The Impact of Implicit Guarantees and Market-Based Guarantees on the Issuance Spreads of Urban Investment Bonds

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Abstract— Preventing and defusing local government debt risks is a core issue in current macroeconomic governance. Against the backdrop of policies that promote the separation of credit between urban investment platforms and local governments, market pricing remains constrained by expectations of implicit guarantees. Using urban investment bonds issued between 2014 and 2024 as the research sample, this paper constructs an issuer-bond and guarantor-bond bipartite network, introduces two dynamic indicators: issuer node degree and guarantor node degree, and employs a quasi-natural experiment based on a series of debt resolution policies to examine the interactive effects of policy regulation and network structure on issuance spreads. The empirical results show that policy effects exhibit significant heterogeneity; the pricing weight of network characteristics is reshaped with the policy environment, where issuer node degree transforms into a market-oriented signal, while guarantor node degree reverses into a hub for risk transmission. Urban investment bond pricing deviates systematically from traditional financial theories, with variables capturing government credit linkages acting as the core pricing determinants. The findings of this paper indicate that the risk pricing of urban investment bonds is undergoing a transition from relationship dependence to fundamental risk pricing, which provides empirical support for identifying implicit guarantees and preventing risk contagion within guarantee networks.

Keywords— Urban Investment Bonds (UIBs); Issuance Spread; Implicit Guarantee; Network Analysis.

I. INTRODUCTION

1.1 Research Background and Significance:

Against the backdrop of the fiscal revenue-expenditure gap caused by the 1994 tax-sharing reform, urban investment bonds emerged as a "quasi-municipal bond" with Chinese characteristics. By the end of 2024, the outstanding balance of implicit local government debt had reached 10.5 trillion yuan, and its risk transmission has become a core issue in the establishment of a joint prevention and control mechanism for fiscal and financial risks (Qiu et al., 2022). Since the issuance of Document No. 43 [2014] of the State Council, which established the debt governance framework, China has continuously promoted the resolution of implicit debt through Document No. 50, Document No. 35, and the "package debt resolution" policies. However, discrepancies still exist between the market pricing mechanism and policy orientation, highlighting the path-dependent nature of implicit guarantee expectations (Cao, 2023). Notably, existing studies are mostly limited to the analysis of traditional financial indicators and fail to reveal how the structural position of issuers in the debt network affects risk pricing. Against the background that policies continue to weaken unified implicit guarantees, structural indicators such as network node degree may reshape the formation mechanism of credit spreads through dual channels of information transmission and risk exposure. By constructing two dynamic network indicators—issuer node degree and guarantor node degree—this paper systematically analyzes the interactive effects of policy regulation and network structure on the issuance spreads of urban investment bonds, aiming to provide theoretical references and practical evidence for improving the debt governance system and preventing systemic financial risks.

1.2 Literature Review:

Domestic and foreign scholars have established a multi-level research system on the pricing mechanism of bonds backed by government credit. At the macroeconomic level, early studies constructed an analytical framework including variables such as money supply and GDP (Altman, 1990). Subsequent research verified the transmission effects of the economic cycle and risk-free interest rate on credit spreads (Collin-Dufresne et al., 2001). Chinese scholars have echoed this perspective, finding that financial environment optimization (Pan et al., 2015), fiscal sustainability (Yan & Ma, 2024) can reduce issuance costs, while risks of urban investment bonds may push up treasury bond premiums and exert systemic impacts (Niu et al., 2016).

At the micro level, bond maturity (Fons, 1994), embedded options (Kalotay, 1997), and guarantee arrangements (Zhang & Jiao, 2017) serve as core pricing determinants. Institutional factors represent a key dimension highlighting Chinese characteristics. Foreign studies emphasize the roles of fiscal transparency and governance structure (Bo et al., 2023; Feld, 2017). Domestic research has deeply revealed the dominant role of implicit government guarantees and their substitution effect with market-oriented guarantees (Ouyang & Wang, 2024; Chen et al., 2024), while also noting the upward pressure of administrative intervention on financing costs (Zheng et al., 2025).

Regional economies and issuer characteristics form the micro-foundation of pricing. Pairing assistance (Liang et al., 2025) and equity connections (Tong et al., 2024) can improve financing conditions. In recent years, studies have begun to regard local government economic activities as a complex network system, confirming that risk contagion and information spillover embedded in network structure profoundly affect credit pricing (Mao et al., 2024; Wu et al., 2021).

Nevertheless, existing literature still has obvious limitations. First, most studies treat guarantees as isolated dummy variables, ignoring the impact of the systematic network formed by issuer-guarantor relationships and its topological characteristics on risk pricing. Second, they fail to dynamically reveal the structural evolution of guarantee networks across different policy cycles and their moderating effects on bond pricing logic. Against this background, this paper adopts a network analysis perspective. By constructing two dynamic indicators—issuer node degree and guarantor node degree—we systematically examine the impact of network characteristics on the issuance spreads of urban investment bonds. This study aims to expand the analytical boundaries of bond pricing theory and provide implications for preventing systemic risks.

II.   CURRENT SITUATION AND THEORETICAL ANALYSIS

2.1 Analysis of the Current Situation of Urban Investment Bonds:

China's urban investment bonds originated in Shanghai. On July 22, 1992, with the approval and authorization of the Shanghai Municipal Government to broaden financing channels for urban construction, Shanghai established a specialized investment and holding company dedicated to raising and managing funds for urban construction and maintenance: Shanghai Urban Construction Investment & Development Corporation.

On April 15, 1993, the company issued its first urban construction bond worth 500 million yuan with a maturity of 2 years and a coupon rate of 10.5%. This became China's first urban investment bond, opening a new chapter in the development of China's bond market.

2.1.1 Bond Maturity:

As shown in Table 1, in terms of the evolution of the term structure, China's urban investment bonds exhibit a dual trend of coexisting short-termization and medium- to long-termization, reflecting the complex interaction between market liquidity preferences and policy guidance. The term structure of urban investment bonds underwent a landmark shift in 2024, characterized by a move from the previous concentrated pattern dominated by 3-year bonds to a more extended distribution led by 5-year bonds. This change is not a simple maturity substitution: the share of 5-year bonds surged to 54.5%, while that of 3-year bonds dropped from a high of 71.6% in 2023 to 36.8%, indicating a profound adjustment in market logic. Against the policy backdrop of "controlling new debt and digesting existing debt", this signals that urban investment platforms are proactively managing their debt maturity structure and pursuing long-term stability. It also reflects that investors, guided by policies, have granted longer risk exposure to platforms with relatively sound fundamentals. Although short-term bonds still account for about 10% to meet liquidity needs and ultra-long-term bonds remain stable, the noticeable upward shift in the maturity center is quietly reshaping the risk pricing and rollover model of the urban investment bond market.

TABLE 1
BOND MATURITY OF URBAN INVESTMENT BONDS

Maturity	2020	2021	2022	2023	2024
<1	761	237	1036	146	833
1	379	85	426	108	551
3	1157	352	1222	1753	3083
5	1891	1001	1176	1241	4561
7	948	746	661	430	220
>=10	138	122	49	51	211

Data source: Wind Database, Resset Database. The same below.

2.1.2   Analysis of the Guarantee Network Structure of Urban Investment Bonds:

The visual map of the issuer-guarantor network intuitively presents the coexistence of high fragmentation and local centralization in China's local debt guarantee system. As shown in Figure 1, the nationwide guarantee network of outstanding urban investment bonds at the end of 2024 contains 1,750 nodes with a modularity coefficient as high as 0.882, forming 301 independent communities. This indicates that the so-called national guarantee network is actually a complex composed of hundreds of locally connected, highly isolated local credit clusters.

Network parameters further confirm this feature: the average degree is only 0.994 and the graph density is merely 0.001. Guarantee relationships mostly present a star structure radiating from a single core node, with credit resources highly concentrated in provincial guarantee groups or key municipal platforms. For instance, Jiangsu Credit Re-guarantee Group, Chongqing Three Gorges Financing Guarantee, and Tianfu Credit Enhancement are all core nodes of local clusters.

This structure reveals that, at the macro level, credit resources are fragmented due to administrative and regional barriers, lacking a cross-regional risk-sharing mechanism. At the micro level, each sub-network relies on a small number of core nodes for internal control and coordination. Even under policy interventions such as the "package debt resolution" plan, the basic logic of the guarantee network has not been fundamentally restructured, and the boundaries of local implicit guarantees remain clear. The stability of the entire system highly depends on the individual robustness of local core nodes, and its systemic resilience deserves continuous attention.
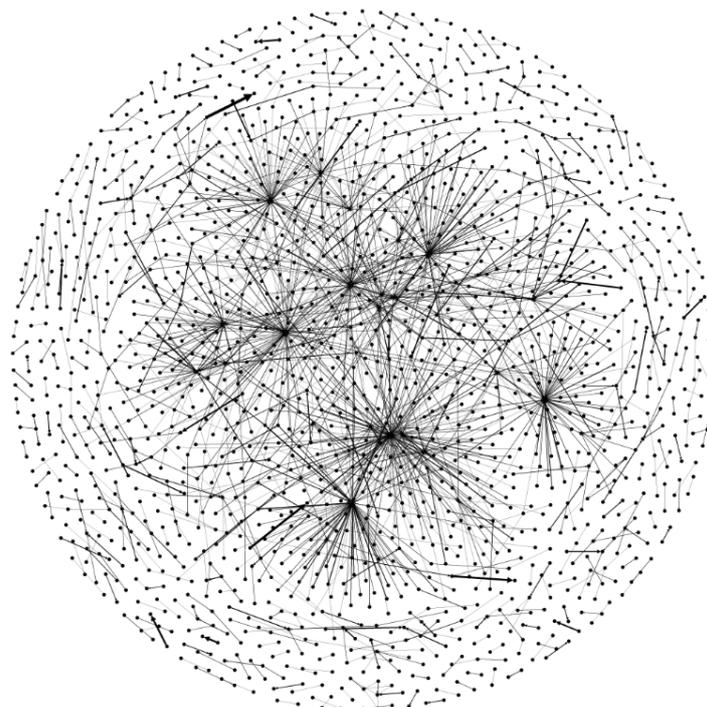

FIGURE 1: Guarantee Network of Outstanding Urban Investment Bonds in China by the End of 2024

2.2   Theoretical Analysis and Research Hypotheses:

2.2.1   Analysis of Implicit Guarantees:

Most financing platforms are established with authorization from local governments, and their debt obligations often carry implicit government credit backing. The market generally expects the public sector to intervene and provide bailouts in the event of default, which significantly depresses the risk pricing of urban investment bonds (Wang et al., 2016), but also distorts risk signals and misallocates financial resources (Luo & Liu, 2016).

To alleviate such distortions, China has successively introduced a series of debt resolution policies. Document No. 43 [2014] of the State Council first clarified the principle of no central government bailout. Document No. 88 [2016] of the General Office of the State Council proposed classified regulation but lacked detailed implementation rules. Document No. 50 [2017] of the Ministry of Finance promoted the construction of an explicit guarantee system through negative lists and market-oriented guarantee mechanisms. Document No. 35 and No. 47 issued in 2023 focused on targeted debt resolution and structural deleveraging, providing directional support to key provinces while strictly controlling new projects.

From the perspective of the guarantee analytical framework, the evolution of implicit guarantees exhibits phased characteristics. The debt restructuring clause in Document No. 43 was interpreted by the market as a continuation of implicit guarantees (Chen et al., 2020). Document No. 50 drove the shift of pricing fundamentals toward explicit guarantees (Ouyang & Wang, 2024). The targeted support in Document No. 35 still implies a logic of "selective support". This policy evolution directly affects the formation of urban investment bond spreads and reshapes market linkages by altering entity behaviors, providing a theoretical foundation for understanding the dynamic changes in network characteristics.

H_1: Although debt resolution policies such as Document 43, Document 50, and Document 35 aim to promote market-oriented clearing, varying degrees of implicit government guarantee still exist in their design.

2.2.2   Network Analysis:

Constructing a spatially correlated network of local government debt risks enables the accurate identification of key nodes and transmission channels of risk contagion from a structural perspective, revealing the dual characteristics of robustness and vulnerability coexisting in the system (Li, 2022). As a core tool for analyzing systemic correlation structures, complex network theory has formed a mature paradigm in research on the cross-entity and cross-market contagion mechanisms of financial risks. Numerous studies have confirmed that network topological features such as degree distribution and clustering coefficient are critical indicators for measuring risk accumulation and outbreak probability (Li et al., 2019; He et al., 2020). Therefore, examining local government debt risks within an integrated network framework is consistent with the evolutionary nature of debt risks and has solid methodological feasibility.

Against this background, this paper constructs two network indicators—issuer node degree and guarantor node degree—to capture how the central position of an issuer in the network structure affects its financing costs. Theoretically, this study introduces complex network analysis into the bond pricing framework, breaking through the limitations of traditional research that only focuses on individual characteristics, and reveals the important role of network externalities in risk pricing. Practically, accurately identifying network centrality features helps to warn against implicit risk contagion caused by joint guarantees, providing a decision-making basis for regulators to identify key nodes and establish a risk early warning system. On this basis, this paper proposes the following hypotheses:

H_2:The impact of network node degree on the issuance spread of urban investment bonds varies dynamically with the strength of implicit guarantees. Specifically, stronger implicit guarantees strengthen the negative effect of node degree on yield spreads, while weaker implicit guarantees amplify the positive effect of node degree on yield spreads. Moreover, explicit guarantees and implicit guarantees exhibit a substitution effect in this moderating mechanism.

III.   RESEARCH DESIGN

3.1   Sample and Data Sources:

This paper collects issuance data of China's urban investment bonds, relevant enterprise data, and provincial local fiscal variables. The data are mainly obtained from the Wind Database, supplemented by the Resset Database. Short-term bonds with a maturity of less than 1 year and long-term bonds with a maturity of more than 10 years are excluded, and continuous variables are winsorized at the 1st and 99th percentiles. The final sample consists of 34,541 bonds issued from March 1, 2014

to March 31, 2024. Macroeconomic data are derived from the *China Statistical Yearbook*, the China Local Government Bond Information Disclosure Platform, and the China Money Network. The econometric software used is Stata 18.0.

3.2   Descriptive Statistical Analysis:

Based on the descriptive statistical results, the mean value of the explanatory variable issuance spread is 1.98 with a standard deviation of 1.11, indicating that the financing costs of urban investment bonds are somewhat differentiated but overall volatility is controllable.

In terms of network characteristics, the mean values of issuer node degree and guarantor node degree are 15.73 and 12.58 respectively, with maximum values reaching 322 and 473, and significantly high standard deviations. This reflects substantial differences in centrality among entities in the urban investment bond guarantee network, with a small number of core entities having far larger connection scales than ordinary entities.

In terms of bond micro characteristics, the mean values of total issuance amount and maturity are 8.35 billion yuan and 4.30 years, consistent with the mainstream issuance characteristics of urban investment bonds. The mean value of explicit guarantee is only 0.20, indicating that most urban investment bonds rely on implicit credit backing. In terms of macro and entity characteristics, the mean value of provincial fiscal self-sufficiency rate is 0.57, reflecting that most provinces rely on transfer payments for fiscal expenditure. The mean value of enterprise type is 0.99, confirming that nearly all urban investment issuers in the sample are state-owned enterprises. The mean registered capital is 8.002 billion yuan with large disparities, and the mean return on net assets is 1.02 with a negative minimum value, reflecting the large divergence in capital scale and weak overall profitability of urban investment platforms.

In addition, the mean values of SHIBOR and FR007 are stable with small volatility, indicating a relatively stable market liquidity environment during the sample period. Overall, the sample covers urban investment entities with different network positions and qualifications as well as diverse characteristics. The data distribution is consistent with the reality of the urban investment bond market, which can provide a reliable foundation for subsequent empirical analysis.

TABLE 2
DESCRIPTIVE STATISTICAL ANALYSIS

	Observations	Mean	Std	Min	Max
Issuance Spread	34541	1.98	1.11	0.32	5.1
Explicit Guarantee	34541	0.2	0.39	0	1
Issuer Node Degree	34541	15.73	20.84	0	322
Guarantor Node Degree	34541	12.58	48.67	0	473
Total Issuance Amount	34541	8.35	5.54	1	30
Maturity	34541	4.3	2.02	1	10
Fiscal Self-sufficiency Rate	34526	0.57	0.15	0.26	0.87
GDP	34532	38199.48	29510.36	2910.1	137008
PPI	34532	100.55	4.59	90.8	115.4
Fixed Asset Investment	33910	7.4	9.84	-27.4	43.9
Inflation Rate	34532	100.04	0.51	98.8	101.3
Growth Rate of Industrial Added Value	34532	6.78	4.86	-12.3	21.5
Money Supply	34541	10.24	1.64	8	13.7
Enterprise Type	34541	0.99	0.09	0	1
Registered Capital	34541	80.02	154.16	1	922.04
ROE	34541	1.02	3.07	-20.48	10.43
Net Asset Liability Ratio	34541	2.25	1.83	0.05	13.45
SHIBOR	34541	2.67	0.79	0.05	13.45
FR007	34541	2.34	0.5	1.4	4

3.3 Empirical Model Specification:

To examine the respective impacts of policy shocks and network characteristics on the issuance spread of urban investment bonds, this paper establishes the following three sets of empirical models.

3.3.1 Heterogeneity of Implicit Guarantees Implied by Policies:

To examine the changing role of explicit guarantees in the issuance pricing of urban investment bonds against the backdrop of evolving implicit guarantees, and to answer whether market-oriented credit enhancement mechanisms can better perform risk-sharing and reduce financing costs when government bailout expectations weaken, this paper first analyzes the dynamic changes in implicit guarantees. Various documents issued during the local government debt management reform provide a convenient setting for this study. We select Document 43, Document 88, Document 50, the outbreak of the COVID-19 pandemic, and Document 35 as time nodes, and use bonds issued six months before and after each event to conduct five sets of difference-in-differences regressions. The specific empirical model is as follows:

$$Spread_{i,p,t} = \alpha_0 + \alpha_1 Treated_i + \alpha_2(Treated_i \times Post_t) + \sum_1^x \theta_x Control_{i,t} + \sum_1^x \mu_x Control_{i,p,t}$$
$$+Time + Province + Industry + IssuerRating + \varepsilon_{i,t}$$

$$(1)$$

where i denotes the individual bond, and p denotes the province (autonomous region / municipality).The dependent variable $Spread_{i,p,t}$ is the difference between the coupon rate of bond i issued at time t and the yield of treasury bonds with the same maturity in the same period.The independent variable Treated$_i$ is a dummy variable indicating whether the bond is an urban investment bond. To mitigate the endogeneity problem caused by omitted variables as much as possible, this paper includes a series of control variables $Control_{i,p,t}$ and $Control_{i,t}$, including bond-level and province-level control variables.The regression controls for monthly time fixed effects (Time), province fixed effects (Province), industry fixed effects (Industry), and issuer rating fixed effects (IssuerRating).

This paper expects that the strength of implicit guarantees for urban investment bonds will change with the issuance of relevant policies. Before the promulgation of policy documents, the market has high expectations of implicit guarantees for urban investment bonds, so their issuance spreads are significantly lower than those of the control group, corresponding to the coefficient $\alpha_1 < 0$.As the implementation effects of different policies vary, if the degree of implicit guarantees weakens after the policy shock, the coefficient α_2 will be positive ($\alpha_2 > 0$).Conversely, if the policy shock increases the degree of implicit guarantees, the coefficient α_2 will be negative ($\alpha_2 < 0$).

3.3.2 The Substitution Relationship Between Explicit Guarantees and Implicit Guarantees:

From a theoretical perspective, the substitution relationship between explicit guarantees and implicit guarantees can be derived: when implicit guarantees exist, the importance and actual value of explicit guarantees are weakened, leading to differences in the impact of explicit guarantees on the issuance pricing of urban investment bonds and non-urban investment bonds. After understanding the changing trend of the degree of implicit guarantees, this paper constructs the following model to examine the changing role of explicit guarantees in the pricing of urban investment bonds:

$$Spread_{i,p,t} = \beta_0 + \beta_1(CE_i \times Post_t) + \beta_2(Treated_i \times Post_t) + \beta_3 CE_i + \beta_4 Treated_i + \sum_1^x \theta_x Control_{i,t}$$
$$+ \sum_1^x \mu_x Control_{i,p,t} + Time + Province + Industry + IssuerRating + \varepsilon_{i,t}$$

$$(2)$$

The core explanatory variable CE_i is a dummy variable for explicit guarantee, which takes the value of 1 if the bond is guaranteed, and 0 otherwise. β_1 captures the impact of policy shocks on the effect of explicit guarantees. β_2 reflects the change in credit spreads of urban investment bonds, i.e., the impact of policy shocks on implicit guarantee expectations.

Theoretically, as implicit guarantees are weakened by policies, explicit guarantees can better play a role in sharing bond risks and reducing financing costs. We therefore expect opposite signs for β_1 and β_2: when implicit guarantee expectations are weakened, $\beta_1 < 0$ and $\beta_2 > 0$.

3.3.3 The Impact of Network Structure Information on Issuance Spread under the Effect of Implicit Guarantees:

To examine the basic effect of network characteristics on urban investment bonds and the moderating effect of policy periods on such impact, this paper constructs the following model:

$$Spread_{i,p,t} = \gamma_0 + \gamma_1(Treated_i \times \text{I}_{\text{Deegree}}) + \gamma_2(Treated_i \times \text{G}_{\text{Deegree}}) + \gamma_3\text{I}_{\text{Deegree}}$$
$$+\gamma_4\text{G}_{\text{Deegree}} + \gamma_5 Treated_i + \sum_1^x \theta_x Control_{i,t} + \sum_1^x \mu_x Control_{i,p,t}$$
$$+Time + Province + Industry + IssuerRating + \varepsilon_{i,t}$$

$$(3)$$

where coefficients γ_1 and γ_2 are the coefficients of the core explanatory variables, identifying the pricing effects of issuer node degree and guarantor node degree on urban investment bonds; γ_3 and γ_4 represent the coefficients of issuer node degree and guarantor node degree on issuance spread across all bonds.

IV. REGRESSION RESULTS AND ANALYSIS

4.1 Analysis of the Heterogeneity of Implicit Guarantees Implied by Policies:

According to the regression results in Table 3, this paper analyzes the dynamic changes in implicit guarantees from the perspective of policy and pandemic shocks. Column (1) shows that the coefficient of urban investment bonds is significantly negative, which confirms the market expectation of government bailouts. The interaction terms in Columns (2) to (6) indicate that: After the issuance of Document 43, the issuance spread narrowed further, as the market interpreted "debt replacement" as a strengthening of implicit guarantees. Coupled with weaker-than-expected implementation and local economic stimulus, guarantee expectations were elevated. Although Document 88 attempted to regulate the debt boundary, its effect was limited. Implicit guarantees weakened significantly after the implementation of Document 50, which promoted the development of explicit guarantees by refining regulations, prohibiting commitment letters, and encouraging market-oriented guarantees. Expectations rebounded significantly after the pandemic shock, due to increased local financing dependence and slower policy implementation amid economic uncertainty. Document 35 reduced the issuance spread, as the market interpreted targeted restructuring and strict project controls as a demonstration of systemic risk management capacity, which in turn strengthened policy bailout expectations.

TABLE 3
HETEROGENEITY OF IMPLICIT GUARANTEES IMPLIED BY POLICIES

	(1)	(2)	(3)	(4)	(5)	(6)
	All Period	Doc 43	Doc 88	Doc 50	the COVID-19	Doc 35
Treated_Post	——	-0.420***	0.00307	0.180***	-0.237***	-0.392***
		(-4.90)	-0.04	-2.67	(-3.99)	(-13.90)
Treated	-0.200***	-0.055	-0.403***	-0.387***	-0.0875	0.0306
	(-17.25)	(-1.07)	(-5.17)	(-6.68)	(-1.63)	-1.05
Amount	-0.0218***	-0.0327***	-0.0107***	-0.0160***	-0.0182***	-0.0141***
	(-28.83)	(-10.52)	(-3.09)	(-6.01)	(-6.58)	(-9.49)
Maturity	0.0142*	0.0153	0.039	0.153***	0.101***	0.0484***
	-1.76	-0.41	-1.04	-5.23	-3.14	-2.58
RED	0.0844***	0.669***	0.403***	0.368***	0.329***	0.0602**
	-5.29	-5.14	-7.19	-8.97	-4.86	-2.41
PO	0.0662***	0.204*	0.343***	0.193***	0.103***	-0.0851***
	-6.9	-1.67	-8.57	-6.48	-3.36	(-4.19)
Fiscal Self-sufficiency Rate	0.847***	1.869	-0.0572	-6.224***	-0.985	3.203***
	-6.07	-1.35	(-0.05)	(-3.62)	(-1.14)	-3.58
Ln(GDP)	-0.0892***	0.544**	-0.274	0.31	-0.26	0.633**
	(-5.86)	-2.46	(-0.65)	-1.34	(-0.99)	-2.18
PPI	0.00923***	0.000698	-0.0182	0.0118	-0.00545	-0.0265**
	-4.67	-0.03	(-1.41)	-0.85	(-0.29)	(-2.10)
Fixed Asset Investment	-0.00487***	0.00114	0.000697	0.00347	-0.0047	-0.00532**
	(-7.43)	-0.12	-0.1	-0.6	(-1.47)	(-2.07)

Inflation Rate	0.00694	0.0749	-0.0247	0.151**	0.143**	-0.0625
	-0.43	-1.06	(-0.25)	-2.3	-2.5	(-1.04)
Growth Rate of Industrial Added Value	0.00171*	-0.00531	0.014	0.0113	0.00965**	-0.00493***
	-1.69	(-0.40)	-1.19	-1.45	-2.15	(-2.61)
Money Supply	0.126***	0	0	0.453**	0	0
	-14.17	0	0	-2.53	0	0
Enterprise Type	-0.157**	0	-0.651**	0.82	-1.493***	-0.314***
	(-2.19)	0	(-2.35)	-1.6	(-5.23)	(-3.53)
Registered Capital	-0.000357***	0.000112	-0.000319**	-0.000369***	-0.000385***	-0.000436***
	(-13.25)	-0.67	(-2.33)	(-3.05)	(-4.71)	(-8.85)
ROE	-0.0215***	-0.00693	-0.00555	-0.0150**	-0.0225***	-0.0225***
	(-15.14)	(-1.03)	(-0.61)	(-2.20)	(-3.38)	(-10.33)
Net Asset Liability Ratio	-0.0278***	-0.00338	-0.0200*	-0.0299***	-0.0380***	-0.0280***
	(-11.75)	(-0.27)	(-1.73)	(-2.82)	(-3.61)	(-7.64)
Shibor	-0.00662	-0.0105	1.003**	0.900***	0.037	-0.15
	(-0.25)	(-0.06)	-2.21	-4.58	-0.29	(-0.61)
FR007	0.127***	0.0667*	0.0463	0.0785*	0.112	0.0991***
	-8.12	-1.67	-0.7	-1.66	-1.62	-3.74
Constant	-0.275	-10.53	6.502	-22.67***	-6.983	2.778
	(-0.16)	(-1.27)	-0.67	(-2.98)	(-1.05)	(-0.43)
Time	YES	YES	YES	YES	YES	YES
Province	YES	YES	YES	YES	YES	YES
Industry	YES	YES	YES	YES	YES	YES
IssuerRating	YES	YES	YES	YES	YES	YES
N	31312	973	1091	1407	3149	8061
R^2	0.61	0.657	0.579	0.505	0.601	0.579

Notes: ∗, ∗∗, and ∗∗∗ denote statistical significance at the 10%, 5%, and 1% levels, respectively. Robust standard errors are reported in parentheses. Columns (2) to (6) correspond to newly issued bonds before and after the policy shocks. The time window restriction results in a decrease in sample size, the same for the following tables.

4.2   The Substitution Relationship between Explicit Guarantees and Implicit Guarantees:

According to Table 4, the phased regression reveals the dynamic interaction between explicit guarantees and implicit guarantees under different policy shocks. In the full-sample regression, the main effect of implicit guarantees is significantly negative, while that of explicit guarantees is significantly positive, confirming the dominant role of implicit guarantees and their substitution relationship with explicit guarantees in the long-run equilibrium. However, this framework undergoes structural changes under policy shocks.

Specifically: During the period of Document 43, the interaction term of implicit guarantees is significantly negative, while that of explicit guarantees is positive but insignificant, indicating that market expectations of implicit guarantees strengthened instead, and explicit guarantees did not play an incremental role. During the period of Document 88, the interaction terms of both types of guarantees are insignificant, as the market adopted a wait-and-see attitude toward the policy. During the period of Document 50, the interaction term of implicit guarantees is significantly positive (expectations weakened), while that of explicit guarantees is negative, suggesting that explicit guarantees began to show a potential substitution effect after the weakening of implicit guarantees, although a market consensus had not yet been formed. During the COVID-19 pandemic and the period of Document 35, the interaction terms of both guarantees are significantly negative, indicating that in the face of systemic risks or overall debt restructuring policies, investors no longer distinguish between the two, but regard them as superimposed risk mitigation tools, resulting in a synergistic enhancement effect.

TABLE 4
THE SUBSTITUTION RELATIONSHIP BETWEEN EXPLICIT GUARANTEES AND IMPLICIT GUARANTEES

	(1)	(2)	(3)	(4)	(5)	(6)
	All Period	Doc 43	Doc 88	Doc 50	the COVID-19	Doc 35
Treated_Post	——	-0.416***	-0.0171	0.129*	-0.209***	-0.310***
		(-4.74)	(-0.21)	-1.92	(-3.51)	(-10.98)
CE_Post	——	0.0369	0.09	-0.0415	-0.125	-0.436***
		(-0.27)	(-1.09)	(-0.61)	(-1.59)	(-10.07)
Treated	-0.204***	-0.0311	-0.368***	-0.354***	-0.118**	-0.00992
	(-17.66)	(-0.61)	(-4.69)	(-6.25)	(-2.19)	(-0.34)
CE	0.0689***	-0.307***	-0.465***	-0.430***	0.249***	0.264***
	-4.96	(-5.61)	(-6.97)	(-7.23)	-3.86	-7.16
Control	YES	YES	YES	YES	YES	YES
N	31312	973	1091	1407	3149	8061
R^2	0.611	0.671	0.607	0.557	0.604	0.586

4.3 The Impact of Network Structure Information on Issuance Spread under Implicit Guarantees:

Table 5 presents the dynamic impacts of issuer node degree and guarantor node degree on bond issuance spreads under implicit guarantees. The full-sample results show that the effects of node degree differ significantly between urban investment bonds and non-urban investment bonds: for non-urban investment bonds, the effect of guarantor node degree is insignificant, whereas for urban investment bonds, it significantly reduces spreads, reflecting the credit endorsement effect under implicit guarantees.

In terms of sub-periods: During the Document 43 period, the market interpreted debt replacement as a strengthening of implicit guarantees. The spread-increasing effect of issuer node degree in non-urban investment bonds was offset in urban investment bonds, and the spread-suppressing effect of guarantor node degree was weakened. During the Document 88 period, although the policy attempted to clarify the debt boundary, implicit guarantees still persisted, and the market-based credit role of guarantor node degree began to emerge. During the Document 50 period, the prohibition of implicit guarantees promoted market-oriented transformation. The effect of node degree returned to market logic, the difference in the impact of issuer node degree narrowed, and the suppressing effect of guarantor node degree became more significant for urban investment bonds. During the pandemic shock period, expectations of implicit guarantees rebounded. The coefficients of both issuer node degree and guarantor node degree tended to be negative, but the latter was insignificant, confirming that stronger implicit guarantees suppress the signal role of node degree. During the Document 35 period, which focused on debt resolution, expectations of implicit guarantees rebounded slightly, and the effect of node degree became divergent again.

Overall, the impact of node degree is highly linked to the strength of implicit guarantees: the stronger the implicit guarantee, the more the market-based credit signal of node degree is suppressed; the weaker the implicit guarantee, the more significant its pricing effect. This confirms the transition of credit pricing for urban investment bonds from "implicit guarantee dependence" to "market-oriented credit dominance".

TABLE 5
THE IMPACT OF NETWORK STRUCTURE INFORMATION ON ISSUANCE SPREAD UNDER IMPLICIT GUARANTEES

	All Period	Doc 43	Doc 88	Doc 50	the COVID-19	Doc 35
I_Degree	0.00105***	0.0196**	0.00889*	0.00355	0.00540***	-0.00114**
	-4.26	-2.47	-1.65	-0.84	-3.22	(-2.55)
Treated_I_Degree	0.00107***	-0.00471	-0.000806	-0.0002	-0.00562***	0.00195***
	-3.29	(-0.43)	(-0.12)	(-0.04)	(-2.76)	-3.17
G_Degree	0.000163	-0.00540***	-0.0221***	-0.0241**	-0.000232	0.00121***
	-0.6	(-4.57)	(-3.49)	(-2.21)	(-0.28)	-2.63
Treated_G_Degree	-0.00111***	0.00126	0.0150**	0.0184*	-0.000429	-0.00181***
	(-3.92)	-1.01	-2.34	-1.69	(-0.45)	(-3.74)
Treated	-0.219***	-0.11	-0.384***	-0.275***	-0.169***	-0.154***
	(-16.25)	(-1.43)	(-4.36)	(-4.27)	(-3.39)	(-5.43)
Control	YES	YES	YES	YES	YES	YES
N	31312	973	1091	1407	3149	8061
R^2	0.612	0.663	0.601	0.553	0.6	0.572

V.   ROBUSTNESS CHECKS

5.1   The Substitution Relationship between Network Structure, Explicit Guarantees and Implicit Guarantees Acknowledgement:

Table 6 examines the substitution relationship between explicit guarantees and implicit guarantees under network structure. In the left column without explicit guarantees, the coefficient of Treated is significantly negative, confirming that implicit guarantees reduce the issuance spreads of urban investment bonds. The main effect of issuer node degree is significantly positive, and the interaction term with urban investment bonds is also significantly positive, indicating that its risk signal is still partially transmitted. The main effect of guarantor node degree is insignificant, whereas its interaction term with urban investment bonds is significantly negative, reflecting the strengthened credit endorsement of the guarantor's network status under implicit guarantees. In the right column with explicit guarantees included, the coefficient of CE is significantly positive, reflecting that explicit guarantees are associated with higher spreads among non-urban investment bonds. The interaction term of issuer node degree becomes significantly negative, while the interaction term of guarantor node degree becomes insignificant. This suggests that implicit guarantees mask the risk signals of both explicit guarantees and node degree, and their network value is dominated by the combined effect.

Overall, in the presence of implicit guarantees, the effect of explicit guarantees is weakened, and the credit signal of node degree is also diminished. This is consistent with the theoretical expectation that the stronger the implicit guarantee, the more limited the independent role of explicit guarantees.

TABLE 6
THE SUBSTITUTION RELATIONSHIP BETWEEN NETWORK STRUCTURE, EXPLICIT GUARANTEES AND IMPLICIT GUARANTEES

	Spread		Spread
Treated	-0.219***	CE	0.159***
	(-15.78)		-9.53
I_Degree	0.00169***	I_Degree	0.00169***
	-6.01		-6.01
G_Degree	-0.0158	G_Degree	-0.0158
	(-1.34)		(-1.34)
Treated _G_Degree	-0.00141***	Treated _G_Degree	0.0159
	(-3.76)		-1.34
Treated _I_Degree	0.000717**	Treated _I_Degree	-0.00150***
	-2.05		(-3.07)
Constant	-0.632	Constant	-0.632
	(-0.36)		(-0.36)
Control	YES	Control	YES
N	31312	N	31312
R^2	0.614	R^2	0.614

5.2   Parallel Trends Test:

The results of the parallel trends test show that before the policy shocks of Document 43, Document 50, the pandemic, and Document 35, the coefficients of the interaction terms between the treatment variable and the monthly dummy variables are all insignificant. The treatment group and the control group exhibit no systematic difference in the credit spreads of urban investment bonds, which satisfies the parallel trends assumption.
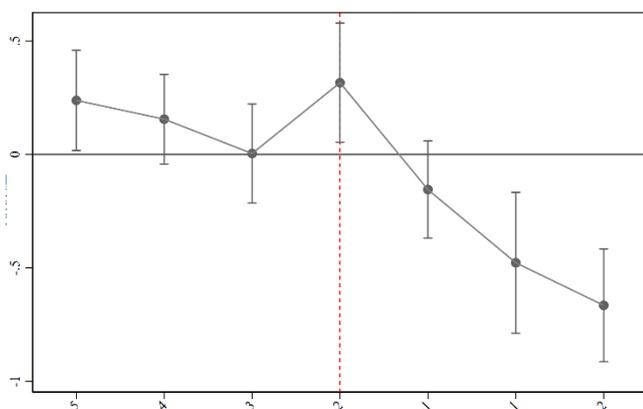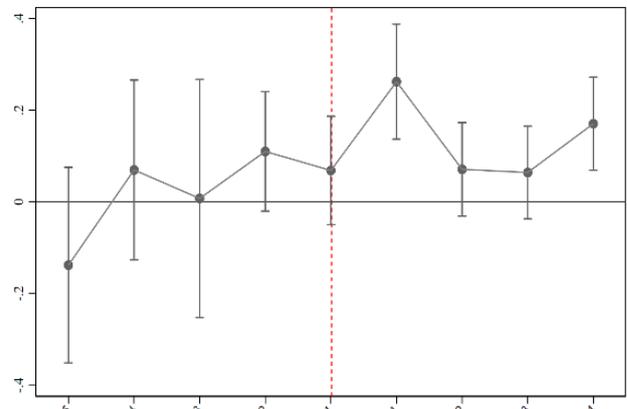

FIGURE 2 (1) Parallel Trends Test for Document 43

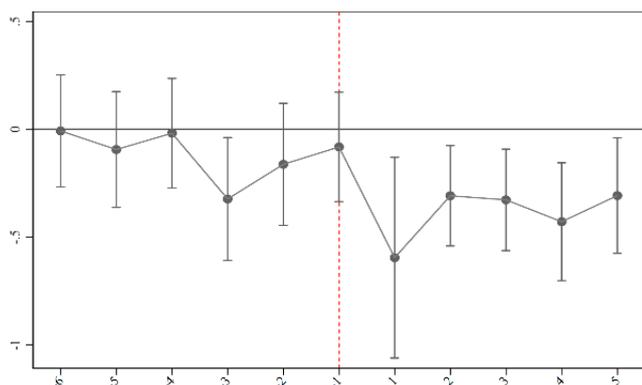**FIGURE 2 (2) Parallel Trends Test for Document 50**

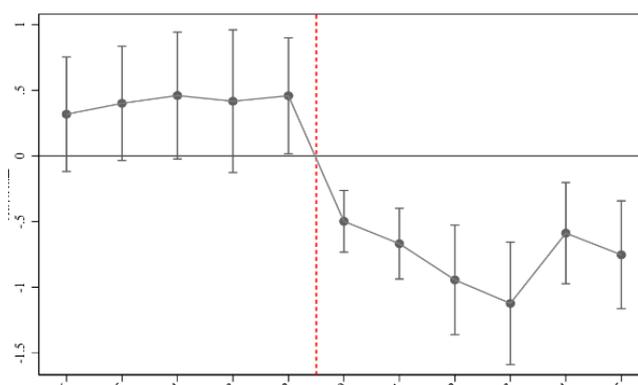**FIGURE 2 (3) Parallel Trends Test for the COVID-19   FIGURE 2 (4) Parallel Trends Test for Document 35**

5.3   PSM-DID Test:

To mitigate the endogeneity problem caused by sample self-selection, this paper further employs the PSM-DID method for re-estimation. We take the total issuance amount, maturity, puttable provision, and callable provision of bonds as covariates. The propensity score is estimated using a Logit model, and 1:1 and 1:3 nearest-neighbor matching with replacement is implemented. Benchmark regression analysis is then conducted using the matched sample. The results show that the sign and significance level of the coefficients of the core explanatory variables are generally consistent with those of the benchmark regression, indicating that the estimated policy effects are not significantly affected by sample selection bias. The findings support the original conclusions.

VI.   CONCLUSIONS

This paper constructs a dynamic network indicator system to systematically examine the interactive effects of policies (Document 43, Document 50, pandemic shock, and Document 35) and network structure on the issuance spreads of urban investment bonds. The conclusions are as follows:

First, the policy effects exhibit significant heterogeneity, depending on the market's interpretation of policy connotations. Debt replacement under Document 43 was regarded as credit endorsement, thus reducing spreads; Document 50 effectively transmitted the signal of breaking rigid repayment; and targeted support under Document 35 strengthened expectations of government bailouts. Second, the pricing weight of network characteristics is structurally reshaped with the policy environment: issuer node degree shifts from a policy transmission channel to a market-oriented signal, while guarantor node degree reverses from credit enhancement to a risk transmission hub, confirming the transition of the pricing benchmark from relationship dependence to risk-based pricing. Third, the pricing of urban investment bonds systematically deviates from traditional financial theories. Variables related to government credit, such as enterprise ownership and issuer rating, become central to pricing, highlighting the dominant role of "government credit discount".

Accordingly, we propose the following recommendations: improve the policy transmission mechanism and stabilize market expectations through regular communication; establish a network risk monitoring system, incorporate node degree into the regulatory framework, and promote the diversification of the guarantee system; deepen the reform of information disclosure and credit rating, strengthen the evaluation of individual solvency, and provide institutional support for market-oriented pricing. This study provides a new perspective for understanding the pricing mechanism of urban investment bonds and also offers empirical evidence for debt risk prevention and control.

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CONFLICT OF INTEREST

The authors declare that there is no conflict of interest regarding the publication of this paper.

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