	(0.0005)	(0.0005)
Observations	1,525,166	1,525,166	1,525,166	1,525,166	1,525,166	1,525,166
Pair controls	YES	YES	YES	YES	YES	YES
R^2	6.23e-5	4.38e-5	5.14e-5	1.37e-6	8.07e-7	3.24e-7
Panel C: Subsample Analysis of Holder-Base Overlap						
	Dependent Variable: Correlation in Abnormal Excess Yield Changes					
	ALL	Bank	Insurance	Investment	Retail	Pension
	First Subsample (2016 to 2020)					
Constant	-0.013***	-0.001	-0.001	-0.002	0.002***	0.004***
	(0.0016)	(0.0007)	(0.001)	(0.001)	(0.0006)	(0.0006)
$\widetilde{FCAP}$	0.019***	0.016***	0.012***	0.023***	0.007	-0.024***
	(0.0023)	(0.0032)	(0.0029)	(0.0066)	(0.0066)	(0.0061)
	Second Subsample (2021 to 2026)					
Constant	-0.006**	-0.000	0.001	0.004**	0.003***	0.003***
	(0.0023)	(0.0008)	(0.0011)	(0.0015)	(0.0007)	(0.0007)
$\widetilde{FCAP}$	0.011***	0.028***	0.006	-0.008	-0.009	-0.006
	(0.0033)	(0.0066)	(0.0035)	(0.0078)	(0.0097)	(0.0061)

Note: This table reports estimates for equation 3. It relates the correlation in security pair's abnormal excess yield changes over the following month with the end of quarter holder-base overlap. The independent variable takes the form of various measures for holder-base overlap measures. The first column reflects overall holder-base overlap. Columns two through six represent sector specific overlap measures for banks, insurance companies, investment funds, retail investors, and pension funds. We report Newey and West (1987) standard errors for of up to four lags. Statistical significance is indicated by *, **, and *** at the 10%, 5%, and 1% level.

ularly, holder-base overlap from common bank holdings, and insurance company holdings leads to greater co-movements of abnormal excess yield changes between two bonds. In the rank-transformed specification, common holdings via investment funds, retail investors, and pension funds are all insignificantly associated with abnormal excess co-movement correlation.

Finally, in table 2, panel C, we show how effects vary over our sample period. We split the sample period into an earlier half (2016 to 2020) as well as a later half (2021 to 2026). Results are reported for non-rank-transformed values of $FCAP$. The link between $FCAP$ and future excess yield change correlation is in place in both sub-samples on aggregate, however the link appears to weaken between the first and second halve of the sample. The aggregate coefficient reported in column one (ALL) declines from 0.019 in the first halve to 0.011 in the second halve. When studying the holder-sector specific overlap measures, the aggregate decline appears to be driven by a weaker link between insurance corporations'- and investment funds' $FCAP$ measures and excess yield change correlation. While the coefficient for banks rises from 0.016 to 0.028, the coefficient for insurance firms drop from 0.012 to 0.006, while the coefficient for investment firms drops from 0.023 to -0.008.

To summarize, the conclusion from table 2 is that holder-base overlap forecasts statistically and economically significant variation in the comovements of abnormal excess bond yield changes. This findings is particularly strong for holder-base overlap arising from bank holdings, and insurance company holdings, with retail and pension fund holdings having a less pronounced effect that can even flip to a dampening effect for the case of pension funds.

4 Germany's 500 billion fiscal shock

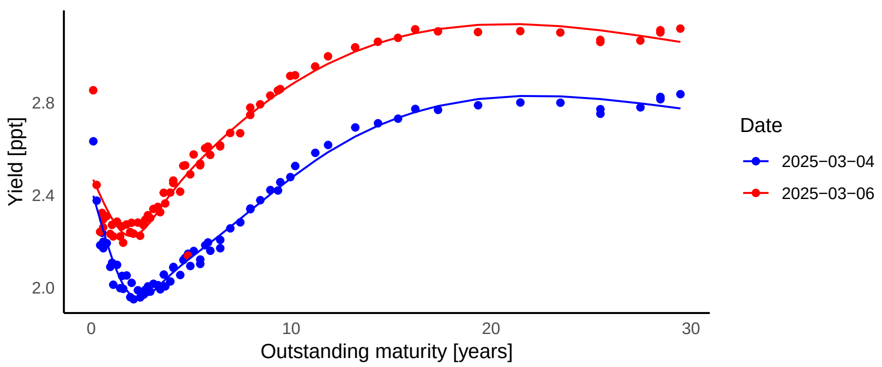
The preceding evidence is consistent with our interpretation, but it does not by itself establish causality, since the observed asset-price movements may have been driven by other developments occurring at the same time. We therefore turn to the unexpected announcement of Germany's €500 billion fiscal package in March 2025, which provides a quasi-experimental setting for identifying the role of holder-base overlap in shock propagation.

On the evening of March 04, 2025, Germany's incoming coalition partners announced a major shift in fiscal policy via a joint press conference. The agreement would relax existing borrowing constraints for defense and certain state expenditures and create a €500 billion special fund to finance infrastructure investment. Financial markets reacted sharply to the announcement, with Bund yields rising dramatically.

As depicted in figure 1, yields of German Bunds rose substantially between market close at 17:00 CET on March 04, 2025 and March 06, 2025. This reflects a two day window around the press-conference commencing at 19:00 CET on March 04, 2025 in which the incoming coalition announced the vast expansion of fiscal spending. After the announcement, yields spiked across the board. At one year out, the yield curve shifted up by 17 basis points, at 8 years the effect peaked at an increase of 42 basis points, which then gradually declined again to an increase of 29 basis points at 30 years out. Some market observers described the move as "the biggest jump in German Bund yields since the fall of the Berlin Wall"

This episode of the German Bund allows to study the transmission of a shock clearly originating in one issuer. We ask the question whether sovereign bonds with a higher investor-base overlap experience larger spillovers to their abnormal excess yield changes over the same

FIGURE 1: GERMAN BUND YIELD CURVE



Note: The figure plots the universe of German fixed coupon, non-callable bonds at various outstanding maturities just before the press conference (March 04, 2025) in blue as well as two days after the press conference (March 06, 2025) in red. Bond yields of individual ISINs are reflected by dots and the imputed yield curves are represented by the solid lines.

two-day window. Similar to earlier, studying the reaction of abnormal excess yield changes allows us to partial out the term structure of issuer specific characteristics that could affect bond yields. Namely, we run the following regression:

$$\Delta u_i^{-DE} = \alpha + \beta \Delta y_j^{DE} + \gamma \Delta y_j^{DE} * \widetilde{FCAP}_{i,j} + \delta \widetilde{FCAP}_{i,j} + \mathbf{X}_{i,j}\mathbf{\Gamma} + \varepsilon_{i,j} \tag{6}$$

Here Δu_i^{-DE} reflects the two day change between 04 and 06 March, 2025 in non-German bond i's abnormal excess yield as described in section 2. Likewise Δy_j^{DE} reflects the change over the same event window in the yield of a German Bund j. As before, $\widetilde{FCAP}_{i,j}$ represents a number of different measures for holder-base overlap between bond i and bond j. Lastly, $\boldsymbol{X}_{i,j}$ is a vector of pairwise bond-controls.

4.1 Results

Table 3 presents the results of the fiscal shock exercise. It reports the coefficient of the interaction term in equation (6). The coefficient described how much more the abnormal excess yield of non-German bonds co-moves with German yields if the degree of holder-base overlap is larger. The table reports this measure for overall holder-base overlap, as well as holder-sector specific holder-base overlap and rank normalized measures.

Table 3 Panel A summarizes results for non-rank-normalized holder-base overlap measures. We find that bonds with a higher holder-base overlap to German Bunds also see larger increases in their abnormal excess yield changes over the two day window around the press conference. Following a one-percentage-point increase in Bund yields, the abnormal excess-yield response is approximately two basis points larger for a non-German bond with a one-unit higher holder-base overlap, all else equal. The effect is even more pronounced for holder-base overlap from bank holdings. Here, a one percentage point rise in the bund yield induces a yield rise 5.6 basis points higher in a sovereign bond with unit bank-holder-base overlap, relative to a sovereign bond with no bank-holder-base overlap. Other holder-sectors do not appear statistically significant.

TABLE 3: REGRESSION RESULTS

Panel A: Holder-Base Overlap						
	Dependent Variable: Correlation in Abnormal Excess Yield Changes					
	ALL	Bank	Insurance	Investment	Retail	Pension
$\Delta y^{DE} * \widetilde{FCAP}$	0.020*	0.056**	0.012	-0.004	-0.009	0.010
	(0.011)	(0.023)	(0.012)	(0.029)	(0.025)	(0.020)
Observations	6,210	6,210	6,210	6,210	6,210	6,210
Pair controls	YES	YES	YES	YES	YES	YES
Panel B: Rank-Normalized Holder-Base Overlap						
	Dependent Variable: Correlation in Abnormal Excess Yield Changes					
	ALL	Bank	Insurance	Investment	Retail	Pension
$\Delta y^{DE} * \widetilde{FCAP}^*$	0.005*	0.005**	0.002	0.000	-0.001	0.001
	(0.0027)	(0.0025)	(0.0018)	(0.0021)	(0.0020)	(0.0018)
Observations	6,210	6,210	6,210	6,210	6,210	6,210
Pair controls	YES	YES	YES	YES	YES	YES

Note: The table reports estimates for equation 6. The table reports the coefficient for the interaction term. Other coefficients are not shown in the table due to space constraints. The six columns correspond to six different measures of holder-base overlap. The first column reflects overall holder-base overlap, columns two through six represent holder-sector specific holder-base overlap measures for banks, insurance companies, investment funds, retail investors, and pension funds respectively. Statistical significance is indicated by *, **, and *** at the 10%, 5%, and 1% level.

Table 3, Panel B, summarizes results for rank-normalized measures of holder-base overlap. Results are similar, but scaled according to the rescaling of $FCAP$. Effect sizes remain statistically and economically significant for aggregate measures of holder-base overlap, but especially so for bank-driven holder-base overlap.

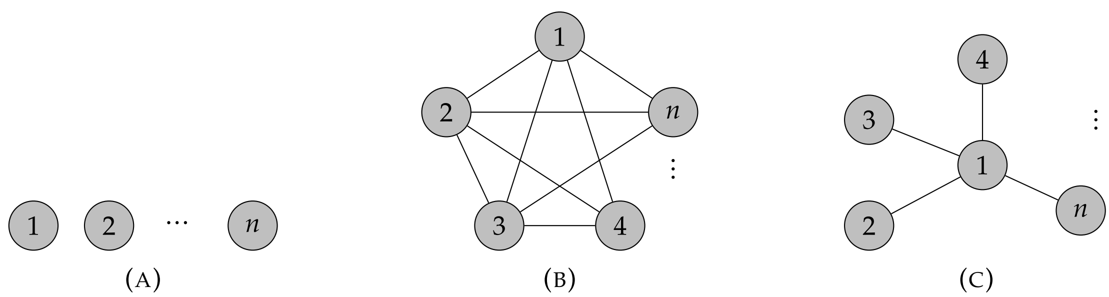
5 A Network Representation

Estimating a pairwise measure of connectedness between bonds allows for a network representation of the European bond market. This representation is motivated by the traditional view that the degree to which shocks from one ISIN spill over to another is governed by market segmentation in the tradition of the preferred habit view (see e.g. Culbertson, 1957; Modigliani and Sutch, 1966; Greenwood et al., 2018; Vayanos and Vila, 2021). Bonds of similar maturity, of similar rating, or of similar currency denomination are traditionally thought to be less segmented, and experience greater spillover effects. Given the empirical evidence from sections 2 to 4 this raises the question of whether the network structure of the holder-base could be informative for how bond- or issuer-specific shocks propagate through the network and affect aggregate financial conditions.

The simple example in figure 2 illustrates how the network structure can matter for propagation and amplification. It parallels the argument from the business cycle literature for why independent idiosyncratic TFP shocks at the firm level may or may not diversify away at the aggregate level (Acemoglu et al., 2012).

Example. Consider financial connections as depicted in figure 2a which consist of n non-connected securities. As n grows, the diversification argument based on the law of large numbers implies that independent shocks to the excess yields of individual securities average out rapidly at the rate $\sqrt{n}$. An identical argument can be made for example 2b. If every security is equally connected to every other security, the symmetric structure of the network ensures that aggregate financial fluctuations are a symmetric function of shocks to each security which implies that the diversification argument remains in place. The diversification argument, however, would not be valid if the financial network resembles a star-like structure as depicted in figure 2c. If the connectedness of securities exhibits no symmetry, then shocks to securities that are more connected to many other securities, such as security 1, propagate stronger to the rest of the financial network and are more likely to drive aggregate financial

FIGURE 2: ILLUSTRATIVE NETWORK STRUCTURES



fluctuations compared to more peripheral securities.

5.1 Network Structure and Aggregate Fluctuations

For a given bond market, consider the following reduced form system capturing interlinkages:

$$x = \tilde{W}x + \varepsilon \tag{7}$$

where x is the vector of abnormal excess yield changes, ε contains security-specific primitive shocks to excess yields, and $\tilde{W}$ is a matrix capturing the inter-linkages between different securities. We assume that shocks ε_i are independent across securities. We can then completely specify the structure of the bond market by the tuple $\mathcal{E} = \{\mathcal{I}, \tilde{W}, \{\varepsilon_i\}_{i\in\mathcal{I}}\}$ where $\mathcal{I} = \{1, ..., n\}$ denotes the set of securities. Thus, interlinkages between securities can be represented by the undirected weighted graph on n vertices, called the *inter-security network* of the bond market. Each vertex corresponds to a security and each undirected edge (i, j) with weight $\tilde{w}_{i,j}$ is present from security i to security j if a shock to the abnormal excess yield in sector i is expected to affect abnormal excess yields in security j.

Based on our empirical exercise in section 2 to 4, we use the observable holder-base overlap as a proxy for $\tilde{w}_{i,j}$ that appears to exhibit a linear relationship with spillovers from shocks originating in one security. Namely, let W denote the matrix of pairwise holder-base overlap: $W_{ij} = FCAP_{ij}/(n-1)$ and $W_{ii} = 0$. The matrix W provides a weighted representation of the common-ownership network. We normalize $FCAP$ by the number of bonds to normalize the rowsum as the number of securities in the inter-security network grows. An element W_{ij} is larger when securities i and j have a greater overlap in their investor bases and are expected to experience greater correlation of abnormal excess yield changes.

This allows us to write the reduced form system as:

$$x = \lambda Wx + \varepsilon, \tag{8}$$

where λ governs the strength with which shocks propagate through common ownership such that $\tilde{W} = \lambda W$. Solving the system allows us to represent the abnormal excess yield changes as a linear function of security-specific primitive shocks:

$$x = (I - \lambda W)^{-1} \varepsilon \tag{9}$$

Here, $(I - \lambda W)^{-1}$ is the well known network multiplier matrix that resembles the *Leontief Inverse* from the production network literature.

First-order connectedness. Following Acemoglu et al. (2012), we define d_i as the *weighted degree* of a security i which equals the sum of normalized holdership-overlaps between bond i and other bonds. A higher weighted degree reflects that a security is more connected to many other securities:

$$d_i := \sum_{j=1}^{n} w_{ij} \tag{10}$$

The collection $\{d_1, ..., d_n\}$ can be referred to as the *degree sequence* of the bond market. We characterize asymmetry in the degree sequence using:

$$CV(d) := \frac{\mathrm{sd}(d_i)}{\mathrm{mean}(d_i)}. \tag{11}$$

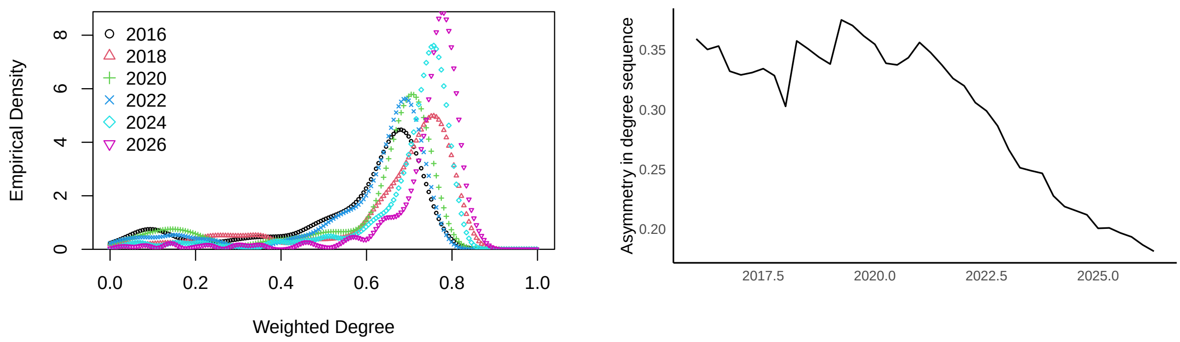
Under a perfectly symmetric network, (e.g. $d_i = 1$ or $d_i = 0$) the asymmetry in the degree sequence is zero: $CV(d) = 0$. Increasing dispersion in d_i indicates that a smaller number of securities account for a disproportionate share of network connections. Acemoglu et al. (2012) show that precisely this type of first-order asymmetry can slow the diversification of idiosyncratic shocks.

Figure 3a summarizes the empirical density securities weighted degrees over time. The figure plots the distribution of weighted degrees for six cross-sections of the inter-security network which correspond to the first quarters of 2016, 2018, 2020, 2022, 2024, and 2026. In line with previous findings from table 1, the average interconnectedness of securities increases over time. The mean weighted degree rises from 0.554 in 2016 to 0.728 in 2026. While there is dispersion how connected securities are via a common holder-base, most securities are con-

FIGURE 3: FIRST-ORDER CONNECTEDNESS

(A) Empirical density of network degrees

(B) Asymmetry in Degree Sequence over Time



centrated around the mean. In 2016, 82.6% of securities were within one standard deviation of the mean weighted degree, which rose to steadily over time to 90.07% in 2026.

Figure 3b displays the arising implications for the asymmetry in the degree sequence. Here, asymmetry remained fairly constant over the first half of the sample until 2021 at a level between 0.303 and 0.375, but then started to steadily decline until reaching its lowest level in 2026 with a asymmetry in the degree sequence of 0.181, related to increasing concentration of weighted security degrees around the mean.

Aggregate Volatility. First-order degrees do not fully characterize the propagation structure of a network. Two securities can have identical direct connectedness while differing substantially in the importance of the securities to which they are connected.

We next link the network structure to an aggregate financial-market outcome. Recall that the solution to the linear system is of the form $x = (I - \lambda W)^{-1}\varepsilon$. The aggregate contribution of shocks to abnormal excess yields can be summarized as the average of x weighted by ω. In the baseline specification, we consider equal security weights to focus on the role of the network structure for aggregate volatility, not the skewness of security capitalization. One subsequently could however also consider weights by market-value. The aggregate contribution of shocks to abnormal excess yields becomes:

$$X = \omega'(I - \lambda W)^{-1}\varepsilon \tag{12}$$

We can similarly rewrite the aggregate contribution as $X = v'\varepsilon$, where we can call $v' := \omega'(I - \lambda W)^{-1}$ the *influence vector*.

The influence vector can equivalently be written as

$$v = \omega + \lambda W'\omega + \lambda^2 (W')^2 \omega + \dots, \tag{13}$$

which makes its network interpretation transparent. The first term captures the direct effect of a security's shock. The second captures transmission to immediate neighbors. Subsequent terms capture increasingly higher-order propagation.

Given that the aggregate contribution to yield changes in the bond market can be expressed as $X = v'\varepsilon$, under the assumption of independent security-specific primitive shocks ε_i, we can compute the standard deviation of aggregate yield effects, which we refer to as *aggregate volatility* by

$$(\text{var } X)^{1/2} := \sqrt{\sum_{i=1}^{n} \sigma_i^2 v_i^2} \tag{14}$$

where v_i denotes the ith element of the influence vector v and σ_i^2 denotes the variance of ε_i.

We consider for a moment the instructive case visualized in figure 2a, where $W = 0$ and we assume identical isins of equal size and equal volatility, such that $\omega = \mathbb{1}/n$ and $\sigma_i^2 = \sigma^2$. In this case, every bond has even influence of $1/n$ for aggregate volatility and aggregate volatility equals $\sigma/\sqrt{n}$. Thus as the number of securities rises, aggregate volatility from security-specific primitive shocks diversifies away and converges to zero. This, however need not be the case depending on the network structure W, or the skewness of securities market capitalization.

5.2 Calibration

The network representation developed above characterizes how shocks propagate conditional on a propagation parameter λ. We discipline this parameter using the German fiscal announcement studied in Section 4. The key idea is to choose λ such that the network model reproduces the empirical relationship between pre-existing holder-base overlap and the transmission of German yield shocks documented in the event study.

Let $\mathcal{I}_G$ denote the set of German Bunds and $\mathcal{I}_N$ the set of non-German sovereign bonds. Consider the following partition of the security-specific primitive shock vector $\varepsilon' = (\varepsilon^G \quad \varepsilon^N)'$. Here ε^G reflects primitive shocks of German Bunds from $\mathcal{I}_G$ and ε^N reflects primitive shocks of non-German bunds from $\mathcal{I}_N$. Similar to the shock to German bunds, we simulate $\varepsilon^G = \mathbb{1}$ and $\varepsilon^N = 0 * \mathbb{1}$. Then, under a given λ, we can derive the effect on all securities' yields via:

$$x(\lambda) = (I - \lambda W)^{-1}\varepsilon \tag{15}$$

This gives us the yield change in German Bunds $x^G(\lambda)$ as well as the yield change in non-German sovereign bonds $x^N(\lambda)$. We then construct the same German–non-German bond-pair sample as in the empirical event study and estimate the corresponding auxiliary regression

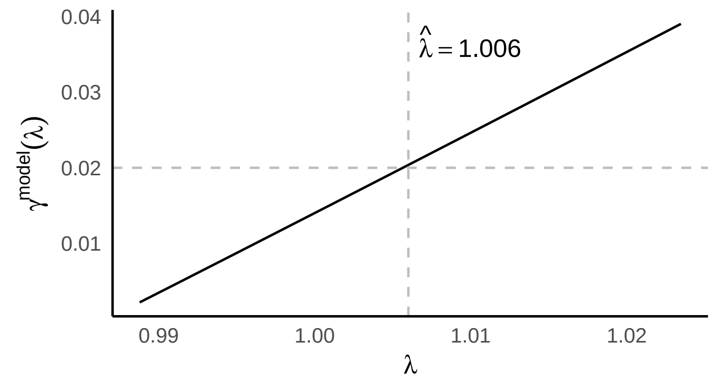
$$x_i^N(\lambda) = \alpha(\lambda) + \beta(\lambda)x_j^G + \gamma^{model}(\lambda)\left(x_j^G \times W_{ij}\right) + \delta(\lambda)W_{ij} + e_{ij}(\lambda). \tag{16}$$

The calibrated propagation parameter is chosen to match the model-implied interaction coefficient to its empirical counterpart:

$$\widehat{\lambda} = \arg\min_{\lambda}\left[\gamma^{model}(\lambda) - 0.020\right]^2. \tag{17}$$

This procedure allows the empirical event-study estimate to discipline the overall strength of network propagation without requiring the regression coefficient $\widehat{\gamma}^{data}$ to map mechanically into an individual element of the propagation matrix. In particular, the calibration accounts for the fact that multiple German Bunds move simultaneously and that shocks can

FIGURE 4: CALIBRATION OF THE NETWORK PROPAGATION PARAMETER



Notes: The solid line plots the interaction coefficient $\gamma^{model}(\lambda)$ obtained by applying the event-study regression to model-implied non-German bond responses for alternative values of λ. The horizontal line denotes the empirical estimate $\widehat{\gamma}^{data} = 0.020$. The calibrated value $\widehat{\lambda}$ is given by their intersection.

propagate through higher-order network paths.

We compute $\gamma^{model}(\lambda)$ over a grid of admissible values of λ and select the value that minimizes the criterion in equation (17). Figure 4 plots the mapping from λ to $\gamma^{model}(\lambda)$ together with the empirical target $\widehat{\gamma}^{data} = 0.020$. For our measure of W_{ij} which equals $FCAP_{ij}$ normalized by $(n-1)$, the calibration yields $\hat{\lambda} = 1.006$.

5.3 Aggregate Implications

Based on this calibration, we next attempt to give preliminary estimates of the quantitative extent to which the network propagation matters for aggregate volatility in excess-bond premia. We compute $||v||_2$ for the European inter-security network across different periods. Importantly, under the assumption that $\sigma_i^2 = \sigma^2$, $||v||_2$ is proportional to aggregate volatility. It also provides an instructive benchmark, as under $\lambda = 0$ and $\omega = n^{-1}\mathbb{1}$, we would have $||v||_2 = 1/\sqrt{n}$. The difference of $||v||_2$ to $1/\sqrt{n}$ gives us the degree to which the network structure alone amplifies aggregate volatility in the inter-security network relative to the counterfactual of an unconnected security system.

Table 4 summarizes the amplification of aggregate financial volatility over time. The first row presents estimates for $||v||_2$. We can see that the network structure implies rising ag-

TABLE 4: ESTIMATION FOR $||v||_2$

	2016	2018	2020	2022	2024	2026
$\|\|v\|\|_2$	0.141	0.186	0.158	0.147	0.190	0.219
	(n = 328)	(n = 295)	(n = 319)	(n = 341)	(n = 333)	(n = 334)
$1/\sqrt{n}$	0.055	0.058	0.056	0.054	0.055	0.055
$\|\|v\|\|_2$ / $(1/\sqrt{n})$	2.55	3.20	2.81	2.71	3.47	3.99

gregate volatility, as $||v||_2$ rises from 0.141 in 2016 to 0.219 in 2026. The number of securities comprising the network stays relatively constant over the sample, starting at 328 in 2016 and finishing at 334 in 2026 with a low point of 295 in 2018 and a highpoint of 341 in 2022. Further the fourth row reveals that estimates for $||v||_2$ are roughly two to four times larger than $1/\sqrt{n_t}$, which suggests that inter-security linkages increase the impact of security-specific primitive shocks by at least two to four times relative to an unconnected network.

This extrapolation exercise suggests that the type of interconnections between securities implied by holder-base overlap may generate significant excess volatility in European bond yields from security-specific primitive shocks. These calculations should be viewed as illustrative rather than conclusive. A rigorous assessment of the financial implications of investor-base overlap for aggregate financial volatility would require a more systematic econometric and quantitative analysis, which we leave to future research.

6 Conclusion

This paper studies whether the ownership structure of financial assets shapes the transmission of security-specific shocks and, ultimately, aggregate financial fluctuations. Using proprietary holdings data for European sovereign bonds, we construct pairwise measures of holder-base overlap and show that bonds held by more similar sets of investors subsequently exhibit greater co-movements in abnormal excess yield changes. This relationship remains intact after controlling for observable characteristics of the securities and security pairs and is particularly pronounced when common ownership arises through banks and insurance companies. These findings suggest that the identity of the investors connecting two securities matters for the extent to which shocks are transmitted between them.

We provide additional evidence on this transmission mechanism using the unexpected German fiscal announcement of March 2025. The announcement generated a large and plausibly exogenous shock to German Bund yields, allowing us to study how an identifiable issuer-level shock propagated to other European sovereign bonds. Non-German bonds with greater pre-existing holder-base overlap with German Bunds experienced larger abnormal excess-yield responses over the event window. The effect is again strongest for connections arising through bank holdings. Taken together with the predictive evidence, these results indicate that common ownership is not merely a correlate of similar fundamental exposures, but is informative about the channels through which shocks propagate across securities.

We then use these pairwise ownership links to represent the European sovereign bond market as an inter-security network. This perspective shifts the focus from whether common ownership generates bilateral comovement to whether the structure of ownership can affect aggregate financial volatility. Calibrating the strength of propagation to the German fiscal episode, our network exercise suggests that security-specific shocks need not diversify away as rapidly as they would in a collection of otherwise disconnected securities. In our baseline calculations, the common-ownership network raises the aggregate effect of security-specific shocks by roughly two to four times relative to the corresponding disconnected benchmark. These quantitative results are necessarily illustrative: they rely on a reduced-form propagation structure and simplifying assumptions about the distribution of primitive shocks. Establishing the precise contribution of ownership networks to observed aggregate financial volatility therefore remains an important avenue for future work.

More broadly, our results provide a financial-market counterpart to the idea that aggregate fluctuations can have microeconomic origins. Financial cycles need not reflect only shocks that are aggregate at their source. An initially localized disturbance can acquire aggregate consequences when it affects securities that are linked to the rest of the market through common investors. The ownership structure of financial markets therefore matters not only for who ultimately bears asset-price risk, but also for how that risk travels through the financial system. Understanding financial cycles may consequently require understanding the network through which securities are connected.

References

Daron Acemoglu, Vasco M. Carvalho, Asuman Ozdaglar, and Alireza Tahbaz-Salehi. The network origins of aggregate fluctuations. *Econometrica*, 80(5):1977–2016, 2012.

Miguel Antón and Christopher Polk. Connected stocks. *Journal of Finance*, 69(3):1099–1127, 2014.

Nicholas Barberis and Andrei Shleifer. Style investing. *Journal of Financial Economics*, 68(2): 161–199, 2003.

Nicholas Barberis, Andrei Shleifer, and Jeffrey Wurgler. Comovement. *Journal of Financial Economics*, 75(2):283–317, 2005.

Geert Bekaert, Campbell R. Harvey, and Angela Ng. Market integration and contagion. *The Journal of Business*, 78(1):39–69, 2005.

Christoph E Boehm and T Niklas Kroner. The u.s., economic news, and the global financial cycle. *The Review of Economic Studies*, 93(1):215–249, 01 2026.

Markus K. Brunnermeier and Yuliy Sannikov. A macroeconomic model with a financial sector. *American Economic Review*, 104(2):379–421, February 2014.

Fabio Caccioli, J. Doyne Farmer, Nick Foti, and Daniel Rockmore. Overlapping portfolios, contagion, and financial stability. *Journal of Economic Dynamics and Control*, 51:50–63, 2015.

Vasco M. Carvalho. From micro to macro via production networks. *Journal of Economic Perspectives*, 28(4):23–48, November 2014.

Nuno Coimbra and Hélène Rey. Financial cycles with heterogeneous intermediaries. *The Review of Economic Studies*, 91(2):817–857, 03 2024.

Joshua Coval and Erik Stafford. Asset fire sales (and purchases) in equity markets. *Journal of Financial Economics*, 86(2):479–512, 2007. ISSN 0304-405X.

J. M. Culbertson. The term structure of interest rates. *The Quarterly Journal of Economics*, 71(4): 485–517, 08 1957.

Matthew Elliott, Benjamin Golub, and Matthew O. Jackson. Financial networks and contagion. *American Economic Review*, 104(10):3115–53, October 2014.

Xavier Gabaix. The granular origins of aggregate fluctuations. *Econometrica*, 79(3):733–772, 2011.

Robin Greenwood and David Thesmar. Stock price fragility. *Journal of Financial Economics*, 102(3):471–490, 2011. ISSN 0304-405X.

Robin Greenwood, Augustin Landier, and David Thesmar. Vulnerable banks. *Journal of Financial Economics*, 115(3):471–485, 2015.

Robin Greenwood, Samuel G Hanson, and Gordon Y Liao. Asset price dynamics in partially segmented markets. *The Review of Financial Studies*, 31(9):3307–3343, 09 2018.

Zhiguo He and Arvind Krishnamurthy. Intermediary asset pricing. *American Economic Review*, 103(2):732–70, April 2013.

Dong Lou. A flow-based explanation for return predictability. *The Review of Financial Studies*, 25(12):3457–3489, 12 2012.

Silvia Miranda-Agrippino and Hélène Rey. U.s. monetary policy and the global financial cycle. *The Review of Economic Studies*, 87(6):2754–2776, 11 2020.

Franco Modigliani and Richard Sutch. Innovations in interest rate policy. *The American Economic Review*, 56(1/2):178–197, 1966.

Whitney K. Newey and Kenneth D. West. A simple, positive semi-definite, heteroskedasticity and autocorrelation consistent covariance matrix. *Econometrica*, 55(3):703–708, 1987.

Linda Fache Rousovãi and Antonio Rodrãguez Caloca. The use of securities holdings statistics (shs) for designing new euro area financial integration indicators, None 2015. URL https://ideas.repec.org/h/bis/bisifc/39-32.html.

Dimitri Vayanos and Jean-Luc Vila. A preferred-habitat model of the term structure of interest rates. *Econometrica*, 89(1):77–112, 2021.