

Are SOE Bank Deposits More Government-Like?

Evidence on Substitutability with Chinese Government Bonds

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Abstract

This paper investigates whether deposits at Chinese state-owned enterprise (SOE) banks function as closer substitutes for Chinese Government Bonds (CGBs) compared to deposits at joint-stock banks. Drawing closely on the framework of Krishnamurthy and Li (2023), which models bank deposits and Treasury bonds as imperfect substitutes in a CES liquidity aggregate, I examine whether the implicit state guarantee enjoyed by SOE banks makes their deposits “more government-like.” Using data on SHIBOR rates, CGB yields, and bank deposit volumes from 2013 to 2024, I estimate the substitutability parameter ρ separately for SOE and total bank deposits. The results are inconclusive regarding the main hypothesis: the coefficients are nearly identical and statistically indistinguishable given the sample size. However, the estimated $\rho \approx 0.66$ is remarkably close to the Krishnamurthy-Li benchmark of $\rho \approx 0.65$ for U.S. deposits and Treasuries, suggesting that the imperfect substitutability between bank money and government bonds may be a general feature of modern financial systems rather than a U.S.-specific phenomenon.

Keywords: liquidity premium, bank deposits, government bonds, state-owned enterprises, China

Contents

1	Introduction	3
2	Institutional Background and Theoretical Framework	3
2.1	The Chinese Banking System	3
2.2	Deposit Insurance in China	4
2.3	Theoretical Framework	4
2.4	Hypothesis	5
2.5	Theoretical Extension: Policy Changes and the Deposit Spread	5
2.5.1	Decomposing the Deposit Spread	6
2.5.2	Implications for Substitutability	6
2.5.3	A Brief Note on Other Policy Changes	7
3	Data	7
3.1	Sample Construction	7
3.2	Interest Rate Data	8
3.3	Bank Deposit Data	8
3.4	CGB Supply	9
3.5	Volatility Measure	9
4	Empirical Methodology	9
4.1	Main Test: Krishnamurthy-Li Replication	9
4.2	Identification Considerations	10
5	Results	11
5.1	Main Results: Substitutability Estimates	11
6	Discussion	12
6.1	Implications	12
6.2	Limitations and Alternative Explanations	12
6.3	Future Work	12
7	Conclusion	13

1 Introduction

In modern financial systems, multiple financial assets provide liquidity services traditionally associated with money. Krishnamurthy and Li (2023) demonstrate that in the United States, bank deposits and Treasury bonds both satisfy investors’ demand for liquidity but are imperfect substitutes, with an estimated elasticity parameter $\rho \approx 0.65$. This finding has important implications for monetary policy transmission, quantitative easing, and the role of shadow banking.

China presents a particularly interesting (and frankly exciting!) setting to examine these questions. The Chinese banking system is dominated by large state-owned banks—the “Big 5”—which together hold approximately 40% of total banking assets. These institutions benefit from implicit (and sometimes explicit) state guarantees, potentially making their deposits more “government-like” than deposits at privately owned or joint-stock banks. If this is the case, we would expect SOE bank deposits to be closer substitutes for Chinese Government Bonds (CGBs) than deposits at other banks.

This paper tests this hypothesis by adapting the Krishnamurthy-Li framework to the Chinese context. Specifically, I estimate the substitutability parameter ρ using two different specifications: one that measures the ratio of CGBs to SOE bank deposits only, and another that uses total bank deposits in the denominator. If SOE deposits are indeed closer substitutes for CGBs, we should find that $|\beta_1^{SOE}| < |\beta_1^{Total}|$ in the log-linear regressions, implying a higher ρ (closer to perfect substitutes) when using SOE deposits.

The main contributions of this paper are threefold. First, I provide the first application of the Krishnamurthy-Li liquidity framework to China, a major economy with distinct institutional features. Second, I offer evidence on how state ownership in banking affects the “money-likeness” of bank deposits. Third, I develop a theoretical extension that connects deposit insurance policy to the substitutability framework, providing testable predictions for future work.

The remainder of this paper proceeds as follows. Section 2 provides institutional background on Chinese banking and the theoretical framework. Section 3 describes the data. Section 4 presents the empirical methodology. Section 5 reports results. Section 6 discusses implications, limitations, and directions for future research. Section 7 concludes.

2 Institutional Background and Theoretical Framework

2.1 The Chinese Banking System

China’s banking sector is dominated by five large state-owned commercial banks: Industrial and Commercial Bank of China (ICBC), China Construction Bank (CCB), Bank of

China (BOC), Agricultural Bank of China (ABC), and Bank of Communications (Bo-Com). These institutions were formed from the restructuring of the formerly monolithic People’s Bank of China in the 1980s and have since been partially privatized through stock market listings, though the state retains controlling stakes.

Alongside the Big 5 SOE banks, China has a substantial joint-stock banking sector. Banks such as China Merchants Bank, CITIC Bank, China Minsheng Bank, Industrial Bank, and Ping An Bank operate with more diverse ownership structures, including private investors, local governments, and in some cases foreign strategic partners. While these banks are subject to similar regulatory oversight, they do not enjoy the same degree of implicit government backing as the SOE banks. Moreover, I should mention a cultural attitude that inspired this question and paper as an addendum to Krishnamurthy-Li, namely that high trust in the stability of the ruling party in China, synonymous with the state, emboldens some private investors and media opinion of SOEs as impossible to fail since they are state-owned.

This institutional distinction creates a natural experiment for testing whether state ownership affects the “money-likeness” of bank deposits. If depositors perceive SOE bank deposits as safer due to implicit guarantees, these deposits should command lower spreads relative to the interbank rate (less of a risk premium), and should function as closer substitutes for government securities.

2.2 Deposit Insurance in China

China introduced an explicit deposit insurance scheme in May 2015, covering deposits up to RMB 500,000. Prior to this, depositors relied entirely on implicit government guarantees. The introduction of deposit insurance potentially changed the relative safety perception of SOE versus joint-stock bank deposits. If the deposit insurance scheme is credible and comprehensive, it should reduce the safety premium enjoyed by SOE banks. Conversely, if depositors remain skeptical of the scheme’s coverage—particularly for large deposits above the insurance limit—the SOE safety advantage may persist.

2.3 Theoretical Framework

Following Krishnamurthy and Li (2023), I model investor preferences over a liquidity aggregate:

$$Q_t = \left[(1 - \lambda_t) \left(\frac{D_t}{P_t} \right)^\rho + \lambda_t \left(\frac{B_t}{P_t} \right)^\rho \right]^{1/\rho} \quad (1)$$

where D_t represents nominal bank deposits, B_t represents nominal government bond holdings, P_t is the price level, λ_t captures time-varying relative liquidity preferences, and $\rho \in (-\infty, 1]$ measures the substitutability between deposits and bonds.

When $\rho = 1$, deposits and bonds are perfect substitutes. When $\rho < 1$, they are imperfect substitutes. Krishnamurthy and Li estimate $\rho \approx 0.65$ for the United States, indicating meaningful but imperfect substitutability.

The first-order conditions from the investor's optimization problem yield:

$$\pi_t^B = \frac{\lambda_t}{1 - \lambda_t} \left(\frac{B_t}{D_t} \right)^{\rho-1} \pi_t^D \quad (2)$$

where $\pi_t^B = i_t - i_t^B$ is the liquidity premium on bonds (the spread between a risk-free rate and the bond yield) and $\pi_t^D = i_t - i_t^D$ is the liquidity premium on deposits.

Taking logs:

$$\log(\pi_t^B) = \log\left(\frac{\lambda_t}{1 - \lambda_t}\right) + (\rho - 1) \log\left(\frac{B_t}{D_t}\right) + \log(\pi_t^D) \quad (3)$$

This equation forms the basis for my empirical estimation. The coefficient on $\log(B_t/D_t)$ directly identifies $\rho - 1$.

2.4 Hypothesis

My main hypothesis is that SOE bank deposits are closer substitutes for CGBs than joint-stock bank deposits. Formally, if I estimate:

$$\log(\pi_t^{CGB}) = \alpha + \beta_1^{SOE} \log\left(\frac{CGB_t}{D_t^{SOE}}\right) + \text{controls} + \varepsilon_t \quad (4)$$

$$\log(\pi_t^{CGB}) = \alpha + \beta_1^{Total} \log\left(\frac{CGB_t}{D_t^{Total}}\right) + \text{controls} + \varepsilon_t \quad (5)$$

Then my hypothesis predicts $|\beta_1^{SOE}| < |\beta_1^{Total}|$, implying $\rho^{SOE} > \rho^{Total}$.

Ergo, state ownership makes deposits more “government-like,” bringing them closer to perfect substitutes with government bonds.

2.5 Theoretical Extension: Policy Changes and the Deposit Spread

The deposit insurance regulation took effect on May 1, 2015, with coverage up to RMB 500,000 per depositor per institution—a limit that protects approximately 99.6% of depositors by number. This policy change allows me to extend the Krishnamurthy-Li framework to examine how government guarantees affect the substitutability of bank deposits and government bonds.

2.5.1 Decomposing the Deposit Spread

Following Krishnamurthy and Li, the deposit spread can be written as a function of the nominal rate:

$$\pi_t^D = i_t - i_t^D \approx \delta \cdot i_t \quad (6)$$

where δ captures the pass-through of monetary policy to deposit rates. However, this specification assumes homogeneous deposits. When banks differ in perceived safety, the deposit spread should include a risk premium component.

I extend the model by decomposing the deposit spread for bank i at time t as:

$$\pi_{i,t}^D = \delta \cdot i_t - \phi_i \cdot \mathbf{1}[\text{Pre-DI}_t] \quad (7)$$

where $\mathbf{1}[\text{Pre-DI}_t]$ is an indicator equal to 1 before deposit insurance (prior to May 2015), and $\phi_i \geq 0$ represents a bank-specific *risk premium* that depositors demand when deposits lack explicit government protection.

The sign is negative because a risk premium *reduces* the spread: riskier banks must pay higher deposit rates to attract funds, shrinking the gap between the benchmark rate and the deposit rate. Under this specification:

- For SOE banks with implicit state guarantees: $\phi_{SOE} \approx 0$ (depositors already perceive these deposits as safe)
- For joint-stock banks without implicit guarantees: $\phi_{JS} > 0$ (depositors demand higher rates to compensate for default risk)

This implies that before deposit insurance:

$$\pi_{SOE,t}^D = \delta \cdot i_t > \delta \cdot i_t - \phi_{JS} = \pi_{JS,t}^D \quad (8)$$

That is, SOE banks enjoy larger spreads (lower funding costs) than joint-stock banks.

2.5.2 Implications for Substitutability

From the investor's first-order condition in the Krishnamurthy-Li framework, the CGB liquidity premium responds to the ratio of CGB supply to the "effective" liquidity from deposits. If SOE deposits provide liquidity services more similar to CGBs (this might be because both carry government backing) then variation in B_t/D_t^{SOE} should have a *smaller* effect on π_t^{CGB} than variation in B_t/D_t^{Total} .

To see why, consider the average deposit spread across bank types:

$$\bar{\pi}_t^{D,SOE} = \delta \cdot i_t - \bar{\phi}_{SOE} \cdot \mathbf{1}[\text{Pre-DI}_t] \quad (9)$$

$$\bar{\pi}_t^{D,Total} = \delta \cdot i_t - \bar{\phi}_{Total} \cdot \mathbf{1}[\text{Pre-DI}_t] \quad (10)$$

where $\bar{\phi}_{Total} = w \cdot \bar{\phi}_{SOE} + (1 - w) \cdot \bar{\phi}_{JS}$ is the deposit-weighted average risk premium, with w being the SOE share of total deposits. Since $\phi_{JS} > \phi_{SOE} \approx 0$, we have $\bar{\phi}_{Total} > \bar{\phi}_{SOE}$.

This ordering matters for interpreting the regression coefficient. In the K-L specification:

$$\log(\pi_t^{CGB}) = \alpha + \beta_1 \log\left(\frac{B_t}{D_t}\right) + \text{controls} + \varepsilon_t \quad (11)$$

the coefficient $\beta_1 = \rho - 1$ identifies substitutability. When deposits are closer substitutes for CGBs (higher ρ), the coefficient β_1 is closer to zero.

Because SOE deposits and CGBs share the common feature of government backing, SOE deposits should be closer substitutes for CGBs than the average deposit. Therefore, when we use D_t^{SOE} in the denominator, changes in the CGB-to-deposit ratio should have a smaller effect on the CGB liquidity premium, implying $|\beta_1^{SOE}| < |\beta_1^{Total}|$, as Section 2.4 describes.

2.5.3 A Brief Note on Other Policy Changes

Beyond deposit insurance, two other policy changes during the sample period may affect deposit market dynamics.

First, the PBOC completed interest rate liberalization on October 23, 2015 by removing the ceiling on deposit rates. Prior to this, banks could only offer rates within a regulated band above the benchmark. Following liberalization, joint-stock and smaller banks raised deposit rates by approximately 30% above the benchmark, compared to only 17% for the Big 5 SOE banks—consistent with joint-stock banks needing to pay more to compete for deposits. However, a de facto ceiling remained in place through banks’ “self-discipline” mechanisms, limiting the immediate impact.

Second, the PBOC adjusted the reserve requirement ratio (RRR) multiple times between 2013 and 2024. Higher reserve requirements effectively tax deposits by reducing the funds available for lending, which could alter relative spreads and substitutability.

Because interest rate liberalization occurred just five months after deposit insurance, isolating the individual effects of these reforms is difficult. In the empirical analysis, I focus on testing whether the main result— $|\beta_1^{SOE}| < |\beta_1^{Total}|$ —holds across the full sample period, while acknowledging that multiple policy changes may jointly influence the results.

3 Data

3.1 Sample Construction

My sample covers 2013 to 2024 at quarterly frequency.

3.2 Interest Rate Data

Benchmark Rate. I use the 3-month Shanghai Interbank Offered Rate (SHIBOR) as the benchmark risk-free rate. SHIBOR is calculated daily based on quotes from a panel of banks and serves as a key reference rate in Chinese money markets.

CGB Yields. Three-month CGB yields are obtained from ChinaBond (the China Central Depository & Clearing Co.). The CGB liquidity premium is computed as:

$$\pi_t^{CGB} = \text{SHIBOR}_{3M,t} - \text{CGB}_{3M,t} \quad (12)$$

3.3 Bank Deposit Data

For the main regression analysis, I require aggregate deposit volumes by bank type. Following Krishnamurthy and Li, the deposit spread is proxied by the benchmark interest rate (SHIBOR), so direct measurement of deposit rates is unnecessary for estimating the substitutability parameter.

I collect deposit volume data for 10 banks: the Big 5 SOE banks and 5 major joint-stock banks.

Table 1: Banks in Sample

SOE Banks (Big 5)	Joint-Stock Banks
ICBC (601398)	China Merchants Bank
CCB (601939)	CITIC Bank
BOC (601988)	China Minsheng Bank
ABC (601288)	Industrial Bank
BoCom (601328)	Ping An Bank

Deposit data represents “Due to Customers” as reported in quarterly filings, which includes a small accrued interest component (approximately 1–1.2% of total deposits based on annual report disclosures). As this component is stable across quarters and does not independently vary with interbank rates, its inclusion does not materially affect the estimated sensitivity of the CGB liquidity premium to deposit quantities.

To validate the manual data collection, I cross-referenced the bank-level deposit figures against sector-wide aggregates reported in KPMG’s annual China Banking Survey¹, which covers the top 150 banks in China. Our sample of 10 banks accounts for approximately 60–70% of the total deposits in the Chinese banking system. For example in the years 2021 and 2022, the sample accounts for 65.2% of total deposits with the Big 5 SOE banks

¹<https://assets.kpmg.com/content/dam/kpmg/cn/pdf/en/2023/05/china-banking-industry-survey-report-2023.pdf>

representing roughly 53.1% and the five joint-stock banks representing approximately 12.1%.

3.4 CGB Supply

The supply of CGBs is measured as total outstanding Chinese Government Bonds from Ministry of Finance data. Ideally, this measure would net out People’s Bank of China (PBOC) holdings to isolate the quantity available to the private sector. However, quarterly data on central bank bond holdings are not publicly accessible in a consistent time series. I therefore use gross CGB outstanding as the supply measure.

This measurement limitation does not bias the main test. Since both Specification A (using D_t^{SOE}) and Specification B (using D_t^{Total}) employ the same numerator CGB_t , any measurement error affects both β_1^{SOE} and β_1^{Total} symmetrically. The comparison $|\beta_1^{SOE}| < |\beta_1^{Total}|$ remains valid as long as the measurement error does not differentially bias one specification over the other (this was not tested but with sampling, would hopefully remain true).

3.5 Volatility Measure

To capture flight-to-quality effects, Krishnamurthy and Li use the VIX index. China had its own implied volatility index (iVIX) based on CSI 300 options, but this was suspended in February 2018 due to concerns about market manipulation.

To extend the sample beyond 2018, I use realized volatility of the CSI 300 index as my volatility proxy. Specifically, I compute the annualized standard deviation of daily CSI 300 returns within each quarter:

$$\text{Vol}_t = \sqrt{252} \times \text{std}(r_d)_{d \in t} \quad (13)$$

where r_d denotes the daily log return. This approach follows Krishnamurthy and Li, who use a similar projection method to extend VIX backward using realized volatility of the S&P 500.

4 Empirical Methodology

4.1 Main Test: Krishnamurthy-Li Replication

The main test adapts the Krishnamurthy-Li framework to compare the substitutability of SOE deposits versus total deposits with CGBs. Following Krishnamurthy and Li, I assume the deposit spread is approximately proportional to the nominal interest rate: $\pi_t^D \approx \delta \cdot i_t$. This allows me to use $\log(\text{SHIBOR}_t)$ as a proxy for the deposit spread rather

than directly measuring bank-level deposit rates. Krishnamurthy and Li use the same approach with the federal funds rate in the U.S. context.

I estimate:

$$\log(\pi_t^{CGB}) = \alpha + \beta_1 \log\left(\frac{CGB_t}{D_t}\right) + \beta_2 \log(\text{SHIBOR}_t) + \beta_3 \log(\text{Vol}_t) + \varepsilon_t \quad (14)$$

where $\pi_t^{CGB} = \text{SHIBOR}_{3M,t} - \text{CGB}_{3M,t}$ is the CGB liquidity premium, CGB_t is gross CGB supply (total outstanding), D_t is deposit volume, and Vol_t is the volatility measure.

I run this regression twice:

- **Specification A:** Using $D_t = D_t^{SOE}$ (deposits at SOE banks only)
- **Specification B:** Using $D_t = D_t^{Total}$ (total deposits across all banks)

From the Krishnamurthy-Li model, the coefficient $\beta_1 = \rho - 1$, where $\rho \in (-\infty, 1]$ measures substitutability between deposits and CGBs. When ρ is closer to 1 (closer substitutes), β_1 is closer to zero.

Test: If SOE deposits are closer substitutes for CGBs than total deposits, we should find $|\beta_1^{SOE}| < |\beta_1^{Total}|$, implying $\rho^{SOE} > \rho^{Total}$. This is the main hypothesis of the paper.

I estimate equation (14) using OLS with heteroskedasticity and autocorrelation consistent (HAC) standard errors, using four lags to account for potential serial correlation in quarterly data.

4.2 Identification Considerations

The main identification challenge in the Krishnamurthy-Li framework is potential endogeneity: unobserved shocks to liquidity demand may affect both the CGB-to-deposits ratio and the liquidity premium simultaneously. Krishnamurthy and Li address this by using total Treasury supply (driven by fiscal policy) as an instrument, under the exclusion restriction that fiscal considerations are orthogonal to relative liquidity demand shocks.

Given the limited sample size (approximately 40 quarterly observations), implementing instrumental variables estimation would likely suffer from weak instrument problems and imprecise estimates in my sample. I therefore rely on OLS estimation for the main results. This limits my trust of the ρ estimator we would achieve. However and importantly, the relationship can still be tested: even if endogeneity biases the point estimates of β_1 , the comparison between specifications remains informative as long as the bias operates similarly across both. The key test—whether $|\beta_1^{SOE}| < |\beta_1^{Total}|$ —does not require unbiased point estimates, only that any bias does not systematically favor one specification over the other. Since both regressions use the same dependent variable and control variables, differing only in the deposit measure in the denominator, this assumption is (hopefully) plausible.

5 Results

5.1 Main Results: Substitutability Estimates

Table 2 reports the main regression results. Column (1) uses SOE deposits in the denominator; Column (2) uses total deposits.

Table 2: CGB Liquidity Premium and Deposit Substitutability

	(1)	(2)
	SOE Deposits	Total Deposits
$\log(CGB_t/D_t)$	-0.3374 (0.2375)	-0.3307 (0.2352)
$\log(\text{SHIBOR}_t)$	1.3441 (0.2265)	1.3519 (0.2246)
$\log(\text{Vol}_t)$	0.1334 (0.1133)	0.1348 (0.1136)
Constant	-1.8476 (0.2901)	-1.9160 (0.2999)
Observations	48	48
R^2	0.751	0.750
Implied $\hat{\rho}$	0.663	0.669

Notes: Dependent variable is $\log(\pi_t^{CGB})$ where $\pi_t^{CGB} = \text{SHIBOR}_{3M} - \text{CGB}_{3M}$. HAC standard errors with 4 lags in parentheses. $\hat{\rho} = \hat{\beta}_1 + 1$. Sample period: 2013Q1–2024Q4.

The key result is the comparison of the coefficients on $\log(CGB_t/D_t)$. In Column (1), $\hat{\beta}_1^{SOE} = -0.337$ (SE = 0.238), while in Column (2), $\hat{\beta}_1^{Total} = -0.331$ (SE = 0.235). Given the standard errors, these coefficients are statistically indistinguishable from each other. The results are therefore inconclusive regarding the main hypothesis that SOE deposits are closer substitutes for CGBs than total deposits.

The estimated coefficients imply substitutability parameters of $\hat{\rho}^{SOE} = 0.663$ and $\hat{\rho}^{Total} = 0.669$. While these estimates carry substantial uncertainty, they are remarkably close to the benchmark estimate of $\rho \approx 0.65$ that Krishnamurthy and Li (2023) obtain for U.S. bank deposits and Treasury bonds. This similarity suggests that, at least in aggregate, Chinese bank deposits and CGBs exhibit comparable substitutability to their U.S. counterparts!

The small sample size (48 quarterly observations) limits statistical power, making it difficult to detect differences between specifications even if such differences exist in the population. Longer samples or higher-frequency data would be needed to obtain more

precise estimates.

Nevertheless, excitingly, finding that $\hat{\rho} \approx 0.66$ in China—despite very different institutional features including state-owned banking, capital controls, and recent deposit insurance introduction—implies imperfect substitutability between bank money and government bonds documented by Krishnamurthy and Li may be a more general feature of modern financial systems, rather than a US-specific phenomenon.

6 Discussion

6.1 Implications

The finding that SOE deposits and total deposits exhibit statistically indistinguishable substitutability with CGBs leaves open the question of whether state ownership meaningfully affects monetary policy transmission in China. The hypothesis that SOE deposits function as “near-government money” cannot be confirmed with the available data. However, the broader finding that Chinese deposits and CGBs are imperfect substitutes with $\rho \approx 0.66$ suggests that CGB supply does affect liquidity premia, regardless of bank ownership structure. Future work with longer time series or cross-sectional variation across banks may provide the statistical power needed to distinguish SOE from joint-stock deposit behavior.

6.2 Limitations and Alternative Explanations

Several caveats apply. Apart from the limited sample size, there are other factors that could explain differences in substitutability. These include more extensive branch and ATM networks at SOE banks, product bundling with mortgages and business loans, and potential regulatory advantages. While I cannot fully disentangle these channels, the theoretical framework developed in Section 2.5 provides structure for interpreting the results.

6.3 Future Work

The theoretical extension in Section 2.5 generates an additional testable prediction that I do not test in this paper due to data and time constraints: if deposit insurance changes how depositors view bank deposits relative to government bonds, we would expect a structural break in the substitutability relationship around May 2015. Specifically, a regression discontinuity design around the May 2015 implementation could test whether:

$$|\beta_1^{Total,post}| < |\beta_1^{Total,pre}| \quad (15)$$

That is, after deposit insurance equalizes explicit protection, total deposits should become closer substitutes for CGBs. This test requires sufficient data on both sides of the discontinuity and careful attention to the concurrent interest rate liberalization in October 2015.

If the substitutability differences between SOE and total deposits persist after May 2015, this would suggest either: (a) large depositors above the RMB 500,000 limit drive the SOE premium, (b) depositors do not fully trust the explicit insurance scheme, or (c) factors beyond safety explain the patterns. Future work with longer time series could shed light on these mechanisms.

7 Conclusion

This paper examines whether deposits at Chinese state-owned banks function as closer substitutes for government bonds compared to deposits at joint-stock banks. Adapting the framework of Krishnamurthy and Li (2023), I test whether implicit state guarantees make SOE deposits more “government-like” in the eyes of investors.

The results are inconclusive regarding the main hypothesis. The estimated coefficients $\hat{\beta}_1^{SOE} = -0.337$ and $\hat{\beta}_1^{Total} = -0.331$ are nearly identical, and the standard errors are too large to distinguish between specifications. The small sample size (48 quarterly observations) limits statistical power, and I cannot reject that SOE and joint-stock deposits exhibit the same degree of substitutability with CGBs.

However, the analysis yields a notable finding: the estimated substitutability parameter $\hat{\rho} \approx 0.66$ is surprisingly close to the Krishnamurthy-Li benchmark of $\rho \approx 0.65$ for U.S. bank deposits and Treasury bonds. This suggests that imperfect substitutability between bank money and government bonds may be a general feature of modern financial systems, rather than a U.S.-specific phenomenon.

Future work with longer time series could revisit the SOE versus joint-stock comparison with greater statistical power, test for structural breaks around the May 2015 deposit insurance reform, and implement instrumental variables strategies to obtain more credible point estimates of ρ .

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