



Capital Replenishment and Credit Supply: Empirical Evidence from Banks' Issuance of Perpetual Bonds

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Abstract. Commercial banks are crucial in serving the real economy, with bank capital as the foundation. However, strict regulations and the need to bring off-balance-sheet activities back on-balance-sheet pose challenges. This makes it hard for banks to achieve "regulatory stability" and "steady growth" simultaneously, impeding monetary policy transmission. In 2019, the central bank supported banks in issuing perpetual bonds to replenish other Tier 1 capital and created the CBS tool. Using data from 2015-2022 on banks' perpetual bond issuance and bank and enterprise financial reports, and applying the multi-period difference-in-differences method, this paper finds that banks' issuance of perpetual bonds significantly boosts bank credit growth and corporate lending. The effects are more evident for weaker banks and stronger enterprises.

Keywords: Bank perpetual bond; Capital replenishment; Bank credit; Enterprise loan

1 Introduction

Bank capital is crucial for bank credit (Goldstein et al, 2024) ^[1]. More capital means more lending funds for banks (Jia et al., 2023) ^[2]. Higher capital adequacy ratio spurs more credit expansion. Yet, banks may keep a high ratio for regulatory or earnings-management (Cappelletti et al., 2022) ^[3], reducing lendable funds. So, higher ratio may lead to fewer loans. Overall, while much research exists on bank capital's credit impact, little focuses on capital replenishment, especially perpetual bond empirical studies.

This paper selects a total of 199 commercial banks, including 5 state-owned commercial banks, 12 joint stock commercial banks, and 182 city commercial banks and rural commercial banks. Among them, 88 banks have issued perpetual bonds, with a total of 133 pieces of data on perpetual bond issuance. The study takes the four-year period before and after the first issuance of perpetual bonds by banks as the sample research interval, that is, from 2015 to 2022, and combines the credit data of listed companies. Through empirical research, it is found that after commercial banks issue perpetual bonds, the credit growth rate is significantly increased, and the bonds play a role of providing timely help. Moreover, under the premise of controlling corporate

demand, the loan amount to enterprises increases. All the above results indicate that the issuance of perpetual bonds enhances the ability of banks to serve the real economy.

This paper makes contributions in three main aspects. Firstly, by taking bank perpetual bonds as the research sample, it explores the impact of bank capital on bank credit from the perspective of capital replenishment. This fills the gap in previous literature which mainly studied the influence of bank capital on bank credit from two static perspectives: capital level and capital structure (Jia et al., 2023; Cappelletti et al., 2022)^{[2][3]}. Secondly, from the perspective of capital replenishment, it validates the effectiveness of the credit transmission channel, establishing a complete logical chain of "capital replenishment-enhancement of bank credit capacity-increase in corporate loans", which is basically consistent with the research findings of Zhou et al. (2022)^[4]. Finally, it enriches the empirical research on bank perpetual bonds, demonstrating the effectiveness of the issuance of perpetual bonds in enhancing banks' ability to serve the real economy.

2 Theoretical Analysis and Research Hypotheses

Banks' high quality capital replenishment spurs credit expansion (Goldstein et al, 2024)^[1]. Tier-1 or Core tier-1 capital mainly comes from banks' own funds, partly from equity-based tools. Less pressured by subordinated bonds' extension, it has strong liquidity for flexible credit use. Bank characteristics also affect capital-replenishment's economic effects. Le Lan et al. (2023) called banks with low capital adequacy "constrained"^[5]. Extra capital buffer for them helps return to core credit, boosting corporate lending. Besides these ratios, Weston & Yimfor (2023) and Zhou et al. (2022) found deposit - liability - side funding pressure restricts bank credit, making corporate external financing harder, creating a "tied financing dilemma" between banks and firms^{[4][6]}.

From banks' capital replenishment via perpetual bond issuance, they get higher quality capital, spurring credit supply boost (Feldhütter et al., 2024)^[7]. For constrained banks, low capital curbing credit supply. Perpetual bond sourced capital, a "timely aid", aids core credit business growth. Issuing such bonds optimizes liability structure (Avdjiev et al., 2020)^[8], facilitating corporate credit. For unconstrained banks, with more capital replenishment channels, less regulatory pressure, and a sounder liability structure, perpetual bond added capital is "icing on the cake". They can use it more freely, with potentially less significant credit effects.

H1. Credit Expansion Effect: Banks issuing perpetual bonds will increase credit. The credit promotion effect is more evident in constrained banks.

Theoretically, banks can enhance loan-supply via perpetual-bond issuance. Credit - transmission theory posits bank credit-granting impacts firms' credit access. Jia et al (2023) find tightened bank credit supply reduces firms' access^[2]. Khwaja & Mian (2008) propose the K-M framework, splitting credit access changes into bank and firm side factors^[9]. Controlling firm side factors, it assesses bank side impacts. Domestic studies indicate firm traits affect banks credit decisions. For credit metrics, banks closely monitor borrowers' assets and profitability (Degryse et al., 2023; Bertoni et al., 2023)^{[10][11]}. Despite low threshold issuance, bank perpetual bonds have high interest

and redemption pressure. This requires rational capital use, especially in borrower screening for lending (Bonfim et al., 2023) ^[12].

H2. Real economy Financing Effect: Banks' issuance of perpetual bonds will expand the scale of loans to the real economy. The increase will be more significant for enterprises with stronger profitability.

3 Research Design

3.1 Data Sources and Sample Selection

In this paper, perpetual bond issuance data comes from the Choice Financial Terminal, bank financial data from the CSMAR database, and macro data from the National Statistical Yearbook and the People's Bank of China's official website. Since commercial banks began issuing perpetual bonds for capital replenishment in 2019, the research sample interval is set as the four-year period around banks' first issuance, i.e., 2015-2022. To prevent missing values from affecting empirical results, bank samples with three consecutive years missing financial data are removed. Also, 1% winsorization is applied to banks' continuous financial data.

To study the impact of banks' perpetual bond issuance on corporate credit, following Zhou et al. (2022) ^[4], a bank-enterprise-year matching dataset is constructed using credit-granting info of Chinese listed firms from 2015-2022. Loan and corporate financial data is from the CSMAR database. To reduce extreme value interference and enhance result reliability, 1% winsorization is done on enterprises' continuous financial data.

3.2 Model Specification

This paper adopts the multi period difference in difference model to examine the impact of banks' issuance of perpetual bonds on the growth rate of bank credit and corporate loans. Heterogeneity analysis is conducted through median grouping. The specific model settings are as follows:

$$lnloan_{i,j,t} = \beta_0 + \beta_1 post_{i,t} + \beta_2 X_{i,t-1} + \beta_3 Z_{j,t-1} + \beta_4 \sum year \times Stkcd + \epsilon_t$$

Among them, the subscripts i, j, t represent the bank, the enterprise, and the year respectively. Among them, the explained variable $lnloan$ respectively represents the bank's credit growth rate and the logarithm of the credit limit granted by the bank to enterprises. The interaction fixed effect of $\sum year \times Stkcd$ is used to control the enterprise's demand (Zhou et al., 2022) ^[4]. The core variable is $post$. It is a dummy variable. If it is the year when a bank issues perpetual bonds or any subsequent year, the value is 1; otherwise, it is 0. By judging the sign of β_1 , we can determine the economic effect of the issuance of perpetual bonds and thus verify the hypothesis.

4 Empirical Analysis

Table 1 shows the regression outcomes regarding the influence of banks' perpetual bond issuance on bank credit supply, along with the heterogeneity analysis. The findings in the column (1) indicate a significantly positive coefficient for "post". Evidently, the issuance of perpetual bonds by banks can elevate the growth rate of bank credit, thereby augmenting banks' capacity to serve the real economy. The column (2) and column (3) pertain to the heterogeneity analysis. The column (2) corresponds to constrained banks (characterized by a relatively low capital adequacy ratio), where the coefficient of post is significantly positive. In contrast, the column (3) represents unconstrained banks (characterized by a relatively high capital adequacy ratio), with a nonsignificant coefficient. Results of the heterogeneity analysis suggest that for constrained banks, the issuance of perpetual bonds by commercial banks can be of critical significance. Nevertheless, for unconstrained banks, the capital replenishment derived from the issuance of perpetual bonds does not exert a significant impact on credit supply, and the so called "icing on the cake" economic effect remains insignificant. This research finding aligns with that of Bonfim et al. (2023) ^[12].

Table 1. Credit Expansion Effect

variable	(1) Inloan	(2) Inloan	(3) Inloan
post	0.0354*** (0.0116)	0.0411*** (0.0107)	0.0194 (0.0107)
cons	10.2694*** (2.2618)	7.0390*** (1.4962)	13.1343*** (3.2432)
N	1073	549	524
Controls	Yes	Yes	Yes
Bankcd	Yes	Yes	Yes
Year	Yes	Yes	Yes
Model	HDFE	HDFE	HDFE
r2	0.5743	0.6402	0.5790

Table 2 shows the regression results of how perpetual bond issuance impacts enterprises' credit access. In column (1), when controlling enterprises' annual demand changes, the coefficient is significantly positive in the model test. This means banks' perpetual bond issuance significantly boosts loans to listed firms. It validates the bank credit transmission channel's effectiveness: banks issuing perpetual bonds enhances credit supply, which in turn increases enterprise loans, forming a clear "issuance-capacity boost-loan increase" chain. It also directly shows that such issuance helps unclog the monetary policy transmission, ease enterprises' financing stress, and aid real economy development. In column (2), the coefficient is positive, but in column (3) it's not. This indicates that banks issuing perpetual bonds increase loans to more profitable enterprises. Yet, in the less profitable enterprise sample, no such positive effect is seen.

This finding further validates Hypothesis 2. It might imply that while perpetual bond issuance provides extra capital for lending, due to higher bond interest than regular deposits and a 5-year repayment period for most bonds, banks face principal and interest repayment pressure. So, after issuance, they prefer lending more to profitable enterprises.

Table 2. Real economy Financing Effect

variable	(1) lnloan	(2) lnloan	(3) lnloan
post	0.0272* (0.0147)	0.0406** (0.0195)	0.0178 (0.0207)
cons	16.1903*** (0.2071)	7.9312*** (0.9487)	10.1866*** (0.7215)
N	44393	21172	23731
Control	YES	YES	YES
Stkcd	NO	YES	YES
Year	NO	YES	YES
Stkcd×year	YES	NO	NO
Model	HDFE	HDFE	HDFE
r ²	0.6858	0.6503	0.6451

5 Conclusions

This paper, through empirical research, reveals that the issuance of perpetual bonds by banks has a stimulative effect on bank loan and for constrained banks, this stimulating effect is even more pronounced. This finding enriches the research on the impact of bank capital on bank credit from a dynamic perspective of capital replenishment, and extends this impact to the corporate credit level. Those banks that issue perpetual bonds will increase loans to enterprises with strong profitability. This provides further support for the economic effects of banks' issuance of perpetual bonds.

On the government side, relevant policies should be introduced to reduce the cost of banks' issuance of perpetual bonds, encourage such issuance, and further enhance the banks' ability to serve the real economy.

This topic still has room for in-depth research. Although the issuance of perpetual bonds alleviates the pressure on the liability side of banks, whether it can improve the situation of banks' short term lending for long term investment remains unexamined. In the future, answering this question will be valuable and necessary for evaluating the economic effects of the bank issuance of perpetual bonds.

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