INSTITUTO
UNIVERSITÁRIO
DE LISBOA

The Influence of State-owned Enterprises Issuing Perpetual Bonds on Operating Performance

YUAN Ye

Doctor of Management

Supervisors:
PhD Ilídio Tomás Lopes, Assistant Professor,
ISCTE University Institute of Lisbon
PhD LI Qiang, Professor,
University of Electronic Science and Technology of China

December, 2024

BUSINESS
SCHOOL

Marketing, Operations and General Management Department

The Influence of State-owned Enterprises Issuing Perpetual Bonds on Operating Performance

YUAN Ye

Doctor of Management

Supervisors:
PhD Ilídio Tomás Lopes, Assistant Professor,
ISCTE University Institute of Lisbon
PhD LI Qiang, Professor,
University of Electronic Science and Technology of China

December, 2024

BUSINESS
SCHOOL

Marketing, Operations and General Management Department

The Influence of State-owned Enterprises Issuing Perpetual Bonds on Operating Performance

YUAN Ye

Doctor of Management

Jury:

PhD Liliana Marques Pimentel, Assistant Professor,
Faculdade de Economia da Universidade de Coimbra
PhD Wang Xiaoming, Associate Professor,
UESTC - University of Electronic Science and Technology of China
PhD Inna Choban de Sousa Paiva, Associate Professor with Habilitation,
ISCTE University Institute of Lisbon
PhD Ilídio Tomás Lopes, Assistant Professor,
ISCTE University Institute of Lisbon
PhD Elizabeth Reis, Full Professor,
ISCTE University Institute of Lisbon

December, 2024

Declaration

I declare that this thesis does not incorporate without acknowledgment any material previously submitted for a degree or diploma in any university and that to the best of my knowledge it does not contain any material previously published or written by another person except where due reference is made in the text.

Signed: YUAN Ye Date: 2024.12.1

Name: YUAN Ye

作者申明

本人郑重申明：除了论文致谢中明确说明并致以谢意的部分外，所呈交的论文不包含任何他人或作者本人已用于获得任何教育机构的学位和证书而使用过的材料。同时尽我所知，除了文中特别加以标注引用的内容外，本论文不包含任何其他个人或集体已经发表或撰写的成果作品。

作者签名： 袁晔 日期：2024.12.1

姓名(拼音)：YUAN Ye

[This page is deliberately left blank.]

Abstract

After the 2008 subprime crisis, the Chinese government launched a RMB 4 trillion fiscal expansion plan. As the plan progressed, the leverage levels of Chinese state-owned enterprises (SOEs) continued to rise rapidly. In December 2015, the Central Economic Work Conference proposed the reform goal of "deleveraging" for SOEs. Since perpetual bonds can effectively adjust the ratio of debt to equity, they have become one of the means for SOEs to deleverage. However, the rapid increase in the issuance of perpetual bonds has also raised concerns about potential hidden financial risks and impact on corporate operating performance. This research collects information on 4,946 perpetual bonds issued by 953 Chinese enterprises from 2013 to the end of 2023 from the Wind Database, employing a fixed-effects model to analyze the characteristics of enterprises issuing perpetual bonds, as well as the impacts of perpetual bond on the financial stress, operating performance, and short-term stock prices of non-financial SOEs in China. The results show that: First, a high leverage ratio is the most prominent feature of issuing enterprises, "deleveraging" being the primary motivation. Second, issuing perpetual bonds can alleviate short-term debt pressure and temporarily reduce the leverage ratio on the books. However, the reduction in leverage is achieved by hiding debt and thus cannot relieve the long-term debt repayment pressure. Third, perpetual bonds can increase the operating profit margin but not the return on equity, as the expansion effect of operating profit is diluted by the expansion of equity. Fourth, because perpetual bond financing reflects the financial distress of a company, the issuance of perpetual bonds leads to a decline in the stock price.

Keywords: State-owned enterprises; Perpetual bond; Operating performance; Deleveraging; Financial pressure

JEL: G32; M21

[This page is deliberately left blank.]

Resumo

Após a crise do *subprime* de 2008, o governo chinês lançou um plano de expansão orçamental de 4 mil milhões de iuanes. À medida que o plano avançava, os níveis de alavancagem das empresas públicas chinesas continuaram a aumentar rapidamente. Em dezembro de 2015, a Conferência Central do Trabalho Económico propôs o objetivo de reformar a desalavancagem das empresas públicas. Uma vez que as obrigações perpétuas podem ajustar eficazmente o rácio entre a dívida e o capital próprio, tornaram-se um dos meios de desalavancagem das empresas públicas. No entanto, o rápido aumento da emissão de obrigações perpétuas também suscitou preocupações quanto aos potenciais riscos financeiros ocultos e ao impacto no desempenho operacional das empresas. Esta pesquisa tem como base dados sobre 4.946 obrigações perpétuas emitidas por 953 empresas chinesas entre 2013 e o final de 2023. Foram recolhidos a partir da Wind Database, tendo-se utilizado um modelo de dados em painel com efeitos fixos, procurando-se analisar as caraterísticas das empresas que emitem obrigações perpétuas, bem como os impactos das obrigações perpétuas no stress financeiro, no desempenho operacional e nos preços das ações num horizonte de curto prazo. Os resultados indicam que em primeiro lugar, um elevado rácio de endividamento é a caraterística mais relevante das empresas emitentes, sendo a desalavancagem a principal motivação. Em segundo lugar, a emissão de obrigações perpétuas pode aliviar a pressão da dívida de curto prazo e reduzir temporariamente o rácio de endividamento contabilístico. No entanto, a redução do efeito de alavanca é conseguida através da ocultação da dívida, pelo que não pode aliviar a pressão do reembolso da dívida a longo prazo. Em terceiro lugar, as obrigações perpétuas podem aumentar a margem de lucro operacional, mas não a rendibilidade do capital próprio, uma vez que o efeito de expansão do lucro operacional é diluído pela expansão do capital próprio. Em último lugar, uma vez que o financiamento por obrigações perpétuas reflete as dificuldades financeiras de uma empresa, a emissão de obrigações perpétuas conduz a uma descida do preço das ações.

Palavras-chave: Empresas detidas pelo Estado; Obrigações perpétuas; Desempenho operacional; Desalavancagem; Pressão financeira

JEL: G32; M21

[This page is deliberately left blank.]

摘要

2008 年次贷危机后，中国政府推出了“四万亿”财政扩张计划。随着计划的推进，中国国有企业的杠杆水平继续快速上升。2015 年 12 月，中央经济工作会议提出了国有企业“去杠杆”的改革目标。由于永续债能够有效调节负债与权益的比例，成为国有企业去杠杆的手段之一。然而，永续债发行量的快速增长也引发了人们对潜在隐藏财务风险的担忧，令人怀疑其能否对企业经营业绩产生积极影响。本文利用 Wind 金融数据库数据，对 2013 - 2023 年末中国 953 家企业发行的 4,946 只永续债信息进行了收集和整理，使用固定效应模型分析永续债发行企业的特征，以及永续债发行对中国非金融国有企业财务压力、经营业绩和短期股价的影响。结果表明，第一，高杠杆率为发行企业最主要特征，“降杠杆”为永续债融资最主要的动机；第二，发行永续债可以缓解短期的债务压力并暂时降低账面杠杆率，然而杠杆率的降低是通过“明股实债”隐藏债务的方式实现的，因而并不能缓解长期的债务偿还压力；第三，永续债可以提高营业利润率却不能提高净资产回报率，这是因为营业利润的扩张效果被股权扩张所稀释；第四，由于永续债融资反映了公司财务困境，永续债发行会导致公司股价下跌。

关键词：国有企业；永续债；经营业绩；去杠杆；财务压力

JEL: G32; M21

[This page is deliberately left blank.]

Acknowledgements

Four years seem like a blink of an eye. Goethe once said: people who have not cried in the long night are not enough to talk about life. Looking back on my studying experience, I have been tossing and turning for many long nights, sleepless, worried, anxious and confused. Fortunately, there will always be good advice, help, along the way, full of gratitude.

First of all, I would like to thank professors Ilidio Tomas Lopes and Li Qiang, who gave me great help and support from the selection of my topic, the proposal, the mid-term, to the final draft of my thesis. The two supervisors left a deep impression on me in life, work and learning.

Secondly, I would like to thank my wife Pu Yaxi and my daughter Zoe and my parents. I would like to thank you for your encouragement, support and dedication during my study years, which allowed me to focus on my research and complete my thesis.

Besides, I would like to thank my head teacher, Ms. Gao Xiaoli, and the class of DOM2021, for having a wonderful four years together.

Finally, I would like to thank the two universities ISCTE and UESTC for providing me with a broad learning platform, so that I can get a peace of mind.

Thanks to all those who have helped, guided and cared for me. I hope that in the future, there are still you, me and everyone, and we will move forward firmly all along!

[This page is deliberately left blank.]

致谢

四年如一瞬，弹指一挥间。歌德曾经说过：没有在长夜痛哭过的人，不足以谈人生。回顾自己的求学生涯，也曾在多个长夜辗转反侧、夜不能寐，担心、焦虑、迷茫。幸运的是总会遇到高人指点、贵人相助，一路走来，充满感激。

首先，我要感谢的是 Ilídio Tomás Lopes 教授和李强教授，两位导师从我的选题、开题、中期到最后的论文定稿，都给予我很大的帮助和支持。两位导师在做人、做事、治学方面均给我留下深刻的印象。

其次，我要感谢我的妻子蒲亚茜和女儿袁若伊和我的家人。在求学期间，感谢您们的鼓励、支持和付出，让我能专注研究，完成论文。

再次，我要感谢我的班主任高小丽老师，和 DOM2021 级的全班同学们，和大家一起度过了愉快的四年。

最后，我还要感谢 ISCTE 和 UESTC 这两所大学，为我提供了一个广阔的学习平台，让我能够获得内心的一份安宁。

感谢所有帮助、指导、关心过我的人。希望在未来的路上，一路依然有您、有我、有大家，一路坚定地向前！

[This page is deliberately left blank.]

Contents

List of Tables

[This page is deliberately left blank.]

List of Figures

[This page is deliberately left blank.]

Chapter 1: Introduction

1.1 Research background

Since the launch of reform and opening-up in 1978, China has significantly accelerated its economic and social development. During this period, the real sector has provided ample liquidity support for the expansion of enterprises by increasing leverage (Gertler & Hofmann, 2018), which has promoted the continuous expansion of the size of enterprises and the continuous growth of financing needs. However, this model of economic growth relying on high leverage has also given rise to a series of subsequent problems (Wagner, 2010). In the 21st century, the pace of China's economic growth gradually slowed down and entered a new stage of stable growth. At the same time, the market economy has become increasingly sound and mature. With the growth of enterprises and the overall economy, the demand for capital is also increasing. At this time, the company cannot meet the requirements of its development and expansion without relying on some external resources to obtain funds. Therefore, the company needs to consider introducing external funds and expanding diversified sources of funds to support further development. In order to adapt to this change, Chinese enterprises must explore diversified financing channels to ensure adequate external financial support while maintaining a sound financial position. Against this backdrop, policymakers and corporate management are faced with the important task of balancing corporate growth with risk control.

In the 21st century, the pace of China's economic growth gradually slowed down and entered a new stage of stable growth. At the same time, the market economy has become increasingly sound and mature. With the growth of enterprises and the overall economy, the demand for capital is also increasing. At this time, the company cannot meet the requirements of its development and expansion without relying on some external resources to obtain funds. Therefore, the company needs to consider introducing external funds and expanding diversified sources of funds to support further development. In order to adapt to this change, Chinese enterprises must explore diversified financing channels to ensure adequate external financial support while maintaining a sound financial position. Against this backdrop, policymakers and corporate management are faced with the important task of balancing corporate growth with risk control (Gertler & Hofmann, 2018). However, excessive leverage ratio may adversely

affect the financial health of enterprises, increase the difficulty of repaying debts and the interest of financing, negatively affect the company's profitability, and bring a greater possibility of bankruptcy to the company (Deangelo et al., 2018), which may extend the debt risk to the macroeconomic level, and have a negative impact on the economic and social stability of the country. Therefore, the central government issued a package of rules and regulations, hoping to control the company's asset-liability ratio within a controllable range, to suppress the overall debt risk to a certain extent, and to control the overall risk.

At the end of December 2015, at the Central Economic Work Conference, the supply-side structural reform policy of "the five priority tasks of cutting overcapacity, reducing excess inventory, deleveraging, lowering costs, and strengthening areas of weakness " was put forward for the first time, which is the first time to make the task of "deleveraging" clear. Its core is to reduce the leverage of enterprises with high leverage ratio and high risk through legalization and market-oriented methods, and the starting point is to reduce financial risks. With the deepening of the deleveraging policy, state-owned enterprises with "high debts and high leverage" have become the focus of attention. The deleveraging work emphasizes combining the reduction of enterprise leverage ratio with the prevention of financial risks while controlling the total leverage ratio, and regards the prevention and control of financial risks as the top priority, paying particular attention to the leverage problem of state-owned enterprises (Jiang & Lu, 2018).

In October 2016, the *Opinions of The State Council on Actively and Prudently Reducing the Leverage Ratio of Enterprises* were released, which clearly pointed out the basic principles of deleveraging: marketization, rule of law, orderly implementation and overall coordination. The guidelines call for enterprises to steadily reduce their leverage ratio by promoting corporate mergers and reorganizations, and strengthening corporate strategies such as standardizing corporate management systems and self-restraint mechanisms. The guideline also encourages exploring other ways to achieve the deleveraging target, ensure the financial soundness of enterprises, and promote the long-term healthy development of the economy. The above-mentioned adjustments will not only help ease the debt pressure of non-financial enterprises, but also provide a solid foundation for macroeconomic stability. In the implementation process, special attention has been paid to the importance of state-owned enterprises, as they play a key role in China's economy. Through effective implementation of these policies, the capital structure can be optimized and enterprises' market competitiveness enhanced, while also providing a guarantee for the stable development of China's macro economy.

In 2018, the Central Committee for Financial and Economic Affairs outlined the concept

of "structural deleveraging" for the first time, laying out a framework to follow for preventing and defusing financial risks. In the same year, the State Council also issued *the Guiding Opinions on Strengthening the Asset and Liability Constraints of State-owned Enterprise*s, in which the early warning line for the supervision of State-owned enterprises' leverage ratio was determined and the key monitoring line was also clarified. Then, the *Key points of Work to Reduce Enterprise Leverage Ratio in 2018* and *Key Points of Work to reduce Enterprise Leverage ratio in 2019* were successively released, putting forward a total of 27 specific measures from six aspects, including establishing and improving the enterprise debt risk management mechanism, promoting market-oriented and law-based debt-to-equity swaps, and accelerating the handling of debts of "zombie enterprise", aiming at accelerating the work process of reducing the corporate leverage ratio.

As early as in July 2016, President Xi Jinping stressed the key role of state-owned enterprises at the national Symposium on State-owned Enterprise Reform: "As an important force to enhance the comprehensive strength of the country and protect the public interest, state-owned enterprises must firmly pursue to become stronger, better and bigger, so as to enhance their vitality, influence and ability to resist risks, and ensure the preservation and appreciation of state-owned assets." Here, "stronger" means to improve the competitiveness and vitality of state-owned enterprises; "better" focuses on optimizing asset quality and resource allocation; and " bigger" means further expanding the size of SOEs.

These policies will not only help ease the debt pressure in the non-financial corporate sector, but also provide a solid foundation for macroeconomic stability. Through effective policy implementation, the capital structure can be improved, the market position of state-owned enterprises strengthened, and the sound development of China's macro economy guaranteed. At the same time, SOEs play a crucial role in this process, as they occupy a core position in China's economy. By following the above guidelines, SOEs are better able to cope with financial challenges and achieve long-term healthy development.

Maintaining and expanding the size of SOEs' assets while advancing their "deleveraging" task is an urgent issue. Traditional financing means cannot meet the growing demand for funds, so new financial instruments such as convertible bonds and perpetual bonds are gradually emerging in the Chinese market. As an innovative capital supplement tool, perpetual bonds can break through the traditional debt financing restrictions, increase the equity, increase the total assets, and reduce the company's asset-liability ratio, thereby reducing the company's financial risk. Therefore, perpetual bonds have attracted the attention of the market. For enterprises, after issuing perpetual bonds, they can supplement the long-term funds needed for their own

development, increase their own capital, and polish their financial statements (Scott et al., 2011). From the perspective of investors, due to the above advantages of perpetual bonds, their fixed coupon yield is relatively high. It has also become an ideal choice for investors to optimize their own investment portfolios. Given the need to reduce asset-liability ratios, some SOEs have begun to issue a large number of perpetual bonds to achieve their deleveraging goals.

While perpetual bonds are well developed in foreign capital markets, they were adopted late in China, where they were first issued in 2013. Compared with other financing instruments, the development history of perpetual bonds in China is relatively short, and many enterprises have limited understanding of their advantages, characteristics, and their impact on business performance, resulting in its insufficient application. In the market, perpetual bonds are usually issued by financial institutions and large enterprises with high credit ratings. For example, water companies in Holland and Gazprom of Russia both issued such bonds. In China, Wuhan Metro Group Co LTD successfully issued its first renewable corporate bond in 2013, with an amount of 2.3 billion yuan, but the bond was classified as a debt instrument and did not fully reflect its equity nature because there was no selective deferral clause in the prospectus. Subsequently, GD Power Development Co., Ltd. issued the first perpetual bond in the Chinese mainland that was counted as equity rather than liability, which lowered the company's asset-liability ratio and triggered a positive reaction in the market.

As the application scenarios and scale of perpetual bonds continue to expand, their impact on business performance has attracted more and more attention. By the end of 2023, China had issued 4,946 perpetual bonds with a total scale of 8.94 trillion yuan, according to data from the Wind Database. Among them, the central and local state-owned enterprises issued 1,947 and 2,763, respectively, accounting for 95.23 percent of the total, indicating that SOEs dominate the perpetual bond issuance. Therefore, for the purpose of guiding the future issuance of perpetual bonds, it is of great significance to research the changes in the operational performance of SOEs after issuing perpetual bonds. The purpose of this study is to conduct an empirical analysis of the SOEs issuing perpetual bonds from 2013 to 2023, explore the motivation of their issuance and the specific impact on business performance, and provide a valuable reference for other enterprises using perpetual bonds to raise capital. This study will help to reveal the mechanism of the impact of perpetual bonds on the financial status and operating results of Chinese state-owned enterprises, provide theoretical support for the formulation of relevant policies, and promote the optimization and healthy development of Chinese enterprises' financing structure.

1.2 Research problem and questionS

1.2.1 Research problem

In China, central SOEs are usually larger and have more policy responsibilities, so they need to fulfill these responsibilities by increasing leverage. Faced with the requirement of asset-liability ratio control, SOEs must explore multiple ways to achieve their deleveraging goals. The emergence of perpetual bonds provides an effective means for this process. At the same time, due to more financial subsidies, loan support, and implicit guarantee or support from the government, the central SOEs may exhibit overconfidence in corporate governance, overestimate corporate value and tend to expand debt financing, which may increase the debt burden, and thus weaken the effectiveness of perpetual bonds in deleveraging.

Compared with central SOEs, local SOEs have certain weaknesses in the quality of their assets and resources, as well as in their profitability and bargaining power, making it more difficult to raise funds. In addition, some local SOEs are burdened with large amounts of government debt, so they are faced with higher debt levels and greater deleveraging pressure. Therefore, some enterprises may use perpetual bonds to carry out the so-called "book deleveraging", which means adjusting their financial statements to reduce their apparent leverage ratio. The real motives of such behavior and its economic consequences, especially whether it affects the allocation of resources and business performance of enterprises, deserve in-depth study.

1.2.1 Research questions

How to continuously expand the asset scale of SOEs and optimize their operating performance while effectively promoting the task of "deleveraging" is an important challenge facing SOEs at present. As an innovative financial tool, perpetual bonds offer a new solution for reducing the asset-liability ratio of SOEs and expanding their asset scale. However, whether the issuing of perpetual bonds has a positive or negative impact on the operational performance of enterprises still needs to be further explored.

While perpetual bonds offer a new path for SOEs to deleverage, their actual effect may vary depending on the nature of enterprises. For central and local SOEs, it is important to ensure that the use of perpetual bonds can not only improve financial indicators, but really help to boost the long-term health and development of the enterprises. To this end, it is necessary to

conduct a detailed analysis of the motivation for the issuance of perpetual bonds and their impact on the allocation of corporate resources and operational performance to ensure the effectiveness and compliance of the tool and promote the sound development of SOEs. The study is directed at these questions:

(1) what are the characteristics of SOEs that issue perpetual bonds, and what are the motivations for these enterprises to issue perpetual bonds for financing?

(2) in the context of China's financial deleveraging, can perpetual bonds play a role in reducing the leverage ratio of SOEs? Has it truly alleviated the debt pressure of enterprises, and what is the mechanism behind it?

(3) what impact does the issuance of perpetual bonds by SOEs have on their operational performance (especially profitability), and will the issuance cause stock price fluctuations?

1.3 Research objectives

1.3.1 Theoretical level

First, this research is devoted to expanding and deepening the theoretical framework of perpetual bonds. At present, the research on perpetual bonds focuses on the characteristics of debt and equity, accounting classification, and tax treatment, and most of them are case studies. However, there is a lack of empirical studies on the influence of issuing perpetual bonds on operational performances. In addition, the existing case studies often fail to fully integrate the macroeconomic policy context, resulting in a single research perspective. This study conducts research in the context of China's deleveraging policy, and integrates with China's policy development in recent years to explore the reasons why Chinese SOEs prefer to issuing perpetual bonds for financing in recent years from multiple perspectives. Through this process, we will be able to combine the actual situation of China, supplement and improve the theoretical research related to perpetual bonds, so that it suits the actual national conditions of China better.

Second, this study is committed to providing practical support and theoretical guidance for the development of innovative instruments such as perpetual bonds in China. Since the first appearance in the Chinese market in 2013, perpetual bonds, as an emerging capital instrument, have played an important role in promoting the improvement of the capital market, supporting the basic needs of the national economy, and promoting the gradual integration of China's financial market with international standards. Since China's perpetual bond market is still in the development stage, this study will discuss and study the issuance of perpetual bonds by SOEs

under the background of deleveraging policy, focusing on the terms involved in perpetual bonds and the mechanism of redemption of perpetual bonds. It is expected to provide valuable guidance for the development of various types of innovative instruments in China, and help the healthy and stable development of the market.

To sum up, this study not only seeks to deepen the understanding of the theory of perpetual bonds, but also hopes to reveal the motivation and economic consequences behind the issuance of perpetual bonds by state-owned enterprises in a specific period through empirical analysis, to provide references for future policy formulation and corporate practice. At the same time, by combining the macroeconomic policy background, this study seeks to provide more comprehensive and in-depth insights to promote the healthy development and widespread application of perpetual bonds in the Chinese market.

1.3.2 Practical level

Firstly, this thesis provides a new way for financing while deleveraging for enterprises. For highly leveraged enterprises in China, under the background of strong supervision of deleveraging, the bank's credit policy is also continuously tightened. China's SOEs should not only prevent and resolve debt risks, but also maintain sustainable development. Because SOEs naturally enjoy the "invisible guarantee" of the government and have no hard constraints on the budget, it is easier for them to get bank loans than private enterprises, which aggravates the debt level of SOEs to a certain extent. Therefore, to effectively deal with the difficulties of high leverage ratio, it is of great significance to increase the ways of raising funds and explore innovative fundraising models to reduce the leverage ratio. As a new capital instrument, perpetual bonds are gradually emerging in China's financial market. This study focuses on the terms and conditions of Chinese SOEs issuing perpetual bonds and their impact on financial performance, and summarizes the advantages of perpetual bond financing, aiming to provide a new financing idea for other enterprises. By analyzing the potential of perpetual bonds in reducing the asset-liability ratio, this study is expected to provide a reference for Chinese enterprises to explore more diversified financing paths.

On the other hand, it provides suggestions on the laws and regulations related to perpetual bonds and the rules and regulations restricting leverage. At present, China's laws and regulations related to perpetual bonds have room for improvement, and there are still some deficiencies in policies and legal documents related to leverage constraints. The definition of perpetual bonds has not been clarified at the official level, and the protection of issuers and

investors also needs to be further clarified and improved. This study aims to better promote the healthy deleveraging process of Chinese enterprises through the aspects of issuance terms, issuance risks and the impact on business performance after issuance.

1.4 Thesis structure

This thesis is divided into six chapters, specifically analyzing the impact of China's non-financial SOEs issuing perpetual bonds on operational performance.

Chapter One: Introduction. This chapter describes the research background as a whole -- the development of SOEs' perpetual bond financing under the policy background of making SOEs stronger, better and bigger as well as SOEs' "deleveraging"; and points out the research problem and research questions of this thesis, as well as the significance of the academic level and the value of the practical level. With the rapid development of China's economy and society, Chinese enterprises continue to increase their leverage ratio to promote the rapid development of enterprises. However, the rapidly increasing leverage ratio has a negative impact on the financial health of enterprises, which may lead to systemic risks. In China, SOEs are of great significance to the sustainable and stable development of the national macro economy, so in the context of deleveraging, how to continuously expand the scale of SOEs has become a dilemma faced by all SOEs. The emergence of perpetual bond provides a new idea to solve this problem, so perpetual bond has developed rapidly in China. However, there is little research on the impact of reducing the asset-liability ratio and increasing the amount of capital on the operating benefits of enterprises by issuing perpetual bonds. Finally, the structure of the study is introduced..

Chapter Two: Literature review. This chapter reviews the literature in the related fields involved in this research, including the relevant research on "deleveraging", the relevant research on the dynamic adjustment of capital structure, the relevant economic characteristics of perpetual bond, and the relevant research on the financing decision of SOEs, and then makes a brief literature review. Through systematic collection, sorting and induction of existing domestic and foreign research literature, this chapter grasps the generation background, ideological connotation and development context of relevant classical theories and core concepts, and identifies the research direction to be further explored in this field. These studies explain the value of this research from the theoretical level, and provide a theoretical basis for the fourth chapter of the research hypothesis.

Chapter Three: The Environment of the Perpetual Bonds by State-Owned Non-Financial

Enterprises in China. This chapter expounds the status of perpetual bond issuance and the financial performance of China's non-financial SOEs through the descriptive of data and analysis of relevant policies. From the financial and profit dilemma of China's non-financial SOEs and the reality of the rapid growth of perpetual bond financing, the significance of paying attention to the impact of perpetual bond financing on the performance of China's non-financial SOEs is drawn. Moreover, the realistic basis of corporate financial characteristics and the policy orientation of "deleveraging" provides a realistic basis for the research hypothesis in the next chapter.

Chapter Four: Methodology and Research Methods. This chapter describes how the research is carried out， which clarifies the quantitative positivist methodology, combines the theoretical basis of Chapter 2 and the practical basis of Chapter 3, puts forward testable research hypotheses, selects appropriate data sets and variables according to the hypotheses, and puts forward empirical strategies, that is, the setting of measurement models and the criteria for verifying research hypotheses.

Chapter Five: Results and Discussion. This chapter presents the basic results obtained according to the empirical strategy in Chapter 4, and conducts a robustness test and mechanism analysis. It answers the extent to which the empirical results confirm the research hypothesis proposed in Chapter 4, and explains the gaps with the research hypothesis and literature.

Chapter 6: Conclusions, Recommendations， Research Limits and Future Research Direction. This chapter summarizes the research results of the whole thesis, and puts forward suggestions on the development of perpetual bond financing of China's non-financial SOEs according to the empirical results and the development status of China's perpetual bonds. Based on the deficiencies of this study, the future research direction is prospected. The research architecture of the study is shown in Figure 1.1.

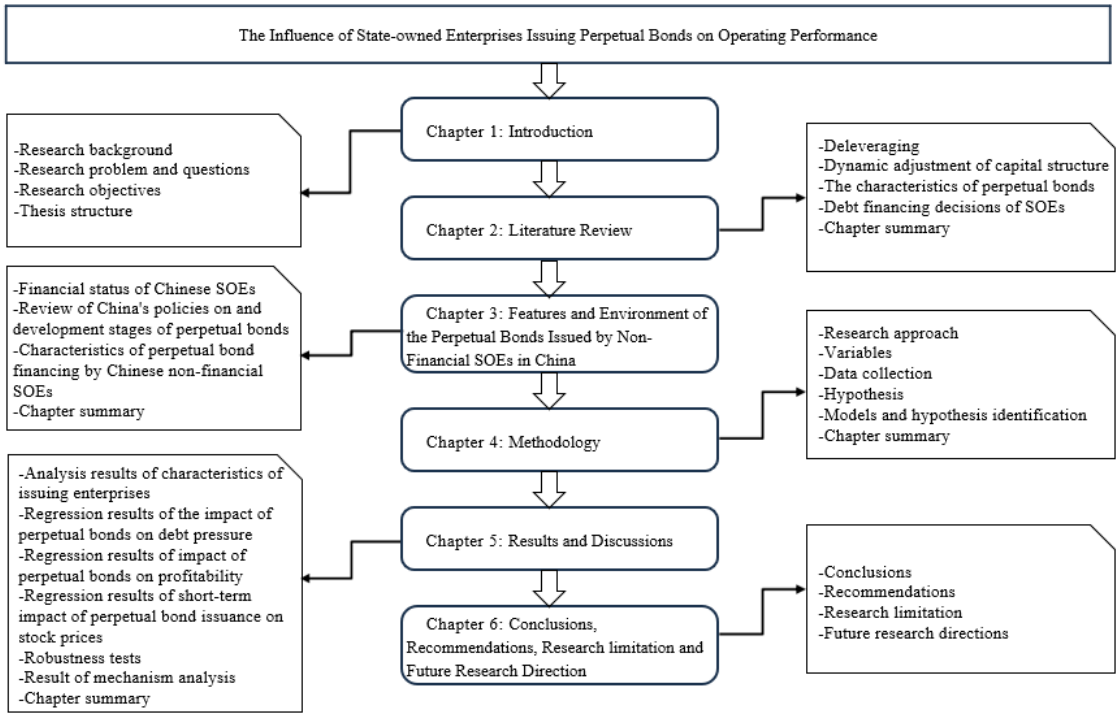

Figure 1.1 Research architecture

The above picture is the structure of the whole thesis, and the order of the chapters in the thesis is shown according to the order in the above picture.

Chapter 2: Literature Review

Based on clearly proposing the research background, significance and content of this study, this chapter systematically combs the literature related to the policy, theory, economic characteristics of perpetual debts and financing decisions of SOEs. The main content covers the following aspects: (1) deleveraging-related research, to explore the formation of high leverage ratio and its impact on enterprises and social economy; analysis on the motivation and implementation of "deleveraging"; research on how the corporate financing decisions are affected by the policy of "deleveraging", and in the process, the influence on the company's operational performance; (2) research on the dynamic adjustment of capital structure, introducing the basic framework of capital structure theory, exploring various factors affecting capital structure adjustment, and analyzing the relationship between capital structure and corporate performance; (3) research on the economic characteristics of perpetual bonds, in-depth analysis of the essential attributes of perpetual bonds, issuance terms, pricing mechanism, financing motivation, financing effect, redemption and renewal arrangements and their potential risks; (4) research on debt financing decisions of SOEs, focusing on the characteristics of SOEs and their debt financing decision-making models, and exploring their financing behaviors under different economic environments, while carrying out a brief literature review.

By comprehensively collecting, sorting and summarizing the existing literature in the above fields, this chapter aims to reveal the background, ideological connotation and development context of classical theories and core concepts, and identify the research direction to be further explored in this field. The literature review provides a solid theoretical foundation and strong support for the construction of theoretical models, the proposal of research hypotheses and the discussion of research results in the following chapters. This chapter not only lays the necessary theoretical framework for understanding the research topic, but also points out the possible direction for future research, ensuring the systematic and scientific research work. By comparing with existing research results, this study is expected to provide valuable references for relevant policy makers and practitioners, and promote the effective integration of theory and practice.

2.1 Deleveraging

Scholars' research on deleveraging mainly focuses on six aspects. First, the causes of high leverage ratio; second, the impact of high leverage ratio; third, the motivation of deleveraging; fourth, the way of deleveraging; fifth, deleveraging and financing methods; and sixth, deleveraging and corporate performance.

2.1.1 Causes of high leverage ratio

From the perspective of individual enterprises, the main influencing factors of high corporate leverage ratio include: reliance on debt financing, excessive pursuit of financialization, and carrying out asset securitization beyond the reasonable scope. Current assets and fixed assets are the main starting points of asset securitization, and credit assets belong to the category of current assets, which is easy to bring leverage effect. For example, Gorton and Metrick (2012) point out that some speculators in the United States promoted the issuance of local mortgage loans with high risk coefficient by excessive leverage, greatly increased the leverage level, and brought about the real estate bubble in the United States. Their method was to securitize fixed assets through the packaging of innovative financial instruments.

In terms of the relationship between high leverage and financing. According to the study of Z. H. Gao and Bao (2022), when enterprises generate high leverage in the short term, they may improve their debt structure. Y. S. Xu et al. (2023) propose that the large-scale promotion of corporate financialization should be supported by multiple types of fundraising methods, such as bond financing and bank fundraising, which may push the leverage level to an excessively high level. The study of W. Li et al. (2021) shows that in enterprises with principal-agent relationships, agents may use financialization to obtain excess returns, while excessive funds flowing into financial assets will lead to a rapid increase in financial leverage, resulting in an increase in fundraising costs, thus intensifying financing constraints and ultimately pushing up financial leverage.

From a macro perspective, the main factors leading to high leverage include economic cycle fluctuations, systemic problems and external economic shocks. Y. Guo et al. (2022) propose that in order to cope with macroeconomic shocks, residents would deposit monetary funds in banks to obtain profits and ensure the safety of funds, which would increase the amount of loans available to banks, thus promoting the increase of the overall leverage level of society and the leverage ratio of enterprises. Fu et al. (2021) point out that when the government adopts specific

monetary policies and fiscal policies to cope with shocks, if the policies adopted are not enough to stimulate the economy, the regulating effect on the financial crisis will not be obvious, and the destructive effect of the financial crisis will be difficult to be contained, so that various departments may still increase leverage and borrow a lot to ensure the stability of operations.

In addition, Pedrosa and Lang (2021) point out that the low leverage ratio of a company means that the company has a large room for leverage improvement, so in a short period of time, the low leverage of a company may mean that the financial leverage will increase significantly in the future.

2.1.2 Impact of high leverage ratio

In terms of the impact of high leverage on operating performance. Margaritis and Psillaki (2010) point out that a high leverage ratio would reduce agency costs, promote the continuous improvement of corporate performance and corporate governance, and convey positive performance signals to the outside world. However, Campello (2006) emphasizes that the effect of debt level on corporate performance is not linear. A moderate debt scale helps to improve profitability, but once the debt exceeds a certain limit, it will have a negative impact on profitability. Therefore, enterprises should carefully control the scale of debt financing.

In terms of the impact of high leverage on economic activity. Research by Dodd et al. (2021) shows that the leverage ratio of emerging market firms rose rapidly after the crisis, which could lead to an increase in potential credit risk. Schularick and Taylor (2012) analyze the data of advanced economies and propose that the advent of financial crises is usually equated with a sharp increase in leverage levels. Fornaro (2018) points out in his research on international debt leverage that there is a significant inverse correlation between excessive leverage level and social and economic development, and reducing leverage ratio is conducive to restoring economic growth. Cecchetti and Kharroubi (2012) argue that a moderate leverage ratio can positively promote economic growth, but an excessive leverage ratio will inhibit economic activities.

In terms of the pass-through effect of high leverage. Drehmann and Juselius (2014) studied and point out that the high leverage ratio of individual enterprises has a pass-through effect, and the leverage ratio of a country may be affected by the high leverage ratio of a single enterprise. One enterprise passes from one enterprise to another, thus forming a chain of transmission, which may even bring systemic flow risks and possibly trigger financial crisis. In addition, the high leverage ratio may have adverse effects on the operation and production of enterprises,

mainly reflected in the increasing difficulty in obtaining profits and the weakening of debt repayment ability (Kini et al., 2017). Operating with high leverage will also lead to higher financing costs, thus weakening the profitability of enterprises and increasing financial risk and bankruptcy risk (Deangelo et al., 2018).

In terms of the relationship between high leverage and financial crises. According to the study of M. F. Allen (1996), countries with financial crises in the past generally have the problem of excessive leverage on balance sheets, which is considered to be one of the important factors leading to financial crises. Reinhart and Rogoff (2011) also agree with this view, arguing that although a moderate leverage ratio can promote economic growth, it is also accompanied by potential financial risks and may even trigger financial crises. Ahmed and Wahid (2011) emphasize that maintaining a reasonable leverage level is more beneficial to the long-term development of enterprises, because excessive leverage ratio is easy to have a negative impact on the economic effect of enterprises.

C. Y. Ma and Zhu (2020) point out that the "deleveraging" policy can improve the production and operation efficiency of enterprises with high asset-liability ratio to a certain extent, but it may have a negative impact on the production quality and efficiency of enterprises with low asset-liability ratio, private enterprises and other entities.

2.1.3 Motivation of deleveraging

From the macro perspective, Miao and Wang (2018) point out that in the case of intensified credit restrictions, the leverage effect may amplify the volatility of the financial and real economic system, and the bursting of the bubble may trigger a deep economic recession and financial market turbulence. The Korean market case study by Hyun and Minetti (2019) shows that the deleveraging measures implemented after the financial crisis not only promoted the optimization of the credit structure, but also enhanced the liquidity of the capital market, which in turn played a positive role in promoting economic growth. Van Der Hoog and Dawid (2019) emphasize that the leverage cycle between firms and financial institutions is an important mechanism for risk transmission. Unhealthy enterprises maintain debt bubbles by borrowing new debt to repay old debt, which needs effective supervision to avoid, because without proper liquidity constraints, banks may continue to support those enterprises with poor performance, thus fueling debt bubbles.

In the adjustment period after the financial crisis, Kuchler (2020) research shows that firms with high debt levels face more severe challenges in obtaining investment credit. The

deleveraging process can help alleviate the financial pressure that these enterprises may encounter in the future, and promote the diversification of financing channels.

From the micro perspective, surveys conducted by Priftis and Theofilakou's (2021) of European non-financial firms show that proactive deleveraging strategies are usually accompanied by a contraction in investment activities and an increase in net savings as a way to improve their financial ratios. Taking China's A-share new energy industry as an example, J. Z. Wang et al. (2020) explore the impact of debt financing on corporate risk management based on data from 2011 to 2018, and the results show that reducing leverage can lower companies' risk exposure. Z. J. Wang et al. (2020) further pointed out that for the real economy, deleveraging can help high risk enterprises ease their debt burden, encourage them to eliminate excess capacity, and then promote the optimization and upgrading of industrial structure, so as to achieve the goal of economic development and stable growth.

In terms of corporate financing decisions. The empirical analysis by Kalantonis et al. (2021) covers the financial structure choices of Greek listed companies from 2005 to 2018, indicating that macroeconomic conditions significantly affect the borrowing decisions of enterprises, especially when the economy is in a downturn, the leverage ratio tends to decline. They suggest fostering a favorable macroeconomic environment so that firms can more easily access the necessary funds. Blackwell and Nocera (1988) point out that the reduction of leverage ratio of enterprises has a positive effect on the optimization of their fundraising structure. Aghion et al. (2010) find that a high level of leverage will weaken the financing ability of enterprises, which may lead to a decline in efficiency, limited innovation and a decline in long-term investment ratio. The work of Guariglia and Liu (2014) also reveals how barriers to financing impede firms' ability to innovate.

2.1.4 Ways to deleverage

In some of the common ways in which enterprises deleverage. Dechow and Shakespear (2009) propose that asset securitization could optimize the balance sheet of enterprises to a certain extent, so as to achieve the effect of deleveraging. Romei (2015) points out that the active fiscal policy adopted by the government would help push the market to reduce the overall leverage level.

Walentin (2014) emphasizes that the key for enterprises to deleverage is to have a deep understanding of their debt composition, rather than simply easing credit conditions. Deangelo et al. (2018) point out that the common deleveraging methods used by enterprises include

increasing internal accumulation, repaying existing debts and issuing new shares, which are aimed at reducing liabilities or strengthening capital base. According to the comparative study of Chinese and American enterprises by Lai et al. (2020) , Chinese enterprises are more inclined to rely on equity financing rather than increasing the proportion of their own funds when optimizing their capital structure.

On the choice of ways for Chinese and American enterprises to deleverage. Elsiefy and AbdElaal (2019) observe that in dealing with small and insolvent enterprises, the US government supports orderly restructuring through regional mergers and acquisitions, which not only increases the company's equity but also effectively reduces its debt burden. Analysis by Frey (2016) points out that for enterprises in distress, new tax regulations and default risk may limit their ability to recapitalize. In addition, US companies benefit from more direct financing options, which not only solve the problem of capital shortage, but also reduce the dependence on bank loans.

At the critical point of corporate deleveraging. Korteweg's (2010) research shows that moderate indebtedness can increase the net income of enterprises, but when the leverage ratio is too high, this gain effect will be weakened, indicating the existence of an optimal capital structure for enterprises. Reinhart and Rogoff (2010) believe that debt growth can promote economic growth within a certain range, that is, before a certain threshold is exceeded, a higher capital debt ratio is conducive to economic expansion. Buttiglione et al. (2016) warn that the deleveraging process becomes more complex and difficult during economic downturns, and forcing deleveraging at this time may further worsen economic conditions.

With regard to the deleveraging of SOEs, Ling and Wu (2022) point out that SOEs are required by policies to reduce their active borrowing activities. However, considering the principle of sound operation, banks usually grant SOEs lower loan interest rates, resulting in relatively low debt costs for SOEs. At the same time, state owned banks have so-called "soft budget constraints" on SOEs, which form a financing constraint. As a result, SOEs' leverage levels can still be controlled and managed to a certain extent despite policy pressure.

2.1.5 Impact of deleveraging on financing methods

Khatua (2017) conducts an empirical analysis of companies in India, which are in the process of rapid development, and reveals that these enterprises generally show a trend of outbound leverage. This trend leads to a decrease in their access to deficit financing and a rise in the cost of debt of intra-group companies. Because banks are worried about the risk of highly leveraged

enterprises, they have tightened credit policies for such enterprises, raising their funding costs.

The study of L. Li and Wang (2019) takes Chinese enterprises as the samples to explore the impact of capital structure on corporate competitiveness. They find that enterprises with low leverage but rapid leverage growth in capital structure have stronger performance in the product market. By contrast, high levels of debt make enterprises less competitive in the market. Enterprises with low leverage have easier access to financing, which helps them expand their business scope and enhance their competitive edge in the market.

The study of Bolognesi et al. (2020) shows that in Europe, the securitization of NPLS can effectively reduce the deleveraging cost incurred when NPLS are sold directly. Securitization measures supported by public guarantee can further minimize the cost of deleveraging and provide an effective financial adjustment tool for enterprises.

Mahmood et al. (2021) point out that macroeconomic factors and the institutional environment significantly affect firms' financial flexibility. In a high-quality institutional environment, a firm's financial flexibility may decline, as it operates in a stricter regulatory environment and may increase borrowing to strengthen its business, thereby increasing leverage.

X. F. Xu and Lu (2020) propose after their research that enterprises with high leverage ratio manipulate leverage by means of clear equity and real debt and off-balance sheet financing, to reduce the leverage ratio on the surface, but in fact, the leverage ratio remains at a high level. The reason for them to do so is to hide their actual leverage ratio and better cope with regulatory and policy requirements. Not only does this mask the true financial position, it can also have negative effects in terms of the quality of accounting information and agency costs.

2.1.6 Deleveraging and corporate performance

The influence of deleveraging on corporate performance is multifaceted, including not only the constraining role of management behavior and long-term corporate development, but also corporate financing capacity, operational efficiency, internal governance mechanisms, and the broader economic and ecological environment.

As for the positive impact of deleveraging on management behavior and the long term development of enterprises, Habib and Hasan (2017) point out that deleveraging helps to curb management's tendency to overinvest, thus benefiting the long-term development of the enterprise. Cecchetti et al. (2011) emphasize that although leverage itself has certain potential risks, a high leverage ratio may cause enterprises to fall into a liquidity crisis and reduce operating profits, which deviates from the original intention of enterprises to improve operating

efficiency through debt. Therefore, enterprises need to use leverage according to their actual conditions. This can have a positive effect on the optimal expansion of enterprises.

As for the negative impact of high leverage on corporate financing and operation, Aghion et al. (2010) reveal that the rise of leverage ratio tends to have a negative impact on corporate performance, while the decline of leverage ratio is conducive to performance growth. The high leverage ratio of enterprises will have a negative impact on investment, innovation and daily operations. High leverage ratio will also make it more difficult for enterprises to raise capital, and multiple effects will bring about a decline in productivity when combined.

In terms of the impact of debt financing on performance. Ehrich and Billett (2006) find that debt financing has a negative impact on a company's performance and excess return on equity in the next three years. Campello (2006) further points out that moderate debt financing may be beneficial to the performance of the futures market, while too much debt will lead to poor performance. Ang (2008) mentions that highly leveraged firms have to bear higher interest costs, which reduces the cash flow available for management decisions, but at the same time leverage can reduce agency costs between shareholders and management, thereby enhancing the return on net assets. Research by Berk et al. (2010) shows that excessive leverage increases a firm's financial risk, leads to higher interest payments, increases financial costs, weakens corporate performance, and increases operating costs. Yazdanfar and Öhman (2015) state that when the debt held by a company exceeds the target ratio, the cost of financial distress faced by the company exceeds the benefit brought by tax incentives, which has a negative impact on the business performance of the company. K. Kim et al. (2017) argue that high leverage can dampen the motivation of measures such as equity incentives and increase the burden of responsibility on management.

In terms of the impact of deleveraging policies. D. Y. Shen and He (2022) show that the impact of deleveraging policies is not limited to the economic category, but still has an important impact on the ecological category. For listed manufacturing enterprises, the deleveraging policy has improved the number of patents applied for green innovation by adjusting the structure of assets and liabilities within the company. Especially for SOEs favored by finance, if equity financing is carried out, the promotion of green innovation of the enterprise will be more obvious. Devlin and Mckay (2008) point out that the strengthening of deleveraging policies may lead to the lack of additional funds for investment activities, which in turn will reduce the investment expenditure and asset value of enterprises, and ultimately reduce the profitability of non-financial enterprises and restrict the development of enterprises.

In the research on deleveraging and company value. B. Y. Qiu and Cheng (2022) evaluate

the deleveraging policy implemented in China in 2015 and analyze the impact of the policy on corporate leverage level, cost on the debt side, funds invested in the innovation sector, and funds invested in fixed assets. The research results show that the good aspect of the deleveraging policy is that it reduces the leverage ratio of enterprises, but at the same time, reduces the funds invested in fixed assets and pushes up the financing cost of enterprises. B. Y. Qiu and Cheng (2022) point out that deleveraging will significantly improve the operating quality and efficiency of the company and reduce the financial leverage ratio of the company. The empirical study of Margaritis and Psillaki (2010) confirms that the rational use of financial leverage can positively affect the corporate value. Eggertsson and Krugman (2012) warn that liquidity in the financial market is positively related to leverage ratio, and excessive deleveraging will bring adverse effects on the fundraising and growth of real enterprises, even leading to the risk of economic recession in a prolonged period. The research of Zeitun and Saleh (2015) emphasizes that the change of corporate financial leverage significantly affects corporate performance. Liang and Wu (2021) point out that investment efficiency plays a certain intermediary role in the relationship between firm performance and deleveraging. Deleveraging measures can enhance the investment efficiency of enterprises, and then improve the overall performance. Lu and Yang (2020) show that the reduction of corporate leverage has a significant promoting effect on total factor productivity, especially in private enterprises, regions with superior institutional environment, and enterprises with weak innovation foundation.

2.2 Dynamic adjustment of capital structure

2.2.1 Capital structure theory

Capital structure describes the composition and proportion of the funds raised by enterprises, which is the key factor that enterprises must consider when making financing decisions. Because the demand and supply of short-term capital are highly uncertain, and its proportion in the total capital often changes, it is usually not in the focus of capital structure management. On the contrary, long-term capital forms the core of capital structure management because it is more important for the stability and long-term development of an enterprise.

The factors that determine the capital structure of an enterprise mainly include the following: the level of the market interest rate and its change trend, the asset allocation of the enterprise, the financial health, and the income tax rate. The theory of capital structure discusses

how to reasonably determine the ratio of debt capital and equity capital in the context of pursuing the maximization of enterprise value.

Since the capital structure theory was first proposed, the field has experienced significant development, forming a variety of theoretical frameworks including MM theory, tradeoff theory, signal transmission theory, priority financing theory and timing financing theory. These theories provide valuable guidance to enterprises and help them make better financing decisions. However, with the increasing complexity of the external financing environment, the diversification of financing procedures, and the diversification of financing types, the relationship between corporate value and financial condition has become more difficult to accurately assess. As a result, in practice, management often relies on past experiences and subjective judgment to formulate financial strategies.

When a company's balance sheet ratio is high, the risk of bankruptcy increases; and if the proportion of equity financing is too high, it may harm the interests of existing shareholders. Considering that the goal of the management should be to maximize the value of the company, when the asset-liability ratio is low, giving priority to debt financing can take advantage of the financial leverage effect, but the risks caused by excessive use should be vigilant; on the contrary, if the asset-liability ratio is high, it should be more inclined to equity financing and attention should be paid to protecting the original shareholders' rights and interests.

In general, enterprises need to find a balance between debt financing and equity financing, especially in the face of new financing restrictions, should make full use of the existing financing tools and optimize the capital structure, to enhance the value of enterprises. Through reasonable capital structure adjustment, enterprises can not only enhance their competitiveness, but also ensure that they maintain a steady development trend in the complex and changeable market environment.

To achieve this goal, enterprises also need to pay close attention to changes in market conditions and flexibly adjust their capital structure to adapt to the changing internal and external environment. In addition, effective risk management measures are also essential to ensure that enterprises maintain a healthy financial position while pursuing growth.

2.2.1.1 MM theory

Modigliani and Miller (1958) explore the impact of capital structure on firm value and propose the famous "MM theory". The theory is based on a series of idealized assumptions, including the absence of personal and corporate income taxes, and the absence of a firm's risk of bankruptcy. These assumptions form the basic framework of the MM theory, from which it is

concluded that the market value of a firm has nothing to do with its capital structure. In particular, no matter what financing method a firm chooses, its market value is mainly determined by expected returns and discount rates, rather than the financing decision itself.

Durand (1959) challenges the strict assumptions of the MM theorem, pointing out that it is difficult for the theory to explain many investment phenomena in reality because there are many factors in reality that do not conform to these assumptions. Durand emphasizes that the analysis of the relationship between capital structure and firm value by MM theorem relies on strict assumptions and has certain limitations in practical application.

In a follow-up study, Modigliani and Miller (1963) relax the assumption that corporate income tax does not exist and introduce the concept of tax shield effect. They point out that corporations receive tax breaks when they pay interest on their debt, thereby increasing the market value of the corporation and increasing the profits of the corporation after tax.

Miller (1977) conducts a deeper study of the theory and optimizes the theory on the basis of considering capital gains tax and personal income tax, making the MM theorem more prominent as a guide to reality. His research work improved the relationship between capital structure and firm value, and provided a more comprehensive understanding.

2.2.1.2 Pecking order theory

Myers and Majluf (1984) proposed the pecking order theory, which broke through the limitation of the assumption of complete information, and, based on the asymmetric information theory, considered the existence of market imperfection and transaction costs. According to this theory, enterprises tend to carry out financing according to specific priorities in practice: first internal financing, then debt financing, and then equity financing to raise funds.

According to the theory, enterprises rank their options according to the cost of different financing methods. Since internal financing does not require the introduction of external investors, it avoids various fees and potential impacts and becomes the lowest-cost option. When enterprises need to further seek external funds, they usually consider the safer debt financing first, and take the equity financing with higher operating risks as the last choice. This financing sequence reflects enterprises' comprehensive consideration of cost and risk, as well as their concern about information asymmetry.

The pecking order theory points out that due to the asymmetry of information resources, different stakeholders may obtain different information in the decision-making process. The difference of information between managers and external investors may lead to different choices of financing forms, and then affect the effect of information transmission in the

financing process. Therefore, when making the optimal financing plan, enterprises must comprehensively consider factors such as their own value, information transparency and financing cost.

Baskin (1988) conducts an empirical study on five OECD countries in order to verify the theory of priority financing. He points out that the research results provide support for the theory of priority-based financing, while the traditional trade-off theory ignores the role of information asymmetry in the financial market, so it fails to fully explain the financing behavior of enterprises. Shyam-Sunder and Myers (1999) compare the application effect of the trade-off theory with that of the priority-based financing theory and find that the former has stronger expansion ability in time series and can better explain the financing decisions of enterprises.

2.2.1.3 Principal-agent theory

The principal-agent theory initially aims to explore the conflict of interest between owners (shareholders) and management caused by the separation of ownership and management. Ross (1973) first puts forward this concept, pointing out that on the premise of information asymmetry, two traders are called the principal and the agent based on the advantage of information. The one with less information is called the principal, and the one with more information is called the agent.

Meckling and Jensen (1976) further develop the principal-agent theory, arguing that an enterprise is a network composed of multiple agency relationships, including the relationships between shareholders and management, creditors and management, and an enterprise and upstream and downstream customers. They classify the conflicts of interest arising from these agency relationships into two main types:

One is the internal agency cost: owners (shareholders) pursue the maximization of the company's value, while management may be more concerned about personal gains and the satisfaction of their own needs. This difference among goals leads to the conflict between shareholders and management, which is called external shareholder agency cost.

The second is the creditor's agency cost: in order to maximize the company's interests, shareholders may choose to make high-risk investments, which may damage the interests of creditors, and then lead to conflicts between shareholders and creditors. The cost arising from such conflicts is called the cost of creditor agency.

For perpetual debt financing, there may be specific agency costs due to asymmetric information and inconsistent goals between enterprises and creditors. In this case, the financing decision of an enterprise not only affects its own financial health, but also involves how to

balance the needs and expectations of different stakeholders.

In addition, the principal-agent theory provides a framework for the study of corporate capital structure, financing decisions and corporate governance. It reminds the management of enterprises that they must consider the demands of different stakeholders and ensure transparency and impartiality when formulating strategies, to achieve long-term stability and development of the company.

2.2.1.4 Trade-off theory

By introducing the bankruptcy cost factor, the tradeoff theory expands and improves the analysis of the influence of MM theorem on the financing choice of enterprises. The theory is divided into two main parts: the static trade off theory and the dynamic trade off theory.

Robichek and Myers (1966) propose that the bankruptcy risk of a company would increase with the increase of the company's debt ratio. Baxter (1967) includes the bankruptcy risk in his theoretical model and finally concludes that the relationship between the debt ratio and the bankruptcy risk of a company is not linear.

Kraus and Litzenberger (1973) introduce tax and bankruptcy risk, and use the "state selection" model to study the relationship between the market value of an enterprise and its capital structure. Their conclusion is that the market value of a company is the tax rate plus the value of its debt-free state, then the market value of its debt is multiplied by the market value of its debt, the tax rate is subtracted and then the bankruptcy cost is multiplied, and the existing value of the enterprise is discounted by the above cost.

In order to demonstrate the existence of a long-term optimal capital structure of a company, Taggart (1977) establishes a capital structure adjustment model of a company, and the results support his judgment. Brennan and Schwartz (1984) propose the impact of debt tax shield and bankruptcy risk, and build a dynamic tradeoff model based on the idea of option pricing. Their basic assumption is that if the transaction cost of raising capital is equal to zero, then the enterprise can adjust its raising plan anytime when faced with external pressure. Fischer et al. (1989) point out that the optimal capital structure exists, but the adjustment cost will occur every time a company adjusts its fundraising decision, and the adjustment cost of different enterprises will vary greatly, so it is difficult for the real capital structure of a company to completely overlap with the optimal capital structure. Based on the large difference in the cost of adjusting the capital structure of different enterprises, it is flawed to judge the capital raising effect of enterprises solely from the perspective of tax shield effect and capital security. Therefore, the capital structure of the company often fluctuates around the optimal state, and it

is difficult to achieve it overnight.

Pinegar and Wilbricht (1989) investigate whether investors judge the investment value of a target company based on the capital structure of the target company, and thus affect the investment decision judgment. They survey the management of top 500 companies, and find that the management would not judge the value of the target companies based on their capital structure. Leary and Roberts (2005) set up a dynamic duration model based on the dynamic equilibrium theory to judge whether the capital structure of a company can be maintained in the best state. The study finds that the capital structure of an enterprise is not adjusted in real time. When there is a deviation between the actual capital structure and the optimal capital structure, the adjustment mechanism will not appear immediately, but will start to adjust after entering a certain deviation range.

2.2.1.5 Signaling theory

The signaling theory was first proposed by Ross (1977), which discusses the problem of information asymmetry between management and investors. In this case, investors can only rely on the public information to evaluate their potential return on investment, while the internal managers of enterprises have more non-public information, and can optimize the capital structure according to it to enhance the market value.

According to this theory, changes in a firm's debt ratio serve as an important signal to the outside world about the company's internal information. When a company's debt ratio rises, it is often seen as a sign that management is optimistic about the company's future profitability. For investors, such a change sends a positive signal that the company has greater potential and attractiveness as a long-term investment.

Specifically, by adjusting debt levels, management can convey confidence to the market about the company's prospects. If management has increased the company's debt ratio, this may mean that they believe that future cash flows will be sufficient to cover the cost of the new debt and that they expect to generate higher earnings. As a result, changes in the debt ratio not only reflect a company's financial strategy, but also serve as an important window for investors into what's going on inside the company.

The signaling theory emphasizes the important role of information asymmetry in the capital market, revealing how firms influence the market's judgment of their value through capital structure decisions. This theory provides a new perspective for enterprises to make use of information advantages for strategic planning, and at the same time provides investors with a way to interpret corporate behavior.

2.2.2 Factors influencing dynamic adjustment of capital structure

It is generally believed in modern finance that an enterprise has an optimal capital structure (Flannery & Rangan, 2006). However, Leary and Roberts (2005) point out that the actual capital structure of an enterprise is often shaped by internal financing, debt financing and equity financing decisions, and will deviate from this optimal state in most cases.

In terms of influencing factors at the micro level, researches on the dynamic adjustment of capital structure mainly focus on financial characteristics. Booth et al. (2001) emphasize that the financial status and investment opportunities of enterprises are the key driving forces to promote capital structure adjustment. Drobetz and Wanzenried (2006) find that enterprises with high growth and large deviation of actual capital structure from target have a faster adjustment speed. Faulkender et al. (2012) propose that firms have a target capital structure. Due to the existence of adjustment costs, capital structure decision-making is a process of getting closer to the target step by step. In addition, the company's cash flow situation will also affect the speed of adjustment and the final optimal capital structure. Dangl and Zechner (2021) point out that when an enterprise is in a situation of low profit, if the company's loan is due and needs to be repaid, the company's holders are keen to optimize the capital structure by reducing the debt ratio. Admati et al. (2018) propose that when an enterprise is in a situation, it will have a significant effect on the dynamic adjustment of the asset structure of the company, that is, when the enterprise can hardly confirm the future fundraising.

Studies on the impact of macroeconomic environment show that the macroeconomic environment also has an important impact on the dynamic adjustment of capital structure. Cook and Tang (2010) point out that the speed of capital structure adjustment of a company is directly proportional to the macroeconomic operation. The empirical results of Russo et al. (2000) show that the adjustment of interest rate directly affects the capital structure of a company. For example, after the interest rate falls, the interest rate of debt financing will decrease, so the enterprise will follow the trend and increase the proportion of debt financing compared with equity financing. Hackbarth et al. (2006) make an in-depth analysis of the relationship between capital structure and regulatory policies. They point out that enterprises tend to increase the debt ratio during economic recession. In the economic boom period, the opposite is true.

2.2.3 Capital structure and enterprise performance

The choice of capital structure not only affects the investment decision and value realization of the enterprise, but also is closely related to the innovation ability of the enterprise and the

macroeconomic environment.

Capital structure is of great significance to corporate investment decision and value realization. Bhagat and Welch (1995) point out that a reasonable capital structure is crucial to corporate investment decision and directly affects the realization of corporate value.

Rajan and Zingales (1995) emphasize that there is a negative correlation between capital structure and corporate output.

As to the advantages of low leverage on innovative enterprises, O'brien (2003) believes that for innovative enterprises, if they want to maintain independent innovation ability continuously and make R&D a continuous and stable activity, it is better for enterprises to keep the leverage ratio at a low range.

Regarding the economic consequences of excessive debt, Deangelo et al. (2018) show that developing business beyond the scope of an enterprise' s debt would lead to risks such as reduced profitability and increased bankruptcy risk.

In terms of the impact of insufficient debt, C. Y. Ma and Zhu (2020) propose that low debt level not only inhibits the improvement of total factor productivity of enterprises, but also has a negative impact on the investment decision of enterprises, although low debt will reduce the bankruptcy risk of enterprises.

In terms of the relationship between capital structure and investment behavior, S. C. Ma et al. (2022) establish a theoretical model for the improvement of enterprise performance and proved that when the asset-liability ratio is low, the increase of leverage ratio is proportional to the innovation and investment of the company, thus improving enterprise performance.

2.3 The characteristics of perpetual bonds

2.3.1 The nature of perpetual bonds

The definition of the nature of perpetual bonds not only affects the preparation of financial statements of enterprises, but also relates to the decision-making of investors, creditors and other stakeholders. Understanding these different viewpoints and methods can help enterprises make better capital structure decisions in a complex market environment, so as to achieve long-term stable development and performance improvement.

Due to the dual characteristics of both "equity" and "debt", perpetual bonds have attracted wide attention in the academic circles at home and abroad, and triggered a wide discussion and controversy on their accounting recognition methods. According to Lane (2009) , perpetual

bonds is a typical hybrid financial instrument, with both debt and equity attributes.

Schmidt (2018), from the perspective of stakeholder decision-making, points out that the traditional dichotomy is difficult to objectively and truly reflect the essence of perpetual bonds. Therefore, this classification method is insufficient when dealing with perpetual bonds.

Liability or equity is an important point of contention regarding the nature of perpetual bonds. Baldeaux et al. (2015) point out that no matter they are defined as equity instruments or financial liabilities, the common characteristics of perpetual bonds are that the repayment date is not clear, the interest needs to be paid by the issuer, and the payment can be deferred. This feature makes the classification of perpetual bonds more complicated.

In order to deal with the dilemma of "liabilities and equity", Fargher et al. (2019) propose an innovative solution: to use the unique item of "mezzan-class composite instrument" to carry out accounting for perpetual bonds. This method aims to more accurately reflect the unique properties of perpetual bonds and provide more useful information for stakeholders' decision-making.

Some scholars advocate treating perpetual bonds as equity instruments. Kühn and Van Schaik (2008) emphasize that perpetual bonds should be treated as equity financial instruments, and the expenses incurred in issuing them should be deducted from equity. If a perpetual bond is not expected to be redeemed, it should be accounted for as equity, and its equity should be indexed against the issuance cost and interest expense.

Levi and Segal (2015) point out that perpetual bonds are generally more likely to be issued when they are treated as equity instruments than when they are treated as debt. This is because the nature of equity instruments makes enterprises more inclined to choose perpetual bonds when financing, to reduce short-term debt repayment pressure.

In terms of the similarity of perpetual bonds and equities. From a theoretical perspective, Bagus et al. (2016) propose that some characteristics of perpetual bonds are similar to those of stocks, that is, issuers can hold the principal forever without returning it to investors, which is closely related to the uncertainty of the maturity date of perpetual bonds and the deferred payment of interest. In addition, the way of interest payment is also similar to dividend payment, which further enhances the "share-ness" of perpetual bonds.

In terms of maturity date setting. Research by Hacısalihzade (2018) shows that if a perpetual bond does not have a fixed maturity date, it usually has the characteristics of long-term existence, which makes it closer to equity than debt capital. Therefore, he suggests that it is more reasonable to treat perpetual bonds as equity instruments.

Also in terms of maturity date setting. H. Y. Shan (2019) points out that since the maturity

date of perpetual bonds is not fixed, the issuer only needs to pay the interest on schedule in accordance with the issuance terms, and the holder cannot force the issuer to redeem the perpetual bonds. The aspect of paying interest on schedule means that perpetual bonds are defendable, while the feature of not having fixed maturity date means that perpetual bonds are equity. In summary, perpetual bonds are a hybrid financial instrument with both debt and equity characteristics.

In the inclusion of perpetual bonds in equity instruments. Fargher et al. (2019) believe that two important conditions should be met when perpetual bonds are listed as equity: first, the perpetual bonds have no fixed maturity date, and the issuers can choose whether to pay interest or not; and second, the issuer of the perpetual bonds does not need to provide guarantee. These two principles aim to ensure that the equity nature of perpetual bonds is fully reflected.

In the relationship between interest payment expense and equity instruments. Cheng (2019) points out that a perpetual bond should be regarded as an equity instrument when the issuer clearly stipulates in the issuance terms that it can decide whether to defer interest payment according to its own business conditions. W. T. Luo (2019) points out that if an enterprise includes the related expenses incurred by issuing perpetual bonds in the income statement, it means that the enterprise includes the perpetual bonds as equity instruments, which is the common practice of a large number of enterprises.

In the enterprise's choice of perpetual bond as equity instrument. Petras (2022) finds that when financial institutions include perpetual bonds in equity instruments, they can obtain the dual income of perpetual bonds as equity and liabilities. H. Y. Wang et al. (2023) calculate the perpetual bond financing situation of A-share listed enterprises from 2013 to 2022, and find that perpetual bonds were mostly disclosed in equity instruments before the announcement of the new regulations. However, after the release of the new regulation, although practitioners were aware of the new regulation, the perpetual bonds issued in the past were not reclassified, but the contract terms of future perpetual bonds were adjusted to meet the conditions for inclusion in equity instruments.

Some scholars advocate that perpetual bonds should be classified as financial liabilities. Hopkins (1996) finds that financial analysts were influenced by the classification of perpetual bonds when they forecast the stock price of listed enterprises. When perpetual bonds are classified as liabilities, the stock price forecast is higher; And lower share price forecasts when perpetual bonds are classified as equity.

The inclusion of perpetual bonds in financial liabilities can truly reflect the company's situation. Sarkar and Hong (2004) point out that if perpetual bonds are classified as equity, the

assets and liabilities of enterprises may be hidden, thus failing to truly reflect their financing status. Therefore, they argue that perpetual bonds should be classified as financial liabilities to ensure the accuracy and transparency of financial statements.

In terms of guarantee terms and the nature of perpetual bond. Hui (2012) points out that if there are security conditions attached to the issuance of perpetual bonds, such security conditions may cause the enterprises to assume certain obligations, which is inconsistent with the equity. Therefore, if a perpetual bond is attached with a guarantee, the perpetual bond should be treated as a financial liability to reflect its potential risks more accurately.

X. Q. Liu (2019) points out based on the policy that we need to comprehensively determine whether perpetual bonds should be included in equity or financial liabilities according to the maturity date, interest rate jump mechanism, guarantee terms and other conditions of perpetual bonds in the process of implementation. This approach helps us to understand the true nature of perpetual bonds in a more comprehensive way.

The order of repayment of creditors in bankruptcy liquidation. Lynch and Reeves (2019) start from the repayment order of the holders of perpetual bonds when the issuer of perpetual bonds is in bankruptcy liquidation and point out that when the repayment order of the holders of perpetual debt is consistent with other creditors, it means that the perpetual bonds should not be regarded as subordinated debt, but should be classified as financial liabilities.

X. F. Xu and Lu (2020) point out that, from the perspective of issuance conditions, the issuer has the right to renew and defer interest payment. However, since the choice of renewal and deferred interest payment tends to significantly increase the interest rate of the perpetual bond, the issuer is unwilling to bear high interest, so it has already decided to redeem the perpetual bond at maturity and on time when it is issued. Based on the above reasons, this perpetual bond presents more "debt".

In the interest rate jump mechanism and the nature of perpetual bond. Based on practical experience, Gou (2022) analyzes the issuance terms of perpetual bonds and finds that its interest rate jump characteristics may eventually lead to the interest rate of perpetual bonds being higher than the average of the same period in the industry. This feature contradicts the requirements of current accounting standards, so she suggests that they be treated as debt instruments in accounting.

Some scholars argue that perpetual bonds should be judged as equity instruments or financial liabilities according to the specific terms of their issuance. Korteweg (2010) points out that perpetual bonds in the bond market have dual properties, so they should be analyzed in detail according to their specific issuance terms in order to accurately define their nature.

Some scholars believe that perpetual bond has both equity and debt characteristics. Mande et al. (2012) emphasize that perpetual bonds, as a financing instrument with both debt and equity characteristics, should be defined in terms of issuance and economic substance. The research of Leibowitz et al. (2013) indicates that a cautious and objective attitude should be taken towards the hybrid financial instrument of perpetual bonds, and its attributes should be divided based on its dual attributes of "equity" and "debt".

Some scholars believe that it is necessary to judge the equity and debt properties of perpetual bond according to the actual situation. Marques et al. (2018) point out that both equity and debt are important characteristics of perpetual bonds. When determining the attributes of perpetual bonds, specific analyses should be made according to the economic characteristics of perpetual bonds. Tian (2019) points out that when judging the nature of perpetual bonds, we should not over-rely on legal and regulatory requirements, but should judge whether they are equity instruments or financial liabilities by the economic essence reflected in the issuance terms, so as to conduct proper accounting treatment. J. P. Qiu (2020), through in-depth analysis of TBEA's two-period perpetual bonds, believes that the accounting attributes of perpetual bonds mainly depend on their special terms. Hill et al. (2021) propose a new classification method: classifying the external capital obtained from issuing bonds as "liabilities" and the capital earned from selling goods and services as "equity", and emphasizing the importance of the concept of ownership in financial reports.

Some scholars point out that it needs to be judged according to the terms of perpetual bond. X. N. Liu and Liu (2021) point out that it is necessary to judge the debt and equity nature of perpetual bonds realistically. Specifically, it can be analyzed through terms such as renewal, deferred interest payment, interest rate jump, and whether tax deduction can be made before tax. This method ensures the accuracy and rationality of the classification.

D. Zhu and Liu (2023) believe that when perpetual bonds are included in equity, they can reduce the asset-liability ratio and have a promoting effect on deleveraging. However, they also acknowledge that achieving a simple "split of equity and debt" is difficult for such hybrid financial instruments and requires a comprehensive consideration of various factors.

2.3.2 The issuance terms of perpetual bonds

The terms of issuance of perpetual bonds not only affect the financing strategy and capital structure of enterprises, but also relate to the rights and interests of investors, creditors and other stakeholders.

Redemption terms for perpetual bonds. The research of Sarkar (2001) shows that reasonable redemption terms are crucial to corporate financing decisions. Compared with ordinary bonds, issuers of perpetual bonds can choose to redeem at any time during the life of perpetual bonds, while issuers of ordinary bonds do not have the above rights. Sarkar and Hong (2004) point out after research that if an enterprise exercises early redemption, it may have a negative impact on the asset structure of the enterprise, and then affect the operation efficiency.

In terms of the need to focus on the characteristics of perpetual bond. F. X. Sun et al. (2020) point out that Chinese enterprises should focus on three aspects when issuing and investing in perpetual bonds. First, the duration, that is, whether the issuer can renew the maturity and how much the interest rate jumps during the renewal; second, the order of repayment, that is, when a company goes bankrupt and liquidated, whether the order of repayment of perpetual bonds is the same or weaker than that of other bonds; and the third, the interest deferral, that is, whether the issuer can unconditionally choose the interest deferral, and whether the choice of interest deferral involves penalty interest. After the choice of interest deferral, dividends or capital reduction shall not be distributed to shareholders during the period.

On the basis of the above three characteristics. Diao (2020) refines the characteristics of China's perpetual bonds. First, most of the existing stock of perpetual bonds are perpetual medium bonds; second, there is no difference between the order of payment of perpetual bonds and other bonds in bankruptcy; third, the issuer has the right to defer interest payment; and fourth, there is an interest rate jump mechanism when the perpetual bond is renewed.

In the exercise of rights. X. Tan and He (2021) find that if the right of deferred interest payment of perpetual bonds is to be exercised, the company cannot distribute dividends or reduce registered capital during the period. However, in the actual operation process, the issuer will often control the rhythm of dividend distribution and capital reduction to achieve the purpose of deferred interest payment. This provides enterprises with greater flexibility, enabling them to defer interest payments when necessary to relieve short term financial pressure.

2.3.3 The pricing mechanism of perpetual bonds

The pricing mechanism of perpetual bonds not only involves complex financial theories, but also combines a variety of mathematical models and technical means. In-depth understanding and research of these different viewpoints and methods can help enterprises make better capital structure decisions in a complex market environment to achieve long-term stable development and performance improvement.

As perpetual bonds are regarded as a debt instrument that includes the issuer's options, research on their pricing mechanism is closely related to option pricing. Mjøs and Persson (2010) regard perpetual bonds as debt instruments with call options, study their impact on the issuer's optimal capital structure, and discuss how to determine the coupon rate.

In terms of the adjustment of option prices. S. P. Zhu and Chen (2011) derive the analytic formula of option price and optimal strike price by using perturbation method. They find that when the price of the underlying asset falls, the price of the put option generally rises, thus delaying the best time to execute the option contract.

In the pricing of options. Grossinho et al. (2017) derive the analytic formula of option price and optimal strike price by using perturbation method. They find that when the price of the underlying asset falls, the price of the put option generally rises, thus delaying the best time to execute the option contract.

Also in terms of option pricing. F. Xu and Zhou (2019) investigate the pricing of permanent American put options when the underlying asset price follows a sub mixed fractional Brownian motion. They use Delta hedging method and the No Arbitrage Principle to establish the corresponding partial differential equation, and obtains the pricing formula by solving the free boundary problem.

In terms of the valuation of options. Deng (2020) estimates permanent American floating repo call options under a multi-scale stochastic volatility model, taking into account two stochastic processes driven by fast mean recovery factor and slow change factor. By introducing new dimensionality reduction variables and using multi-scale asymptotic techniques, he obtained a closed-form pricing formula.

Also in the pricing of options. Phelan et al. (2020) propose new numerical schemes for pricing perpetual Bermuda options, American options, and quantum options. Their method has good error convergence in calculation time, which improves the efficiency and accuracy of pricing.

In terms of considerations in the pricing of perpetual bonds. Lv and Qiu (2019) explore the factors to be considered in the pricing of perpetual bonds from three dimensions: enterprise nature, clause pricing and variety spread. They believe that when investing in perpetual bonds, we should pay special attention to potential problems such as the risk of extension and the risk of deferred interest payment.

In the pricing of options. Al-Hadad and Palmowski (2021) propose a perpetual American-style put option pricing algorithm with asset-dependent discounting. The algorithm starts from the case where the discount function is constant and extends to the pricing case where the

discount function conforms to a specific expression.

In the pricing of assets with dividend payments. Rozkosz (2022) uses Multidimensional Black and Scholes models to study the pricing of perpetual American options for the underlying assets with dividend payments, and propose a formula for calculating the premium rate of early call warrants.

2.3.4 Motivation of perpetual bond financing

Scholars have carried out multi-angle research on the motivation of enterprises to finance through issuing perpetual bonds.

Some scholars put forward that optimizing the structure of corporate assets and liabilities is one of the important motivations for issuing perpetual bonds. Leland (1994) points out that the upper limit of an enterprise's asset-liability ratio is stipulated in the debt contract. Enterprises with high asset-liability ratio are often under great financial pressure with high financing costs. By issuing perpetual bonds, enterprises can reduce their asset-liability ratio. Banko and Zhou (2010) show that the main purpose of using perpetual bond financing is to reduce information asymmetry and alleviate under-investment, so as to achieve the optimal capital structure. Korteweg (2010) points out that the issuance of perpetual bonds can supplement the funds needed for development, reduce the asset-liability ratio, and adjust the leverage ratio to an ideal level. Jin (2014) finds that under certain conditions, real estate enterprises can divide perpetual bonds into equity instruments, which can not only raise a lot of funds but also reduce the asset-liability ratio, so it has become the preferred financing tool for these enterprises. Sunderland and Berry (2016) show that when listed enterprises with a high asset-liability ratio face financing needs, this indicator has a negative impact on financial data, and makes enterprises tend to reduce the asset-liability ratio by issuing perpetual bonds. The study of Chinese banks supplementing Tier 1 capital through perpetual bonds shows that this method can improve the structure of assets and liabilities (J. C. Sun, 2019). J. J. Shan (2020) emphasizes that enterprises choose perpetual bond financing not only to reduce risks, but also to take advantage of its low-cost characteristics to solve the problem of insufficient capital. J. Zhang (2020) believes that real estate enterprises can obtain several benefits by issuing perpetual bonds: obtaining stable funds, reducing asset-liability ratio and improving credit rating. Y. W. Yang (2020) collects statistics on the historical issuance of perpetual bonds and points out that since the government put forward the requirement of "deleveraging" in 2015, the scale of issuance of perpetual bonds has surged, and some perpetual bonds with weak "equity" have been recorded as other equity

instruments. The purpose of issuing perpetual bonds by SOEs is to reduce the debt ratio without diluting shareholders' equity. X. F. Xu and Lu (2020) point out that the goal of enterprises issuing perpetual bonds is to optimize their capital structure, and then optimize their financial data and asset-liability ratio index, so as to help enterprises expand long-term and stable sources of capital, rather than merely meet the current capital demand. G. F. Sun and Luan (2021), by establishing GMM model and fixed effect model, point out that commercial banks can significantly improve their own profitability after issuing perpetual bonds.

Some scholars propose that the motivation for enterprises to issue perpetual bonds is to relieve the pressure of capital liquidity. Repullo and Suarez (2004) emphasize that when the cost of equity financing is high and the interest rate of bond market is low, issuers are more inclined to choose perpetual bonds to reduce financing cost and obtain more flexible sources of funds.

Öncü (2017) mentions that enterprises can raise funds by issuing zero-coupon perpetual bonds to support the development of the company. This method can reduce the pressure of interest payment and meet the capital needs of enterprises, especially for projects requiring long-term and stable financial support.

Some scholars put forward that the motivation for enterprises to issue perpetual bonds is to break through policy barriers. Cai (2018) proposes that in order to break through the policy barriers and provide financial support for some key projects, SOEs in some industries in China would seek to break the market by issuing perpetual bonds, which is a strategy that helps enterprises maintain competitiveness in the complex and changeable market environment. And Wišniewski (2018) proposed that when enterprises faced sudden financial difficulties, they could reduce the financial pressure by issuing perpetual bonds, which provided more space and time for enterprises to cope. The study on Evergrande Real Estate's perpetual bond financing shows that the downturn in the real estate market and the adjustment of government policies have led to the liquidity problems faced by enterprises, prompting them to seek a new financing method of perpetual bonds (Bai, 2019). De Grauwe (2020) analyzes the impact of COVID-19 on the real economy and points out that the double shocks of supply and demand brought about by the epidemic have made the loan scale of real enterprises continue to increase. Based on this, European governments withdrew from zero-coupon perpetual bonds, and financial institutions first bought such zero-coupon perpetual bonds in the primary market, held them for a period, and then sold them to European banks in the secondary market to monetize their debts.

In terms of strategic support. Qi et al. (2020) point out that the strategic direction of enterprises is closely related to the choice of financing methods. Raising funds by issuing

perpetual bonds not only enriches the source of funds, but also spreads out the pressure of debt repayment, thus better supporting the long-term development strategy of the enterprise.

Some scholars put forward that the motivation of issuing perpetual bonds is to enhance the external image of enterprises. Islam et al. (2010) point out that regulators have regulatory requirements for capital adequacy ratio of financial institutions, and the issuance of perpetual bonds by financial institutions can improve capital adequacy ratio and risk resilience.

In terms of improving financial stability. Feng (2014) analyzes the role of perpetual bonds from the perspective of government bonds. She believes that the long-term characteristics of perpetual bonds can effectively solve the problem of "maturity mismatch", improve financial stability through the inflow of long-term funds, and reduce the probability of financial risks to a low level.

In response to regulatory requirements. Cai (2018) points out that in accordance with the regulatory requirements of State-owned Assets Supervision and Administration Commission of the State Council (SASAC) on the asset-liability ratio of SOEs, China's highly indebted SOEs often actively issue perpetual bonds, so as to meet the indicators required by SASAC to reduce the asset-liability ratio in their assessment. Therefore, issuing perpetual bonds has become an effective means for these enterprises to optimize their asset-liability structure.

Also in response to regulatory requirements. L. Li (2019) points out that financial institutions need to meet the regulatory requirements of minimum capital, but some financial institutions have not reached the minimum capital requirements, so they increase their capital amount by issuing perpetual bonds to meet the regulatory and structural requirements. This not only helps to maintain the normal operation of financial institutions, but also guarantees the stability of the financial market.

Yusniar and Hadi (2018) find through a comparative study on debt financing and equity financing that the adoption of debt financing by SOEs may lead to a decline in financial performance, especially an increase in financial risk when the leverage ratio is high. In contrast, equity financing, such as equity financing, can promote financial performance. Therefore, as a hybrid financing tool, perpetual bonds can take into account the advantages of the two financing methods to a certain extent.

In optimizing the asset-liability ratio. D. Wang (2021) proposes that credit rating agencies pay great attention to the asset-liability ratio index of enterprises. When an enterprise issues perpetual bonds, its asset-liability ratio will decrease, which may enhance the favorable attitude of credit rating agencies toward the enterprise. Therefore, issuing perpetual bonds will not only help improve the credit rating of enterprises, but also enhance the confidence of investors and

the market.

Some scholars have suggested that the motivation of issuing perpetual bonds is to respond to the external environment and policy orientation. Mande et al. (2012) summarize the stock or bond issuance data of 900 different companies and find that when the information transparency between internal managers and investors is improved, enterprises are more inclined to choose bond financing. This enhanced transparency boosts investors' confidence and makes bond financing a more attractive option.

Gelfand (2020) finds that the US government is supportive of perpetual bond issuance. On the one hand, policies support enterprises to obtain low-cost long-term funds through issuing perpetual bonds; on the other hand, the US government encourages enterprises to invest the funds obtained through the issuance of perpetual bonds into projects whose returns are higher than the cost of issuance. This policy incentive provides issuers with a low-cost source of long-term funding, thus boosting the economy.

In the area of bank perpetual bonds. S. H. Wang and Li (2016) point out that with the advance of interest rate liberalization reform, banks are seeking more flexible and lower-cost financing methods, so perpetual bonds become a preferred tool.

Also in the banking sector. Fan (2020) stresses that *Basel III* has higher requirements for banks' Tier 1 capital and Tier 2 capital adequacy ratio, so banks have to adjust the terms of issuance of perpetual bonds to meet the new regulatory standards. This is an important reason for the significant increase in issuance of perpetual bonds by commercial banks in recent years. The implementation of the new standard has forced banks to find innovative financing ways to meet the higher capital requirements. X. P. Shen (2021) shows that the scale of banks' issuance of perpetual bonds increased rapidly with the policy support of the People's Bank of China. The development of the regulatory system has provided banks with more financing options and enhanced the flexibility and stability of the financial market.

2.3.5 The financing effect of perpetual bonds

Scholars' research on the effect of perpetual bond financing reveals its multi-faceted impact. From the perspective of its impact on financial performance and capital cost, Gapeev and Kühn (2005) point out that perpetual bonds have more advantages than traditional bonds and equity financing in optimizing corporate capital structure. While enterprises enjoy tax saving effect or lower capital cost, they also need to deal with certain potential risks. Baldwin (2017) emphasizes that in the field of real estate, perpetual bonds can improve the capital structure of

enterprises, supplement the capital of investment projects of enterprises, and broaden the ways of raising funds of enterprises. Bagus et al. (2016) point out that the way of interest payment of perpetual bonds is very different from that of traditional bond financing. The way of interest payment of perpetual bonds is more like equity investment, because enterprises do not need to repay the principal, but pay interest to the holders in the form of dividends.

In enhancing enterprise value. Q. Li (2018) finds that financing by issuing perpetual bonds can obtain low-cost funds in a short period of time, thus reducing financial costs and improving corporate performance. However, with the passage of time, its positive influence may gradually weaken. Tsuji and Nakamura (2019) show that the choice of debt structure is crucial to the overall value of an enterprise, and the maturity of an enterprise's stock debt is closely related to the overall value of an enterprise.

Taking Evergrande Real Estate as an example, Bai (2019) discusses the impact of perpetual bonds on corporate cash flow and capital expansion speed. She points out that perpetual bonds are of great help in building a company's refinancing capacity. Although the financing cost of perpetual bonds is higher than that of ordinary bonds, from the perspective of income, Evergrande Real Estate's net profit and earnings per share increased year by year after issuing more than 80 billion yuan of perpetual bonds between 2015 and 2016, which shows that perpetual bond financing has a positive effect on stock price growth.

Bécsi et al. (2021) propose that enterprises with high asset-liability ratio could promote capital restructuring by issuing perpetual bonds. Therefore, perpetual bonds can be used as an effective recapitalization tool.

In terms of improving corporate profitability. According to Y. J. Kim et al. (2023), the main advantages of perpetual bonds are that they do not dilute equity when included in equity instruments, and interest payments are treated as dividends, which do not affect net income and thus enhance profitability; when it is included in debt, the interest payments enjoy a tax offset effect, further optimizing the financial statements.

D. Zhu and Liu (2023) find that issuing perpetual bonds can beautify the structure of the balance sheet and the operating results reflected in the profit statement. This strategy provides a temporary means for enterprises to polish their financial statements, which helps to improve market confidence.

Scholars have pointed out that the main purpose of many enterprises choosing to issue perpetual bonds for financing is to optimize their capital structure. Holz (2002) points out that by issuing perpetual bonds, enterprises can effectively reduce financial leverage and reduce financing costs. This approach not only enhances the financial flexibility of enterprises, but also

enhances their competitiveness in the market.

In terms of optimizing capital structure. J. Wu (2018) conducts a study on perpetual bonds and the risk management of financial institutions, and points out that the issuance of perpetual bonds by financial institutions would have an impact on their own capital structure. He used leverage ratio as a trigger to give timely warning of the possible risks faced by financial institutions, which effectively improved the profitability and stability of financial institutions. H. Y. Shan (2019) emphasizes that financial institutions can optimize their capital structure by issuing perpetual bonds and meet the minimum capital limit required by regulation. Perpetual bonds, as a financing method, provide a flexible and effective tool to cope with regulatory requirements and market changes, and can also promote the operational efficiency of financial institutions.

Lai (2019) believes that issuing perpetual bonds can meet the expectations of corporate shareholders without diluting the equity of existing shareholders. This is particularly important for enterprises that want to maintain a stable shareholding structure, while also providing more value creation opportunities for shareholders.

For financing cost control. F. M. Wu (2020) conducts a study on construction enterprises with high asset-liability ratio, and finds that the purpose of issuing perpetual bonds of construction enterprises was to repay bank debts, which reduced the asset-liability ratio of enterprises. This strategy not only relieves the pressure of short-term debt repayment, but also improves the financial status of enterprises.

S. Luo (2021), through a case study of M Construction Engineering Group, finds that perpetual debt financing has a lower cost and can bring higher earnings per share. This method provides the enterprise with additional financial support while maintaining the low financing cost and maximizing the economic benefits.

Academics have studied the market's reaction to perpetual bond issuance, revealing its complex dynamic impact. X. N. Liu and Liu (2021) analyze the event of the Bank of China's first commercial bank perpetual bond issuance, and show that in the short term, the stock price of the Bank of China showed a downward trend. In the long run, the stock price of the Bank of China has risen. This proves that the market has finally recognized the positive effect of perpetual bonds after an initial adjustment.

In terms of market value management. J. P. Guo and Zhang (2020) study the stock price changes of Gezhouba Group in the 10 working days before and after the announcement of perpetual bonds, and find that the stock price showed a clear upward trend during this period. Their research shows that the issuance of perpetual bonds sent positive signals to the market

and enhanced investor confidence, thus driving up the stock price.

Some scholars point out that issuing perpetual bonds can optimize financial statements. Y. P. Ren and Zhai (2020), in conjunction with the new financial instrument standard, point out that when enterprises classify perpetual bonds as equity instruments and choose to defer redemption, the interest generated will not be included in the expense, which may lead stakeholders to make wrong decisions based on financial statements that do not fully reflect the real situation of the company. They stress the importance of accurate information disclosure to ensure that market participants can make judgments based on comprehensive information.

Mocanu et al. (2021) emphasize the importance of information disclosure in perpetual bond financing, and point out that active disclosure by issuers can eliminate uncertainty, enhance investor confidence and improve the effect of financing. Good information disclosure not only enhances the transparency of the market, but also promotes the effective allocation of capital.

2.3.6 Redemption and renewal of perpetual bonds

In terms of the choice of redemption timing. Sarkar and Hong (2004) point out that in the process of perpetual bond financing, enterprises need to pay special attention to the choice of redemption timing. They believe that choosing the appropriate redemption time can maximize the financial flexibility and fund efficiency of enterprises.

Whether to renew the perpetual bond after it matures. B. Liu (2022) points out that companies typically opt to redeem perpetual bonds on the maturity date, as failing to do so would result in significantly higher financing costs due to the interest rate step-up mechanism triggering increased rates upon renewal. When the company has sufficient cash flow or less demand for funds, it can exercise the right of redemption and redeem the bonds while paying the principal and interest, which gives the company more initiative and enables it to make flexible adjustment according to its own situation.

Add points for renewal. K. Wang and Nie (2019) conduct research on the renewal point and redemption pricing of perpetual bonds, which further provides theoretical basis and practical guidance for enterprises to deal with the issue of perpetual bond redemption.

X. G. Wang et al. (2019) conduct research on the renewal point and redemption pricing of perpetual bonds, which further provides theoretical basis and practical guidance for enterprises to deal with the issue of perpetual bond redemption.

In terms of redemption at maturity. F. Liu (2020) analyzes the trend of the interest rate of perpetual bonds rising over time and points out that most enterprises tend to redeem perpetual

bonds in the first callable period. She also mentions that the asset-liability ratio of enterprises may rise rapidly after redemption. In addition, because perpetual bonds are usually included in equity instruments, their interest payments are not eligible for pre-tax deduction, which indirectly increases financing costs.

Also in terms of redemption at maturity. C. P. Tan et al. (2022) analyze the trend of the interest rate of perpetual bonds rising over time and point out that most enterprises tend to redeem perpetual bonds in the first callable period. They also mention that the asset-liability ratio of enterprises may rise rapidly after redemption. In addition, because perpetual bonds are usually included in equity instruments, their interest payments are not eligible for pre-tax deduction, which indirectly increase financing costs.

2.3.7 Financing risks of perpetual bonds

In terms of financial risks, many enterprises have cleverly made use of the dual attributes of "shares" and "debts" of perpetual bonds to classify them in equity. This approach has optimized the financial statements of enterprises to a certain extent, but also brings potential risks, especially after the renewal of perpetual bonds, the chain reaction may be more significant.

In terms of financial cost improvement. Islam et al. (2010) point out that once an enterprise triggers the mandatory interest payment clause and the interest rate jump clause of perpetual bonds, it will face extremely high interest payment, which will have a significant negative impact on profits. These clauses increase the financial burden of enterprises, especially when the market environment is unfavorable.

Also in terms of financial cost improvement. When Wolski (2017) conducts an empirical analysis of the return on venture capital of real estate enterprises, he finds that compared with ordinary bonds, perpetual bonds usually need to provide a higher return rate to attract investors due to their higher risks. This directly leads to the rise of the financing cost of enterprises and increases the financial pressure.

In terms of cash flow risk. H. H. Liu et al. (2019) point out that while perpetual bonds can provide cash flow support to enterprises in the short term and alleviate funding shortfalls, financial risks are often hidden behind such benefits and are often masked by doctored financial statements H. H. Liu et al. (2019) emphasize that the real financial situation of enterprises is masked by the long-term sustainability of perpetual bonds, and once the redemption clause of perpetual bonds is triggered, enterprises will face greater financial risks.

The empirical research of Corsetti et al. (2020) indicates that perpetual bond financing is

not the best financing method to promote economic recovery in Europe during the COVID-19 pandemic due to certain risks. During this period, market uncertainty increased, making perpetual bonds less attractive.

In view of the financial burden brought by the interest rate jump mechanism. F. P. Wang (2020) believes that when enterprises encounter operational difficulties, the interest rate jumping mechanism of perpetual bonds will increase the financial burden and fall into a vicious circle of capital flow. In addition, against the backdrop of an increasingly stringent macroeconomic and regulatory environment, the issuance of perpetual bonds by financial institutions may lead to lagging interest payments, further exacerbating financial risks.

Also in terms of the impact of interest rate jumps. J. Li (2020) points out that as a special debt instrument, perpetual bonds' interest rate jumping clause has a significant impact on corporate financial decisions. This clause means that if an enterprise chooses not to redeem the perpetual bond, it will have to pay an increasingly higher interest rate over time. This mechanism effectively incentivizes enterprises to prioritize redemptions of perpetual bonds if their funding situation allows, to avoid high funding costs in the future. However, this option may also reflect the funding position of enterprises, as they will only be able to carry out redemption operations when they have sufficient liquidity. If enterprises give up redemption opportunities several times, this may send a signal to the market that the capital chain is tight, attract investors' attention, and may lead to an increase in financial risk.

Cheng (2019) proposes that a sound financing system is essential for the normal operation of perpetual bond financing. In a sound financing system, enterprises can obtain funds through a variety of channels, which helps to spread financing risks and enhance their anti-risk ability. On the contrary, if the financing system is not sound enough, enterprises may over-rely on a single financing channel, such as bank loans, which may lead to a sharp increase in liquidity risks in times of market turbulence or problems in corporate operations.

In terms of diversifying risk. Y. Liu (2020) conducts a study on the construction industry and pointed out that enterprises in the construction industry often rely on a single bank for financing. If the production and operation of the enterprise have problems, it will bring the risk of bankruptcy due to the restriction of financing channels and other influences. The emergence of perpetual bonds provides an important channel for the construction of financing channels for construction enterprises, and at the same time provides a long term and stable source of funds for construction enterprises, which helps to disperse risks.

Goncharenko et al. (2021) propose that in the banking sector, high-risk banks tend to be cautious about issuing perpetual bonds. This is because high-risk banks may suffer from more

debt overhangs, resulting in higher issuance costs, thus affecting their willingness and ability to issue perpetual bonds. Therefore, a bank's risk level directly affects its decision to issue perpetual bonds.

Scholars have conducted extensive research on the credit risk of perpetual bonds. Hennessey et al. (2014) point out that under the framework of *Basel III*, there is an obvious trend for banks to issue perpetual bonds to enhance tier 1 capital. However, many banks cannot reach the rating standard required for issuing perpetual bonds due to their inadequate ratings, which limits their ability to enhance capital through perpetual bonds. In order to improve their credit rating, banks must continuously increase the issuance of loans.

X. Y. Li (2018) believes that the credit risk compensation mechanism embedded in perpetual bonds is an important feature. Due to the long maturity of perpetual bonds, the credit risk of perpetual bonds is also high. In order to cope with such high risk, the issuer usually sets the coupon rate higher than that of ordinary bonds. At the same time, when the perpetual bond is renewed, the coupon rate jumping mechanism will be triggered to attract investors. To ensure the stability of the bond rating, the issuer needs to ensure that the interest is paid on time, otherwise the credit rating of the bond will be lowered, which will lead to credit risks.

In terms of operational risk. Wišniewski (2018) points out that when the company was under a lot of short-term financial pressure, it could solve the above problem by issuing perpetual bonds. However, the issuance or renewal of perpetual bonds may attract high attention from the regulatory authorities, which may adversely affect the operation of enterprises. Once regulators start asking questions, the negative market reaction could be amplified, affecting companies' reputations and funding costs.

J. C. Sun (2019) analyzes the perpetual debt risks faced by real estate enterprises. Due to the high asset-liability ratio and slow recovery of funds in this industry, it may be difficult for enterprises to fulfill their repayment obligations once they are short of funds. This makes real estate companies face higher risks in terms of perpetual bond financing.

In the negative impact on corporate debt rating. Barone (2019) conducts a study on issuers' principal credit rating and perpetual bond rating, and finds that the principal rating was higher than the debt rating. The main reason is that when an enterprise goes bankrupt, the compensation order of investors in perpetual bonds is weaker than that of other creditors, so there are greater risks. Therefore, the interest income of perpetual bonds is higher, but the debt rating of perpetual bonds is weaker than that of the principal rating.

Also in terms of credit rating. Harford et al. (2014) point out that if an enterprise chooses to renew the perpetual bond, it may convey to the market that the enterprise is facing some

difficulties in production and operation, which may lower the credit rating of the enterprise and increase the financing difficulty of the enterprise.

In terms of liquidity risk. H. B. Wang (2023) points out that an important factor for commercial banks to issue perpetual bonds is to meet regulatory requirements, and issuing perpetual bonds can improve the capital adequacy ratio of banks. However, after the perpetual bonds expire, banks are faced with the decision of whether to renew or repay them. If the bonds are renewed, banks will face high interest; if the bonds are repaid, banks will face liquidity pressure.

Scholars have carried out extensive research on policy risks, and the research points out that policy regulations have an important impact on the accounting attribute recognition of perpetual bonds. Mhedhbi and Zeghal (2016) argue that the accounting treatment of perpetual bonds is not fixed, but adjusted according to current policies. This suggests that the policy plays a decisive role in determining the accounting attributes of perpetual bonds. Zhai (2018) emphasizes that the setting of terms for the issuance of perpetual bonds is closely related to the policy environment. To adapt to specific regulatory requirements, some special designs may be introduced. Therefore, a change in policy could easily lead to the adjustment of these terms, leaving the structure of perpetual bonds with some flexibility and uncertainty. She points out that the design of issuance terms is often tailored to meet a specific policy requirement. According to the analysis of H. Chen et al. (2019), policy support plays a significant role in promoting the perpetual bond market. They point out that when the policy supports the issuance of perpetual bonds, the perpetual bond market will usher in vigorous development, but once the policy is adjusted, the issuance of perpetual bonds may be severely restricted. So, any policy change could have a significant impact on the perpetual bond market.

H. Y. Wang et al. (2023) propose that the adjustment of accounting policies would have an impact on the classification of accounting attributes of perpetual bonds. They emphasize that when facing the new accounting standards, enterprises must pay close attention to and correctly classify perpetual bonds as equity instruments or financial liabilities to ensure compliance with the latest policy requirements. Accurate classification not only helps the true reflection of financial statements, but also helps investors make informed investment decisions.

2.4 Debt financing decisions of SOEs

2.4.1 SOEs

One type of literature discusses the role of SOEs in economic and social development. Scholars have delved into the role of SOEs in economic and social development. Dong and Putterman (2003) point out that in China, the actual control of SOEs was in the hands of governments at all levels, and this natural close connection enabled the government to directly ask state owned enterprises to assume social responsibilities such as maintaining employment and providing public goods. Meanwhile, SOEs were more likely to obtain economic resources support provided by the government.

In terms of operational efficiency of SOEs. Morck et al. (1988) point out that SOEs may have the problem of inefficiency, because political leaders sometimes transfer the resources of SOEs to their supporters, or use these enterprises to promote their personal affairs, thus affecting the operation quality and efficiency of the enterprises.

In terms of improving public welfare in SOEs. Stiglitz (1993) studies the effect of SOEs on improving public welfare and points out that the state, as the owner, may accept a lower profit level to ensure the provision of specific public services. For example, when private operators are unwilling to provide services to the people in the suburbs, SOEs need to step up to improve social welfare and show their responsibility. Similar examples also include railway and power network industries.

Shleifer and Vishny (1994) hypothesize that SOEs are often used by politicians as a tool to increase voter satisfaction and employment levels.

Research on the operational efficiency of SOEs reveals some key problems. Megginson and Netter (2001) point out that the operational efficiency of SOEs is generally lower than that of private enterprises. Q. Sun and Tong (2003) find that the economic efficiency of SOEs is relatively low compared with other ownership types of enterprises at the macro level. Ferri and Liu (2010) further find that the main source of profits of SOEs is not the result of market competition, but depends on the subsidized interest rate policy.

In terms of the tasks of SOEs. Megginson et al. (2014) emphasize that SOEs not only pursue economic benefits, but also shoulder important social and political tasks, which to some extent affect their ability to focus on efficiency improvements. Therefore, the economic efficiency of SOEs is often weaker than that of non-SOEs. SOEs are unique in that they not only pursue economic benefits, but also take into account non-economic objectives, such as maintaining

social stability under major negative shocks (Bruton et al., 2015). Gan et al. (2018) find that senior managers appointed by the government may pay more attention to political tasks rather than professional operation and management skills, leading SOEs to be more inclined to short-term investments in the decision-making process. Under such circumstances, SOEs may be inclined to make short-term investment decisions (X. Q. Zhang et al., 2020). In addition, the special status of SOEs may lead to the intensification of administrative monopoly and weaken the competitive power of the market (Gan et al., 2018).

The special status of SOEs may lead to increased administrative monopolization and weaken the dynamics of market competition. Mixed-ownership reform has had a profound impact on SOEs. First, cross shareholdings between different capitals strengthen the power checks and balances mechanism of state-owned controlling shareholders and the internal supervision of enterprises, encouraging enterprises to actively innovate and add value. Secondly, with the increase of non-state capital shareholding, the corporate governance structure has been optimized, which has promoted a series of innovative research and development activities within the company. Finally, the mixed ownership reform has broken the long-standing dominance of SOEs, enhanced the vitality of market competition, stimulated the innovation ability and operation and management efficiency of SOEs, and made them more competitive in the market (X. Q. Zhang et al., 2020).

2.4.2 SOEs' debt financing decisions

The development of financial market is crucial to the financing decision of enterprises (Demirgüç-Kunt & Levine, 1996). F. Allen et al. (2005) point out that SOEs tend to get more credit funds and other financial support due to their policy support and resource tilt, which poses a challenge to private enterprises in resource acquisition. This imbalance in resource distribution puts private enterprises in a relatively disadvantageous position in financing environment.

In enterprise cash flow management. The study of Faulkender et al. (2012) reveals that the cash flow status of enterprises is one of the key factors in capital structure adjustment. The cash flow not only determines the goal setting of capital structure, but also affects the speed of adjustment. Good cash flow management enables enterprises to respond more flexibly to market changes and internal demands, ensuring the optimization of the capital structure.

From the perspective of financing structure, enterprises mainly have two structures of internal financing and external financing. Internal financing is mainly composed of the

company's undistributed profits to shareholders, which is less affected by external stakeholders, and the financing cost is mainly sunk cost. The advantage of internal financing lies in its flexibility and low cost, but it may be difficult to meet the needs of large-scale expansion of enterprises only by internal financing. External financing mainly includes equity financing and debt financing. In China's indirect financing system, debt financing has a particularly significant impact on corporate financing costs. The main sources of debt financing are bank loans, commercial credit, and bond issuance.

Debt financing is an important way for enterprises to obtain external funds, which mainly includes bank loans, commercial credit, and bond issuance. Bank loans are the most common way of debt financing, especially in an indirect financing dominated economy like China, where the role of banks is particularly prominent. Commercial credit provides short-term liquidity support for enterprises, while bond issuance provides an important option for enterprises in need of long-term funding.

2.4.2.1 Bank financing

Scholars have delved into the unique position of SOEs in the field of bank financing. Since state-owned banks and SOEs are both controlled by the government, there is a natural interest relationship between them (Kornai, 1998), and SOEs have more financial and political support from the government (Y. Y. Qian, 1994). In China's banking system, state-owned banks play an absolute leading role, while state-owned banks are more prudent in investing funds in private enterprises (Brandt & Li, 2003).

In terms of the difficulty and ease of obtaining bank credit resources for SOEs. The study of Khwaja and Mian (2005) shows that there is significant ownership discrimination in the process of bank credit allocation, and SOEs or enterprises with political connections are more likely to obtain loans. Claessens et al. (2008) further point out that senior executives with government background can effectively reduce the difficulty of enterprises in obtaining debt financing, which further strengthens the financing advantage of SOEs.

Research on SOE bank financing costs reveals some key issues. Armstrong et al. (2010) emphasize that financial capital is a key element of enterprise production and operation, which gives rise to complex contractual relationships among owners, managers and creditors. When constructing these contracts, the cost of capital is the main factor considered by the relevant contracting parties (F. Allen et al., 2005). Pan et al. (2019) find that when entering into a bank debt contract, the cost of capital largely depends on the creditor's perception of the borrower's risk. Easley and O'hara (2004) mention that when the degree of information asymmetry is high,

investors will face greater uncertainty of returns, and the risks brought by information asymmetry are not dispersed, which will lead to adverse selection behavior, thus increasing the price of banks' funds to SOEs.

Pittman and Fortin (2004) find that when the audit quality of SOEs is higher, its debt financing cost will be lower. This indicates that high-quality audit can enhance creditors' confidence and reduce financing costs.

2.4.2.2 Commercial credit

Commercial credit refers to the credit relationship between an enterprise and its suppliers and customers through deferred payment or prepaid accounts in its daily business activities (Amiti & Weinstein, 2011). In China's emerging capital market, because the financial system is still in an improving stage, commercial credit is widely used in inter-enterprise transactions. This kind of financing provides a flexible way for enterprises to obtain funds, which is especially suitable for those enterprises that have difficulty in obtaining bank loans (Ge & Qiu, 2007).

In the upstream and downstream enterprises to obtain commercial credit support. Love et al. (2007) emphasize that in the supply chain, the competitive market position of upstream and downstream enterprises determines their financing ability. Specifically, enterprises with a strong market position can obtain more commercial credit support more easily. This not only enhances a company's capital liquidity, but also improves its ability to cope with short-term financial needs.

In terms of the value of commercial credit. Petersen et al. (2008) analyze how enterprises along the supply chain have become more closely linked in the modern highly decentralized economic environment. The long-term cooperative relationship between suppliers and customers encourages both sides to make many proprietary asset investment and joint investment, forming a strong synchronization effect -- that is, "no company stands or falls alone ". Therefore, the commercial credit not only exists as a financing channel, but also can be regarded as an effective substitute for bank credit resources. They further point out that, to some extent, the commercial credit can be seen as an alternative financing channel for bank credit resources. For businesses that do not have easy access to bank loans, the commercial credit provides an important source of funding to help maintain day-to-day operations and facilitate business expansion.

2.4.2.3 Bond financing

Bond issuance is one of the important ways for enterprises to obtain funds. In China, financing

through bond issuance usually has two significant characteristics: first, bond is not the preferred way of debt financing for enterprises; Secondly, there are certain entry thresholds for bond financing, and SOEs and large enterprise groups are more likely to get the opportunity to issue bonds.

In terms of the importance of political connections for financing. The study of Houston et al. (2014) is based on the data analysis of listed enterprises in the United States from 2003 to 2008, and reveals that the credit rating of enterprises is affected by political connections. This correlation can reduce the bond financing cost of enterprises, indicating the important role of political factors in corporate financing.

In terms of government support and bond financing costs. Borisova and Megginson (2011) conduct an in-depth study on bonds from 14 countries and found that due to the effect of implicit government guarantee, the higher the degree of government control of a company, the lower its debt cost. This means that government support can reduce the financing cost of enterprises by enhancing credit endorsements.

In terms of government subsidies and bond financing. Research by Lim et al. (2018) shows that government subsidies significantly influenced investors' expectations of corporate default risk between 2007 and 2011. Investors generally believe that enterprises receiving subsidies have a lower probability of default, and therefore the debt financing cost of these enterprises is lower. This implicit government guarantee mechanism helps reduce the bond issuance cost of state owned enterprises and thus the overall financing cost (Borisova et al., 2015).

Benzoni et al. (2022) analyze the fixed transaction costs that enterprises encounter in the process of issuing bonds, and how enterprises' bond scales dynamically adjust in the absence of the ability to commit to future debt financing and repayment plans. This study sheds light on the complex decision-making processes that firms face in managing their debt structures.Based on the above literature review of "deleveraging", "Dynamic adjustment of capital structure", "Relevant economic characteristics of sustainable debt" and "Financing decisions of SOEs". The existing literature still has some shortcomings.

In terms of the impact of "deleveraging" on the capital structure and performance of enterprises, the existing literature shows that the "deleveraging" policy significantly affects the capital structure and performance of enterprises. Scholars have deeply discussed the causes and consequences of high corporate leverage, as well as the methods and effects of "deleveraging". The causes of high leverage include enterprises' excessive reliance on bond financing, as well as the impact of economic cycles and external shocks. In terms of the impact of high leverage ratio, scholars generally believe that high debt increases the risk of enterprises and reduces the

economic efficiency. As for the motivation of deleveraging, scholars pointed out that enterprises are greatly affected by their own financing constraints and external macro environment changes. As for the methods of deleveraging, scholars found that asset securitization, debt repayment and stock issuance were effective, that is, optimizing capital structure by increasing equity or reducing debt. In the actual process, to meet the regulatory requirements, some enterprises adopt such methods as open equity real debt or off-balance sheet debt to adjust. Deleveraging is beneficial to the long-term development of enterprises, can limit excessive investment, and has a positive impact on corporate performance. However, few studies have focused on whether firms increase leverage to expand investment in the context of deleveraging, and then reduce leverage after reaping the benefits.

As to research on the dynamic adjustment of enterprise capital structure, many literatures have analyzed the dynamic adjustment of the capital structure of enterprises, covering both micro enterprise and macro-economic factors. Existing studies have explored the factors influencing the speed of capital structure adjustment from multiple perspectives, and examined the impact of capital structure on firm investment and innovation. However, the research on how capital structure adjustment affects business performance is still insufficient. Future research should be further expanded in this field.

In the aspect of the economic characteristics and related research aspects of perpetual debt, perpetual bonds have the characteristics of both equity and creditor's rights. Careful study and careful grasp of their economic essence will help to define it accurately. The interest rate in the terms of perpetual bond issue jumping by the basis point, the order of creditors' payment and the determination of special period are worth discussing. The main motivations for enterprises to issue perpetual bonds include improving their balance sheet, easing liquidity pressure, creating a good external image and responding to the external environment and policy impetus. Regarding the financing effect of perpetual bonds, scholars believe that it not only helps to optimize the financing structure, improve the efficiency of the use of funds and broaden financing channels, but also may bring risks of stock price fluctuations and rising financing costs. In the existing literature, there are few studies on which types of enterprises are more inclined to issue perpetual bonds (for example, seeking expansion or replenishment of funds), and most of them are case studies, lacking extensive empirical studies, especially the study on the impact of issuance of perpetual bonds on corporate stock prices.

The research on bond financing decision of SOEs. The existing literature mainly focuses on the role of SOEs in economic and social development and their operational efficiency. Research on the external financing methods of SOEs: bank financing, commercial credit and

bond financing shows that SOEs have low default risk, so their financing costs are relatively low. However, the existing research is limited on what kind of pressure SOEs are more inclined to choose bond financing.

To sum up, although scholars' understanding of perpetual bonds is basically the same, it still needs to be supplemented and improved in some aspects. Especially in the context of the "deleveraging" policy, there is a lack of research on the impact of perpetual bond issuance on business performance. Based on this, this thesis aims to analyze the causes of high corporate leverage and the deleveraging policies implemented by the government in combination with China's domestic macroeconomic background, analyze the correlation between macro policy changes and the adoption of sustainable bond financing by Chinese SOEs, further discuss its impact on business performance, propose improvement suggestions, with a view to providing new ideas for enterprises to expand financing channels, provide reference for enterprises planning to issue perpetual bonds, and enrich the relevant academic research content.

2.5 Chapter summary

The second chapter is a detailed review of the development of relevant theories and past research. Through the review, it is found that the existing research mainly focuses on the issue of perpetual bonds by single enterprises, and pays less attention to the group of SOEs in China. The existing studies mainly focus on the definition of the nature of perpetual bonds by enterprises, the motivation of issuing perpetual bonds, the risk of issuing perpetual bonds, the accounting treatment of enterprises for perpetual bonds and the effect of issuing perpetual bonds by single enterprises. However, there are few studies on whether the impact of issuing perpetual bonds on the business performance of enterprises is positive or negative, and whether the impact on stock price is positive or negative. The existing researches mainly focus on financial enterprises, and pay little attention to non-financial enterprises. Therefore, by combining the development of theories and literature review, this thesis demonstrates the impact of China's non-financial SOEs issuing perpetual bonds on their business performance through quantitative research.

Chapter 3: Features and Environment of the Perpetual Bonds Issued by Non-Financial SOEs in China

This chapter provides a statistical analysis of the financial data from all publicly-issued bond enterprises between 2010 and 2023, aiming to delineate the financial characteristics of non-financial SOEs, and by compiling statistics on perpetual-bond-related policies and the issuance of perpetual bonds in China, this chapter offers a comprehensive understanding of the environment of perpetual bonds by Chinese SOEs, laying a realistic foundation for studying their issuance feature. Although the primary focus of this study is on non-financial SOEs, this chapter also includes a brief overview of the situations in private enterprises and financial enterprises, facilitating a comparative analysis to further illuminate the financial characteristics and perpetual bond issuance patterns specific to non-financial SOEs and private enterprises.

3.1 Financial status of Chinese SOEs

3.1.1 High deleveraging pressure on Chinese non-financial SOEs

Following the 2008 global financial crisis, the Chinese government embarked on a fiscal expansion of RMB 4 trillion to “expand domestic demand and maintain growth.” A significant portion of these funds flowed into SOEs, which subsequently assumed a substantial burden of investment expansion in response to the national call for stimulating domestic demand, leading to a rapid escalation in corporate debt levels. Moreover, the investment expansion was heavily concentrated in traditional industries such as energy, communications, and transportation, where overcapacity emerged, impeding capital reflow and perpetuating high leverage ratios. Consequently, the pressure for “deleveraging” and financial risks intensified. Figure 3.1 compares the changes in asset-liability ratios between Chinese SOEs and private enterprises post-2010. It reveals that from the financial crisis until 2015, SOEs' leverage ratios were consistently higher than those of private enterprises. Although the gap narrowed as private enterprises' expansionary demands revived with economic recovery, SOEs' leverage ratios remained elevated.

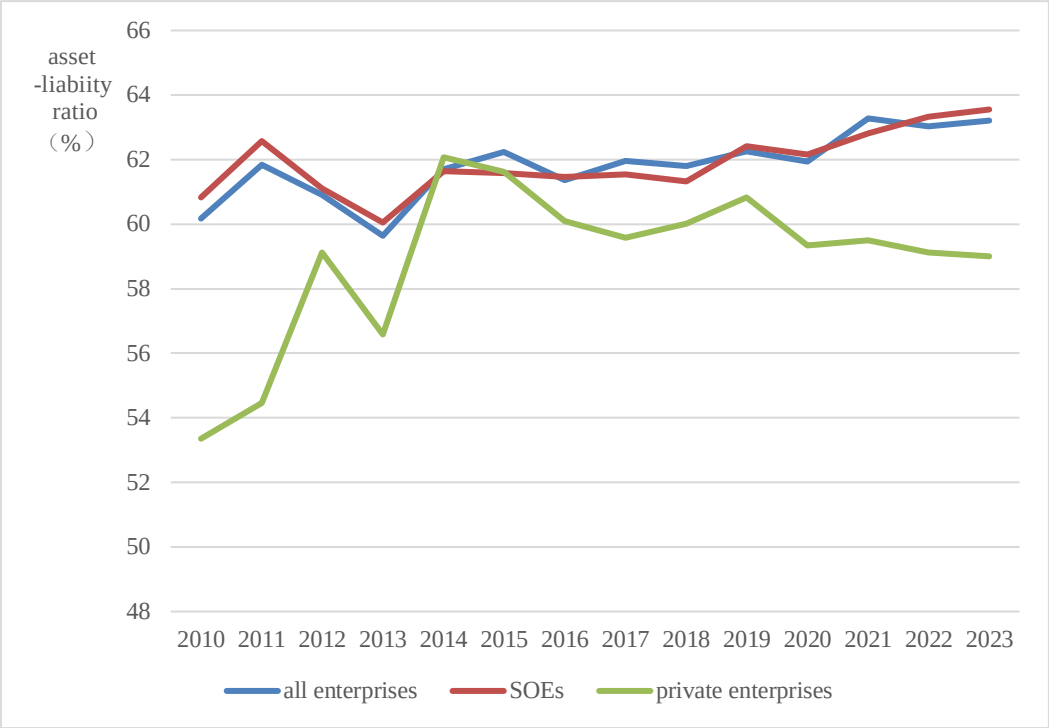

Figure 3.1 Changes in asset-liability ratio of non-financial enterprises from 2010-2023

In response, the Chinese State Council issued the "*Opinions on Actively and Prudently Reducing Corporate Leverage Ratios*" (Guo Fa [2016] No. 54) in September 2016. Addressing the high leverage ratios, rapid debt growth, and mounting debt burdens of Chinese enterprises, the document called for proactive and prudent measures to reduce corporate leverage, supporting "supply-side structural reforms" and laying a solid foundation for long-term, sustainable, and healthy economic development. Influenced by China's SOE deleveraging policies and strategic adjustments, the growth of SOE leverage ratios was contained. Figure 3.1 shows the changes in asset-liability ratio of non-financial enterprises classified by ownership from 2010-2023. The data is sorted from the financial analysis database of bond issuing enterprises according to Wind Database. Unless otherwise specified, all data presented originate from this database. SOEs encompass both central and local ones as categorized by the Wind Database, while private enterprises comprise private enterprises, foreign-funded enterprises, and Sino-foreign joint ventures. The following charts and tables in this chapter adopt the same classification method. The annual data is weighted average based on the total assets of enterprises. Since SOEs account for a significant portion of assets, their data tends to be closer to the average data of all enterprises. To address potential distortions caused by extreme values in the sample, samples in the upper and lower 1% quantiles have been directly excluded from the calculations. This truncation method is frequently applied to the data used in the subsequent charts and tables of this chapter, and thus will not be reiterated.

As shown in Figure 3.1 Changes in asset-liability ratio of non-financial enterprises from 2010-2023

, from 2015 to 2019, SOE leverage ratios remained stable at around 62%, and the gap with private enterprises did not widen. However, after 2019, amid the economic downturn caused by the COVID-19 pandemic, SOEs once again took on the task of countercyclical expansion to maintain economic stability (Z. Li & Wang, 2021; S. N. Wang & Wang, 2023; Xie & Wang, 2020). Consequently, SOE debt levels expanded once more, and Figure 3.1 Changes in asset-liability ratio of non-financial enterprises from 2010-2023

indicates that post-2020, SOE leverage ratios surpassed pre-financial crisis levels. In contrast, private enterprises were engaged in deleveraging during this period due to subdued investment amid economic challenges, resulting in asset-liability balance sheet “shrinkages” (CMF, 2024). The contrasting trends in asset-liability ratios between Chinese SOEs and private enterprises have led to a concentration of debt within SOEs, underscoring the urgency for SOEs to optimize their debt structures and control financial risks.

Figure 3.2 illustrates the changes in the current ratio of Chinese SOEs and private enterprises over the past fifteen years. The current ratio (CR), defined as the ratio of current assets to current liabilities, serves as an indicator of a company's short-term solvency and short-term debt risk. A higher current ratio suggests less pressure on the company to repay short-term debts. The annual data in Figure 3.2 represents the weighted average calculated based on the scale of current liabilities of enterprises. A notable trend emerges with 2017 as a dividing line: prior to 2017, the current ratio of SOEs was lower than that of private enterprises; however, subsequently, it surpassed the private sector. Furthermore, the current ratio of SOEs has, on average, shown an upward trend. This shift may indicate that following the "deleveraging" policies and reforms in SOEs, their ability to manage short-term debt risks has improved. By combining the insights from the current ratio, which reflects short-term solvency, with the asset-liability ratio, which provides a more comprehensive view of long-term debt levels, it can be inferred that the debt pressures and risks of Chinese SOEs are concentrated in the long term, underscoring the ongoing significance and challenges of the long-term deleveraging task. Consequently, SOEs must anticipate and prepare for potential long-term debt risks by strengthening debt management and optimizing their structural arrangements.

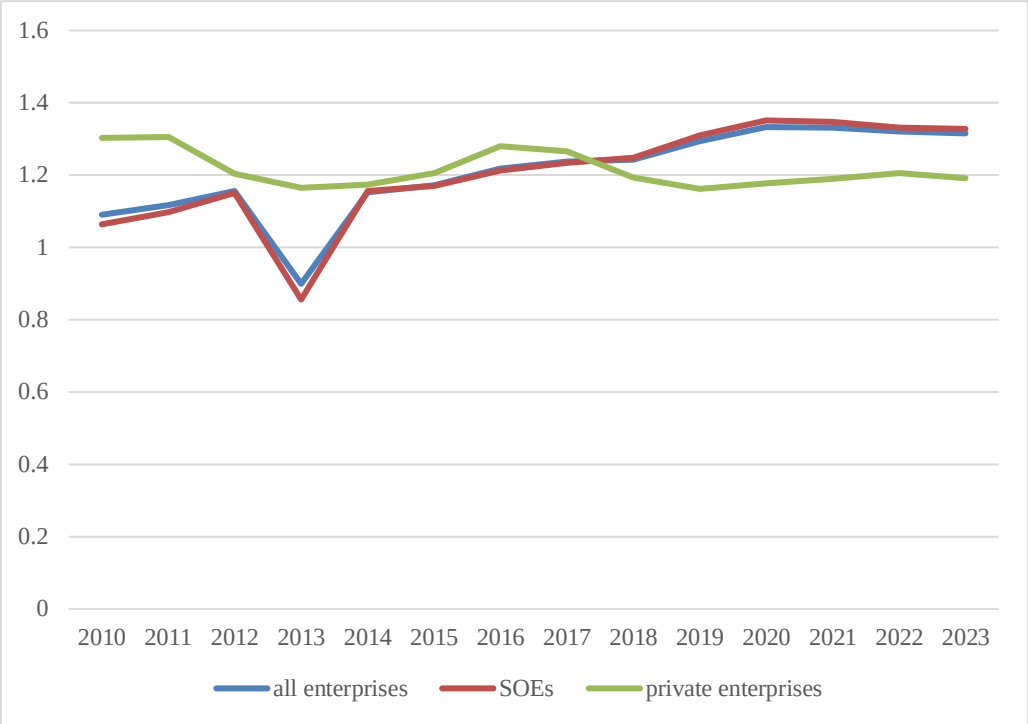

Figure 3.2 Changes in current ratio of non-financial enterprises from 2010-2023

3.1.2 Weak profitability of China's non-financial SOEs

The issue of operational efficiency and profitability of China's SOEs has been a hotly debated topic in Chinese academia. Most scholars argue that, with exceptions in certain industries and individual enterprises, the efficiency of SOEs is generally lower than that of private enterprises (Q. Guo & Zhang, 2022; R. M. Liu, 2011; Y. J. Wang & Liu, 2016; Wei, 2020; Y. Yang et al., 2022). Figure 3.3 illustrates the profitability of Chinese enterprises using the Return on Assets (ROA), with each year's data weighted by the total asset size of enterprises. It can be observed that post-financial crisis, the profitability of all enterprises has been declining continuously. This period, termed by the Chinese government as the "New Normal" of the economy, is characterized by a shift from high-speed to medium-to-high-speed economic growth, optimization of economic structure, and transformation of economic growth drivers, posing new challenges for SOEs to adapt to the new environment (H. Q. Huang, 2016).

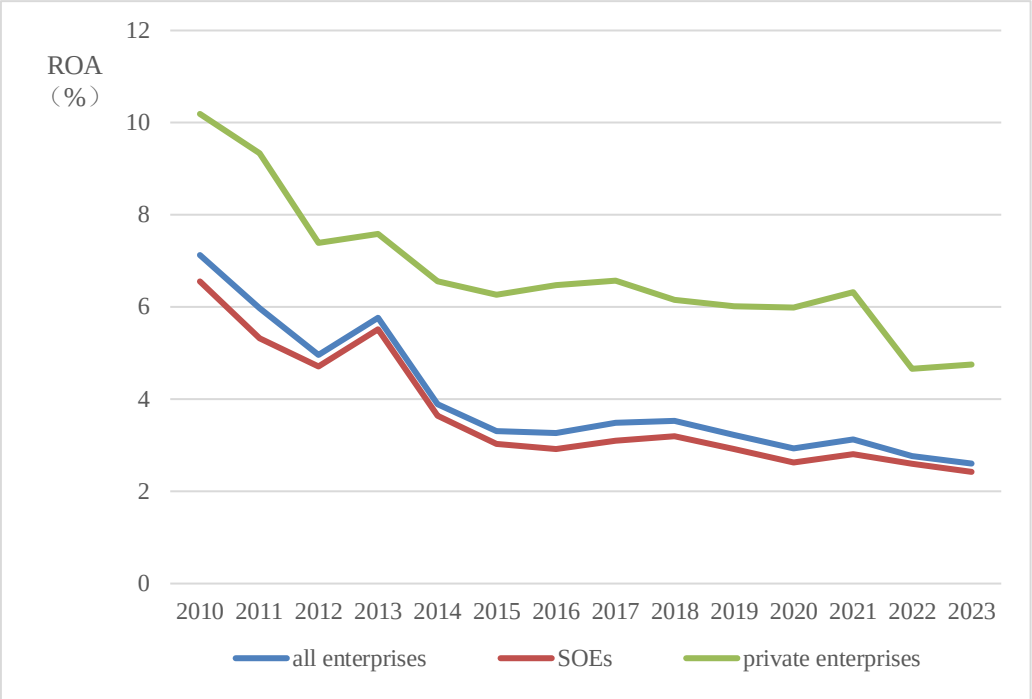

Figure 3.3 Changes in ROA of non-financial enterprises from 2010-2023

While the ROA of both SOEs and private enterprises in China has declined simultaneously, the indicator for SOEs has consistently remained lower than that of private enterprises, falling below 3% in the past two years, marking the lowest level in 15 years. ROA represents the profit after interest and tax. When profit margins decline while asset-liability ratios and interest rates remain unchanged, it increases the pressure on debt repayment and reinvestment. If the profit fails to cover interest expenses, it may force enterprises to continue borrowing to repay old debts, maintaining a high leverage ratio. In the face of declining profitability after 2020, Chinese private enterprises have adopted "deleveraging" measures to reduce their balance sheets, whereas SOEs have maintained or even increased their leverage ratios (see Figure 3.1). Therefore, Chinese SOEs need to improve their profitability and strengthen debt management, which creates a market for the use of new financing instruments such as perpetual bonds.

3.1.3 Relatively controllable risks in financial enterprises

The most crucial indicator for measuring the operational risks of banking financial institutions is the ratio between their own capital and the total assets involved in their business. The *Basel III* categorizes bank capital into Tier 1 Core Capital, Other Tier 1 Capital, and Tier 2 Capital. Among these, Tier 1 Core Capital, which can be replenished through IPOs, issuance of convertible bonds, capital increase and share allotment, among other methods, is the most vital, as it directly covers the bank's operating losses. Other Tier 1 Capital replenishment tools typically include preferred shares and perpetual bonds, the focus of this study. Tier 2 Capital,

on the other hand, is supplementary capital, encompassing loan loss provisions and Tier 2 Capital Bonds, which can be written down or converted into equity when the bank faces existential risks. The calculation of capital adequacy ratios serves as a vital metric for assessing the solvency and risk tolerance of banks or financial institutions. These ratios include Core Capital Adequacy Ratio, Tier 1 Capital Adequacy Ratio, and Total Capital Adequacy Ratio, which are the ratios of Tier 1 Core Capital, all Tier 1 Capital, and the sum of all Tier 1 and Tier 2 Capital, respectively, to risk-weighted assets. Since perpetual bonds are classified as Other Tier 1 Capital, they only impact the Tier 1 and Total Capital Adequacy Ratios.

Figure 3.4 illustrates the changes in these three capital adequacy ratios among publicly disclosed state-owned financial enterprises in China over recent years. The annual data are weighted averages based on the enterprises' risk-weighted asset sizes. On average, all three capital adequacy ratios are significantly higher than the requirements set by the China Banking Regulatory Commission's (CBRC) "*Measures for the Administration of Commercial Bank Capital*" (Trial) in 2012 (Core Capital Adequacy Ratio no less than 5%, Tier 1 Capital Adequacy Ratio no less than 6%, and Total Capital Adequacy Ratio no less than 8%). Moreover, these ratios have shown an upward trend year by year.

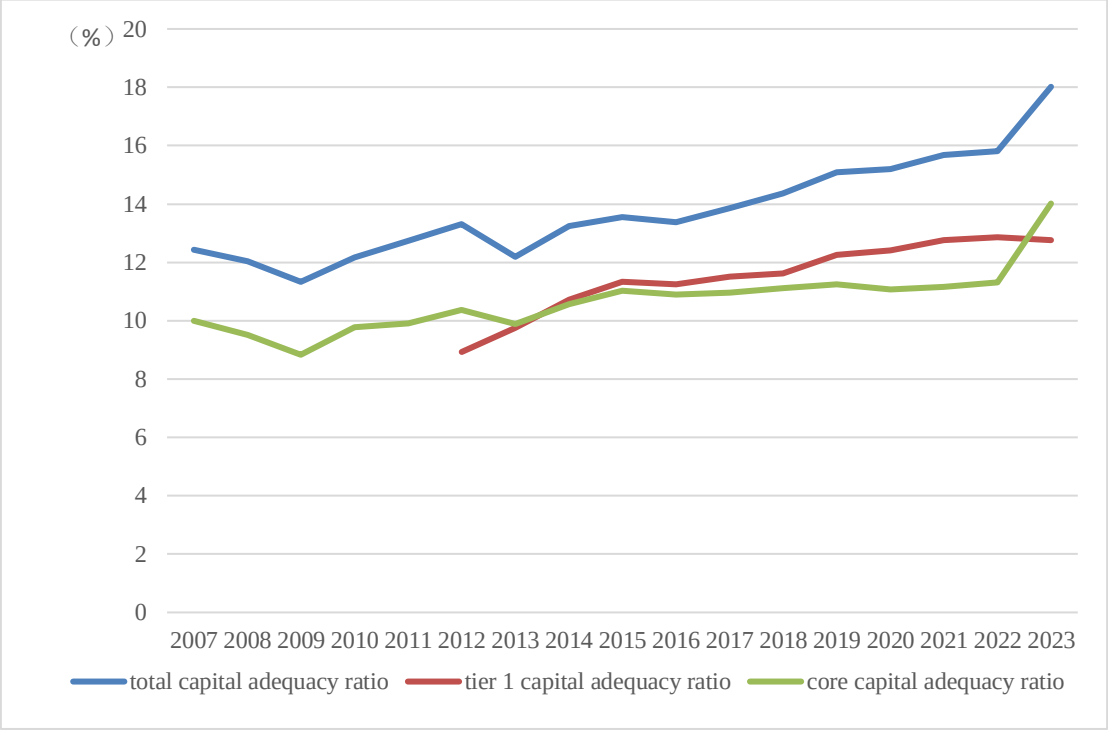

Figure 3.4 Changes in capital adequacy ratio of state-owned financial enterprises

Data source: collected according to CSMAR Database

Therefore, it can be roughly concluded that China's state-owned financial enterprises operate relatively prudently and do not exhibit the accumulated financial risks seen in non-financial SOEs. Consequently, the need to replenish their own capital through the issuance of

perpetual bonds is less urgent. This justifies the focus of this study on non-financial SOEs.

3.2 Review of China's policies on and development stages of perpetual bonds

According to data from the bond special topic in the Wind Database, since the issuance of China's first perpetual bond in 2013, the perpetual bond market has maintained a steady upward trend. Although there was a slight decline after reaching a peak of RMB 1.66 trillion in 2020, the issuance scale of perpetual bonds has remained large, exceeding RMB 1.2 trillion in recent years, and in 2023, it has nearly recovered to the 2020 level (see Figure 3.5, private enterprises concluded). By the end of 2023, various entities had cumulatively issued 4,946 perpetual bonds, with a cumulative issuance scale reaching 8.94 trillion. Looking back at the development of China's perpetual bond market, it can be divided into the following three stages:

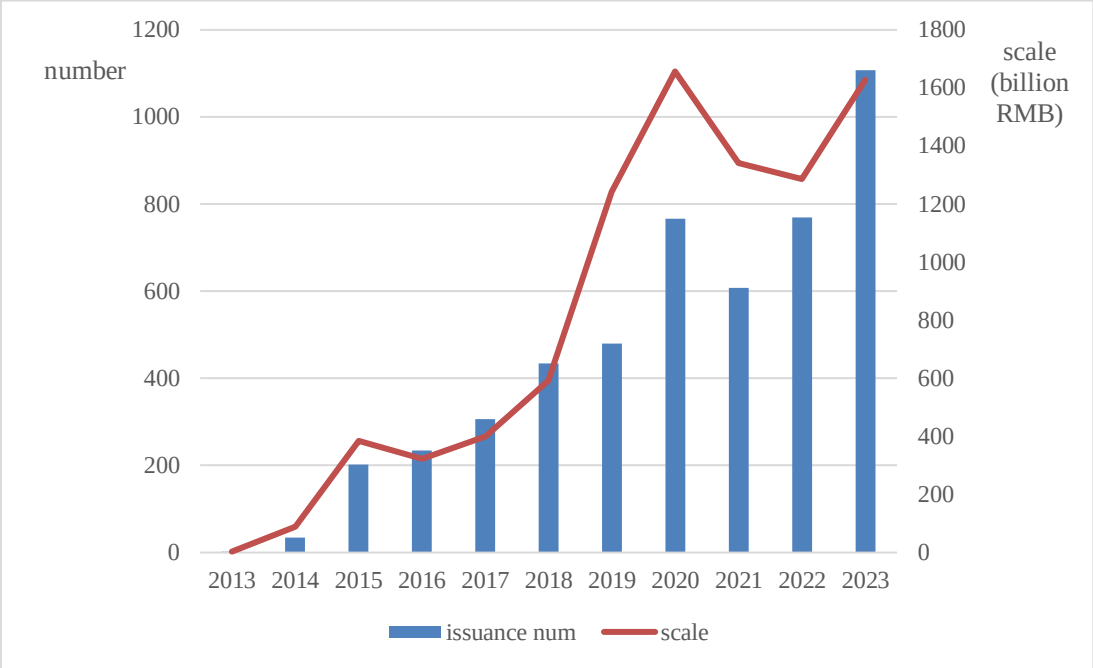

Figure 3.5 Total statistics of China's perpetual bond issuances

3.2.1 Pilot stage promoted by the national development and reform commission of China (2012-2015)

In 2012, to meet the financing needs of domestic enterprises, the National Association of Financial Market Institutional Investors (NAFMII) introduced the concept of long-term bonds with embedded options, known as perpetual medium-term notes. Simultaneously, the National Development and Reform Commission (NDRC) of China also actively explored the issuance of perpetual bonds. On October 25, 2013, the NDRC approved Wuhan Metro Group Co., Ltd.

to issue the first renewable corporate bond in China, and on September 18, 2013, the NAFMII approved Guodian Power Development Co., Ltd. to issue the first perpetual medium-term note in China. Alongside the introduction of these innovative financial instruments, relevant accounting rules were also proposed. After several rounds of research, the Ministry of Finance formulated and issued the "*Regulations on the Distinction between Financial Liabilities and Equity Instruments and Related Accounting Treatments*" (Cai Kuai [2014] No. 13) on March 17, 2014, standardizing the accounting treatment of perpetual bonds and stipulating when perpetual bonds should be recorded as liabilities and when as equity items.

During this stage, the application of perpetual bonds in China was still in the experimental phase, characterized by: firstly, a relatively small number of issuances and a small scale, with the cumulative scale not exceeding RMB 500 billion; secondly, the NDRC served as the primary promoter and approver of issuances. As an agency responsible for formulating and implementing national economic and social development strategies, medium- and long-term plans, and annual plans, as well as coordinating economic and social development, rather than a specialized financial regulatory agency, the NDRC's involvement indicated that perpetual bonds had not yet entered China's professional financial regulatory system, reflecting the nature of a pilot program; and thirdly, the application of perpetual bond financing was limited, primarily used for long-term fundraising for infrastructure construction projects and public welfare projects related to national development strategies, such as the "Guidance on the Issuance of Special Bonds for the Elderly Care Industry" issued by the NDRC on April 7, 2015, and the "Notice on Giving Full Play to the Financing Function of Corporate Bonds to Support Key Projects and Promote Steady and Rapid Economic Development" issued on May 25, 2015.

3.2.2 Comprehensive expansion phase under the financial regulatory system (2016-2020)

This period marked the professionalization and all-industry-wide development of perpetual bond financing in China. Firstly, perpetual bonds officially entered China's financial regulatory system for specialized management. A landmark event was the China Securities Regulatory Commission's (CSRC) initiation of a pilot program for renewable corporate bonds in 2016. On March 8 of the same year, Zhejiang Provincial Communications Investment Group issued a RMB 2 billion renewable corporate bond and listed it on the Shanghai Stock Exchange, becoming the first perpetual bond approved and issued under the CSRC system nationwide.

Secondly, perpetual bonds accelerated their "listing" process. On December 20, 2017, the Shanghai and Shenzhen Stock Exchanges respectively issued the "*Pre-Review Guidelines for*

Corporate Bonds (IV) - Special Types - Renewable Corporate Bonds" and the "*Business Handling Guidelines for Corporate Bonds No. 3 - Renewable Corporate Bond Business*", classifying renewable corporate bonds as a type of corporate bond and providing significant support for the issuance of perpetual bonds, allowing them to be publicly issued and traded on the Shanghai and Shenzhen Stock Exchanges. This led to the formation of a specialized market for perpetual bond issuance and trading, which subsequently saw rapid expansion in the perpetual bond market size from 2018 to 2020 (see Figure 3.5).

Thirdly, the application of perpetual bond financing continued to broaden. Prior to 2016, perpetual bonds were primarily used for financing long-term infrastructure construction and public welfare projects. However, with the maturity and specialization of perpetual bonds, especially after they could be listed as a type of corporate bond, more enterprises across industries – as long as they met the issuance requirements – could apply to issue perpetual bonds. In January 2018, the People's Bank of China (PBOC, China's central bank), the CBRC, the CSRC, and three other ministries and commissions jointly issued the "*Opinions on Further Supporting Commercial Banks' Innovation in Capital Instruments*" (Yin Jian Fa [2018] No. 5), encouraging commercial banks to innovate in capital replenishment instruments. Since then, perpetual bond financing has expanded from the real sector to the financial sector, with Chinese authorities repeatedly encouraging commercial banks to issue perpetual bonds to supplement their capital. On January 24, 2019, the PBOC announced the creation of a Central Bank Bill Swap (CBS) tool to provide liquidity support for banks issuing perpetual bonds, which are a type of non-maturing capital bond. Primary dealers in open market operations can use perpetual bonds issued by qualified banks to swap for central bank bills from the PBOC. Additionally, perpetual bonds issued by banks with a credit rating of AA or above were included in the eligible collateral scope for the Medium-term Lending Facility (MLF), Targeted Medium-term Lending Facility (TMLF), Standing Lending Facility (SLF), and re-lending of the PBOC. On the same day, the China Banking and Insurance Regulatory Commission (CBIRC, the CBRC integrated with the China Banking and Insurance Regulatory Commission in March, 2018) announced that second-tier capital bonds and perpetual bonds would be included in the investment scope of insurance enterprises. Following this, several commercial banks successively issued perpetual bonds.

3.2.3 Regulation and constraint phase (2021 to present)

With the rapid development of perpetual bonds among enterprises, the risks associated with

high leverage disguised as equity investments have gradually emerged. SOEs have dominated the issuance of perpetual bonds, accounting for most of all issuances. To effectively manage and mitigate financial risks within SOEs, the State-owned Assets Supervision and Administration Commission (SASAC) has intensively issued policies to constrain perpetual bond issuance since 2021, subjecting the development of perpetual bonds to regulatory oversight.

On February 28, 2021, the SASAC issued the "*Guiding Opinions on Strengthening the Control of Debt Risks in Local State-owned Enterprises*" (Guozi Fa Cai Ping Cui [2021] No. 18), explicitly limiting the proportion of perpetual bonds, perpetual insurance, perpetual trusts, and other equity-like perpetual debt products, as well as consolidated fund product, relative to net assets. In March of the same year, the SASAC released the "*Notice on Reporting the Control of Debt Risks in Local State-owned Enterprises*", classifying perpetual bonds as hidden debts and imposing restrictions on the proportion of perpetual bond financing in total assets. Additionally, SOEs were required to report perpetual bond-related data in their debt risk monitoring tables. Following this, SASACs at all levels have successively introduced policies, with local SASACs in Henan, Fujian, and Nanjing provinces following the lead of the central SASAC by imposing additional restrictions on perpetual bond financing by local SOEs.

Concurrently, the issuance rules for perpetual bonds by state-owned enterprises at all levels have become clearer. On April 26, 2023, the SASAC issued the "*Measures for the Administration of Bond Issuance by Central Enterprises*" (Guozi Fa Chan Quan Gui [2023] No. 34), explicitly stating that the proportion of perpetual bonds in an enterprise's net assets must be strictly controlled according to relevant regulations, and the scale of perpetual bonds should be reasonably controlled. The expansion of perpetual bond issuance by subsidiaries of central enterprises should, in principle, be reported to and approved by the central enterprise group enterprises. Central enterprises are required to scientifically demonstrate the necessity of issuing perpetual bonds and other equity-like bonds. These documents indicate that from central SOEs to local SOEs, and from state-owned holding groups to subsidiaries at all levels, perpetual bond financing is becoming increasingly standardized under constraints.

Influenced by the economic environment and tightened regulatory constraints, the number and scale of perpetual bond financings by Chinese enterprises peaked in 2020 and have since declined (see Figure 3.5). Additionally, the average issuance size, nominal maturity, and coupon rates of each issuance have also decreased compared to previous periods, suggesting that China's perpetual bond market has moved away from the rapid expansion phase of its early development and is now seeking a reasonable perpetual bond financing ratio, gradually

evolving towards a more mature perpetual bond trading market.

3.3 Characteristics of perpetual bond financing by Chinese non-financial SOEs

3.3.1 Ownership structure of issuance

Table 3.1 presents the distribution of perpetual bond issuers by ownership as of the end of 2023 (inclusive of financial enterprises). Since the same enterprise may issue perpetual bonds multiple times, each issuing entity is counted only once in the "Number of Issuers" column, while in the "Number of Issuances" column, each issuance by the same entity is counted separately. From the perspective of both the number of issuers, the number of issuances, and the total issuance size, the combined proportion of central state-owned enterprises (CSOEs) and local state-owned enterprises (LSOEs) exceeds 90%, indicating that the vast majority of perpetual bonds are issued by SOEs. Furthermore, in terms of the average issuance size per issuance, the public enterprises and SOEs (both CSOEs and LSOEs), as public ownership enterprises, have larger issuance sizes than private enterprises and wholly foreign-owned enterprises (WFOEs), which are forms of private ownership (joint ventures with both Chinese and foreign investments are not representative as they have only issued once). This results in an even smaller proportion of private economic sectors in terms of total issuance size. Therefore, an analysis of perpetual bond issuance by Chinese SOEs effectively encompasses the majority of perpetual bonds in China.

Table 3.1 Comparison of the number and size of perpetual bond issuances by enterprises of different ownership types

	enterprise number	%	number of issuances	%	average scale (billion)	total scale (billion)	%
CSOEs	255	26.76	1,947	39.37	2.32	4520.51	50.55
LSOEs	607	63.69	2,763	55.86	1.33	3662.79	40.96
public	57	5.98	150	3.03	4.45	667.72	7.47
private	30	3.15	81	1.64	1.06	85.55	0.96
joint ventures	1	0.1	1	0.02	2.50	2.50	0.03
WFOEs	3	0.31	4	0.08	1.08	4.30	0.05
total	953	100	4,946	100	1.81	8943.37	100

3.3.2 Industry structure of issuance

This subsection focuses on the industry-specific statistics of perpetual bond issuance by SOEs.

Error! Reference source not found. classifies SOEs into two categories: financial and non-financial, based on the Wind first-level industry classification standard (where financial includes finance and real estate, and the rest are classified as non-financial). The statistical results show that the number of issuances by non-financial SOEs far exceeds that of financial SOEs, with 4,349 issuances versus 511 issuances, respectively, as of the end of 2023. As previously discussed, the promotion of perpetual bonds in China expanded from the real sector to the financial sector, leading to a later start in perpetual bond issuance by financial SOEs, with fewer issuances before 2019. Additionally, the "Financial Status of Chinese SOEs" section in this chapter points out that non-financial SOEs face greater financial pressure compared to financial ones, which helps explain why the use of perpetual bonds by financial SOEs started later and occurred less frequently.

Table 3.2 Statistics of major categories of financial and non-financial enterprise issuances in each year

	all enterprises		all SOEs		non-financial SOEs		financial SOEs	
year	num	average scale (billion)	num	average scale (billion)	num	average scale (billion)	num	average scale (billion)
2013	2	1.65	2	1.65	2	1.65	0	0
2014	35	2.53	34	2.60	34	2.60	0	0
2015	202	1.90	194	1.93	173	1.90	21	2.17
2016	235	1.38	216	1.41	208	1.40	8	1.64
2017	307	1.30	287	1.31	262	1.24	25	2.03
2018	434	1.36	422	1.37	387	1.39	35	1.20
2019	480	2.59	474	2.61	435	1.46	39	15.48
2020	766	2.16	760	2.17	659	1.39	101	7.28
2021	608	2.21	605	2.21	501	1.18	104	7.19
2022	769	1.67	764	1.68	674	1.30	90	4.50
2023	1,108	1.47	1,102	1.47	1,014	1.22	88	4.31
total	4,946	1.81	4860	1.82	4,349	1.34	511	5.91

Although the proportion of perpetual bond issuances by financial SOEs is relatively small, the average issuance size per issuance is larger than that of non-financial enterprises, especially since 2019, when it has been significantly higher. Considering that the total perpetual bond size reached the trillion-yuan level in 2019, the overall issuance size of perpetual bonds by financial s SOEs is higher than that of non-financial enterprises (as also evident in the "Average Size" column, where the average issuance size for financial enterprises is 6.657 billion yuan, significantly higher than other industries). The difference in issuance size stems from the scale of the operating funds and operational modes of the two types of enterprises. Financial SOEs have low ratios of own capital and rely heavily on debt financing (which can be reflected in the capital adequacy ratio shown in Figure 3.4). The significant differences in capital operation modes between these two types of enterprises are also the reason why this study focuses on

non-financial SOEs.

Table 3.3 provides a more detailed breakdown of the distribution of perpetual bond issuances among various industries by SOEs. Overall (as shown in the "All Years" column of Table 3.3), enterprises in industries such as construction, electricity, heat, gas, and water production and supply, mining, transportation, warehousing, and postal services have issued perpetual bonds more frequently. These industries are primarily infrastructure sectors, public utilities, and upstream sectors of the industrial chain, which are also areas where Chinese SOEs are concentrated (X. Huang & Ping, 2020; R. M. Liu, 2011; X. F. Qian et al., 2019). Additionally, this underscores the policy orientation of perpetual bond issuance by Chinese SOEs, encouraging project legal persons and investors to raise project capital funds through the issuance of equity-type financial instruments and diversifying funding channels for investments in infrastructure and industries encouraged by the state. For instance, on November 20, 2019, in order to attract social investment and make full use of market funds to solve the problem of capital financing for infrastructure projects, the State Council issued “the notice on strengthening capital management of fixed asset investment projects” (Guo Fa [2019] No.26).

Table 3.3 Proportion of issuance by industry in each year (%)

	all years	average scale (billion）	2013	2014	2015	2016	2017	2018	2019	2020	2021	2022	2023
Unclassified	0.93	1.89	0	2.94	5.15	3.7	0.7	2.84	0.63	0.92	0.33	0	0
Transportation, warehousing and postal services	9.73	1.38	0.5	5.88	8.25	18.98	13.24	7.11	11.39	10.39	10.25	7.72	8.26
Lodging and catering	0.12	1.00	0	0	0	0.46	0	0	0	0	0.5	0	0.18
Information transmission, software and information technology services	0.23	1.64	0	0	0	0	0	0.24	0	0.39	0.5	0	0.36
Agriculture, forestry, animal husbandry and fishery	0.68	1.42	0	0	0.52	1.39	0.7	0.95	0.84	0.66	0.99	0.26	0.54
Manufacturing	9.16	1.44	0	14.71	23.2	12.96	10.1	10.19	10.97	8.68	5.29	7.33	8.08
Construction	27.7	1.15	0	17.65	14.43	25.46	29.62	30.57	22.36	23.16	30	31.54	30.49
Real estate	2.2	1.22	0	0	4.12	2.31	6.97	5.45	2.53	2.37	1.49	0.39	0.82
Wholesale and retail	8.19	1.10	0	11.76	14.95	9.72	9.06	9	6.75	7.76	7.77	8.25	7.17
Culture, sports and entertainment	0.04	0.60	0	0	0	0.46	0	0	0	0	0	0	0.09
Water conservancy, environment and public facilities management	0.93	0.75	0	0	1.55	3.24	3.14	0.71	0.21	0.53	0.99	0.65	0.64
Electricity, heat, gas and water production and supply	17.9	1.58	0.5	29.41	7.22	6.94	10.45	11.85	23.63	22.89	11.07	18.46	23.23
Leasing and business services	3.11	1.07	0	0	3.09	3.7	4.53	4.27	2.53	2.24	3.64	2.62	3.18
Mining	10.02	1.61	0	17.65	14.43	8.8	8.36	14.22	12.24	8.03	9.26	10.21	8.8
Finance	9.07	6.66	0	0	3.09	1.85	3.14	2.61	5.91	11.97	17.52	12.57	8.17

Furthermore, examining the annual changes in the proportion of industries involved, we observe a gradual shift from concentration to diversification. This reflects the promotion of China's perpetual bond policy discussed in the previous section of this chapter. From 2013 to 2016, perpetual bond issuances were primarily concentrated in basic industries such as construction, electricity, heat, gas, and water production and supply, mining, transportation, warehousing, and postal services. This aligns with the pilot period of perpetual bond issuance in China, where perpetual bonds were primarily used for long-term funding of infrastructure construction projects and public welfare projects related to national development strategies. Subsequently, as perpetual bonds were opened up to general industries and the financial sector, the proportion of perpetual bond issuances in other industries began to rise, especially with the financial sector experiencing rapid growth after 2019.

3.3.3 Basic characteristics of the bonds

This section primarily showcases the maturity and interest rate features of perpetual bonds issued by non-financial SOEs in China. Table 3.4 indicates that the nominal maturities of perpetual bonds are concentrated in short-term durations of three years and within, as well as five-year durations, with the three-year term (structured as 3+N years, allowing redemption or renewal after three years) being the most prevalent, accounting for 60.4% of the total. The average nominal maturity, weighted by issuance size, is 3.13 years.

Table 3.4 Nominal maturity distribution of China's perpetual bonds

Nominal maturity（year）	num	proportion（%）
1	54	1.24
2	935	21.5
3	2,627	60.4
4	8	0.18
5	682	15.68
6	16	0.37
7	2	0.05
9	5	0.11
10	19	0.44
12	1	0.02
Total	4,349	100

In terms of coupon rates (as shown in Figure 3.6), the rates cluster between 3% and 4%, exhibiting a right-skewed distribution, with the average coupon rate weighted by issuance size standing at 4.38%.

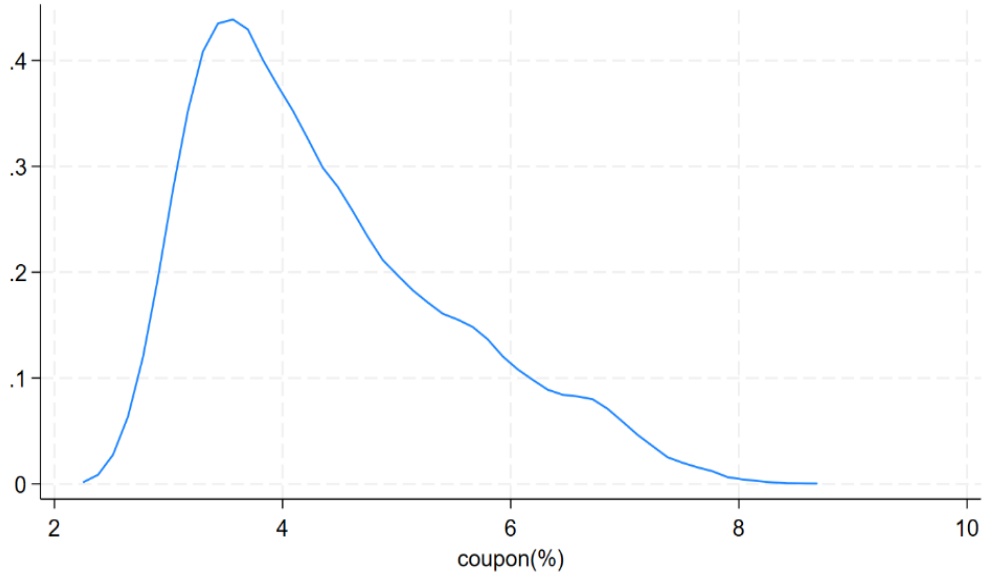

Figure 3.6 Coupon rate distribution density chart

Figure 3.7 depicts the evolution of average maturities and coupon rates, both of which exhibit a downward trend when weighted by individual bond issuance sizes. Possible explanations for this trend include: firstly, amid economic downturns and weaker corporate expectations, enterprises are more inclined towards short-term liquidity, avoiding long-term borrowings, which also leads to a decrease in interest rates as the premium based on maturity diminishes; secondly, the central bank's interest rate cut policies have driven down benchmark interest rates, subsequently lowering lending rates; and thirdly, as perpetual bond regulations mature, corporate issuance becomes more rational, favoring bonds with flexible maturities and reasonable interest rates.

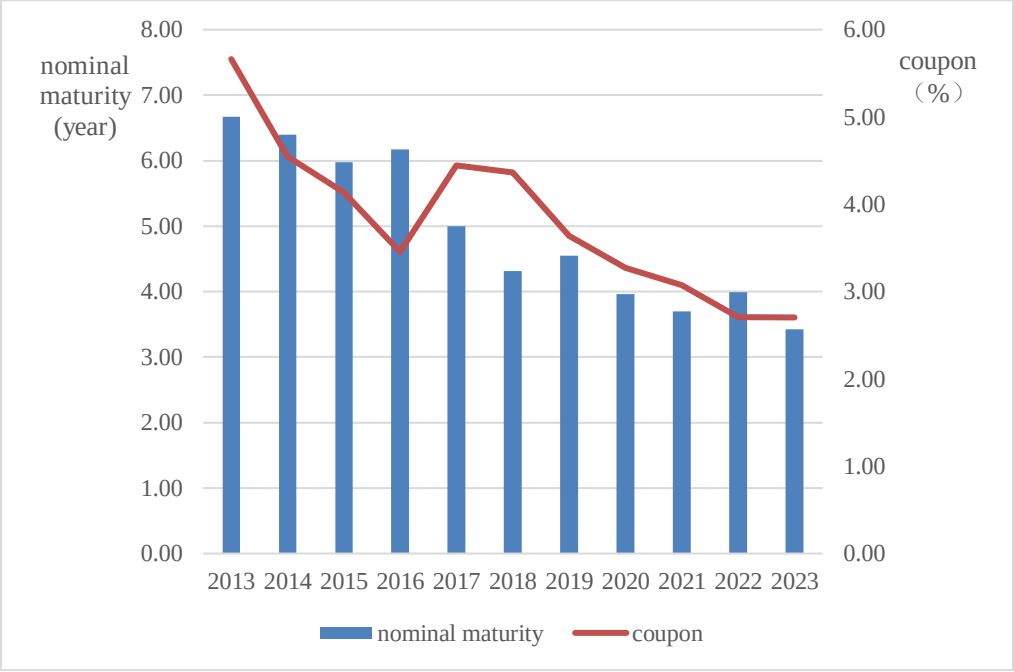

Figure 3.7 Average maturity and coupon rate by year

3.4 Chapter summary

This chapter describes the financial characteristics of China's non-financial SOEs and provides statistics on the relevant policies and issuance features of perpetual bonds. It emphasizes the rationality of this thesis's focus on the financing of non-financial SOEs. Firstly, the perpetual bond financing of China's SOEs accounts for most of all perpetual bond financing. Secondly, compared with financial enterprises, non-financial SOEs face increased pressure to reduce leverage and weakening profitability, indicating a financial dilemma. This chapter also summarizes and interprets China's perpetual bond issuance policy and development history, and analyzes the ownership characteristics, industry characteristics, and coupon features of perpetual bond issuance. This work helps to provide a practical basis for the following empirical research, interpret the empirical results, and offer policy recommendations to promote the development of perpetual bond financing in China based on the real-world context and empirical conclusions.

[This page is deliberately left blank.]

Chapter 4: Methodology

4.1 Research approach

The quantitative research approach is a positivist research paradigm that focuses on exploring the quantitative attributes of things and their movements. This method involves collecting and analyzing quantifiable data, utilizing mathematical and statistical tools to provide precise descriptions, explanations, and predictions of the research subject. In social sciences, natural sciences, and business research, quantitative research methods are widely used to test and validate theoretical hypotheses, reveal relationships between variables, and evaluate the effectiveness of interventions.

The core of quantitative research lies in data collection and analysis. It typically relies on methods such as questionnaires, experiments, and observational records to obtain large amounts of standardized data. These data are then organized into statistical tables and graphs for descriptive and inferential statistical analysis. Through these analyses, researchers can understand the distribution characteristics, trends, and relationships between variables of the research subject, thereby forming scientific research conclusions.

4.2 Variables

4.2.1 Core explanatory variables

Holding Perpetual Debt (PD_{it}): A dummy variable, which takes a value of 1 if enterprise i has outstanding perpetual debt in period t and 0 otherwise. This variable serves as the core explanatory variable in the regression model examining the impact of perpetual debt issuance on corporate performance, measuring the overall effect of perpetual debt on corporate performance.

Perpetual Debt Ratio to Total Liabilities (PDR_{it}): A ratio variable ranging from 0 to 1, indicating the scale of perpetual debt issuance and the enterprise's reliance on perpetual debt financing. This variable is often used as an alternative to PD_{it} in robustness checks.

Relative Maturity Position of Existing Perpetual Debt (PDT_{it}): Calculated as the ratio of the elapsed time from the issuance date to period t to the nominal maturity term for outstanding

perpetual debt of the enterprise in period t. For example, if a perpetual debt with a 3+N term is issued at the end of 2019, the ratio at the end of 2021 would be 2/3. If the company has several outstanding perpetual debts in period t, a weighted average is calculated based on the proportion of each bond's size to the total outstanding perpetual debt in period t. This value ranges from 0 to 1 and is used to measure the enterprise's position within the maturity structure of its perpetual debt at the current point in time. A lower value ($0 < PDT_{it} < 0.5$) indicates that most perpetual debts have been issued recently, while a higher value ($0.5 < PDT_{it} < 1$) suggests that perpetual debts are approaching their redemption or extension dates. This variable is primarily used in the regression equation to evaluate whether the impact of perpetual debt on corporate performance exhibits a time-varying trend.

4.2.2 Dependent variables

Issuance in next period (ISS_{it}): A 0-1 variable, which takes a value of 1 if there is additional perpetual debt issuance in period t and 0 otherwise. This variable serves as the explained variable in the regression analysis of characteristics of issuing enterprises.

Current Ratio (CR): The current ratio is the ratio of current assets to current liabilities, reflecting a company's short-term solvency and the amount of short-term liquid assets available. A higher current ratio indicates that there is a larger excess of current assets over current liabilities, providing greater assurance for the repayment of current liabilities and stronger short-term solvency (J. H. Liu et al., 2021; Y. Yu, 2024). This indicator is used as the dependent variable in the analysis of the impact of perpetual debt on a company's short-term solvency.

Quick Ratio (QR): The quick ratio is a refined indicator of a company's short-term liquidity, calculated by excluding assets from current assets that have poor liquidity and significant uncertainty in their convertibility, such as inventory, prepaid accounts, and deferred expenses (G. F. Chen & Tian, 2021)). It serves as an alternative dependent variable to the current ratio in the analysis of the impact of perpetual debt on a company's short-term solvency.

Asset-Liability Ratio (LVR): The ratio of total liabilities to total assets, also the most common measure of leverage (J. Li et al., 2024; Zhao et al., 2020). A high leverage ratio indicates that a company is using more debt funding relative to equity funding, which can amplify earnings to a certain extent but also increases risk. Enterprises with lower asset-liability ratios are more likely to repay debts on time, indicating safer debt positions (Juan, 2020). This is a book-based indicator, and enterprises have many ways to manipulate hidden leverage (X. F. Xu & Lu, 2020). Therefore, this indicator may not accurately reflect a company's actual debt

level, but we temporarily focus on the book-based management effect. The more substantial impact of perpetual debt will be discussed later. As this indicator includes all assets and long-term liabilities, it is used as the dependent variable in the study of the impact of perpetual debt on long-term solvency (G. F. Chen & Tian, 2021).

Debt-to-Capital Ratio (DCR): The ratio of long-term debt to long-term capital, calculated as (non-current debt) / (non-current debt + equity capital). It reflects the proportion of long-term assets contributed by long-term debt and measures the long-term debt repayment pressure of a company. Compared to the asset-liability ratio, this indicator excludes current assets and liabilities, providing a more refined measure of a company's long-term debt structure. It serves as an alternative dependent variable to the asset-liability ratio in the study of the impact of perpetual debt on long-term solvency.

Interest Coverage Ratio (ICR): The ratio of earnings before interest and taxes (EBIT) to interest expenses, which is another critical indicator measuring a company's long-term solvency. The need for this indicator arises because both the asset-liability ratio and the debt-to-capital ratio only reflect the asset structure and the ability to repay debt with net assets, which is a stock concept. From a flow perspective, enterprises do not directly pay for the interests form debts with their stock net assets but with the profit flow generated from operations to cover interest expenses. For indicators like the asset-liability ratio and the equity ratio, enterprises can manipulate leverage through off-balance-sheet debt and hidden debt, but interest payments are unavoidable in financial accounting. Therefore, using an interest flow-based indicator can more accurately reflect debt repayment pressure. The interest coverage ratio reflects the extent to which earnings generated from operating activities cover interest expenses, serving as a measure of a company's long-term repayment ability (G. F. Chen & Tian, 2021; J. Li et al., 2024). A higher interest coverage ratio indicates a stronger ability to pay interest expenses.

Return on Assets (ROA): The ROA is the ratio of net profit (after deducting interest expenses and income taxes) to the average total assets. It represents the level of income earned by all assets of the enterprise and comprehensively reflects the profitability and input-output situation of the enterprise (D. Liu et al., 2023; X. F. Wu & Li, 2023; Xing et al., 2024). Analyzing this indicator can enhance various aspects of attention to the enterprise's asset operations and promote the enterprise to improve the profitability of its unit assets. This indicator is the primary measure of profitability in this study and serves as the explained variable in the study of the impact of perpetual debt on profitability.

Return on Equity (ROE): The ROE is the percentage of net profit to the average shareholders' equity. It is the profitability from the shareholders' perspective, taking into

account the capital structure in addition to the ROA. It is highly comprehensive, encompassing both the operating and financial performance of the company (L. Wang et al., 2023). The ROE can also be analyzed through the DuPont analysis system to identify the influencing factors of the return rate. This indicator serves as an alternative explained variable to ROA in the study of the impact of perpetual debt on profitability.

The control variables in different models vary according to actual needs. Therefore, the specific control variables included in each model will be explained in the corresponding sections.

4.3 Data collection methods

All empirical data used in this study are sourced from the Wind Database. Specifically, the information regarding perpetual bond issuance comes from the perpetual bond statistics module, where a total of 4,349 perpetual bond issuance records from non-financial SOEs in China from 2013 to the end of 2023 have been collected. Corporate financial data, on the other hand, are obtained from Wind's Corporate Financial Analysis Database, encompassing annual report data from all non-financial SOEs that have issued bonds between 2010 and 2023 (quarterly data are only used for the motivation analysis). While many of these enterprises have not issued perpetual bonds, the inclusion of all bond-issuing enterprises, including those that have issued conventional bonds, aims to enhance the sample size and improve estimation accuracy. Additionally, it allows for a comparison between perpetual bond issuers and non-issuers, thereby facilitating a better assessment of the financial performance advantages of perpetual bond issuers over their counterparts. Observations with missing data are excluded without interpolation, and a 1% trimming is applied to all continuous variables, excluding dummy variables, to mitigate the influence of outliers.

4.4 Hypothesis

Drawing from the literature review on the financing motivations for perpetual bonds, several underlying reasons for perpetual bond financing have been summarized: the desire to reduce leverage and enhance financial statement presentation (C. Chen & Zhu, 2024; Jin, 2014; Sunderland & Berry, 2016; D. Wang, 2021), as well as to expand operating capital amidst short-term debt pressure and financing constraints (Leibowitz et al., 2013; H. G. Ma, 2016; J. C. Sun, 2019). However, some studies also argue that enterprises facing higher debt burdens and risks

may encounter larger interest rate spreads when using hybrid debt instruments such as perpetual bonds and convertible bonds, thereby increasing the financing costs associated with these instruments (Goncharenko et al., 2021; Q. L. Yu et al., 2024). Given the context of perpetual bond issuance in China as presented in Chapter 3, where debt instrument innovation emerged from the need for SOEs to "deleverage" and alleviate increased debt repayment pressures, mitigating these issues also serves as a primary application scenario for perpetual bonds. Based on this, the first hypothesis of this study is proposed:

Hypothesis 1: SOEs with high leverage ratios and facing greater short-term debt pressures are more likely to issue perpetual bonds.

Perpetual bonds can transcend traditional debt financing limitations by offering the flexibility to postpone redemption dates or even renew them indefinitely, enabling enterprises to secure liquidity in the short term while deferring debt repayment, thereby alleviating short-term debt repayment pressures. As a financial instrument for capital supplementation, perpetual bonds, while providing liquidity, can also be classified as equity on the balance sheet, effectively adjusting the debt-to-equity ratio and reducing accounting leverage. For issuers, perpetual bonds not only replenish capital but also possess the capability to enhance financial statement presentation (Scott et al., 2011). Consequently, the banking and financial sectors often issue perpetual bonds to supplement Tier 1 capital and meet regulatory requirements for own funds (L. Li, 2019; M. Ren & Zhang, 2016). Additionally, perpetual bonds serve the "deleveraging" objectives of enterprises (J. C. Sun, 2019). In reality, a significant portion of perpetual bonds issued in China are indeed accounted for as debt items (S. L. Ren, 2019). Based on these observations, the following second and third hypotheses are proposed:

Hypothesis 2: Perpetual bonds can provide liquidity to enterprises, thereby alleviating short-term debt repayment pressures.

Hypothesis 3: The unique equity-like nature of perpetual bonds can improve the book leverage ratio of enterprises.

Indeed, the ultimate goal of expanding corporate liquidity and improving the debt-to-equity ratio is undoubtedly to help enterprises emerge from financial distress and enhance their operating performance. This represents the more indirect and long-term impact that perpetual bond issuance may bring. Perpetual bonds can augment an enterprise's short-term operating net cash flow and accelerate the overall turnover of project operating funds (Shangguan et al., 2015). This translates into improved indicators such as asset turnover and operational efficiency, leading to shortened production and sales cycles, which in turn foster growth in operating revenue (growth capacity) and profitability. Furthermore, new debt instruments with equity-

like characteristics, such as perpetual bonds, can also provide a "tax shield," thereby enhancing net profit (Petras, 2022; H. Y. Shan, 2019; Zong et al., 2017). Therefore, the fourth hypothesis is proposed as follows:

Hypothesis 4: The issuance of perpetual bonds may improve an enterprise's profitability.

Drawing upon Myers and Majluf's (1984) pecking order theory, an increase in a company's bond financing level suggests potential business expansion and given that the interest on debt financing is tax-deductible, external investors may be inclined to invest more, thereby boosting the company's stock price. In contrast, equity financing dilutes existing shareholders' stakes and often leads to a decrease in dividends, sending unfavorable signals to the market. Perpetual bonds offer the advantages of debt financing while also serving as equity instruments without diluting actual shareholder ownership (C. Chen & Zhu, 2024; Zong et al., 2017). Moreover, "*the Announcement on the Corporate Income Tax Policy Issues Related to Perpetual Bonds*" issued by China's Ministry of Finance and State Taxation Administration in 2019, and the *Interpretation of Accounting Standards for Business Enterprises No. 16*, which took effect in 2022, permit perpetual bonds to be treated as equity instruments; a portion of dividends can be deducted as interest before tax, acknowledging the perpetual bonds' dual nature as equity instruments with partial "tax shield" capabilities. Consequently, the issuance of perpetual bonds may lead to an increase in stock prices.

However, the aforementioned theory may not necessarily apply to the Chinese context, as the signals conveyed by the issuance of perpetual bonds by Chinese SOEs may differ from those envisioned by Myers and Majluf's (1984) theory. Reducing leverage is the primary motivation for Chinese non-financial SOEs to issue perpetual bonds, indicating that these bonds are not necessarily issued by enterprises with robust operations and strong expansion needs but rather by those under financial pressure who have a pressing need to "deleverage" and resort to unconventional financial instruments. When the market anticipates this, it naturally interprets perpetual bond financing as a signal of the company's poor financial health, which can adversely affect its stock price.

These two hypotheses are alternative, and empirical research findings are mixed. On the one hand, studies have shown that announcements of debt instrument issuance can positively impact company stock prices (Akdoğu et al., 2020; Y. J. Kim et al., 2023; Song, 2023). On the other hand, research has also concluded that such announcements can have a negative impact (X. N. Liu & Liu, 2021; Vesala, 2019). Therefore, it's believed that both of the following hypotheses are possible:

Hypotheses 5a: The issuance of perpetual bonds may cause a short-term increase in stock

prices.

Hypotheses 5b: The issuance of perpetual bonds may cause a short-term decline in stock prices.

4.5 Models and hypothesis identification

4.5.1 Basic methods

Given that the data type consists of panel data segmented by enterprise and year, this implies the existence of time-invariant enterprise effects, exogenous shocks from the macroeconomic environment that change over time, and industry-related exogenous shocks within the sample period. These factors are often difficult to measure with appropriate proxy variables. Therefore, this thesis selects a panel data regression model with fixed effects that can control for these effects. In fact, this research compares the estimation results using a random effects model and a fixed effects model, and finds that there is a significant difference in the coefficient estimation results between the two. For the reason of the assumption of heteroscedasticity in the regression model used in this study, the Hausman test is not applicable for testing between heteroscedastic models. This research compared the estimation results of the random effects model and the fixed effects model, and found significant differences in the coefficient estimation results between the two. To make the Hausman test applicable, this research also conducted Hausman tests on fixed effects and random effects models under the assumption of homoscedasticity. The test results of all regression models are shown in Table 4.1. The null hypothesis of the Hausman test is that there is no systematic difference in the estimated coefficients between the fixed effects model and the random effects model. If the null hypothesis is rejected, the fixed effects model should be accepted. As can be seen in Table 4.1, except for the case where the χ^2 statistics are negative and the test fails, all other results significantly reject the null hypothesis, indicating that the fixed effects model is supported in all cases. Therefore, fixed effects models should be accepted both theoretically and empirically.

Table 4.1 Results of Hausman test

	(4.1)	(4.3)	(4.4)	(4.5)	(4.6)	(4.7)	(4.8)	(4.9)	(4.10)	(4.11)	(4.12)	(4.13)	(4.14)	(4.15)	(4.16)	(4.17)
χ^2 statistic	-90.66	3697	3999	-7148	-7148	-337.1	702.3	-1894	98.16	-2577	-3551	-60.7	-4000	-3997	-3986	-3983
P value		0.000	0.000				0.000		0.000							

To identify whether the core explanatory variable (typically whether perpetual bonds are issued) has a significant impact on corporate operating performance (such as debt-to-asset ratio and ROA), The method used in this research is to observe the significance level of the regression coefficients of the core explanatory variables. Based on the standard fixed effects model, it is assumed that the estimated the random distribution of coefficient values satisfy the T-distribution. Assuming that the coefficients satisfy the T-distribution with a mean of 0, the probability of the coefficient estimation results occurring is inferred, which is the significance level. According to usual criterion, a significance level of 5% is used as the criterion for judgment. That is, if the probability of the coefficient estimation values occurring is less than 5% based on the obtained coefficient estimation values and probability distribution assumptions, it can be considered that the coefficient estimation values are significantly different from 0, and the impact of this variable on the dependent variable is significant. The goodness of fit of the model is measured using the adjusted R^2 metric. In testing each hypothesis, the specific model settings and identification methods vary, with detailed information introduced in the next subsection.

Although this study examined numerous models in the subsequent regression, it did not test the differences in core explanatory variables between different models through methods such as T-tests, which is because although some core explanatory variables are the same, the dependent variables are different, and even after standardized adjustments, the comparison is of little significance. For example, the meaning of the 5% decrease in leverage ratio and 5% change in profit margin caused by perpetual bond issuance, as well as the 5% change in stock price, are different and have different levels of impact. In addition, the comparison between different models is not the focus of this research. We focus more on which indicators are affected by the issuance of perpetual bonds. Even if there are differences in the degree of impact, conclusions can be drawn based on the differences in significance levels generally.

Furthermore, this thesis employs multiple methods to test the robustness of the estimation results. For instance, explanatory and explained variables are replaced, and to better handle serial correlation issues, the estimation method proposed by Driscoll and Kraay (1998) for robust handling of heteroscedasticity and serial correlation is used. To control for the endogeneity issues introduced by the lagged terms of the explained variables, this thesis also applies dynamic panel estimation methods to some models.

This study primarily utilizes Stata18 software to complete the aforementioned data analysis, employing various regression commands such as xtreg, xtlogit, xtscc, and xtabond. Examples of using these commands in addressing specific issues are provided in the next subsection.

4.5.2 Analysis of characteristics of issuing enterprises - testing of Hypothesis 1

As previously discussed, enterprises issuing perpetual bonds may be doing so to reduce leverage and embellish their financial statements (Jin, 2014; Sunderland & Berry, 2016; D. Wang, 2021), or to alleviate short-term debt pressure and expand operating funds amidst financing constraints (Leibowitz et al., 2013; H. G. Ma, 2016; J. C. Sun, 2019). Considering the context of deleveraging among SOEs, this section verifies Hypothesis 1, which states that SOEs with high leverage ratios, greater short-term debt pressure, and faster expansion while facing financing constraints are more inclined to issue perpetual bonds.

Empirically, this study intends to use indicators measuring leverage ratios, short-term debt pressure, business expansion velocity, and financing constraints to examine whether differences in these indicators can explain why enterprises choose to finance through perpetual bonds rather than other traditional bond instruments. According to the introduction of key variables, ISS_{it} serves as the dependent variable, indicating whether a perpetual bond issuance has occurred. In terms of explanatory variables, leverage ratios are measured by the asset-liability ratio (LVR). Short-term debt pressure is gauged by the current ratio (CR) and the alternative quick ratio (QR), both of which reflect a company's short-term debt-paying ability. Furthermore, the growth rate of main business income (GRMI) is used to measure the speed of an enterprise’s business expansion, which is the ratio of the increase in main operating income during the current year to the total main operating income of the previous year, reflecting the enterprise's growth pace. This metric is a crucial indicator for assessing an enterprise's operating conditions, market share capabilities, and predicting its business expansion trends. It also reflects the growth and development potential of an enterprise’s operating income.

Regarding financing constraints, we incorporate the index developed and used by Whited and Wu (2006), Livdan et al. (2009), D. Li (2011), among others, to measure the degree of financing constraints faced by enterprises (denoted as the MM index). This index estimates the parameters of the Euler equation using the nonlinear GMM method to obtain the financing constraint parameter value. The calculation formula is as follows: $WW = -0.091 * CF - 0.062 * DivPos + 0.021 * DCR - 0.044 * Size + 0.102 * ISG - 0.035 * SG$. (CF: cash flow-to-total assets ratio—net cash flow from operating activities/total assets; DivPos: cash dividend payment dummy variable, equal to 1 if cash dividends are paid in the current period, otherwise 0; DCR: long-term debt-to-assets ratio; Size: natural logarithm of total assets; ISG: industry-average sales growth rate (aggregate average within secondary industry classification of Wind Database); SG: enterprise sales growth rate). A higher index value indicates stronger financing

constraints for the enterprise.

To validate the aforementioned mechanisms, the following panel binary choice models are constructed and estimated using the "xtlogit" command in Stata software. The regression models are written in a linear form for explanatory purposes, though it's important to note that xtlogit inherently estimates a logistic regression model for binary dependent variables.

$$\mathbf{ISS_{i(t+1)} = \alpha + \beta_1 CR_{r_{it}} + \beta_2 QR_{r_{it}} + \beta_3 LVR_{r_{it}} + \beta_4 GRMI_{r_{it}} + \beta_5 MM_{r_{it}} + BX_{it} + t + \varepsilon_{it}} \quad (4.1)$$

$$\mathbf{ISS_{i(t+1)} = \alpha + \beta_1 CR_{r_{it}} + \beta_2 QR_{r_{it}} + \beta_3 LVR_{r_{it}} + \beta_4 GRMI_{r_{it}} + \beta_5 MM_{r_{it}} + BX_{it} + t + u_i + \varepsilon_{it}} \quad (4.2)$$

In these models, the explained variable $ISS_{i(t+1)}$ is a 0-1 variable, which takes a value of 1 if there is an issuance of perpetual bonds in the next period (t+1), and 0 otherwise. All core explanatory variables are presented in relative form - the ratio of an individual's value to the average value of the secondary industry in the current period (denoted with subscript r). Other control variables include total asset size (Size for short, the original unit is 100 million yuan, which is taken as logarithm, and then the asset size in the regression model is taken as logarithm by default), return on assets (ROA), inventory turnover (IT), and variables describing the characteristics of the decision-making level, such as the shareholding structure of shareholders (SS), which is measured by the sum of the square of the shareholding ratios of the top two shareholders, and the proportion of independent directors (POID) - this is because whether to issue perpetual bonds is a decision-making process, which is inevitably affected by the characteristics of policymakers. Model **Error! Reference source not found.**) employs a random effects panel model, incorporating only time fixed effects t (in quarterly units), without including individual fixed effects u_i. The use of random effects panel model is because we aim to investigate differences among individual companies to analyze how varying company characteristics - specifically, the variation in core explanatory variables among enterprises - impact the issuance of perpetual bonds. If β is significantly different from 0, for example, β_3 is significantly positive, it shows that enterprises with high asset liability ratio are more likely to finance through perpetual bonds.

In contrast, Model **Error! Reference source not found.**) incorporates individual effects u_i, controlling for cross-company differences (individual fixed effect, IFE). This model estimates the influence of fluctuations in core explanatory variables within companies on perpetual bond issuance, namely when enterprises are more inclined to issue perpetual bonds. For example, if β_1 is significantly positive, it means that enterprises are more likely to finance

through perpetual bonds in periods of higher current ratios.

Moreover, the data used to estimate Models **Error! Reference source not found.**) and **Error! Reference source not found.**) are quarterly data with a higher frequency. This is because perpetual bond issuances often occur towards the end of the year, and the operational performance of the current year may be too far removed from the end of the next year to significantly influence the decision to issue perpetual bonds in the subsequent year. The reason for not examining the impact of current company characteristics on the current issuance choice of perpetual bonds is due to endogeneity issues, which could lead to a reciprocal causality between issuance and performance in such a model setup. By contrast, the setups of Models **Error! Reference source not found.**) and **Error! Reference source not found.**) ensure that current performance affects the decision to issue perpetual bonds in the next period, but perpetual bond issuance does not affect previous performance levels.

Taking **Error! Reference source not found.**) as an example, the command to implement the regression in Stata is “xtlogit ISS CRr QRr LVRr GRMIr MMr X i.quarter, fe”. Where X is the set of control variables; "i.quarter" is the time fixed effect t (involved as dummy variables), and the “fe” declaration uses the individual fixed effect.

4.5.3 The regression model of the impact of perpetual bonds on corporate debt pressure

4.5.3.1 Impact on short-term debt pressure - testing of Hypothesis 2

To validate the second hypothesis: the issuance of perpetual bonds by SOEs can alleviate short-term debt repayment pressure, we employ the current ratio (CR) and quick ratio (QR) as measures of a company's short-term debt repayment pressure (G. F. Chen & Tian, 2021; J. H. Liu et al., 2021; Y. Yu, 2024). Taking the current ratio as an example, a double fixed-effects panel regression model is constructed as follows:

$$\mathbf{CR_{it} = \alpha + \beta_1 PD_{it} + BX_{it} + ind * t_{ind,t} + u_i + \varepsilon_{it}} \quad (4.3)$$

In the regression model, CR_{it} represents the current ratio of the enterprise in the current year. The core explanatory variable is PD_{it} , which, as previously mentioned, takes a value of 1 if the enterprise has outstanding perpetual bonds in the current period and 0 otherwise. X_{it} represents a series of control variables, including measures of profitability (ROA), asset operation (Turnover Ratio, IT), growth potential (Growth Rate of Main Business Income, GRMI) - these three indicators involve three of the four categories of indicators (solvency indicators, operational capacity indicators, profitability indicators and development capacity indicators) in the analysis of financial indicators, and the current ratio is placed in the position

of dependent variables as a solvency indicator. Other control variables include corporate capital structure (Leverage Ratio, LVR), and firm size (Size). Among the control variables, the lagged value of the dependent variable, $CR_{i(t-1)}$, is also included. This is because some time-varying unobservable factors may exhibit strong serial correlation and, thus, correlation with the previous period of the dependent variable. Controlling for the lagged term of the dependent variable helps mitigate the endogeneity caused by omitted variables. Although the lagged term of the dependent variable becomes endogenous when group-mean averaging is used to control for fixed effects, this study does not intend to use dynamic panel estimation methods. This is because the consistency of the coefficient of the lagged term of the dependent variable is not the primary concern of this study; rather, its role is only to control for some unobservable factors.

Item u_i represents the individual fixed effects (IFE) for each company, which control for unobservable, time-invariant company characteristics such as industry position and corporate culture. The other fixed effect, $ind * t_{ind,t}$, is unique in that it is an interaction term between the dummy variable for the company's primary Wind industry classification and time. Instead of using a pure time fixed effect, this approach acknowledges that the impact of unquantifiable external shocks can vary across industries. Controlling for this interactive fixed effect effectively addresses industry-specific unobservable heterogeneity (namely industry-time fixed effect, I-TFE). The random term ε_{it} is set to account for heteroskedasticity and allows for clustered robust standard errors that are correlated between firms within the fourth-level Wind industry classification. This ensures that the estimates are robust to the specific clustering of errors within industries.

Furthermore, to investigate the trend of the impact of perpetual bond issuance, we introduce PDT_{it} into Equation **Error! Reference source not found.**, transforming it into:

$$\mathbf{CR_{it} = \alpha + \beta_1 PD_{it} + \beta_2 PDT_{it} + BX_{it} + ind * t_{ind,t} + u_i + \varepsilon_{it}} \qquad (4.4)$$

If β_1 is positive and β_2 is negative, it suggests that perpetual bond issuance initially improves corporate liquidity but the effect diminishes over time. However, it is also possible that the improvement in liquidity leads to a sustained improvement in the financial position of enterprises, in which case β_2 could be positive. The specific situation will depend on the empirical results.

In Stata operations, for cases where the explained variable is a continuous variable, the xtreg command is used for data analysis in basic regression. Taking Model **Error! Reference source not found.** as an example, the code is "xtreg CR pd X L.CR i.ind_t, fe vce(cluster ind)", where X represents the set of control variables, and "i.ind_t" introduces the interaction term

between industry categories and time in the form of dummy variables. In the additional settings, "fe" is used to include individual fixed effects, and "vce(cluster ind)" sets up cluster-robust standard errors that account for heteroscedasticity and allow for correlation in error terms among enterprises within the same industry classification.

4.5.3.2 Impact on long-term debt pressure - testing of Hypothesis 3

This section of the thesis validates Hypothesis 3, which states that non-financial SOEs in China can leverage the issuance of perpetual bonds to "deleverage". The asset-liability ratio (LVR) reflects the proportion of a company's total assets financed by its own capital, and it is the most common measure of leverage (J. Li et al., 2024; Zhao et al., 2020), which is also adopted in this study. A high asset-liability ratio indicates that the enterprise relies more on debt financing than equity financing. While this can amplify revenue to a certain extent, it also increases debt risk (Juan, 2020). Furthermore, the asset-liability ratio is correlated with a company's long-term debt repayment pressure, as it encompasses both long-term assets and liabilities, offering a glimpse into the enterprise's long-term debt burden, albeit with some imprecision. Firstly, to refine the picture of long-term debt structure, it is essential to exclude short-term assets and liabilities from the overall asset-liability ratio, leading us to consider the long-term asset-liability ratio (DCR). Secondly, it is crucial to assess the company's ability to sustain long-term debt payments, which can be supplemented by the interest coverage ratio (ICR) as a measure of long-term solvency (G. F. Chen & Tian, 2021; J. Li et al., 2024).

It is acknowledged that both the asset-liability ratio and the long-term asset-liability ratio are book-based indicators, and enterprises may employ various means to conceal their leverage (X. F. Xu et al., 2020), making these metrics potentially inaccurate reflections of the true long-term debt level. Nonetheless, this study initially focuses on the bookkeeping effects, and the subsequent discussion will address whether the issuance of perpetual bonds has actually achieved "deleveraging".

In this subsection, the estimation models follow the basic setup of Models **Error! Reference source not found.** and **Error! Reference source not found.**, with the dependent variables replaced by the total asset-liability ratio (LVR), the long-term debt-to-capital ratio (DCR), and the interest coverage ratio (ICR). The explanatory variable reflecting the overall long-term debt pressure, the total asset-liability ratio, is removed, and the current ratio, which indicates short-term debt structure, is added. Correspondingly, the lagged values of the dependent variables are also included.

4.5.4 The regression model of the impact of perpetual bonds on corporate profitability - testing of Hypothesis 4

To analyze the impact on profitability, this section primarily aims to validate Hypothesis 4, which posits that the issuance of perpetual bonds by SOEs can enhance their profitability. Indeed, the ultimate goals of expanding working capital and improving leverage ratios are undoubtedly to enhance a firm's operational performance, which represents a more indirect and deep effect that perpetual bond issuance might bring about. Based on the key variables introduced earlier, this subsection focuses on measuring profitability using the Return on Assets (ROA) and Return on Equity (ROE). Taking ROA as an example, the following regression model can be constructed:

$$\mathbf{ROA_{it} = \alpha + \beta_1 PD_{it} + BX_{it} + ind * t_{ind,t} + u_i + \varepsilon_{it}} \quad (4.5)$$

$$\mathbf{ROA_{it} = \alpha + \beta_1 PD_{it} + \beta_2 PDT_{it} + BX_{it} + ind * t_{ind,t} + u_i + \varepsilon_{it}} \quad (4.6)$$

The core variable PD_{it} is the same as in Equation **Error! Reference source not found.** , where ROA_{it} represents the total asset return rate of company i in period t. The control variables include the growth rate of main business revenue (GRMI) reflecting development capability, the LVR reflecting asset structure, inventory turnover (IT) reflecting capital operational efficiency, the total asset size of the enterprise, and the lagged value of ROA. $ind * t_{ind,t}$ and u_i control for industry time-varying effects and individual effects, respectively. The random term ε_{it} is set similarly to **Error! Reference source not found.** and **Error! Reference source not found.**to control for individual heteroskedasticity and intra-industry correlation. To further investigate the dynamic changes in the impact of perpetual bonds on the total asset return rate, PDT is added to estimate Equation**Error! Reference source not found. Error! Reference source not found.** using a similar approach to **Error! Reference source not found.**.

4.5.5 The regression model of short-term impact of perpetual bond issuance on stock prices - testing of Hypotheses 5

Given that the impact of perpetual bonds on stock prices is primarily a short-term shock, while the medium- to long-term trends of stock prices are complex, this analysis does not examine the medium- to long-term effects on stock price trends. Instead, it focuses on data from the five days prior to the announcement of the perpetual bond issuance, the issuance day itself, and the five days following the announcement day. This set is based on the fact that the perpetual bond issuance day constitutes a minimal portion of the overall timeline, and its impact on stock prices occurs within a short period. By including only the data before and after the shock, we avoid

data redundancy, ensuring that each sample comprises only 11 periods of data. Given that many enterprises issue perpetual bonds multiple times, each issuance is treated as a separate sample. Due to the varying issuance dates among different enterprises, the dates are aligned for ease of processing. For instance, the issuance day for all enterprises is uniformly designated as period 6 in the data, with the preceding five days being periods 1 through 5, and the five days following the announcement being periods 7 through 11. Based on this data structure, the following regression model is constructed:

$$\begin{aligned} \mathbf{SVF_{id}} = \boldsymbol{\alpha} + \boldsymbol{\beta_{npc}}\mathbf{after_{id}} + \boldsymbol{\beta_{pc}}\mathbf{after_{id}} * \mathbf{PC_i} + \boldsymbol{\delta_{-1}}\mathbf{SVF_{i(d-1)}} \\ + \boldsymbol{\delta_{-2}}\mathbf{SVF_{i(d-2)}} + \mathbf{i.weekday} + \mathbf{pct\_index_{ind,d}} + \mathbf{u_i} + \boldsymbol{\varepsilon_{it}} \end{aligned} \tag{4.7}$$

The proposed model is a panel model with a daily time span, where the explanatory variable is stock value volatility (denoted as SVF_{id}), which is calculated as the percentage change in the closing price between the current trading day d and the previous trading day (d−1). For those bond-issuing companies that are subsidiaries of listed enterprises, SVF is derived from the stock price volatility of their listed parent companies. It is acknowledged that the impact of perpetual bond issuance on the stock price of a parent company may be relatively smaller compared to a bond-issuing company that is listed itself. Therefore, it is necessary to consider these two types of enterprises separately by including an interaction term with a dummy variable in the regression model. The dummy variable PC takes a value of 1 if the bond-issuing company is itself listed and 0 if it is a subsidiary of a listed company. It is inevitable that only listed enterprises have publicly available stock price data. Many bond-issuing enterprises are not listed, nor do they have listed parent enterprises, which will inevitably limit the sample size for this part of the study.

The core explanatory variable $after_{id}$ takes a value of 1 on the day of perpetual bond issuance and the following five days, and 0 for the preceding five days. The dependent variable SVF_{id} represents the stock price change rate of company i on day d. Among other control variables, $SVF_{i(d-1)}$ and $SVF_{i(d-2)}$ are the stock price change rates of the preceding two periods, controlling for the inertia characteristic of stock price trends. Item i.weekday is a weekday dummy variable (the day of the week may have an impact on stock prices, such as the phrase 'Black Thursday'), and $pct\_index_{ind,d}$ represents the Wind second-level industry index on the trading day, which is used to control for the impact of other external shocks in the industry to which the stock belongs, similar to the role of $ind * t_{ind,t}$ in capturing industry time-varying effects in the regression model from Chapter 5. The interaction term $after_{i,d} * PC_i$ distinguishes between the impact of perpetual bond issuance on stock prices between companies that are

listed themselves and those that are subsidiaries of listed companies. Specifically, β_{npc} (when PC=0) represents the impact of perpetual bond issuance by a subsidiary on the stock price of its listed parent company, while $\beta_{npc} + \beta_{pc}$ (when pc=1) represents the impact of perpetual bond issuance by a listed company on its own stock price. Furthermore, the significance of β_{pc} indicates whether there is a differential impact of perpetual bond issuance between these two types of enterprises.

It is noteworthy that **Error! Reference source not found.** does not include an excessive number of control variables due to the complexity and randomness of stock price movements, especially short-term fluctuations that are difficult to explain well by certain factors, which also allows us to examine the impact of an exogenous shock on stock prices but makes it challenging to construct a highly fitting model. Besides, although the issuance of perpetual bonds is not strictly exogenous, it has significant exogeneity in the very short term because the characteristics of the company will hardly change in the very short term, which excludes the endogenous impact of perpetual bonds on stock prices by affecting other characteristics of the company in the very short term.

4.5.6 Robustness tests

This research mainly uses two methods of robustness testing, and only conducts robustness testing on models with significant regression results of core independent variables, and does not conduct robustness testing on models with insignificant results.

Firstly, the financial characteristics of a company may have continuity, which may lead to serial correlation in the regression error term, thus requiring the use of a robust standard error form for serial correlation. To this end, this research uses the standard error settings proposed by Driscoll and Kraay (1998), which consider heteroscedasticity, sequence correlation, and intra group correlation, and adopts the assumption of maximum two period sequence correlation to re estimate the above regression model. Taking the robustness test of regression (4-3) as an example, the command in Stata is "xtscc CR PD X L. CR i.ind_t, fe lag (2)", where "lag (2)" indicates that the error term is correlated with the lagged sequence of two periods.

Another robustness test method is to replace the core explanatory variable PD with the proportion of perpetual bonds issued to the total debt financing of the enterprise PDR. If both robustness tests can reproduce the previous regression results, it is considered that the results are robust.

4.5.7 Mechanism analysis - further discussions of Hypotheses 3&4

4.5.7.1 "Deleveraging" mechanism - leverage manipulation

The reduction in leverage, as reflected by the decline in the asset-liability ratio (LVR) - if supported by empirical evidences - can stem from several scenarios: a decrease in total liabilities while total assets remain largely unchanged; an increase in total assets while total liabilities remain constant; or a combination of both growing or shrinking, but with total assets growing faster or total liabilities declining faster. To gain clarity on the trends in a company's book total assets and total liabilities post-perpetual bond issuance, this section constructs a fixed-effects model.

$$\mathbf{Size\_GR_{it}} = \boldsymbol{\alpha} + \boldsymbol{\beta_1 PD_{it}} + \boldsymbol{\beta_{-t} L.\, Size\_GR_{it}} + \boldsymbol{\beta_l Size_{it}} + \mathbf{BX} + \mathbf{ind} * \mathbf{t_{ind,t}} + \mathbf{u_i} + \boldsymbol{\varepsilon_{it}} \quad (4\text{-}8)$$

$$\mathbf{Debt\_GR_{it}} = \boldsymbol{\alpha} + \boldsymbol{\beta_1 PD_{it}} + \boldsymbol{\beta_{-t} L.\, Debt\_GR_{it}} + \boldsymbol{\beta_l Debt_{it}} + \mathbf{BX} + \mathbf{ind} * \mathbf{t_{ind,t}} + \mathbf{u_i} + \boldsymbol{\varepsilon_{it}} \quad (4\text{-}9)$$

The explained variables in models **Error! Reference source not found.** and **Error! Reference source not found.** are the growth rates of total assets and total liabilities, respectively. The control variables include the lagged value of the explained variable ($L.\,Size\_GR_{it}$, $L.\,Debt\_GR_{it}$) and the logarithm of the level value ($Size_{it}$, $Debt_{it}$). The unlisted control variables also include return on assets (ROA), inventory turnover (IT), and growth rate of main business income (GRMI), which control the company's profitability and business expansion speed in the current year, respectively. Similar to the previous models, the interaction term of industry and time $ind * t_{ind,t}$ and the individual effect of the company u_i are also controlled. The error term ε_{it} is set to consider the heteroscedasticity and industry-related Wind four-level industry clustering standard error.

Normally, if perpetual bonds are treated as liabilities on the balance sheet, their issuance would increase the total liability amount. Even if they serve as a substitute for traditional debt, they should not cause significant fluctuations in the overall liability size. These findings suggest that perpetual bonds are more often accounted for as equity instruments, allowing them to function as bonds while also removing some traditional debt instruments off the balance sheet, which resulting in a decrease in the debt-to-asset ratio even when the total asset size remains constant or grows, thereby reducing leverage. Numerous studies have argued that the decline in corporate leverage through perpetual bond issuance is achieved through leverage manipulation, such as concealing debt as equity (H. X. Ma & Yao, 2021; X. F. Xu et al., 2020). Therefore, leverage manipulation is a key pathway for perpetual bond issuance to reduce

leverage ratios. However, these studies lack comprehensive empirical analysis. To further validate this pathway, this study empirically examines whether the issuance of perpetual bonds increases the degree of leverage manipulation in these enterprises.

Since off-balance-sheet liabilities and debt disguised as equity (DDE) are not directly reflected in the balance sheet, it is necessary to devise a method to estimate these off-balance-sheet liabilities and DDE. This study adopts the method proposed by X. F. Xu et al. (2020) to construct the Leverage Manipulation Ratio (LVM) indicator, Which provides two methods to measure the LVM: the predictive model approach and the industry median approach. While the industry median approach is convenient to operate, it is not entirely reasonable to consider the industry average as the normal level, as it tends to underestimate the hidden leverage behavior of enterprises when such manipulation is prevalent in the industry. Therefore, this study adopts the predictive model approach to construct the LVM. The basic idea of this method is that when a company has off-balance-sheet liabilities, the corresponding off-balance-sheet assets also increase, and the off-balance-sheet liabilities can be indirectly estimated by estimating the off-balance-sheet assets. The existence of off-balance-sheet assets will cause the book total asset turnover ratio to be higher than the expected (normal) total asset turnover ratio, and the difference between the two can be used to estimate the off-balance-sheet assets. The expected total asset turnover ratio is obtained by performing Tobit regression on the overall sample by year and industry, and then generating the model-predicted total asset turnover ratio. The estimation of DDE is conducted through the expected interest-bearing liabilities model. Due to the existence of hidden debts, the company will have abnormal interest expenses that are higher than the expected (normal) interest expenses. The difference between the two can be used to estimate the DDE. The normal level of interest-bearing liabilities is also obtained through Tobit regression by year and industry. By adjusting the book leverage ratio to account for off-balance-sheet debts and DDE financing, the actual leverage ratio is obtained, and the difference between the two is the LVM. Furthermore, to ensure that the final estimate of the actual leverage falls within a reasonable range, this study applies a 1% quantile trimming treatment to the estimated off-balance-sheet liabilities, DDE, and the finally calculated actual leverage ratio throughout the calculation process. To verify whether the decrease in leverage ratio caused by perpetual bond issuance can be explained by an increase in leverage manipulation, Model **Error! Reference source not found.** is used to empirically study whether perpetual bond issuance expands the scope for leverage manipulation.

$$\mathbf{LVM_{it} = \alpha + \beta_1 PD_{it} + BX_{it} + ind * t_{ind,t} + u_i + \varepsilon_{it}} \quad (4.10)$$

Drawing upon research by Scott et al. (2011), G. Li et al. (2009), P. Gao and Zheng (2018)

and S. Z. Huang (2005), the control variables X_{it} in our model include asset size, logarithmic form of operating cash flow (OCF), board independence (POID), profitability (ROA), and equity structure (SS). The key explanatory variables, PD_{it}, model fixed effects, and error term settings are identical to those in Model **Error! Reference source not found.**. If the results show that perpetual bond issuance reduces the leverage ratio while simultaneously increasing the LVM, it implies that leverage manipulation or hidden debts are the channels through which perpetual bonds lower the book leverage ratio, rather than solely through actual deleveraging.

4.5.7.2 DuPont analysis - decomposition of profitability

Over 100 years ago, The DuPont Company conducted a thorough study on how to enhance shareholder return, specifically Return on Equity (ROE), and decomposed ROE into a formula:

$$\mathbf{ROE} = \frac{\textbf{net profit}}{\textbf{total equity}} = \frac{\textbf{net profit}}{\textbf{total asset}}(\mathbf{ROA}) \times \frac{\textbf{total asset}}{\textbf{total profit}}(\textbf{Equity Multiplier}, \mathbf{EM})$$
$$= \frac{\textbf{net profit}}{\textbf{operating revenue}}(\mathbf{ROR}) \times \frac{\textbf{operating revenue}}{\textbf{total asset}}(\textbf{total asset turnover}, \mathbf{TAT}) \times$$
$$\frac{\textbf{total asset}}{\textbf{total profit}}(\textbf{Equity Multiplier}, \mathbf{EM})$$

In other words, to improve profitability, accelerate turnover, and utilize leverage, colloquially speaking, it means selling at a higher price (higher ROR), selling more (higher TAT), and borrowing more (larger EM). These three ratios jointly drive the company's ROE level. The DuPont Analysis illustrates that ROE is a highly comprehensive indicator that integrates a company's profitability, operational efficiency, and financial management capabilities. Based on this, this study also adopts the analytical approach of the DuPont formula to analyze the mechanisms affecting profitability, examining the impact of perpetual bond issuance on each decomposed factor and making a comprehensive judgment. To this end, the study estimates the following three equations separately:

$$\mathbf{ROR_{it}} = \boldsymbol{\alpha} + \boldsymbol{\beta_1}\mathbf{PD_{it}} + \mathbf{BX_{it}} + \mathbf{ind} * \mathbf{t_{ind,t}} + \mathbf{u_i} + \boldsymbol{\varepsilon_{it}} \quad (4.11)$$

$$\mathbf{TAT_{it}} = \boldsymbol{\alpha} + \boldsymbol{\beta_1}\mathbf{PD_{it}} + \mathbf{BX_{it}} + \mathbf{ind} * \mathbf{t_{ind,t}} + \mathbf{u_i} + \boldsymbol{\varepsilon_{it}} \quad (4.12)$$

$$\mathbf{EA_{it}} = \boldsymbol{\alpha} + \boldsymbol{\beta_1}\mathbf{PD_{it}} + \mathbf{BX_{it}} + \mathbf{ind} * \mathbf{t_{ind,t}} + \mathbf{u_i} + \boldsymbol{\varepsilon_{it}} \quad (4.13)$$

The model setup of equation **Error! Reference source not found.** is identical to **Error! Reference source not found.** except for the substitution of the dependent variable and its lagged term. For Equation **Error! Reference source not found.**, the dependent variable is Total Asset Turnover (TAT). Compared to **Error! Reference source not found.**, the inventory turnover variable in the control variables is removed, and the Operating Profit Ratio (ROR), which reflects the company's business profitability, is added. Additionally, the lagged term is replaced with the lagged Total Asset Turnover (L.TAT). In Equation **Error! Reference source**

not found., the dependent variable is the Equity Multiplier (EM). Similarly, since the capital structure is directly represented in the dependent variable, variables in the control variables that reflect the company's capital structure are omitted. Instead, the Operating Profit Ratio (ROR) and turnover variables are included, and the lagged variables are replaced accordingly. These adjustments in the control variables and lagged terms are made to ensure that the models focus on the specific aspects of profitability being analyzed, while avoiding potential multicollinearity issues that could arise from including variables that are highly correlated with the dependent variables.

4.5.7.3 Decomposition of the income statement

The DuPont formula links the income statement and balance sheet, helping us to generally determine whether changes in ROE originate from the income statement or balance sheet. However, the DuPont formula does not delve into the details of the income statement—specifically, the net profit is not decomposed, making it impossible to identify which factors affecting net profit have changed and to explain the reasons for changes in the operating profit ratio (ROR). To explore how perpetual bonds affect changes in net profit, we will re-decompose the Return on Assets (ROA) from the perspective of net profit decomposition:

ROA = Net Profit / Average Total Assets = (Main Business Profit + Other Business Profit - Expenses + Non-operating Items - Income Tax) / Average Total Assets

Here, we focus primarily on main business profit, which can be further decomposed into main business revenue and main business profit margin (MPM):

ROA = (Main Business Revenue × Main Business Profit Margin + Other Business Profit - Expenses + Non-operating Items - Income Tax) / Average Total Assets

In other words, the increase in main business profit can be considered from two aspects: "breadth" and "depth." "Breadth" refers to the expansion of the company's main business scale and sales volume, indicating an enhanced development momentum. "Depth" reflects improved operational efficiency and reduced unit costs of production and operation. The indicator reflecting "breadth" can be chosen as the Growth Rate of Main Revenue (GRMI), which is the ratio of the increase in main business revenue this year to that from the previous year. It reflects the growth speed of the company's main business, serves as a measure of the company's operating conditions and market share capabilities, and is an important indicator for predicting the expansion trends of the company's business operations. The most direct measure of "depth" is the Main Business Profit Margin (MPM).

Another critical factor related to perpetual bonds that affects net profit is interest expense.

According to China's tax system, the corporate income tax rate can be as high as 20%, while according to Figure 3.6, the coupon interest on perpetual bonds is significantly lower than the corporate income tax. This implies that if the interest payments on perpetual bonds are classified as interest expenses rather than dividends, they can be deducted before tax, serving as part of a "tax shield" and thereby increasing net profit (Petras, 2022; H. Y. Shan, 2019; Zong et al., 2017). This is permissible in China, as stipulated in the "Announcement on Issues Related to the Corporate Income Tax Policy for Perpetual Bonds" (Ministry of Finance and State Taxation Administration Announcement No. 64, 2019), which allows the interest expenses of perpetual bonds meeting certain conditions to be deducted before corporate income tax. While these conditions primarily target financial instruments that are formally perpetual bonds but essentially closer to debt financing, the "Enterprise Accounting Standards Interpretation No. 16," which took effect in 2022, permits perpetual bonds to be treated as equity instruments, and a portion of dividends based on profit sources can also be deducted as interest before tax. This means that enterprises can choose to classify perpetual bonds as equity items or debt items through contractual arrangements, balancing between "deleveraging" and "tax shield" (Fargher et al., 2019), and some qualified perpetual bonds even possess both functions.

Another factor related to ROA but not directly reflected in its calculation formula is the efficiency of capital turnover. When capital turns over faster within a certain period, the same amount of funds can be used to complete more production and sales activities, generating multiple revenue streams, which translates into an increase in total profit. Similarly, faster turnover means less capital is tied up or stagnant in production and sales processes, enabling the completion of the same scale of production and sales with less average capital, i.e., using less average assets without compromising profit. From any perspective, faster capital turnover can lead to a higher ROA. Here, Total Asset Turnover (TAT) is used as an indicator to measure the efficiency of capital turnover for a company, which is calculated as the ratio of operating income to average assets.

To separately discuss whether the issuance of perpetual bonds affects the Return on Assets (ROA) by influencing the growth rate of main revenue income (GRMI), main business profit margin (MPM), total asset turnover (TAT), and interest expense (Intrst), we can utilize interaction terms to conduct a mechanism analysis and construct the following estimation model:

$$\mathbf{ROA_{it}} = \boldsymbol{\alpha} + \boldsymbol{\beta_1}\mathbf{PD_{it}} + \boldsymbol{\beta_2}\mathbf{PD_{it}} \times \mathbf{GRMI_{it}} + \boldsymbol{\beta_3}\mathbf{GRMI_{it}} + \mathbf{BX_{it}} + \mathbf{ind} * \mathbf{t_{ind,t}} + \mathbf{u_i} + \boldsymbol{\varepsilon_{it}} \quad (4.14)$$

$$\mathbf{ROA_{it} = \alpha + \beta_1 PD_{it} + \beta_2 PD_{it} \times MPM_{it} + \beta_3 MPM_{it} + BX_{it} + ind * t_{ind,t} + u_i + \varepsilon_{it}} \quad (4.15)$$

$$\mathbf{ROA_{it} = \alpha + \beta_1 PD_{it} + \beta_2 PD_{it} \times TAT_{it} + \beta_3 TAT_{it} + BX_{it} + ind * t_{ind,t} + u_i + \varepsilon_{it}} \quad (4.16)$$

$$\mathbf{ROA_{it} = \alpha + \beta_1 PD_{it} + \beta_2 PD_{it} \times Intrst_{it} + \beta_3 Intrst_{it} + BX_{it} + ind * t_{ind,t} + u_i + \varepsilon_{it}} \quad (4.17)$$

Taking **Error! Reference source not found.** as an example, this model examines the mechanism of the growth rate of main revenue. In this model, the coefficient β_3 in front of GRMI reflects the average marginal impact of the growth rate of main revenue on ROA, without considering the influence of perpetual bond issuance. The interaction term $PD_{it} \times GRMI_{it}$ has a coefficient β_2 that reflects the excess marginal impact of the growth rate of main revenue on ROA after perpetual bond issuance, compared to the average impact. If β_2 is significantly positive, it indicates that the positive impact of perpetual bonds on ROA operates through a higher growth rate of main revenue. Similarly, in **Error! Reference source not found.**, **Error! Reference source not found.** and **Error! Reference source not found.**, the growth rate of main revenue (GRMI) is replaced with the main business profit margin (MPM), total asset turnover (TAT), and interest expense (Intrst for short and the original unit is 0.1 billion of RMB, and logarithmic transformation is performed), respectively. The fixed effects and error term settings in each equation are the same as those in the previous models.

4.6 Chapter summary

This chapter introduces the methodology and specific research methods employed in this thesis. Firstly, the thesis adopts a quantitative positivist methodology. Based on the previous literature review, we find that theoretical research on perpetual bonds is relatively abundant. However, at the empirical level, there is relatively little research on the issuance characteristics of perpetual bonds and their impact on corporate performance. Some studies have explored the impact of perpetual bond issuance in specific industries or among certain enterprises. Although these analyses are sufficiently detailed, they also affect the universality and generalizability of these research conclusions. Additionally, existing research on the benefits of perpetual bond issuance mostly focuses on the impact of perpetual bond issuance on a specific aspect of corporate performance, such as stock price changes, financial management performance, and profitability. While focusing on a single aspect of performance facilitates in-depth analysis,

failing to integrate the impact of perpetual bonds on these different aspects of performance hinders a comprehensive understanding of the full picture of perpetual bonds' impact on corporate performance and the underlying mechanisms. Based on this, grounded in a positivist methodology, this thesis aims to expand the results of related empirical research. Furthermore, addressing the dimensionality limitations of existing empirical research discussions, this thesis further clarifies the research questions to explore the financial characteristics of Chinese enterprises issuing perpetual bonds and the multidimensional impacts of perpetual bond issuance on corporate financial pressure, profitability, and stock price fluctuations, thereby discussing the interactions among these impacts.

To refine the above research questions into testable propositions, combining the theoretical foundation in Chapter 2 and the real-world background in Chapter 3, this thesis proposes several research hypotheses: (1) SOEs with high leverage ratios and greater short-term debt pressure are more likely to issue perpetual bonds; (2) Perpetual bonds can provide enterprises with liquidity to alleviate short-term debt repayment pressure; (3) The special equity-like nature of perpetual bonds can improve an enterprise’s book leverage ratio; (4) Issuing perpetual bonds may improve an enterprise’s profitability; (5a) Issuing perpetual bonds may cause a short-term increase in the enterprise’s stock price; (5b) Issuing perpetual bonds may cause a short-term decrease in the enterprise’s stock price.

In terms of specific methods, based on the research hypotheses, indicators for measuring perpetual bond issuance and corporate performance were selected, and data from the Wind Database related to bond-issuing enterprises from 2010 to 2013 were used for analysis. Given the panel data characteristics, a panel model with dual fixed effects was used for data fitting, and methods for hypothesis testing were proposed for each hypothesis.

Chapter 5: Results and Discussions

This chapter shows all the empirical results of this study: the characteristics of issuing enterprises, impact of issuance on financial pressure, profitability, stock price volatility and the identification of underlying mechanisms. Based on these results, we will answer whether the hypothesis proposed in the previous chapter have been validated at last.

5.1 Description analysis of variables

This section presents the descriptive statistics of the core variables introduced above by the method of above data and sample selection. **Error! Reference source not found.** displays the distribution of the dummy variables ISS_{it} and PD_{it}. Although we have collected information on 4,349 perpetual bond issuances by non-financial SOEs in China from 2013 to the end of 2023, due to the necessity of matching the perpetual bond-issuing enterprises with those in the financial database, many data points could not be matched and were thus excluded. Consequently, the number of samples where ISS_{it} equals 1 falls far short of the total number of issuances, which is inevitable. enterprises that hold perpetual bonds represent a minority of the entire sample, accounting for only 7.76% of the firm-year observations.

Table 5.1 Dummy variables description statistics

	value	num	proportion（%）
ISS_{it}	0	39,896	95.5
(New Issuance in next period)	1	1,880	4.5
PD_{it}	0	38,536	92.24
(Holding Perpetual Bond)	1	3,240	7.76

Error! Reference source not found. resents the descriptive statistics for continuous variables. Notably, both PDR_{it} and PDT_{it} are zero when PD_{it} is zero. Therefore, **Error! Reference source not found.** focuses on the statistical situation of PDR_{it} and PDT_{it} when PD_{it} is 1. According to the proportion of perpetual bond issuance size to total liabilities PDR_{it}, it can be observed that the perpetual bond size of most samples only accounts for a small fraction of the total debt—not exceeding 10%, exhibiting a moderately left-skewed distribution. Although the median and mean of the variable PDT_{it} are similar, the quantiles indicate that PDT_{it} rarely approaches 1, suggesting that the samples represent a greater number of enterprises in the early stages of perpetual bond issuance compared to those approaching maturity. This is partly due

to the increasing number of enterprises issuing perpetual bonds, with a larger proportion being in the state of newly issued perpetual bonds. Additionally, some enterprises issue "new bonds to repay old bonds" to alleviate financial pressure related to debt repayment. Other variables have undergone a 1% trimming process at both ends. Notably, the interest coverage ratio (ICR) has numerous extreme high values and a relatively large standard deviation, prompting the trimming of data above the 95th quantile. **Error! Reference source not found.** plays the statistical results after trimming.

Table 5.2 Descriptive statistics for continuous variables

	N	mean	min	p25	p50	p75	max	variance
PDR (Perpetual Debt Ratio to Total Liabilities)	3240	0.0498	0.0001	0.0188	0.0369	0.0626	2.2452	0.0054
PDT (Relative Maturity Position of Existing Perpetual Debt)	3240	0.4106	-0.0009	0.2110	0.3972	0.5875	1.0000	0.0634
CR (Current Ratio)	40920	2.7481	0.2651	1.1205	1.9025	3.4161	19.5590	6.7300
QR (Quick Ratio)	40920	1.3600	0.1738	0.7061	1.0535	1.6529	8.6999	1.1230
LVR (Asset-Liability Ratio)	40940	55.7554	14.2251	45.7764	57.3626	66.5185	90.0806	230.1266
DCR (Long-term Debt-Capital Ratio)	40916	0.3584	0.0018	0.2313	0.3698	0.4866	0.7614	0.0294
ICR (Interest Coverage Ratio)	32997	6.0366	-5.8217	1.6822	3.0390	6.6424	52.5161	68.4128
ROA (Return on Assets)	40917	2.8668	-7.0410	1.0179	1.9818	3.8976	17.2594	8.8525
ROE (Return on Equity)	40782	3.6452	-33.3580	1.0550	2.2269	5.4144	28.3809	36.4931

5.2 Analysis results of characteristics of issuing enterprises

Table 5. presents the estimation results of the random effects model in its first six columns (sign as “re”), followed by the fixed effects estimation results in the last six columns (sign as “fe”). The first five and seventh to eleventh columns of each table show the individual estimation results for the five core explanatory variables (relative current ratio, quick ratio, asset-to-debt ratio, growth rate of main business revenue, and MM index). The sixth and twelfth columns provides the complete estimation results for Models **Error! Reference source not found.** and **Error! Reference source not found.**. The random effects estimation results indicate that a relatively lower current ratio and quick ratio compared to industry levels, as well as a relatively higher asset-to-debt ratio, facilitate the issuance of perpetual bonds. This suggests that enterprises with higher leverage and greater short-term debt pressure tend to use perpetual bonds for financing. Other core explanatory variables reveal that enterprises issuing perpetual bonds are not necessarily those with faster growth rates or facing greater financing constraints (as evidenced by the insignificant coefficients for GRMIr and MMr. When all explanatory variables are included in the regression model (the "all-re" column in the table), the coefficient for the current ratio becomes insignificant, while the coefficient for the quick ratio turns positive, indicating that leverage is the dominant and robust factor influencing perpetual bond issuance.

Turning to the fixed effects model estimation results, when estimating each core variable individually, the coefficients for CRr and QRr become positive, suggesting that enterprises are more inclined to issue perpetual bonds during periods of adequate liquidity. However, these results are only significant at the 10% level and lose significance in the overall equation estimation (the "all-fe" column in the table). In contrast, the positive significance of leverage persists, indicating that the same company is more likely to issue perpetual bonds for financing during periods of high leverage.

Table 5.3 Outcomes of analysis of characteristics of issuing enterprises

	(CR-re)	(QR-re)	(LVR-re)	(GRMI-re)	(MM-re)	(all-re)	(CR-fe)	(QR-fe)	(LVR-fe)	(GRMI-fe)	(MM-fe)	(all-fe)
	$iss_{i(t+1)}$	$iss_{i(t+1)}$	$iss_{i(t+1)}$	$iss_{i(t+1)}$	$iss_{i(t+1)}$	$iss_{i(t+1)}$	$iss_{i(t+1)}$	$iss_{i(t+1)}$	$iss_{i(t+1)}$	$iss_{i(t+1)}$	$iss_{i(t+1)}$	$iss_{i(t+1)}$
CRr	-0.367***					-0.141	0.202**					0.410**
	(0.081)					(0.128)	(0.096)					(0.187)
QRr		-0.209***				0.238**		0.159*				-0.029
		(0.077)				(0.120)		(0.092)				(0.176)
LVRr			3.756***			3.844***			2.868***			3.138***
			(0.222)			(0.238)			(0.366)			(0.384)
GRMIr				0.002		0.003				0.002		0.002
				(0.004)		(0.004)				(0.004)		(0.005)
MMr					-0.012	-0.008					-0.010	-0.011
					(0.017)	(0.017)					(0.023)	(0.024)
Size	1.221***	1.247***	1.056***	1.256***	1.253***	1.049***	0.484***	0.504***	0.264**	0.502***	0.496***	0.297**
	(0.051)	(0.051)	(0.049)	(0.052)	(0.052)	(0.050)	(0.120)	(0.120)	(0.126)	(0.121)	(0.123)	(0.132)
ROA	0.014	0.018	0.038***	0.016	0.015	0.035**	-0.016	-0.011	-0.000	-0.013	-0.015	-0.004
	(0.013)	(0.013)	(0.013)	(0.013)	(0.013)	(0.014)	(0.016)	(0.016)	(0.016)	(0.016)	(0.017)	(0.017)
IT	-0.004	-0.001	0.001	-0.002	-0.002	-0.001	-0.010*	-0.008	-0.004	-0.006	-0.007	-0.009
	(0.004)	(0.004)	(0.004)	(0.004)	(0.004)	(0.004)	(0.005)	(0.005)	(0.005)	(0.005)	(0.005)	(0.006)
SS	0.734*	0.743*	1.129***	0.684*	0.670*	1.148***	2.202***	2.386***	2.205***	2.288***	2.220***	2.000***
	(0.385)	(0.386)	(0.376)	(0.387)	(0.386)	(0.382)	(0.637)	(0.639)	(0.633)	(0.635)	(0.635)	(0.645)
POID	-0.545	-0.418	-0.416	-0.446	-0.488	-0.392	1.584	1.809	1.334	1.665	1.599	1.203
	(0.535)	(0.538)	(0.514)	(0.538)	(0.537)	(0.522)	(1.120)	(1.124)	(1.109)	(1.112)	(1.114)	(1.137)
time fixed	yes	yes	yes	yes	yes	yes	yes	yes	yes	yes	yes	yes
IFE	no	no	no	no	no	no	yes	yes	yes	yes	yes	yes
_cons	-13.08***	-13.48***	-16.77***	-13.62***	-13.53***	-16.84***						
	(0.541)	(0.544)	(0.573)	(0.536)	(0.535)	(0.612)						
N	85345	86146	86657	83458	81572	79111	20121	20218	20371	19876	19497	19142

The standard deviation of coefficient estimation is in brackets, which is significant at ***: 1% level, **: 5% level and *: 10% level. The following regression results are the same

In summary, the analysis partially validates Hypothesis 1: SOEs with high leverage ratios are more likely to issue perpetual bonds. There is insufficient evidence to suggest that perpetual bond issuers are exclusively financially strong, well-performing enterprises with strong expansion needs. Rather, they are likely to be enterprises under financial pressure (with the random effects model even indicating that issuers have poorer short-term financial conditions) and have a strong need to reduce leverage, resorting to unconventional financial instruments out of necessity.

5.3 Regression results of the impact of perpetual bonds on debt pressure

Table 5. shows the regression results of impact on short-term solvency, where Columns 1-3 present the estimation results for Model **Error! Reference source not found.** , while Columns 4-6 show the estimation results for Model **Error! Reference source not found.** . The dependent variables in Columns (1) and (4) are the current ratio, Columns (2) and (5) use the quick ratio, and Columns (3) and (6) feature the cash ratio (CashR), which specifically calculates the most liquid and highly solvent asset—monetary assets. The cash ratio is the ratio of monetary assets to current liabilities, imposing an even stricter standard on solvency than the quick ratio. Across all results in Table 5., PD is significantly positive at least at the 5% level, indicating that the issuance of perpetual bonds by SOEs alleviates short-term debt repayment pressure on the whole.

Table 5.4 Regression results of impact on short-term debt pressure

	(1) CR	(2) QR	(3) CashR	(4) CR	(5) QR	(6) CashR
PD	0.343**	0.106**	0.043**	0.185**	0.067***	0.037***
	(0.148)	(0.048)	(0.021)	(0.084)	(0.025)	(0.012)
PDT				0.388*	0.094	0.015
				(0.196)	(0.091)	(0.046)
ROA	-0.009	-0.001	-0.000	-0.009	-0.001	-0.000
	(0.011)	(0.005)	(0.004)	(0.011)	(0.005)	(0.004)
IT	-0.000	-0.000	0.000	-0.000	-0.000	0.000
	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)
Size	-0.354***	-0.223***	-0.107**	-0.355***	-0.223***	-0.107**
	(0.118)	(0.071)	(0.051)	(0.118)	(0.071)	(0.051)
LRV	-0.022**	-0.011***	-0.006***	-0.022**	-0.011***	-0.006***
	(0.011)	(0.004)	(0.002)	(0.011)	(0.004)	(0.002)
GRMI	0.000	-0.000	-0.000	0.000	-0.000	-0.000
	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)
L.CR	0.015***			0.015***		
	(0.001)			(0.001)		
L.QR		0.020***			0.020***	
		(0.006)			(0.006)	
L.CashR			0.014***			0.014***

			(0.004)			(0.004)
IFE	yes	yes	yes	yes	yes	yes
ITFE	yes	yes	yes	yes	yes	yes
_cons	6.192***	3.180***	1.343***	6.192***	3.180***	1.343***
	(0.490)	(0.281)	(0.231)	(0.491)	(0.280)	(0.231)
R^2_a	0.178	0.178	0.151	0.178	0.178	0.151
N	34437	34437	34436	34437	34437	34436

However, the results in the last three columns of Table 5. reveal that after controlling for PD and other control variables, PDT lacks independent explanatory power for the dependent variables (only Column 4 is significant at a relatively low 10% level). This suggests that the impact of perpetual bond issuance on the short-term solvency of enterprises does not exhibit significant time-varying characteristics, neither diminishing nor increasing over time. This phenomenon might stem from the improved liquidity brought about by perpetual bonds, leading to an overall enhancement in the financial condition of enterprises and out of the shortage of finances.

Table 5. presents the estimation results of the impact of perpetual bonds on long-term debt repayment pressure. According to the adjusted R^2, it can be seen that compared to models **Error! Reference source not found.** and **Error! Reference source not found.**, the estimation model for the impact of long-term debt pressure has a higher goodness of fit, achieving a very ideal state, and the model results are more convincing. Columns 1, 2, 4, and 5 show negative and statistically significant (at the 1% level) coefficients for the PD variable, indicating that the issuance of perpetual bonds, on average, reduces both the total asset-liability ratio and the long-term debt-to-capital ratio. However, the effect on the total asset-liability ratio is stronger than that on the long-term debt-to-capital ratio, and the impact on the interest coverage ratio is not significant. This probably suggests that the issuance of perpetual bonds by Chinese non-financial SOEs primarily achieves a bookkeeping "deleveraging" goal, with the long-term debt pressure reflected in the long-term debt-to-capital ratio not decreasing as significantly as indicated by the decline in the total asset-liability ratio. Additionally, the interest payment pressure associated with long-term debt, as measured by the interest coverage ratio, does not appear to be alleviated.

Table 5.5 Regression results of impact on long-term debt pressure

	(1) LVR	(2) LCR	(3) ICR	(4) LVR	(5) LCR	(6) ICR
PD	-1.143***	-0.010***	0.621	-1.693***	-0.013***	0.115
	(0.159)	(0.002)	(0.656)	(0.211)	(0.003)	(0.484)
PDT				1.367***	0.007	1.248
				(0.284)	(0.008)	(0.913)
ROA	-0.520***	-0.005***	1.294***	-0.520***	-0.005***	1.294***
	(0.025)	(0.000)	(0.095)	(0.025)	(0.000)	(0.095)

IT	-0.005	0.000	0.013	-0.005	0.000	0.013
	(0.004)	(0.000)	(0.009)	(0.004)	(0.000)	(0.009)
Size	3.752***	0.049***	-2.087**	3.746***	0.049***	-2.089**
	(0.228)	(0.004)	(0.993)	(0.227)	(0.004)	(0.995)
GRMI	0.007**	0.000**	-0.004	0.007**	0.000**	-0.004
	(0.003)	(0.000)	(0.002)	(0.003)	(0.000)	(0.002)
L.LVR	0.602***			0.603***		
	(0.020)			(0.020)		
L.LCR		0.535***			0.535***	
		(0.013)			(0.013)	
L.ICR			0.083***			0.083***
			(0.020)			(0.020)
IFE	yes	yes	yes	yes	yes	yes
I-TFE	yes	yes	yes	yes	yes	yes
_cons	7.669***	-0.014	11.574**	7.680***	-0.014	11.470**
	(2.190)	(0.029)	(5.589)	(2.189)	(0.028)	(5.593)
R^2_a	0.559	0.440	0.039	0.559	0.440	0.139
N	32074	32070	25830	32074	32070	25830

In the estimation of the PDT coefficient in Table 5., only Column 4, with the total asset-liability ratio as the dependent variable, shows a significant negative coefficient. This indicates that during the issuance period, the "deleveraging" effect of perpetual bonds exhibits a diminishing characteristic. Specifically, the initial issuance of perpetual bonds has an immediate and substantial "deleveraging" effect, reducing the asset-liability ratio by 1.693 percentage points (when PD=1 and PDT=0). However, as the perpetual bonds approach their nominal maturity, the deleveraging effect diminishes significantly, reducing the asset-liability ratio by only 0.3 percentage points on average (when PD=1 and PDT=1). This may imply that if the issuance of perpetual bonds merely serves as a financial engineering tool to reduce book leverage, the subsequent reduction in book leverage may create room for further debt financing, potentially increasing actual leverage and reversing the intended policy effect of "deleveraging." This possibility will be further explored in the subsequent mechanism analysis section of the study.

5.4 Regression results of impact of perpetual bonds on profitability

The estimation results are presented in

5.5 Regression results of short-term impact of perpetual bond issuance on stock prices

The regression results, taking into account the strong serial correlation in stock price movements, are presented using the robust standard errors for serial correlation as proposed by Driscoll and Kraay (1998). The estimates for model **Error! Reference source not found.** are shown in the first column of

. Notably, the estimated result for β_{npc} is not significant, indicating that the issuance of perpetual bonds by subsidiaries does not significantly impact the stock prices of their listed parent companies. This finding is not surprising, as the link between parent and subsidiary enterprises may not be strong, and the public may not overly consider subsidiary actions when trading the parent company's stock.

Table 5.7 Regression results of impact on short-term stock value volatility

	(4-7) svf	(4-7_cut) svf	(4-7*) svf
After(β_{npc})	-0.048		
	(0.036)		
after_PC(β_{pc})	0.002	-0.047**	-0.182***
	(0.048)	(0.018)	(0.064)
L.SVF	-0.105***	-0.105***	-0.272***
	(0.019)	(0.019)	(0.015)
L2.SVF	-0.079**	-0.079**	-0.187***
	(0.025)	(0.025)	(0.010)
pct_index	82.778***	82.775***	91.913***
	(1.177)	(1.171)	(1.886)
i.weekday	ctrl	ctrl	——
individual effect	ctrl	ctrl	——
_cons	0.081**	0.069*	0.141***
	(0.032)	(0.034)	(0.036)
N	18692	18692	16394

Focusing on the impact of perpetual bond issuance by listed enterprises (not their subsidiaries) on their own stock prices, we modify model **Error! Reference source not found.** by removing the after variable and allowing after_PC to directly reflect this effect. The estimates for this modified model are presented in the (4-7_cut) column of

. The estimated result for β_{pc} is negative and significant at the 5% level, suggesting that the issuance of perpetual bonds by listed enterprises leads to a negative fluctuation in their own stock prices. Additionally, the stock price volatility in the preceding two periods has a negative impact on the current stock price, indicating that short-term intertemporal relationships in stock prices are dominated by corrections rather than inertia. The highly significant positive coefficient for pct_index underscores the significant influence of industry fluctuations on stock prices, effectively fulfilling the role of a control variable.

Addressing the potential endogeneity issue arising from the inclusion of lagged dependent variables in model **Error! Reference source not found.**, we re-estimate the (4-7_cut) specification in

by the Arellano-Bond dynamic panel method, using lagged terms beyond two periods as instrumental variables for L.SVF and L2.SVF. In Stata, the command used for this estimation is: “xtabond SVF after_pc L(1/2). SVF pct_index, lags(2) r”, where "L (1/2). SVF" indicates

that two lag periods of the dependent variable SVF are added to the independent variable of the model, and the lag period of the dependent variable is an endogenous variable. Therefore, the "lags (2)" option is applied to deal with its endogenous nature, that is, the data with more than two lag periods of the dependent variable is used as the instrumental variable with one or two lag periods, and the "r" option means that the model adopts heteroscedastic robust standard error. The results of this estimation are presented in the last column of

, labeled (4-7*). Given that the dynamic panel method employs differenced equations, the need to control for individual effects is eliminated, and the weekday dummy variables become irrelevant and are thus omitted. In the (4-18*) column, β_{pc} is found to be negative and significant at the 1% level, reinforcing the finding that the issuance of perpetual bonds by listed enterprises leads to a decline in their own stock prices.

, with Columns 1-3 showing the regression results for Model **Error! Reference source not found.** and Columns 4-6 for Model **Error! Reference source not found.**. In columns 2 and 5, the dependent variable is the total asset return rate (ROA), while in columns 3 and 6, the dependent variable is the return on equity (ROE). Columns 1 and 4, on the other hand, use the operating profit margin (ROR), which is the ratio of net profit to operating revenue, as the dependent variable. ROR represents profitability based on the income statement and is driven solely by items within the income statement, reflecting the ability of operating revenue to generate profits. Both ROA and ROE consider the capital scale and capital structure factors in the balance sheet in addition to the operating profit margin.

Table 5.6 Regression results of impact on profitability

	(1) ROR	(2) ROA	(3) ROE	(4) ROR	(5) ROA	(6) ROE
PD	4.145**	-0.022	-0.186	1.762	-0.031	-0.327
	(2.006)	(0.059)	(0.194)	(2.189)	(0.079)	(0.247)
PDT				5.892**	0.023	0.352
				(2.710)	(0.108)	(0.307)
Size	4.292**	-0.297***	0.211	4.282**	-0.297***	0.210
	(1.781)	(0.106)	(0.283)	(1.779)	(0.106)	(0.283)
LVR	-0.717***	-0.034***	-0.077***	-0.716***	-0.034***	-0.077***
	(0.061)	(0.008)	(0.028)	(0.061)	(0.008)	(0.028)
IT	-0.020	0.006**	0.018***	-0.020	0.006**	0.018***
	(0.038)	(0.002)	(0.006)	(0.038)	(0.002)	(0.006)
GRMI	-0.019	0.009***	0.017***	-0.019	0.009***	0.017***
	(0.036)	(0.003)	(0.006)	(0.036)	(0.003)	(0.006)
L.ROR	0.102***			0.102***		
	(0.026)			(0.026)		
L.ROA		0.380***			0.380***	
		(0.014)			(0.014)	
L.ROE			0.308***			0.308***
			(0.025)			(0.025)

IFE	yes	yes	yes	yes	yes	yes
I-TFE	yes	yes	yes	yes	yes	yes
_cons	43.719***	4.587***	5.479**	43.848***	4.557***	5.582**
	(7.789)	(0.889)	(2.659)	(7.740)	(0.890)	(2.656)
R^2_a	0.163	0.314	0.213	0.163	0.314	0.213
N	30343	32049	31897	30343	32049	31897

From the overall impact of perpetual bond issuance on various profitability indicators (as indicated by the PD coefficient), only the coefficient estimate in column (1) is significant and positive. This suggests that perpetual bond issuance only improves the profitability of SOEs within the scope of the income statement. The insignificant impact on ROA and ROE may be attributed to the fact that these indicators encompass the balance sheet perspective, and perpetual bonds have an influence on the capital structure, leading to potential offsetting effects. This aspect will be explained in detail in the mechanism analysis section. Additionally, the positive coefficient of PDT in column (4) of

5.5 Regression results of short-term impact of perpetual bond issuance on stock prices

The regression results, taking into account the strong serial correlation in stock price movements, are presented using the robust standard errors for serial correlation as proposed by Driscoll and Kraay (1998). The estimates for model **Error! Reference source not found.** are shown in the first column of

. Notably, the estimated result for β_{npc} is not significant, indicating that the issuance of perpetual bonds by subsidiaries does not significantly impact the stock prices of their listed parent companies. This finding is not surprising, as the link between parent and subsidiary enterprises may not be strong, and the public may not overly consider subsidiary actions when trading the parent company's stock.

Table 5.7 Regression results of impact on short-term stock value volatility

	(4-7) svf	(4-7_cut) svf	(4-7*) svf
After(β_{npc})	-0.048		
	(0.036)		
after_PC(β_{pc})	0.002	-0.047**	-0.182***
	(0.048)	(0.018)	(0.064)
L.SVF	-0.105***	-0.105***	-0.272***
	(0.019)	(0.019)	(0.015)
L2.SVF	-0.079**	-0.079**	-0.187***
	(0.025)	(0.025)	(0.010)
pct_index	82.778***	82.775***	91.913***
	(1.177)	(1.171)	(1.886)
i.weekday	ctrl	ctrl	——
individual effect	ctrl	ctrl	——
_cons	0.081**	0.069*	0.141***
	(0.032)	(0.034)	(0.036)
N	18692	18692	16394

Focusing on the impact of perpetual bond issuance by listed enterprises (not their subsidiaries) on their own stock prices, we modify model **Error! Reference source not found.** by removing the after variable and allowing after_PC to directly reflect this effect. The estimates for this modified model are presented in the (4-7_cut) column of

. The estimated result for β_{pc} is negative and significant at the 5% level, suggesting that the issuance of perpetual bonds by listed enterprises leads to a negative fluctuation in their own stock prices. Additionally, the stock price volatility in the preceding two periods has a negative impact on the current stock price, indicating that short-term intertemporal relationships in stock prices are dominated by corrections rather than inertia. The highly significant positive coefficient for pct_index underscores the significant influence of industry fluctuations on stock prices, effectively fulfilling the role of a control variable.

Addressing the potential endogeneity issue arising from the inclusion of lagged dependent variables in model **Error! Reference source not found.**, we re-estimate the (4-7_cut) specification in

by the Arellano-Bond dynamic panel method, using lagged terms beyond two periods as instrumental variables for L.SVF and L2.SVF. In Stata, the command used for this estimation is: “xtabond SVF after_pc L(1/2). SVF pct_index, lags(2) r”, where "L (1/2). SVF" indicates that two lag periods of the dependent variable SVF are added to the independent variable of the model, and the lag period of the dependent variable is an endogenous variable. Therefore, the "lags (2)" option is applied to deal with its endogenous nature, that is, the data with more than two lag periods of the dependent variable is used as the instrumental variable with one or two lag periods, and the "r" option means that the model adopts heteroscedastic robust standard error. The results of this estimation are presented in the last column of

, labeled (4-7*). Given that the dynamic panel method employs differenced equations, the need to control for individual effects is eliminated, and the weekday dummy variables become irrelevant and are thus omitted. In the (4-18*) column, β_{pc} is found to be negative and significant at the 1% level, reinforcing the finding that the issuance of perpetual bonds by listed enterprises leads to a decline in their own stock prices.

indicates an increasing positive effect of perpetual bond issuance on the operating profit margin.

5.5 Regression results of short-term impact of perpetual bond issuance on stock prices

The regression results, taking into account the strong serial correlation in stock price movements, are presented using the robust standard errors for serial correlation as proposed by Driscoll and Kraay (1998). The estimates for model **Error! Reference source not found.** are shown in the first column of

. Notably, the estimated result for β_{npc} is not significant, indicating that the issuance of perpetual bonds by subsidiaries does not significantly impact the stock prices of their listed parent companies. This finding is not surprising, as the link between parent and subsidiary enterprises may not be strong, and the public may not overly consider subsidiary actions when trading the parent company's stock.

Table 5.7 Regression results of impact on short-term stock value volatility

	(4-7) svf	(4-7_cut) svf	(4-7*) svf
After(β_{npc})	-0.048		
	(0.036)		
after_PC(β_{pc})	0.002	-0.047**	-0.182***
	(0.048)	(0.018)	(0.064)
L.SVF	-0.105***	-0.105***	-0.272***
	(0.019)	(0.019)	(0.015)
L2.SVF	-0.079**	-0.079**	-0.187***
	(0.025)	(0.025)	(0.010)
pct_index	82.778***	82.775***	91.913***
	(1.177)	(1.171)	(1.886)
i.weekday	ctrl	ctrl	——
individual effect	ctrl	ctrl	——
_cons	0.081**	0.069*	0.141***
	(0.032)	(0.034)	(0.036)
N	18692	18692	16394

Focusing on the impact of perpetual bond issuance by listed enterprises (not their subsidiaries) on their own stock prices, we modify model **Error! Reference source not found.** by removing the after variable and allowing after_PC to directly reflect this effect. The estimates for this modified model are presented in the (4-7_cut) column of

. The estimated result for β_{pc} is negative and significant at the 5% level, suggesting that the issuance of perpetual bonds by listed enterprises leads to a negative fluctuation in their own stock prices. Additionally, the stock price volatility in the preceding two periods has a negative impact on the current stock price, indicating that short-term intertemporal relationships in stock prices are dominated by corrections rather than inertia. The highly significant positive coefficient for pct_index underscores the significant influence of industry fluctuations on stock

prices, effectively fulfilling the role of a control variable.

Addressing the potential endogeneity issue arising from the inclusion of lagged dependent variables in model **Error! Reference source not found.**, we re-estimate the (4-7_cut) specification in

by the Arellano-Bond dynamic panel method, using lagged terms beyond two periods as instrumental variables for L.SVF and L2.SVF. In Stata, the command used for this estimation is: “xtabond SVF after_pc L(1/2). SVF pct_index, lags(2) r”, where "L (1/2). SVF" indicates that two lag periods of the dependent variable SVF are added to the independent variable of the model, and the lag period of the dependent variable is an endogenous variable. Therefore, the "lags (2)" option is applied to deal with its endogenous nature, that is, the data with more than two lag periods of the dependent variable is used as the instrumental variable with one or two lag periods, and the "r" option means that the model adopts heteroscedastic robust standard error. The results of this estimation are presented in the last column of

, labeled (4-7*). Given that the dynamic panel method employs differenced equations, the need to control for individual effects is eliminated, and the weekday dummy variables become irrelevant and are thus omitted. In the (4-18*) column, β_{pc} is found to be negative and significant at the 1% level, reinforcing the finding that the issuance of perpetual bonds by listed enterprises leads to a decline in their own stock prices.

5.6 Robustness tests

5.6.1 Robustness tests for impact on short-term debt pressure

In the robustness test regarding the impact on short-term debt pressure, only the estimation results from Columns 1-3 of Table 5. are subjected to robustness checks (due to the unsatisfactory estimation results of model **Error! Reference source not found.** , where the coefficient of PDT is not significant, the robustness tests for the last three columns of Table 5. are ignored). Given that a company's operating behavior and financial characteristics may exhibit continuity, which can lead to serial correlation in the error term of model **Error! Reference source not found.**). Based on this, the first robustness test in this section involves re-estimating Columns 1-3 of Table 5. using an estimation method that is robust to serial correlation. This study adopts the standard error setting proposed by Driscoll and Kraay (1998), which accounts for heteroskedasticity, serial correlation, and intra-group correlation, assuming a maximum of two-period serial correlation. The re-estimated results are presented in Columns

1-3 of Table 5.8, where it can be observed that the results are largely consistent with those of Columns 1-3 in Table 5., and the estimated results for the PD coefficient are even more significant.

Table 5.8 Robustness tests for short-term debt pressure

	(1) CR	(2) QR	(3) CashR	(4) CR	(5) QR	(6) CashR
PD	0.343***	0.106***	0.043***			
	(0.101)	(0.022)	(0.009)			
PDR				3.099***	1.098**	0.399*
				(1.155)	(0.520)	(0.227)
ROA	-0.009	-0.001	-0.000	-0.009	-0.001	-0.000
	(0.011)	(0.006)	(0.004)	(0.011)	(0.005)	(0.004)
IT	-0.000	-0.000	0.000	-0.000	-0.000	0.000
	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)
Size	-0.354***	-0.223***	-0.107***	-0.342***	-0.219***	-0.105**
	(0.055)	(0.055)	(0.034)	(0.121)	(0.072)	(0.051)
LVR	-0.022***	-0.011***	-0.006**	-0.022*	-0.011***	-0.006***
	(0.006)	(0.003)	(0.002)	(0.011)	(0.004)	(0.002)
GRMI	0.000	-0.000	-0.000	0.000	-0.000	-0.000
	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)
L.CR	0.015**			0.015***		
	(0.007)			(0.001)		
L.CR		0.020**			0.020***	
		(0.007)			(0.006)	
L.QR			0.014***			0.014***
			(0.004)			(0.004)
IFE	yes	yes	yes	yes	yes	yes
I-TFE	yes	yes	yes	yes	yes	yes
_cons	6.352***	3.207***	1.317***	6.126***	3.159***	1.334***
	(0.551)	(0.228)	(0.144)	(0.478)	(0.285)	(0.233)
R^2_a				0.151	0.178	0.178
N	34437	34437	34436	34437	34437	34436

Taking model **Error! Reference source not found.**) as an example, the command in Stata is "xtscc CR PD X L.CR i.ind_t, fe lag (2)", where "lag (2)" indicates that the error term accepts a sequence correlation with a lag of two phases.

Another robustness test involves replacing the core explanatory variable PD with the proportion of perpetual bond issuance to all debt financing of the enterprise (PDR). The estimation results are shown in columns 4-6 of Table 5.. Only in the estimation where the cash ratio is the dependent variable is the significance level relatively low (but still reaches the 10%

level). The impact of PDR on both the current ratio and the quick ratio is significant at least at the 5% level. These results indicate that the effect of perpetual bond issuance in alleviating short-term debt pressure on enterprises is robust.

5.6.2 Robustness tests of impact on long-term debt pressure

The examination of the impact of perpetual bonds on long-term debt pressure is presented in

Table 5.9 Robustness tests for long-term debt pressure

	(1) LVR	(2) LCR	(3) ICR	(4) LVR	(5) LCR	(6) ICR	(7) LVR	(8) LCR	(9) ICR	(10) LVR	(11) LCR	(12) ICR
PD	-1.143***	-0.010***	0.621	-1.693***	-0.013***	0.115						
	(0.236)	(0.003)	(0.834)	(0.216)	(0.003)	(1.048)						
PDT				1.367***	0.007*	1.248						
				(0.185)	(0.004)	(0.878)						
PDR							-28.21***	9.838	-0.271***	-40.50***	-0.328***	6.770
							(2.250)	(9.378)	(0.032)	(3.085)	(0.051)	(5.731)
PDR*PDT										30.585***	0.140	7.453
										(5.763)	(0.136)	(13.983)
ROA	-0.520***	-0.005***	1.294***	-0.520***	-0.005***	1.294***	-0.521***	1.294***	-0.005***	-0.522***	-0.005***	1.294***
	(0.012)	(0.000)	(0.086)	(0.012)	(0.000)	(0.086)	(0.025)	(0.095)	(0.000)	(0.025)	(0.000)	(0.095)
IT	-0.005	0.000	0.013	-0.005	0.000	0.013	-0.005	0.013	0.000	-0.005	0.000	0.013
	(0.005)	(0.000)	(0.010)	(0.005)	(0.000)	(0.010)	(0.004)	(0.009)	(0.000)	(0.004)	(0.000)	(0.009)
Size	3.752***	0.049***	-2.087***	3.746***	0.049***	-2.089***	3.716***	-2.059**	0.048***	3.712***	0.048***	-2.059**
	(0.606)	(0.008)	(0.399)	(0.604)	(0.008)	(0.399)	(0.227)	(0.971)	(0.004)	(0.226)	(0.004)	(0.970)
GRMI	0.007***	0.000***	-0.004*	0.007***	0.000***	-0.004*	0.007**	-0.004	0.000**	0.007**	0.000**	-0.004
	(0.001)	(0.000)	(0.002)	(0.001)	(0.000)	(0.002)	(0.003)	(0.002)	(0.000)	(0.003)	(0.000)	(0.002)
L.LVR	0.602***			0.603***			0.602***			0.602***		
	(0.043)			(0.043)			(0.020)			(0.020)		
L.LCR		0.535***			0.535***			0.083***			0.535***	
		(0.047)			(0.047)			(0.020)			(0.013)	
L.ICR			0.083***			0.083***			0.535***			0.083***
			(0.026)			(0.026)			(0.013)			(0.020)
IFE	yes	yes	yes	yes	yes	yes	yes	yes	yes	yes	yes	yes
I-TFE	yes	yes	yes	yes	yes	yes	yes	yes	yes	yes	yes	yes
_cons	7.335***	-0.075***	21.08***	7.326***	-0.073***	21.07***	7.924***	11.233**	-0.012	7.994***	-0.012	11.542**
	(0.958)	(0.019)	(1.861)	(0.960)	(0.018)	(1.861)	(2.171)	(5.442)	(0.028)	(2.167)	(0.028)	(5.530)
R^2_a							0.561	0.139	0.441	0.561	0.441	0.139
N	32074	32070	25830	32074	32070	25830	32074	25830	32070	32074	32070	25830

. The robustness tests conducted for this section are similar to those for short-term debt repayment pressure. The first six columns of

Table 5.9 Robustness tests for long-term debt pressure

	(1) LVR	(2) LCR	(3) ICR	(4) LVR	(5) LCR	(6) ICR	(7) LVR	(8) LCR	(9) ICR	(10) LVR	(11) LCR	(12) ICR
PD	-1.143***	-0.010***	0.621	-1.693***	-0.013***	0.115						
	(0.236)	(0.003)	(0.834)	(0.216)	(0.003)	(1.048)						
PDT				1.367***	0.007*	1.248						
				(0.185)	(0.004)	(0.878)						
PDR							-28.21***	9.838	-0.271***	-40.50***	-0.328***	6.770
							(2.250)	(9.378)	(0.032)	(3.085)	(0.051)	(5.731)
PDR*PDT										30.585***	0.140	7.453
										(5.763)	(0.136)	(13.983)
ROA	-0.520***	-0.005***	1.294***	-0.520***	-0.005***	1.294***	-0.521***	1.294***	-0.005***	-0.522***	-0.005***	1.294***
	(0.012)	(0.000)	(0.086)	(0.012)	(0.000)	(0.086)	(0.025)	(0.095)	(0.000)	(0.025)	(0.000)	(0.095)
IT	-0.005	0.000	0.013	-0.005	0.000	0.013	-0.005	0.013	0.000	-0.005	0.000	0.013
	(0.005)	(0.000)	(0.010)	(0.005)	(0.000)	(0.010)	(0.004)	(0.009)	(0.000)	(0.004)	(0.000)	(0.009)
Size	3.752***	0.049***	-2.087***	3.746***	0.049***	-2.089***	3.716***	-2.059**	0.048***	3.712***	0.048***	-2.059**
	(0.606)	(0.008)	(0.399)	(0.604)	(0.008)	(0.399)	(0.227)	(0.971)	(0.004)	(0.226)	(0.004)	(0.970)
GRMI	0.007***	0.000***	-0.004*	0.007***	0.000***	-0.004*	0.007**	-0.004	0.000**	0.007**	0.000**	-0.004
	(0.001)	(0.000)	(0.002)	(0.001)	(0.000)	(0.002)	(0.003)	(0.002)	(0.000)	(0.003)	(0.000)	(0.002)
L.LVR	0.602***			0.603***			0.602***			0.602***		
	(0.043)			(0.043)			(0.020)			(0.020)		
L.LCR		0.535***			0.535***			0.083***			0.535***	
		(0.047)			(0.047)			(0.020)			(0.013)	
L.ICR			0.083***			0.083***			0.535***			0.083***
			(0.026)			(0.026)			(0.013)			(0.020)
IFE	yes	yes	yes	yes	yes	yes	yes	yes	yes	yes	yes	yes
I-TFE	yes	yes	yes	yes	yes	yes	yes	yes	yes	yes	yes	yes
_cons	7.335***	-0.075***	21.08***	7.326***	-0.073***	21.07***	7.924***	11.233**	-0.012	7.994***	-0.012	11.542**
	(0.958)	(0.019)	(1.861)	(0.960)	(0.018)	(1.861)	(2.171)	(5.442)	(0.028)	(2.167)	(0.028)	(5.530)
R^2_a							0.561	0.139	0.441	0.561	0.441	0.139
N	32074	32070	25830	32074	32070	25830	32074	25830	32070	32074	32070	25830

shows the re-estimated results of Table 5. using the standard error setting proposed by Driscoll and Kraay (1998), which accounts for heteroskedasticity, serial correlation, and intra-group correlation. The last six columns of

Table 5.9 Robustness tests for long-term debt pressure

	(1) LVR	(2) LCR	(3) ICR	(4) LVR	(5) LCR	(6) ICR	(7) LVR	(8) LCR	(9) ICR	(10) LVR	(11) LCR	(12) ICR
PD	-1.143***	-0.010***	0.621	-1.693***	-0.013***	0.115						
	(0.236)	(0.003)	(0.834)	(0.216)	(0.003)	(1.048)						
PDT				1.367***	0.007*	1.248						
				(0.185)	(0.004)	(0.878)						
PDR							-28.21***	9.838	-0.271***	-40.50***	-0.328***	6.770
							(2.250)	(9.378)	(0.032)	(3.085)	(0.051)	(5.731)
PDR*PDT										30.585***	0.140	7.453
										(5.763)	(0.136)	(13.983)
ROA	-0.520***	-0.005***	1.294***	-0.520***	-0.005***	1.294***	-0.521***	1.294***	-0.005***	-0.522***	-0.005***	1.294***
	(0.012)	(0.000)	(0.086)	(0.012)	(0.000)	(0.086)	(0.025)	(0.095)	(0.000)	(0.025)	(0.000)	(0.095)
IT	-0.005	0.000	0.013	-0.005	0.000	0.013	-0.005	0.013	0.000	-0.005	0.000	0.013
	(0.005)	(0.000)	(0.010)	(0.005)	(0.000)	(0.010)	(0.004)	(0.009)	(0.000)	(0.004)	(0.000)	(0.009)
Size	3.752***	0.049***	-2.087***	3.746***	0.049***	-2.089***	3.716***	-2.059**	0.048***	3.712***	0.048***	-2.059**
	(0.606)	(0.008)	(0.399)	(0.604)	(0.008)	(0.399)	(0.227)	(0.971)	(0.004)	(0.226)	(0.004)	(0.970)
GRMI	0.007***	0.000***	-0.004*	0.007***	0.000***	-0.004*	0.007**	-0.004	0.000**	0.007**	0.000**	-0.004
	(0.001)	(0.000)	(0.002)	(0.001)	(0.000)	(0.002)	(0.003)	(0.002)	(0.000)	(0.003)	(0.000)	(0.002)
L.LVR	0.602***			0.603***			0.602***			0.602***		
	(0.043)			(0.043)			(0.020)			(0.020)		
L.LCR		0.535***			0.535***			0.083***			0.535***	
		(0.047)			(0.047)			(0.020)			(0.013)	
L.ICR			0.083***			0.083***			0.535***			0.083***
			(0.026)			(0.026)			(0.013)			(0.020)
IFE	yes	yes	yes	yes	yes	yes	yes	yes	yes	yes	yes	yes
I-TFE	yes	yes	yes	yes	yes	yes	yes	yes	yes	yes	yes	yes
_cons	7.335***	-0.075***	21.08***	7.326***	-0.073***	21.07***	7.924***	11.233**	-0.012	7.994***	-0.012	11.542**
	(0.958)	(0.019)	(1.861)	(0.960)	(0.018)	(1.861)	(2.171)	(5.442)	(0.028)	(2.167)	(0.028)	(5.530)
R^2_a							0.561	0.139	0.441	0.561	0.441	0.139
N	32074	32070	25830	32074	32070	25830	32074	25830	32070	32074	32070	25830

displays the estimation results after replacing the core explanatory variable PD in Table 5. with PDR. Additionally, in Columns 4-6 of Table 5., PDT is replaced with the interaction term PDR_PDT_{it} between PDR and PDT. It can be observed that both methods effectively replicate the results from Table 5., where the coefficient of PD is negatively significant in regressions with LVR and LCR as dependent variables, and the coefficient of PDT is positively significant in regressions with LVR as the dependent variable.

Table 5.9 Robustness tests for long-term debt pressure

	(1) LVR	(2) LCR	(3) ICR	(4) LVR	(5) LCR	(6) ICR	(7) LVR	(8) LCR	(9) ICR	(10) LVR	(11) LCR	(12) ICR
PD	-1.143***	-0.010***	0.621	-1.693***	-0.013***	0.115						
	(0.236)	(0.003)	(0.834)	(0.216)	(0.003)	(1.048)						
PDT				1.367***	0.007*	1.248						
				(0.185)	(0.004)	(0.878)						
PDR							-28.21***	9.838	-0.271***	-40.50***	-0.328***	6.770
							(2.250)	(9.378)	(0.032)	(3.085)	(0.051)	(5.731)
PDR*PDT										30.585***	0.140	7.453
										(5.763)	(0.136)	(13.983)
ROA	-0.520***	-0.005***	1.294***	-0.520***	-0.005***	1.294***	-0.521***	1.294***	-0.005***	-0.522***	-0.005***	1.294***
	(0.012)	(0.000)	(0.086)	(0.012)	(0.000)	(0.086)	(0.025)	(0.095)	(0.000)	(0.025)	(0.000)	(0.095)
IT	-0.005	0.000	0.013	-0.005	0.000	0.013	-0.005	0.013	0.000	-0.005	0.000	0.013
	(0.005)	(0.000)	(0.010)	(0.005)	(0.000)	(0.010)	(0.004)	(0.009)	(0.000)	(0.004)	(0.000)	(0.009)
Size	3.752***	0.049***	-2.087***	3.746***	0.049***	-2.089***	3.716***	-2.059**	0.048***	3.712***	0.048***	-2.059**
	(0.606)	(0.008)	(0.399)	(0.604)	(0.008)	(0.399)	(0.227)	(0.971)	(0.004)	(0.226)	(0.004)	(0.970)
GRMI	0.007***	0.000***	-0.004*	0.007***	0.000***	-0.004*	0.007**	-0.004	0.000**	0.007**	0.000**	-0.004
	(0.001)	(0.000)	(0.002)	(0.001)	(0.000)	(0.002)	(0.003)	(0.002)	(0.000)	(0.003)	(0.000)	(0.002)
L.LVR	0.602***			0.603***			0.602***			0.602***		
	(0.043)			(0.043)			(0.020)			(0.020)		
L.LCR		0.535***			0.535***			0.083***			0.535***	
		(0.047)			(0.047)			(0.020)			(0.013)	
L.ICR			0.083***			0.083***			0.535***			0.083***
			(0.026)			(0.026)			(0.013)			(0.020)
IFE	yes	yes	yes	yes	yes	yes	yes	yes	yes	yes	yes	yes
I-TFE	yes	yes	yes	yes	yes	yes	yes	yes	yes	yes	yes	yes
_cons	7.335***	-0.075***	21.08***	7.326***	-0.073***	21.07***	7.924***	11.233**	-0.012	7.994***	-0.012	11.542**
	(0.958)	(0.019)	(1.861)	(0.960)	(0.018)	(1.861)	(2.171)	(5.442)	(0.028)	(2.167)	(0.028)	(5.530)
R^2_a							0.561	0.139	0.441	0.561	0.441	0.139
N	32074	32070	25830	32074	32070	25830	32074	25830	32070	32074	32070	25830

5.6.3 Robustness tests for impact on profitability

Given that only the impact on operating net profit is significant in the basic regression analysis of perpetual bonds' influence on corporate profitability, we only test the robustness of this particular impact on the operating net profit margin. Columns 1 and 2 of Table 5. show the estimation results of models **Error! Reference source not found.** and **Error! Reference source not found.** using the standard error setting proposed by Driscoll and Kraay (1998). Columns 3 and 4 of Table 5. present the estimation results after replacing the core explanatory variable with the proportion of perpetual bond financing (PDR). The results indicate that in the estimation of model **Error! Reference source not found.**, the replaced variable PDR in column 3 is significant, whereas PD in column 1, which considers serial correlation, is not significant. For the estimation of model **Error! Reference source not found.**, the results show that PDT remains significant after considering serial correlation (column 2), but the interaction term PDR_PDT after replacing variables is no longer significant (column 4). These findings suggest that both the impacts of perpetual bonds on operating profit and the trend of this impact are not robust.

Table 5.10 Robustness tests for profitability

	(1) ROR	(2) ROR	(3) ROR	(4) ROR
PD/PDR	4.145	1.762	40.919**	27.854
	(2.662)	(2.479)	(18.089)	(29.020)
PDT/PDR_PDT		5.892**		32.312
		(2.611)		(61.742)
Size	4.292***	4.282***	4.449**	4.450**
	(0.738)	(0.741)	(1.788)	(1.788)
LVR	-0.717***	-0.716***	-0.716***	-0.716***
	(0.043)	(0.042)	(0.061)	(0.061)
IT	-0.020	-0.020	-0.020	-0.020
	(0.032)	(0.032)	(0.038)	(0.038)
GRMI	-0.019*	-0.019*	-0.019	-0.019
	(0.010)	(0.010)	(0.036)	(0.036)
L.ROR	0.102**	0.102**	0.102***	0.102***
	(0.038)	(0.038)	(0.026)	(0.026)
IFE	yes	yes	yes	yes
I-TFE	yes	yes	yes	yes
cons	45.562***	45.459***	42.952***	43.662***
	(4.169)	(4.199)	(7.650)	(7.635)
R^2_a			0.162	0.163
N	30343	30343	30343	30343

5.7 Result of mechanism analysis

5.7.1 Results of deleveraging mechanism

The first two columns of Table 5. present the estimation results for model **Error! Reference source not found.**, while Columns 3 and 4 show the estimates for model **Error! Reference source not found.**. Columns 1 and 3 use ordinary clustering standard errors, while columns 2 and 4 utilize standard errors that account for serial correlation by the method of Driscoll and Kraay (1998). The results indicate that after controlling for other variables, the issuance of perpetual bonds leads to a decline in the growth rates of both total assets and total liabilities. However, crucially, the decline is much more pronounced on the liability side compared to the asset side. The coefficient estimates suggest that the liability side declines at twice the rate of the asset side, and this decline is also more significant in the liability equation, reaching a 1% significance level.

Table 5.11 Regression on changes in total assets and liabilities

	(1) Size-GR	(2) Size-GR	(3) Debt-GR	(4) Debt-GR
PD	-1.459**	-1.459*	-2.969*	-2.969***
	(0.692)	(0.681)	(1.567)	(0.876)
L.Size-GR	-0.031***	-0.031		
	(0.008)	(0.029)		
L.Debt-GR			-10.033***	-10.033***
			(2.501)	(2.962)
Size	12.363***	12.363**	20.102***	20.102***
	(1.987)	(4.311)	(2.453)	(5.655)
Debt	-0.928	-0.928	0.577**	0.577***
	(1.089)	(1.604)	(0.232)	(0.164)
ROA	1.071***	1.071***	0.034	0.034
	(0.141)	(0.098)	(0.024)	(0.026)
IT	0.036*	0.036**	0.093***	0.093***
	(0.019)	(0.015)	(0.016)	(0.012)
GRMI	0.071***	0.071***	-0.026***	-0.026
	(0.010)	(0.008)	(0.009)	(0.028)
IFE	yes	yes	yes	yes
I-TFE	yes	yes	yes	yes
_cons	-0.523***	-0.508***	-0.293***	-0.303***
	(0.091)	(0.158)	(0.096)	(0.093)
R^2_a	0.135		0.102	
N	26594	26594	26600	26600

The regression results of **Error! Reference source not found.** are presented in Table 5.. The dependent variables in Columns 1 and 3 are the size of debt disguised as equity (DDE), while the dependent variables in Columns 2 and 4 are the Leverage Manipulation Ratio (LVM). Additionally, in Columns 3 and 4, the core explanatory variable is replaced with PDR. The

results in Columns 1 and 3 indicate that perpetual bond issuance increases the scale of DDE in SOEs, leading to the enhanced manipulation of book leverage ratios as shown in Columns 2 and 4. Notably, the estimated coefficient of PDR in Column 4 approaches 0.85, suggesting that a 1% increase in perpetual bond financing as a proportion of total financing leads to an actual leverage ratio that is 0.85 percentage points higher than book leverage ratio. This implies that a significant portion of perpetual bond financing is used for leverage manipulation. Therefore, it can be concluded that the use of perpetual bonds indeed provides enterprises with room for leverage manipulation, allowing them to slow down the growth of debt compared to assets through hidden debts, thereby improving their book leverage ratios.

Table 5.12 Mechanism of leverage manipulation

	(1) DDE	(2) LVM	(3) DDE	(4) LVM
PD	47.481***	0.128***		
	(10.151)	(0.038)		
PDR			361.990*	0.849**
			(195.550)	(0.416)
Size	35.924***	-0.120***	38.196***	-0.112***
	(8.863)	(0.043)	(9.206)	(0.042)
OCF	-2.981	0.001	-2.951	0.001
	(2.352)	(0.006)	(2.366)	(0.007)
ROA	0.470	0.009***	0.468	0.009***
	(0.525)	(0.003)	(0.527)	(0.003)
LVR	0.008	0.006***	0.012	0.006***
	(0.076)	(0.002)	(0.075)	(0.002)
POID	144.497	-0.078	147.925*	-0.077
	(89.243)	(0.196)	(88.884)	(0.204)
SS	36.812	-0.074	38.966	-0.066
	(53.708)	(0.147)	(54.339)	(0.150)
IFE	yes	yes	yes	yes
I-TFE	yes	yes	yes	yes
_cons	-234.005***	-0.119	-248.970***	-0.137
	(64.654)	(0.224)	(66.449)	(0.223)
N	15610	9091	15610	9091

5.7.2 Decomposition of the impact on profitability

Firstly, we show the results of DuPont analysis. The regression results are presented in Table 5.. First, Columns 2 and 3 represent the second-level decomposition (ROE = ROA×EM). Column 2's results, as mentioned, have already been obtained in

5.5 Regression results of short-term impact of perpetual bond issuance on stock prices

The regression results, taking into account the strong serial correlation in stock price movements, are presented using the robust standard errors for serial correlation as proposed by Driscoll and Kraay (1998). The estimates for model **Error! Reference source not found.** are

shown in the first column of

. Notably, the estimated result for β_{npc} is not significant, indicating that the issuance of perpetual bonds by subsidiaries does not significantly impact the stock prices of their listed parent companies. This finding is not surprising, as the link between parent and subsidiary enterprises may not be strong, and the public may not overly consider subsidiary actions when trading the parent company's stock.

Table 5.7 Regression results of impact on short-term stock value volatility

	(4-7) svf	(4-7_cut) svf	(4-7*) svf
After(β_{npc})	-0.048		
	(0.036)		
after_PC(β_{pc})	0.002	-0.047**	-0.182***
	(0.048)	(0.018)	(0.064)
L.SVF	-0.105***	-0.105***	-0.272***
	(0.019)	(0.019)	(0.015)
L2.SVF	-0.079**	-0.079**	-0.187***
	(0.025)	(0.025)	(0.010)
pct_index	82.778***	82.775***	91.913***
	(1.177)	(1.171)	(1.886)
i.weekday	ctrl	ctrl	——
individual effect	ctrl	ctrl	——
_cons	0.081**	0.069*	0.141***
	(0.032)	(0.034)	(0.036)
N	18692	18692	16394

Focusing on the impact of perpetual bond issuance by listed enterprises (not their subsidiaries) on their own stock prices, we modify model **Error! Reference source not found.** by removing the after variable and allowing after_PC to directly reflect this effect. The estimates for this modified model are presented in the (4-7_cut) column of

. The estimated result for β_{pc} is negative and significant at the 5% level, suggesting that the issuance of perpetual bonds by listed enterprises leads to a negative fluctuation in their own stock prices. Additionally, the stock price volatility in the preceding two periods has a negative impact on the current stock price, indicating that short-term intertemporal relationships in stock prices are dominated by corrections rather than inertia. The highly significant positive coefficient for pct_index underscores the significant influence of industry fluctuations on stock prices, effectively fulfilling the role of a control variable.

Addressing the potential endogeneity issue arising from the inclusion of lagged dependent variables in model **Error! Reference source not found.**, we re-estimate the (4-7_cut) specification in

by the Arellano-Bond dynamic panel method, using lagged terms beyond two periods as instrumental variables for L.SVF and L2.SVF. In Stata, the command used for this estimation

is: “xtabond SVF after_pc L(1/2). SVF pct_index, lags(2) r”, where "L (1/2). SVF" indicates that two lag periods of the dependent variable SVF are added to the independent variable of the model, and the lag period of the dependent variable is an endogenous variable. Therefore, the "lags (2)" option is applied to deal with its endogenous nature, that is, the data with more than two lag periods of the dependent variable is used as the instrumental variable with one or two lag periods, and the "r" option means that the model adopts heteroscedastic robust standard error. The results of this estimation are presented in the last column of

, labeled (4-7*). Given that the dynamic panel method employs differenced equations, the need to control for individual effects is eliminated, and the weekday dummy variables become irrelevant and are thus omitted. In the (4-18*) column, β_{pc} is found to be negative and significant at the 1% level, reinforcing the finding that the issuance of perpetual bonds by listed enterprises leads to a decline in their own stock prices.

, indicating that perpetual bond issuance does not enhance Return on Assets (ROA). Column 3 shows that perpetual bond issuance significantly reduces the Equity Multiplier (EM), meaning the proportion of total capital financed by equity decreases, which aligns with the finding in Table 5. that perpetual bond issuance lowers the asset-liability ratio. Based on the previous section's analysis of the "deleveraging" mechanism, this is because perpetual bonds are recorded as equity items, thus reducing the ratio of assets to equity. Combing Columns 3, 4, and 5, we can derive the results of the third-level decomposition (ROE = ROR×TAT×EM), corresponding to the estimates of Equations **Error! Reference source not found.**, **Error! Reference source not found.** and **Error! Reference source not found.**. Among these three regression results, perpetual bonds have significant impacts on both Operating Profit Ratio (ROR) and Equity Multiplier (EM), but the effects are opposite in direction. The influence of perpetual bonds on Total Asset Turnover (TAT) is insignificant (see Column 5). Given the significant missing data in TAT samples, an alternative variable related to turnover—Inventory Turnover—was used, but the result remained insignificant (see Column 6).

Table 5.1 Results of DuPont analysis

	(1) ROE	(2) ROA	(3) EM	(4) ROR	(5) TAT	(6) IT
PD	-0.186	-0.022	-0.231**	4.145**	-0.004	-0.205
	(0.194)	(0.059)	(0.091)	(2.006)	(0.007)	(0.239)
LVR	-0.077***	-0.034***		-0.717***	0.000	-0.020**
	(0.028)	(0.008)		(0.061)	(0.000)	(0.008)
IT	0.018***	0.006**	-0.002	-0.020		
	(0.006)	(0.002)	(0.003)	(0.038)		
ROR			-0.001*		0.000	-0.000
			(0.001)		(0.000)	(0.001)

Size	0.211	-0.297***	0.425**	4.292**	0.003	-0.447
	(0.283)	(0.106)	(0.189)	(1.781)	(0.009)	(0.282)
GRMI	0.017***	0.009***	0.001	-0.019	0.000*	0.012**
	(0.006)	(0.003)	(0.001)	(0.036)	(0.000)	(0.005)
L.ROR	0.308***					
	(0.025)					
L.ROA		0.380***				
		(0.014)				
L.EM			-0.050			
			(0.041)			
L.ROR				0.102***		
				(0.026)		
L.TAT					0.538***	
					(0.058)	
L.IT						0.572***
						(0.035)
IFE	yes	yes	yes	yes	yes	yes
I-TFE	yes	yes	yes	yes	yes	yes
_cons	5.479**	4.587***	0.797	43.719***	0.132***	5.753***
	(2.659)	(0.889)	(0.927)	(7.789)	(0.034)	(1.434)
R^2 _a	0.213	0.314	0.107	0.063	0.377	0.404
N	31897	32049	31706	30343	17064	31117

These results explain why, as seen in

5.5 Regression results of short-term impact of perpetual bond issuance on stock prices

The regression results, taking into account the strong serial correlation in stock price movements, are presented using the robust standard errors for serial correlation as proposed by Driscoll and Kraay (1998). The estimates for model **Error! Reference source not found.** are shown in the first column of

. Notably, the estimated result for β_{npc} is not significant, indicating that the issuance of perpetual bonds by subsidiaries does not significantly impact the stock prices of their listed parent companies. This finding is not surprising, as the link between parent and subsidiary enterprises may not be strong, and the public may not overly consider subsidiary actions when trading the parent company's stock.

Table 5.7 Regression results of impact on short-term stock value volatility

	(4-7) svf	(4-7_cut) svf	(4-7*) svf
After(β_{npc})	-0.048		
	(0.036)		
after_PC(β_{pc})	0.002	-0.047**	-0.182***
	(0.048)	(0.018)	(0.064)
L.SVF	-0.105***	-0.105***	-0.272***
	(0.019)	(0.019)	(0.015)
L2.SVF	-0.079**	-0.079**	-0.187***
	(0.025)	(0.025)	(0.010)
pct_index	82.778***	82.775***	91.913***
	(1.177)	(1.171)	(1.886)
i.weekday	ctrl	ctrl	——

individual effect	ctrl	ctrl	——
_cons	0.081**	0.069*	0.141***
	(0.032)	(0.034)	(0.036)
N	18692	18692	16394

Focusing on the impact of perpetual bond issuance by listed enterprises (not their subsidiaries) on their own stock prices, we modify model **Error! Reference source not found.** by removing the after variable and allowing after_PC to directly reflect this effect. The estimates for this modified model are presented in the (4-7_cut) column of

. The estimated result for β_{pc} is negative and significant at the 5% level, suggesting that the issuance of perpetual bonds by listed enterprises leads to a negative fluctuation in their own stock prices. Additionally, the stock price volatility in the preceding two periods has a negative impact on the current stock price, indicating that short-term intertemporal relationships in stock prices are dominated by corrections rather than inertia. The highly significant positive coefficient for pct_index underscores the significant influence of industry fluctuations on stock prices, effectively fulfilling the role of a control variable.

Addressing the potential endogeneity issue arising from the inclusion of lagged dependent variables in model **Error! Reference source not found.**, we re-estimate the (4-7_cut) specification in

by the Arellano-Bond dynamic panel method, using lagged terms beyond two periods as instrumental variables for L.SVF and L2.SVF. In Stata, the command used for this estimation is: “xtabond SVF after_pc L(1/2). SVF pct_index, lags(2) r”, where "L (1/2). SVF" indicates that two lag periods of the dependent variable SVF are added to the independent variable of the model, and the lag period of the dependent variable is an endogenous variable. Therefore, the "lags (2)" option is applied to deal with its endogenous nature, that is, the data with more than two lag periods of the dependent variable is used as the instrumental variable with one or two lag periods, and the "r" option means that the model adopts heteroscedastic robust standard error. The results of this estimation are presented in the last column of

, labeled (4-7*). Given that the dynamic panel method employs differenced equations, the need to control for individual effects is eliminated, and the weekday dummy variables become irrelevant and are thus omitted. In the (4-18*) column, β_{pc} is found to be negative and significant at the 1% level, reinforcing the finding that the issuance of perpetual bonds by listed enterprises leads to a decline in their own stock prices.

, perpetual bond issuance increases the Operating Profit Ratio (ROR) but does not significantly impact ROA and ROE. Although perpetual bond issuance enhances the income statement performance, it also introduces unfavorable changes in the capital structure that

counteract the positive changes in the income statement by hindering the improvement of asset profitability.

In Chapter 4, we mention the shortcomings of DuPont analysis, for which we decompose the profit composition based on the income statement. The estimation results are presented in Table 5., with the first four columns showing the results for models **Error! Reference source not found.**, **Error! Reference source not found.**, **Error! Reference source not found.** and **Error! Reference source not found.** respectively. The column labeled "ALL" includes all interaction terms in a single equation for estimation. Except for total asset turnover (TAT), which is not significant, the estimates of β_3 are all in line with expectations—faster growth rates of main revenue, higher main business profit margins, and more interest expenses can all contribute to higher ROA. The estimates of the interaction term β_2 indicate the presence of mechanisms related to the expansion of main business scale and main business profit margins. In other words, the positive impact of perpetual bonds on ROA operates through both faster expansion and higher profit margins of the main business. These results suggest that the role of perpetual bonds is related to their intended use. Issuing perpetual bonds can serve two purposes: to enhance financial performance by lowering book leverage and to expand operating funds, smoothen the capital chain, and facilitate business expansion. The former role primarily involves debt structure adjustment and may not have a significant relationship with actual production and operation levels. In contrast, the latter role has a more expansionary and growth-oriented positive impact, thereby increasing net profit and asset return rates.

Table 5.2 Analysis results based on income statement decomposition

	(1) ROA	(2) ROA	(3) ROA	(4) ROA	(all) ROA
PD*GRMI	0.005**				0.004**
	(0.002)				(0.002)
PD*MPM		0.018***			0.018***
		(0.005)			(0.005)
PD*TAT			0.115		0.127
			(0.218)		(0.216)
PD*Intrst				-0.040	-0.025
				(0.077)	(0.078)
PD	-0.232	-0.261	-0.190	-0.081	-0.321
	(0.191)	(0.184)	(0.209)	(0.182)	(0.228)
GRMI	0.000*	0.000*	0.000*	0.000*	0.000*
	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)
MPM	0.001**	0.001*	0.001**	0.001**	0.001*
	(0.001)	(0.000)	(0.001)	(0.001)	(0.000)
TAT	-0.215	-0.213	-0.220	-0.217	-0.214
	(0.204)	(0.204)	(0.205)	(0.204)	(0.206)
Intrst	0.222**	0.223**	0.223**	0.226**	0.223**
	(0.094)	(0.094)	(0.094)	(0.097)	(0.096)

Size	0.163	0.160	0.166	0.166	0.157
	(0.576)	(0.576)	(0.576)	(0.575)	(0.575)
LVR	-0.130***	-0.130***	-0.130***	-0.130***	-0.130***
	(0.035)	(0.035)	(0.035)	(0.035)	(0.035)
L.ROA	-0.032	-0.032	-0.032	-0.032	-0.032
	(0.091)	(0.091)	(0.091)	(0.091)	(0.091)
IFE	yes	yes	yes	yes	yes
I-TFE	yes	yes	yes	yes	yes
_cons	10.343***	10.261***	10.718***	10.371***	10.742***
	(3.483)	(3.394)	(3.372)	(3.360)	(3.369)
R^2_a	0.108	0.109	0.108	0.108	0.109
N	16469	16469	16469	16469	16469

5.8 Chapter summary

Based on these empirical results, the hypothesis proposed in the previous chapter can be validated.

Firstly, the results partially validate Hypothesis 1: SOEs with high leverage ratios are more likely to issue perpetual bonds. That is reasonable for issuers with high leverage ratios have a strong need to "deleverage" and resort to unconventional financial instruments due to necessity, which empirically confirms the viewpoint of a group of literature, who believe that perpetual bond financing has a strong motivation to reduce leverage and modify financial statements (C. Chen & Zhu, 2024; Jin, 2014; Sunderland & Berry, 2016; D. Wang, 2021). However, unlike the literature that suggests perpetual bonds are used to reduce short-term debt pressure and expand operating funds in the face of financing constraints (Leibowitz et al., 2013; H. G. Ma, 2016; J. C. Sun, 2019), no evidence was found to suggest that perpetual bond issuance is driven by enterprises with strong financial health, robust operations, or aggressive expansion plans. Rather, some evidence points to firms with relatively weaker financial positions issuing perpetual bonds. The reason for this discrepancy lies in the unique policy background of China's SOEs perpetual bond financing. From the perspective of Chapter 3 on the background of China's perpetual bond issuance, the innovation of debt instruments is nurtured in the context of the "deleveraging" policy environment of SOEs. Relieving long-term debt pressure and reducing leverage ratio are the application scenarios of SOE perpetual bond financing, rather than serving short-term liquidity needs.

Secondly, consistent with the existing literature, the results basically confirm Hypotheses 2&3. Regarding the impact on corporate debt pressure, perpetual bond issuance can alleviate short-term debt repayment pressure (Leibowitz et al., 2013; H. G. Ma, 2016; J. C. Sun, 2019) and significantly contribute to deleveraging in the long run (C. Chen & Zhu, 2024; Jin, 2014;

Sunderland & Berry, 2016; D. Wang, 2021). However, it does not alleviate the pressure of paying long-term debt interest. The mechanism analysis reveals that the deleveraging effect is achieved by classifying perpetual bonds as equity items, a form of "debt disguised as equity" to manipulate leverage ratios, rather than through improved operations leading to a reduction in actual leverage.

Thirdly, evidences supporting Hypothesis 4 are modest, for the impact of issuance on profitability depends on the caliber of the indicators and has heterogeneity. The analysis of profitability indicates that perpetual bond issuance does not enhance shareholders' return on equity (ROE). Although the net operating profit margin improves, the inclusion of perpetual bonds as equity items increases the base for calculating ROE on a share basis, and the rise in the equity multiplier offsets the positive impact of the improved net operating profit margin. Further, as some literature points out, the analysis of net profit suggests that perpetual bonds' positive effect on profitability is driven by faster expansion and higher profit margins of the main business (Shangguan et al., 2015). This implies that utilizing perpetual bond financing for expanding operating funds, smoothing the capital chain, and facilitating business expansion, rather than solely for financial engineering, can have a more expansionary and growth-oriented impact, ultimately increasing net profit and asset return rates. Meanwhile, the view in some literature that perpetual bonds can provide a "tax shield" to increase net profit (Petras, 2022; H. Y. Shan, 2019; Zong et al., 2017) has not been validated, as in accounting standards, if perpetual bond interest payments are recorded as dividends rather than interest, they cannot be offset against income tax.

Contrary to the predictions of Myers and Majluf's (1984) Pecking Order Theory, the issuance of perpetual bonds by non-financial SOEs in China leads to a decline in the company's stock price. Therefore, this study argues that the Hypothesis 5b should be accepted, which is that the issuance of perpetual bonds driven by the "deleveraging" objective signals the company's poor financial condition—indicating that the company has difficulties in reducing its actual leverage ratio through conventional means and can only resort to debt conversion or concealing debt to reduce its book leverage ratio, thereby affecting its stock price. In particular, many issuing enterprises have incurred losses (S. L. Ren, 2019). If the public had previously anticipated the company's poor financial condition, the issuance of perpetual bonds undoubtedly reinforces this belief.

This suggests that it is crucial to identify which types of enterprises are issuing perpetual bonds. The different motivations for issuance not only relate to the objectives and effects of perpetual bond issuance but also reveal the characteristics of the enterprises, thereby

influencing market expectations of corporate value. However, it is noteworthy that the objectives of perpetual bond issuance may vary significantly among different enterprises. While many enterprises use perpetual bond financing as a means of "deleveraging," as revealed in Table 5. of the previous chapter's mechanism analysis, some enterprises still enhance the positive effect of perpetual bonds on ROA through higher main business profit rates and business expansion speeds. Accordingly, if the enterprises issuing perpetual bonds are more in a period of rapid growth and expansion, the issuance of perpetual bonds can be interpreted as a positive demand for capital expansion, and the mechanism that positively affects stock prices may hold.

Furthermore, due to the relatively short history of perpetual bonds in China - just a decade – they are often viewed as unconventional financing instruments, leading the public to associate them with financial difficulties faced by enterprises. In reality, perpetual bonds are widely used in developed markets and are considered a common choice among various debt instruments, occupying a relatively ordinary position in the debt tool landscape. Meanwhile, according to the results presented in

5.5 Regression results of short-term impact of perpetual bond issuance on stock prices

The regression results, taking into account the strong serial correlation in stock price movements, are presented using the robust standard errors for serial correlation as proposed by Driscoll and Kraay (1998). The estimates for model **Error! Reference source not found.** are shown in the first column of

. Notably, the estimated result for β_{npc} is not significant, indicating that the issuance of perpetual bonds by subsidiaries does not significantly impact the stock prices of their listed parent companies. This finding is not surprising, as the link between parent and subsidiary enterprises may not be strong, and the public may not overly consider subsidiary actions when trading the parent company's stock.

Table 5.7 Regression results of impact on short-term stock value volatility

	(4-7) svf	(4-7_cut) svf	(4-7*) svf
After(β_{npc})	-0.048		
	(0.036)		
after_PC(β_{pc})	0.002	-0.047**	-0.182***
	(0.048)	(0.018)	(0.064)
L.SVF	-0.105***	-0.105***	-0.272***
	(0.019)	(0.019)	(0.015)
L2.SVF	-0.079**	-0.079**	-0.187***
	(0.025)	(0.025)	(0.010)
pct_index	82.778***	82.775***	91.913***
	(1.177)	(1.171)	(1.886)

i.weekday	ctrl	ctrl	——
individual effect	ctrl	ctrl	——
_cons	0.081**	0.069*	0.141***
	(0.032)	(0.034)	(0.036)
N	18692	18692	16394

Focusing on the impact of perpetual bond issuance by listed enterprises (not their subsidiaries) on their own stock prices, we modify model **Error! Reference source not found.** by removing the after variable and allowing after_PC to directly reflect this effect. The estimates for this modified model are presented in the (4-7_cut) column of

. The estimated result for β_{pc} is negative and significant at the 5% level, suggesting that the issuance of perpetual bonds by listed enterprises leads to a negative fluctuation in their own stock prices. Additionally, the stock price volatility in the preceding two periods has a negative impact on the current stock price, indicating that short-term intertemporal relationships in stock prices are dominated by corrections rather than inertia. The highly significant positive coefficient for pct_index underscores the significant influence of industry fluctuations on stock prices, effectively fulfilling the role of a control variable.

Addressing the potential endogeneity issue arising from the inclusion of lagged dependent variables in model **Error! Reference source not found.**, we re-estimate the (4-7_cut) specification in

by the Arellano-Bond dynamic panel method, using lagged terms beyond two periods as instrumental variables for L.SVF and L2.SVF. In Stata, the command used for this estimation is: “xtabond SVF after_pc L(1/2). SVF pct_index, lags(2) r”, where "L (1/2). SVF" indicates that two lag periods of the dependent variable SVF are added to the independent variable of the model, and the lag period of the dependent variable is an endogenous variable. Therefore, the "lags (2)" option is applied to deal with its endogenous nature, that is, the data with more than two lag periods of the dependent variable is used as the instrumental variable with one or two lag periods, and the "r" option means that the model adopts heteroscedastic robust standard error. The results of this estimation are presented in the last column of

, labeled (4-7*). Given that the dynamic panel method employs differenced equations, the need to control for individual effects is eliminated, and the weekday dummy variables become irrelevant and are thus omitted. In the (4-18*) column, β_{pc} is found to be negative and significant at the 1% level, reinforcing the finding that the issuance of perpetual bonds by listed enterprises leads to a decline in their own stock prices.

and Table 5., the return on equity (ROE) of Chinese non-financial SOEs has not significantly declined after issuing perpetual bonds, indicating that there is no evidence of harm

to shareholders' interests. Therefore, from this perspective, it is not necessary to hold an overly negative view of perpetual bond issuance. It is implied that it will take time for perpetual bonds to become more commonplace in China's corporate debt instrument system and for public perceptions to evolve accordingly.

Overall, perpetual bond financing by non-financial SOEs in China is primarily driven by the policy goal of "deleveraging." Enterprises issuing perpetual bonds have a strong motivation to reduce leverage, and the issuance indeed leads to an immediate decline in book leverage ratios. The mutual reinforcement between this motivation and the actual effect has strengthened the frequency of perpetual bond issuance with the goal of deleveraging.

Chapter 6: Conclusions, Recommendations, Research Limitation and Future Research Direction

6.1 Conclusions

In 2013, the perpetual bond, a hybrid debt instrument, was introduced to mainland China. Due to its ability to effectively adjust the ratio of debt to equity to alleviate the financial and operational difficulties faced by enterprises, it quickly adapted to the needs of the "deleveraging" policy of Chinese SOEs (SOEs) at the time and was rapidly promoted. However, the rapid growth in the issuance of perpetual bonds has also raised concerns about potential hidden financial risks and doubts about whether perpetual bonds can have a positive impact on corporate performance. Based on this, this study empirically examines the impact of perpetual bond financing on the financial and operational performance of non-financial SOEs in China through quantitative research.

Specifically, this study uses public data from the Wind Financial Database to collect and organize information on 4,946 perpetual bonds issued by 953 enterprises in China from 2013 to the end of 2023, along with relevant variables reflecting these enterprises' financial characteristics and operating performance. It primarily employs a fixed panel model with dual controls for individual fixed effects and interaction term between industry fixed effects and time fixed effects to analyze the impact of perpetual bond issuance on financial pressure, profitability, and stock price volatility. Additionally, mechanism analysis and robustness tests are conducted. Regarding the three research questions raised at the beginning of this research, the following conclusions were drawn:

6.1.1 Characteristics of issuing enterprises

Firstly, this study answers research question one: what are the characteristics of SOEs that issue perpetual bonds, and what are the motivations for these enterprises to issue perpetual bonds for financing? At the outset, the thesis discusses which types of non-financial SOEs in China are more inclined to use perpetual bonds for financing, finding that a high leverage ratio is the most prominent characteristic of enterprises that use perpetual bonds for financing, suggesting that these bond-issuing enterprises have a strong need to "deleverage" and are forced to use some

unconventional financial instruments. Meanwhile, there is no evidence to suggest that perpetual bond issuance is associated with financially healthy enterprises with good operations and strong expansion needs. On the contrary, there is some evidence that perpetual bond issuance is more common among enterprises with relatively poor financial conditions. Subsequently, the study discusses the actual impacts of perpetual bond issuance by non-financial SOEs in China from different dimensions.

6.1.2 Impact of perpetual bond on debt pressure

Next, this study answer research question 2: in the context of China's financial deleveraging, can perpetual bonds play a role in reducing the leverage ratio of SOEs? Has it truly alleviated the debt pressure of enterprises, and what is the mechanism behind it? From the perspective of its impact on corporate debt pressure, the issuance of perpetual bonds can alleviate short-term debt repayment pressures and temporarily improve the tight cash flow conditions of enterprises. In the long term, it can significantly serve the purpose of "deleveraging," but it does not alleviate the pressure of long-term debt interest payments. Looking at the trend of its impact, during the issuance period, the "deleveraging" effect brought by perpetual bonds exhibits a diminishing characteristic. That is, the initial issuance had an immediate "deleveraging" effect, which implies that as the book leverage decreases, enterprises may have more room to expand debt financing, potentially increasing actual leverage and thus causing the "deleveraging" policy to backfire. Mechanism analysis indicates that the deleverage effect is achieved by recording perpetual bonds as equity items, that is, through the leverage manipulation of "equity in name only," rather than by improving operations to reduce the actual leverage ratio.

6.1.3 Impact of perpetual bonds on profitability and short-term stock price

Finally, the study conclusion can answer the third research question: what impact does the issuance of perpetual bonds by SOEs have on their operational performance (especially profitability), and will the issuance cause stock price fluctuations? Analysis of profitability indicates that perpetual bond issuance does not increase nor decline the return on equity (ROE) from the shareholders' perspective. This is because although the net operating profit margin increases, perpetual bonds are classified as equity items, which increases the base for calculating the return rate on a share basis. The increase in the equity multiplier offsets the impact of the improved net operating profit margin. Meanwhile, through a decomposition of the income statement, the study finds that perpetual bonds enhance profitability through faster

expansion of core business and higher profit margins. This implies that perpetual bond financing should be used to expand operating funds, smooth out capital chains, and promote business expansion, rather than only for financial decoration. Only in this way can perpetual bonds exert a positive impact on corporate expansion and growth, thereby increasing net profit and asset return rates.

We conclude that perpetual bond issuance by non-financial SOEs in China leads to a decline in corporate stock prices, and the results are still significant after considering sequence correlation and endogeneity issues. Based on comprehensive evidence and other research conclusions, the study believes that this outcome is caused by the signal of poor financial condition conveyed by perpetual bond issuance dominated by the "deleveraging" orientation. This indicates that the company has difficulty reducing actual leverage ratios through conventional methods and can only seek debt conversion or debt hiding to reduce book leverage ratios, thereby affecting stock prices. In particular, many issuing enterprises incur losses. If the public previously had expectations of poor financial conditions for the company, perpetual bond issuance undoubtedly reinforces this belief.

Overall, the perpetual bond financing of non-financial SOEs in China is closely related to the "deleveraging" policy of SOEs, and revolves around the policy goal of "deleveraging". Enterprises issuing perpetual bonds have strong motives to reduce leverage ratios, and issuance indeed leads to an immediate decrease in the enterprises' book leverage ratios. The mutual reinforcement between this motive and the actual effect enhances the frequency of using perpetual bonds for deleveraging. Moreover, this "leverage manipulation" is reflected in the market's evaluation of the enterprise and subsequent downward fluctuation in stock prices.

6.2 Recommendations

Based on the above research conclusions, this study proposes the following suggestions for enterprises to use perpetual bonds for financing and policy recommendations:

6.2.1 Increasing support for perpetual bond financing to meet strategic and growth-oriented funding needs of enterprises

The objectives of issuing perpetual bonds by enterprises may vary significantly across different enterprises. Although many enterprises utilize perpetual bond financing as a tool for "deleveraging," as highlighted in the mechanism analysis section of Chapter 5, there are those that enhance the positive impact of perpetual bonds on increasing the return on total assets

through higher main business profit margins and business expansion rates. This implies that the application of perpetual bond financing directly influences the actual outcomes achieved. Furthermore, the approach of reducing leverage ratios through the issuance of perpetual bonds is not sustainable, as research indicates that with the decrease in book leverage ratios, enterprises have more scope to expand debt financing, which paradoxically increases debt risk, thus necessitating the control of risks associated with perpetual bond financing. Concurrently, as revealed by the impact on stock prices, an overemphasis on the deleverage function of perpetual bonds can amplify the adverse signals released by their issuance, leading to negative effects on stock prices. Therefore, it is essential to encourage the transformation of the role of perpetual bonds from a financial adjustment tool to a strategic expansion financing instrument, thereby playing a more significant role in enhancing the operational performance of enterprises.

6.2.2 Promoting the coordination of perpetual bond financing with other debt instruments and leverage the unique advantages of perpetual bond financing

The most fundamental advantage of perpetual bond financing lies in its flexible and extendable term structure, which is particularly suitable for financing ultra-long-term engineering projects. These projects require huge upfront investments with future cash flow inflows that are uncertain in timing and speed. In such cases, perpetual bond financing with continuous renewal options is an excellent choice. In fact, as shown in the statistics on perpetual bond issuance realities in Chapter 3, perpetual bonds were initially primarily used for financing infrastructure construction and public project enterprises. However, in recent years, the nominal maturities of perpetual bonds issued by Chinese SOEs have been continuously shortened, which indicates that perpetual bond financing is deviating from its original intention of financing long-term projects, making it difficult to leverage perpetual bonds' advantages and increasing the risk of financial manipulation through perpetual bonds. Therefore, it is necessary to further allocate perpetual bond financing and traditional debt financing in a reasonable proportion, allowing perpetual bonds to leverage their advantages as long-term and stable financial instruments, and use them more for specialized financing of long-term projects and financing activities of SOEs undertaking major projects, such as construction, energy, transportation, environmental protection and other fields with large investment scale and long recovery cycle, while general financing activities are suggested to be carried out through ordinary debt instruments.

6.2.3 Continuing the expansion of the perpetual bond market funding pool and guiding market expectations regarding corporate perpetual bond financing

The scale of China's perpetual bond financing market is continuously expanding, which is an irreversible trend in the future. However, perpetual bonds have only emerged in China for a short period of time - just ten years - and are therefore often viewed as a non-conventional financing tool, leading the public to associate them with financial difficulties faced by enterprises and causing stock prices to decline after issuance. In fact, perpetual bonds have been widely used in developed market countries and are just a relative ordinary choice among all debt instruments. Meanwhile, empirical research results show that after Chinese non-financial SOEs issue perpetual bonds, their return on equity (ROE) does not significantly decline, indicating no evidence of damage to shareholders' interests. In addition, although perpetual bond issuance does have the purpose of modifying financial leverage, many enterprises still achieve higher operating growth rates after perpetual bond issuance, thereby improving actual operating performance. The public needs to have a clear judgment on the motives for corporate perpetual bond financing to effectively identify the information conveyed by perpetual bond financing. Therefore, from the above perspective, there is no need to hold overly negative views on perpetual bond issuance, which also means that the normalization of perpetual bonds in China's corporate debt instrument system and the deepening of public awareness will take time.

6.2.4 Taking multiple measures to enhance the attractiveness of the perpetual bond market and resolve hidden debt risks.

Firstly, the development of perpetual bonds in China must adhere to market demand orientation. Regulatory authorities need to reasonably evaluate all terms and content of perpetual bonds, optimize term settings based on financial market changes and advanced international experiences, and thereby increase the market appeal of perpetual bonds. At the same time, the variety of maturities for perpetual bonds can be further enriched, such as introducing 10-year term products, to meet the various requirements of the international financial market for the maturities of perpetual bonds. In addition, based on the convertible perpetual bond products in 2021, further research and design of temporary write-down type perpetual bonds can be carried out to broaden the choice space for market investors.

Secondly, the development of perpetual bonds is inseparable from a transparent market environment. Regulatory authorities should focus on improving the transparency of the perpetual bond issuance market, further perfecting market information disclosure, and

increasing the intensity and frequency of information disclosure to ensure that perpetual bonds can be correctly assessed by domestic and international bond markets, thereby enhancing investor confidence. At the same time, further clarify and implement the accounting standards for perpetual bonds, and reduce the space for human manipulation.

Lastly, Chinese government departments or relevant regulatory agencies can further refine the policy content of perpetual bonds, streamline the issuance and approval procedures, and thereby expand the scope of credit endorsement by local government departments and relevant financial management supervision agencies. This would allow perpetual bonds issued by local small and medium banks with lower credit ratings to gain credit enhancement, thereby improving the market liquidity of perpetual bonds and comprehensively increasing their attractiveness.

6.3 Research limitation

6.3.1 Deficiency in the research methods of motivation analysis

The thesis describes the characteristics of enterprises that engage in perpetual bond financing through regression analysis, which can be related to the motivation of SOEs and non-financial enterprises to use perpetual bonds for financing to a certain extent. That is, by answering which enterprises are more likely to use perpetual bonds for financing, the motivation for perpetual bond financing can be inferred partly. However, motivation analysis involves the psychology and preferences of the actor, and belongs more to the category of qualitative research. It is difficult to characterize through quantitative analysis of public data, and may not fully reflect the motivation behind perpetual bond financing.

6.3.2 No classification analysis based on issuance terms

This research only selects dummy variables indicating whether perpetual bonds are issued and the proportion of perpetual bond financing scale to the total financing scale as measures of perpetual bond issuance. In practice, the terms of perpetual bond issuance are more intricate, and the management of debt relationships post-issuance also exhibits diversity. For example, whether perpetual bonds are classified as assets or liabilities in corporate accounting, and whether the interest they generate is tax-deductible, still varies among different enterprises, and different handling methods could lead to varying financial performance impacts. Due to the huge workload of collecting and organizing issuance terms, this research does not conduct such

comparative analysis.

6.3.3 Difficulties in heterogeneity analysis

Due to the short development time of perpetual bonds in China, there is a lack of sample size in more detailed heterogeneity analysis. For example, SOEs in China issue more than 90% of perpetual bonds, which makes it difficult to support comparative analysis between SOEs and private enterprises due to the lack of sample size for private enterprise issuance. Therefore, this research did not conduct heterogeneity analysis on the impact of perpetual bond issuance between central SOEs and local SOEs, as well as between SEOs and private enterprises.

6.4 Future research directions

6.4.1 Using survey methods for motivation analysis

As mentioned in the research limits, the research describes the characteristics of companies that engage in perpetual bond financing through statistical analysis, in order to speculate on the financing motives of perpetual bonds. Motivation analysis involves the psychology and preferences of the actors, and is more of a qualitative research category. Therefore, one future research direction is to analyze the motives for issuing perpetual bonds through field surveys. If the motives are consistent with the actual results achieved (for example, perpetual bond issuers have a strong "deleveraging" motive and have actually achieved significant deleveraging results), it will undoubtedly further strengthen the use of perpetual bonds for this purpose.

6.4.2 Involving a more detailed analysis of the issuance terms

There are differences in the issuance terms of perpetual bonds among different companies, resulting in different accounting treatments, which may lead to different financial performance impacts, such as whether perpetual bonds are treated as assets or liabilities in a company's accounting treatment, which will affect whether the interest generated can be tax deductible. Upon the expiration of the nominal term, enterprises have the option to redeem or extend the perpetual bonds; if a company opts not to redeem, what signals does this send to the market, and what effects will it have on financial pressure? One possibility is that the decision not to redeem may convey a signal that the company is having difficulty repaying its debts and is facing cash flow issues, which could influence public expectations. Moreover, not redeeming

can trigger a rate jump mechanism, thereby increasing the company's financial burden in the later stages. Due to the extensive textual analysis required for these details, this study was unable to complete the analysis within the limited timeframe, but it warrants further investigation.

6.4.3 Further heterogeneity analysis

Due to the insufficient sample size, further heterogeneity analysis has not been conducted. However, it is believed that with the continuous development of perpetual bond financing and the expansion of sample size, heterogeneity analysis between state-owned and private enterprises, as well as between central and local enterprises, will become possible. For instance, SOEs are confronted with the policy objective of "deleveraging," hence it is more probable that enterprises with higher leverage ratios will issue perpetual bonds with the aim of achieving a reduction in their leverage ratios. In another respect, private enterprises are not directly influenced by the deleverage policy, so when they issue perpetual bonds, do they primarily consider the objective of realizing expansion and growth?

6.4.4 Comparison with other debt financing tools

Finally, due to the need to focus on research questions, this study concentrates on analyzing the actual outcomes of issuing perpetual bonds without making comparisons with other debt instruments, and therefore does not provide a comparative analysis of the differences in impact between perpetual bond financing and traditional bond financing tools. Although perpetual bonds possess characteristics of both debt and equity financing, some hybrid debt-equity financing instruments can also achieve some of the effects of perpetual bond financing. The heterogeneous financial impacts of perpetual bonds compared to these hybrid financing tools require further investigation.

Furthermore, the analysis of the impact of perpetual bonds in this research focuses on debtors, yet in reality, the impact of perpetual bonds on creditors is equally noteworthy. Compared to traditional debt instruments, perpetual bonds firstly offer a coupon rate generally higher than that of ordinary bonds, and they incorporate an interest rate step-up mechanism, where a lower step-up basis point results in a higher coupon rate. This makes perpetual bonds more attractive to investors. Secondly, higher interest rates come with higher risks. Since perpetual bonds do not have a fixed maturity date, investors may need to bear higher risks. If the issuer's financial condition deteriorates, investors may not be able to recover their principal.

Additionally, perpetual-bond-holders rank lower in priority compared to depositors and other creditors, thus facing relatively higher risks. Lastly, perpetual bonds suffer from poor liquidity, making it difficult for investors to sell them when needed or requiring them to sell at a lower price. This limits the circulation and liquidity of perpetual bonds. Although these risk and return characteristics are specific to creditors, they incentivize perpetual bondholders to impose additional constraints on debtors, increasing the cost of financing for enterprises utilizing perpetual bonds. Consequently, these underlying factors may indirectly impact the finances of bond-issuing enterprises.

[This page is deliberately left blank.]

Bibliography

Admati, A. R., Demarzo, P. M., Hellwig, M. F., & Pfleiderer, P. (2018). The leverage ratchet effect. *The Journal of Finance*, *73*(1), 145-198.

Aghion, P., Angeletos, G. M., Banerjee, A., & Manova, K. (2010). Volatility and growth: Credit constraints and the composition of investment. *Journal of Monetary Economics*, *57*(3), 246-265.

Ahmed, A. D., & Wahid, A. N. (2011). Financial structure and economic growth link in African countries: A panel cointegration analysis. *Journal of Economic Studies*, *38*(3), 331-357.

Akdoğu, E., Avci, S. B., & Simsir, S. A. (2020). Stock price reaction to debt offerings: The Turkish evidence. *Emerging Markets Finance and Trade*, *57*(14), 4070-4088.

Al-Hadad, J., & Palmowski, Z. (2021). Pricing perpetual American put options with asset-dependent discounting. *Journal of Risk and Financial Management*, *14*(3), 130.

Allen, F., Qian, J., & Qian, M. (2005). Law, finance, and economic growth in China. *Journal of Financial Economics*, *77*(1), 57-116.

Allen, M. F. (1996). The ecology of arbuscular mycorrhizas: A look back into the 20th century and a peek into the 21st. *Mycological Research*, *100*(7), 769-782.

Amiti, M., & Weinstein, D. E. (2011). Exports and financial shocks. *The Quarterly Journal of Economics*, *126*(4), 1841-1877.

Ang, J. B. (2008). A survey of recent developments in the literature of finance and growth. *Journal of Economic Surveys*, *22*(3), 536-576.

Armstrong, C. S., Guay, W. R., & Weber, J. P. (2010). The role of information and financial reporting in corporate governance and debt contracting. *Journal of Accounting and Economics*, *50*(2-3), 179-234.

Bagus, P., Gabriel, A., & Howden, D. (2016). Reassessing the ethicality of some common financial practices. *Journal of Business Ethics*, *136*(3), 471-480.

Bai, X. (2019). 恒大集团永续债融资实例分析 [Evergrande group perpetual bond financing case analysis]. *Communication of Finance and Accounting*, (35), 16-19.

Baldeaux, J., Fung, M. C., Ignatieva, K., & Platen, E. (2015). A hybrid model for pricing and hedging of long-dated bonds. *Applied Mathematical Finance*, *22*(4), 366-398.

Baldwin, A. (2017). New developments in real estate financing. *Economic Affairs*, *37*, 141-145.

Banko, J. C., & Zhou, L. (2010). Callable bonds revisited. *Financial Management*, *39*(2), 613-641.

Barone, G. (2019). Explaining credit ratings through a perpetual-debt structural model. *Journal of Credit Risk*, *17*(2), 1-12.

Baskin, J. B. (1988). The development of corporate financial markets in Britain and the United States, 1600–1914: Overcoming asymmetric information. *Business History Review*, *62*(2), 199-237.

Baxter, N. D. (1967). Leverage, risk of ruin and the cost of capital. *The Journal of Finance*, *22*(3), 395-403.

Bécsi, A., Bognár, G., & Loga, M. (2021). The growing importance of the economic role of the corporate bond market. *Financial and Economic Review*, *20*(4), 5-37.

Benzoni, L., Garlappi, L., Goldstein, R. S., & Ying, C. (2022). Debt dynamics with fixed issuance costs. *Journal of Financial Economics*, *146*(2), 385-402.

Berk, J. B., Stanton, R., & Zechner, J. (2010). Human capital, bankruptcy, and capital structure. *The Journal of Finance*, *65*(3), 891-926.

Bhagat, S., & Welch, I. (1995). Corporate research & development investments international comparisons. *Journal of Accounting and Economics*, *19*(2-3), 443-470.

Blackwell, M., & Nocera, S. (1988). The impact of debt to equity conversion. *Finance and Development*, *25*(2), 15-17.

Bolognesi, E., Compagno, C., Miani, S., & Tasca, R. (2020). Non-performing loans and the cost of deleveraging: The Italian experience. *Journal of Accounting and Public Policy*, *39*(6), 106786.

Booth, L., Aivazian, V., Demirguc-Kunt, A., & Maksimovic, V. (2001). Capital structures in developing countries. *The Journal of Finance*, *56*(1), 87-130.

Borisova, G., Fotak, V., Holland, K., & Megginson, W. L. (2015). Government ownership and the cost of debt: Evidence from government investments in publicly traded firms. *Journal of Financial Economics*, *118*(1), 168-191.

Borisova, G., & Megginson, W. L. (2011). Does government ownership affect the cost of debt? Evidence from privatization. *The Review of Financial Studies*, *24*(8), 2693-2737.

Brandt, L., & Li, H. (2003). Bank discrimination in transition economies: Ideology, information, or incentives? *Journal of Comparative Economics*, *31*(3), 387-413.

Brennan, M. J., & Schwartz, E. S. (1984). Optimal financial policy and firm valuation. *The Journal of Finance*, *39*(3), 593-607.

Bruton, G. D., Peng, M. W., Ahlstrom, D., Stan, C., & Xu, K. (2015). State-owned enterprises around the world as hybrid organizations. *Academy of Management Perspectives*, *29*(1), 92-114.

Buttiglione, L., Lane, P. R., Reichlin, L., & Reinhart, V. (2016). *Deleveraging? What deleveraging?* Centre for Economic Policy Research.

Cai, Z. (2018). 国有企业永续债现状、发行动因与风险防范探讨 [A discussion on the status quo, issuing motivation and risk prevention of perpetual bonds of state-owned enterprises]. *Finance and Accounting for International Commerce*, (06), 71-73.

Campello, M. (2006). Debt financing: Does it boost or hurt firm performance in product markets? *Journal of Financial Economics*, *82*(1), 135-172.

Cecchetti, S. G., & Kharroubi, E. (2012). *Reassessing the impact of finance on growth*. Social Science Electronic Publishing.

Cecchetti, S. G., Mohanty, M. S., & Zampolli, F. (2011). *The real effects of debt*. Bank for International Settlements.

Chen, C., & Zhu, L. Y. (2024). Study on the financial impact of perpetual debt--Based on the case analysis of gezhouba company. *Highlights in Business, Economics and Management*, *37*, 524-528.

Chen, G. F., & Tian, J. (2021). 公司资本制度改革与债权人利益保护——基于偿债能力的考察 [Corporate capital system reform and creditor interest protection: Based on the study of solvency]. *Nankai Economic Studies*, (03), 3-16.

Chen, H., He, R., & Gao, L. (2019). 永续债投资价值分析 [Investment value analysis of perpetual bonds]. *China Bond*, (02), 82-86.

Cheng, L. L. (2019). 对完善我国金融业永续债会计处理规则的思考 [To consummation our country finance industry perpetual debt accounting treatment rule ponder]. *Financial Accounting*, (06), 36-40.

Claessens, S., Feijen, E., & Laeven, L. (2008). Political connections and preferential access to finance: The role of campaign contributions. *Journal of Financial Economics*, *88*(3), 554-580.

CMF. (2024, March 13). *Special report on the two sessions: An in-depth analysis of the 2024 government work report*. China Macroeconomics Forum, Beijing, China.

Cook, D. O., & Tang, T. (2010). Macroeconomic conditions and capital structure adjustment speed. *Journal of Corporate Finance*, *16*(1), 73-87.

Corsetti, G., Erce, A., & Pascual, A. G. (2020). Perpetual bonds are not the best way to finance the European Recovery Fund. In B. Q. Agnès & W. D. M. Beatrice (Eds.), *Europe in the Time of Covid-19* (pp. 221-229). CEPR Press.

Dangl, T., & Zechner, J. (2021). Debt maturity and the dynamics of leverage. *The Review of Financial Studies*, *34*(12), 5796-5840.

De Grauwe, P. (2020). The need for monetary financing of corona budget deficits. *Intereconomics*, *55*(3), 133-134.

Deangelo, H., Gonçalves, A. S., & Stulz, R. M. (2018). Corporate deleveraging and financial flexibility. *The Review of Financial Studies*, *31*(8), 3122-3174.

Dechow, P. M., & Shakespear, C. (2009). Do managers time securitization transactions to obtain accounting benefits? *The Accounting Review*, *84*(1), 99-132.

Demirgüç-Kunt, A., & Levine, R. (1996). Stock market development and financial intermediaries: Stylized facts. *The World Bank Economic Review*, *10*(2), 291-321.

Deng, G. H. (2020). Pricing perpetual American floating strike lookback option under multiscale stochastic volatility model. *Chaos, Solitons & Fractals*, *141*, 114-141.

Devlin, W., & Mckay, H. (2008). The macroeconomic implications of financial 'deleveraging'. *Economic Round-up*, *4*, 47-73.

Diao, A. H. (2020). 新准则下永续债会计处理探究 [Study on accounting treatment of perpetual debt under new standards]. *Communication of Finance and Accounting*, (19), 109-112.

Dodd, O., Kalimipalli, M., & Chan, W. (2021). Evaluating corporate credit risks in emerging markets. *International Review of Financial Analysis*, *73*, 101610.

Dong, X. Y., & Putterman, L. (2003). Soft budget constraints, social burdens, and labor redundancy in China's state industry. *Journal of Comparative Economics*, *31*(1), 110-133.

Drehmann, M., & Juselius, M. (2014). Evaluating early warning indicators of banking crises: Satisfying policy requirements. *International Journal of Forecasting*, *30*(3), 759-780.

Driscoll, J. C., & Kraay, A. C. (1998). Consistent covariance matrix estimation with spatially dependent panel data. *The Review of Economics and Statistics*, *80*(4), 549-560.

Drobetz, W., & Wanzenried, G. (2006). What determines the speed of adjustment to the target capital structure? *Applied Financial Economics*, *16*(13), 941-958.

Durand, D. (1959). The cost of capital, corporation finance, and the theory of investment: comment. *The American Economic Review*, *49*(4), 639-655.

Easley, D., & O'hara, M. (2004). Information and the cost of capital. *The Journal of Finance*, *59*(4), 1553-1583.

Eggertsson, G. B., & Krugman, P. (2012). Debt, deleveraging, and the liquidity trap: A Fisher-Minsky-Koo approach. *The Quarterly Journal of Economics*, *127*(3), 1469-1513.

Ehrich, L. C., & Billett, S. (2006). How Australian small business operators learned about the goods and services tax. *Small Enterprise Research*, *14*(2), 59-73.

Elsiefy, E., & AbdElaal, M. A. (2019). The firm value in case of deleveraging using leasing and the optimal restructuring level. *The Quarterly Review of Economics and Finance*, *72*, 145-151.

Fan, Y. D. (2020). 商业银行永续债发展创新 [Development and innovation of sustainable bonds of commercial banks]. *China Finance*, (02), 75-77.

Fargher, N., Sidhu, B. K., Tarca, A., & Van-Zyl, W. (2019). Accounting for financial instruments with characteristics of debt and equity: Finding a way forward. *Accounting & Finance*, *59*(1), 7-58.

Faulkender, M., Flannery, M. J., Hankins, K. W., & Smith, J. M. (2012). Cash flows and leverage adjustments. *Journal of Financial Economics*, *103*(3), 632-646.

Feng, Q. B. (2014). 永续债利弊 [Pros and cons of perpetual debt]. *Government Finance*, (08), 30-31.

Ferri, G., & Liu, L. G. (2010). Honor thy creditors beforan thy shareholders: Are the profits of Chinese state-owned enterprises real? *Asian Economic Papers*, *9*(3), 50-71.

Fischer, E. O., Heinkel, R., & Zechner, J. (1989). Dynamic capital structure choice: Theory and tests. *The Journal of Finance*, *44*(1), 19-40.

Flannery, M. J., & Rangan, K. P. (2006). Partial adjustment toward target capital structures. *Journal of Financial Economics*, *79*(3), 469-506.

Fornaro, L. (2018). International debt deleveraging. *Journal of the European Economic Association*, *16*(5), 1394-1432.

Frey, R. (2016). Multinational banks' deleveraging in the global financial crisis. *Journal of Multinational Financial Management*, *37*, 90-113.

Fu, Y. T., Liu, J. Q., & Chen, D. K. (2021). "杠杆率"波动、经济增长与经济周期的非线性关联特征 [Nonlinear association characteristics of "leverage ratio" fluctuations, economic growth and business cycles]. *Financial Economics Research*, *36*(05), 3-17.

Gan, J., Guo, Y., & Xu, C. G. (2018). Decentralized privatization and change of control rights in China. *The Review of Financial Studies*, *31*(10), 3854-3894.

Gao, P., & Zheng, Z. (2018). PPP 项目税收政策研究——基于 PPP 模式全生命周期税收影响的分析 [Research on the tax policy of PPP projects-based on the analysis of the tax impact of the whole life cycle of PPP model]. *Journal of Central University of Finance & Economics*, (12), 14-24.

Gao, Z. H., & Bao, Y. (2022). Do acquirers of mega mergers prefer to improve debt level? An investigation on mega deals and leverage change. *Finance Research Letters*, *47*, 102780.

Gapeev, P. V., & Kühn, C. (2005). Perpetual convertible bonds in jump-diffusion models. *Statistics & Risk Modeling*, *23*(1), 15-31.

Ge, Y., & Qiu, J. P. (2007). Financial development, bank discrimination and trade credit. *Journal of Banking & Finance*, *31*(2), 513-530.

Gelfand, M. D. (2020). Consols are forever: US treasury obligations of perpetual maturity. *Journal of Taxation of Investments*, *37*(3), 5.

Gertler, P., & Hofmann, B. (2018). Monetary facts revisited. *Journal of International Money and Finance*, *86*, 154-170.

Goncharenko, R., Ongena, S., & Rauf, A. (2021). The agency of CoCos: Why contingent convertible bonds are not for everyone. *Journal of Financial Intermediation*, *48*, 1-23.

Gorton, G., & Metrick, A. (2012). Getting up to speed on the financial crisis: A one-weekend-reader's guide. *Journal of Economic Literature*, *50*(1), 128-150.

Gou, X. R. (2022). 国有企业永续债属性认定及风险防控探析 [Attribute identification and risk prevention and control of state-owned enterprise perpetual debt]. *China Small Medium Enterprises*, (03), 166-167.

Grossinho, M. D. R., Kord Faghan, Y., & Ševčovič, D. (2017). Pricing perpetual put options by the black–scholes equation with a nonlinear volatility function. *Asia-Pacific Financial Markets*, *24*, 291-308.

Guariglia, A., & Liu, P. (2014). To what extent do financing constraints affect Chinese firms' innovation activities? *International Review of Financial Analysis*, *36*, 223-240.

Guo, J. P., & Zhang, Y. (2020). 永续债融资的适用性与效果分析——以葛洲坝为例 [Analysis on the applicability and effect of perpetual debt financing: A case study of Gezhouba]. *Communication of Finance and Accounting*, (06), 136-140+145.

Guo, Q., & Zhang, J. (2022). 国外上游垄断对我国制造业企业盈利能力的影响研究 [Research on the influence of foreign upstream monopoly on the profitability of our country's manufacturing enterprises]. *Forum of World Economics & Politics*, (02), 35-56.

Guo, Y., Qu, Y. X., & Chen, L. L. (2022). 宏观经济冲击、企业杠杆与银行风险 [Macroeconomic shocks, firm leverage and bank risk]. *Systems Engineering Theory*

Practice, *42*(06), 1463-1480.
Habib, A., & Hasan, M. M. (2017). Managerial ability, investment efficiency and stock price crash risk. *Research in International Business and Finance*, *42*, 262-274.
Hacısalihzade, S. S. (2018). *Control engineering and finance*. Springer.
Hackbarth, D., Miao, J., & Morellec, E. (2006). Capital structure, credit risk, and macroeconomic conditions. *Journal of Financial Economics*, *82*(3), 519-550.
Harford, J., Klasa, S., & Maxwell, W. F. (2014). Refinancing risk and cash holdings. *The Journal of Finance*, *69*(3), 975-1012.
Hennessey, D. C., Sheppard, B. J., Mackenzie, D. E., & Pearson, J. K. (2014). Predicting bond strength from a single Hartree–Fock ground state using the localized pair model. *Physical Chemistry Chemical Physics*, *16*(46), 25548-25556.
Hill, M. S., Price Iii, R. A., & Ruch, G. W. (2021). An alternative approach to distinguishing liabilities from equity. *Accounting Horizons*, *35*(1), 65-85.
Holz, C. A. (2002). The impact of the liability–asset ratio on profitability in China's industrial state-owned enterprises. *China Economic Review*, *13*(1), 1-26.
Hopkins, P. E. (1996). The effect of financial statement classification of hybrid financial instruments on financial analysts' stock price judgments. *Journal of Accounting Research*, *34*, 33-50.
Houston, J. F., Jiang, L. L., Lin, C., & Ma, Y. (2014). Political connections and the cost of bank loans. *Journal of Accounting Research*, *52*(1), 193-243.
Huang, H. Q. (2016). “十三五”时期新一轮国有经济战略性调整研究 [A study on the strategic adjustment of state economy during the 13th Five-Year Plan period]. *Journal of Beijing Jiaotong University (Social Sciences Edition)*, *15*(02), 1-14.
Huang, S. Z. (2005). 资产减值准则差异比较及政策建议 [Asset impairment criteria difference comparison and policy suggestions]. *Accounting Research*, (01), 38-45+94-95.
Huang, X., & Ping, X. Q. (2020). 行政垄断还是自然垄断——国有经济在产业上游保持适当控制权的必要性再探讨 [Administrative monopoly or natural monopoly: A further discussion on the necessity of the state economy to maintain proper control right in the upstream of the industry]. *China Industrial Economics*, (03), 81-99.
Hui, C. Y. (2012). Perpetual bonds: Are they really here to stay? Why should these instruments enjoy the selected benefits of both debt and equity? *Butterworths Journal of International Banking and Financial Law*, *27*(7), 439.
Hyun, J., & Minetti, R. (2019). Credit reallocation, deleveraging, and financial crises. *Journal of Money, Credit and Banking*, *51*(7), 1889-1921.
Islam, S., Chowdhury, N. J., & Kabir, M. R. (2010). The role of mudaraba perpetual bond (MPB) of IBBL for development of Bangladesh bond market. *Thoughts on Economics*, *21*(4), 39-56.
Jiang, L. D., & Lu, Y. (2018). 市场竞争加剧是否助推国有企业加杠杆 [Whether the intensification of market competition boosts the leverage of state-owned enterprises]. *China Industrial Economics*, (11), 155-173.
Jin, Y. (2014). The study of Chinese real estate enterprises issuing perpetual bonds financing: Advantage and risk. *American Journal of Industrial and Business Management*, *4*(12), 709.
Juan, W. (2020). Research on deleveraging of new energy enterprises and risk-taking of enterprises. *IOP Conference Series: Earth and Environmental Science*, *510*(2), 20-34.
Kalantonis, P., Kallandranis, C., & Sotiropoulos, M. (2021). Leverage and firm performance: New evidence on the role of economic sentiment using accounting information. *Journal of Capital Markets Studies*, *5*(1), 96-107.
Khatua, A. (2017). Does business group affiliation matter for external debt finance? Evidence from India. *Asian Business & Management*, *16*, 290-322.
Khwaja, A. I., & Mian, A. (2005). Do lenders favor politically connected firms? Rent provision

in an emerging financial market. *The Quarterly Journal of Economics*, *120*(4), 1371-1411.
Kim, K., Patro, S., & Pereira, R. (2017). Option incentives, leverage, and risk-taking. *Journal of Corporate Finance*, *43*, 1-18.
Kim, Y. J., Choi, S., Lee, E. Y., & Lee, S. J. (2023). Perpetual securities and stock prices: Korean evidence. *Journal of Contemporary Accounting & Economics*, *19*(1), 100340.
Kini, O., Shenoy, J., & Subramaniam, V. (2017). Impact of financial leverage on the incidence and severity of product failures: Evidence from product recalls. *The Review of Financial Studies*, *30*(5), 1790-1829.
Kornai, J. (1998). The place of the soft budget constraint syndrome in economic theory. *Journal of Comparative Economics*, *26*(1), 11-17.
Korteweg, A. (2010). The net benefits to leverage. *Journal of Finance (John Wiley & Sons, Inc.)*, *65*(6), 2137-2170.
Kraus, A., & Litzenberger, R. H. (1973). A state-preference model of optimal financial leverage. *The Journal of Finance*, *28*(4), 911-922.
Kuchler, A. (2020). Leverage, investment, and recovery from a financial crisis: The role of debt overhang. *Studies in Economics and Finance*, *37*(1), 143-159.
Kühn, C., & Van Schaik, K. (2008). Perpetual convertible bonds with credit risk. *Stochastics: An International Journal of Probability & Stochastic Processes*, *80*(6), 585-610.
Lai, K. (2019). *Perpetual bonds raise tax, balance sheet issues for Chinese banks*. Euromoney Trading Limited.
Lai, K., Prasad, A., Wong, G., & Yusoff, I. (2020). Corporate deleveraging and financial flexibility: A Chinese case-study. *Pacific-Basin Finance Journal*, *61*, 101299.
Lane, D. (2009). The cost of capital, corporation finance and the theory of investment: A refinement. *Applied Economics Letters*, *16*(10), 1017-1019.
Leary, M. T., & Roberts, M. R. (2005). Do firms rebalance their capital structures? *The Journal of Finance*, *60*(6), 2575-2619.
Leibowitz, M. L., Homer, S., & Kogelman, S. (2013). *Inside the yield book: The classic that created the science of bond analysis*. John Wiley & Sons.
Leland, H. E. (1994). Corporate debt value, bond covenants, and optimal capital structure. *Journal of Finance (Wiley-Blackwell)*, *49*(4), 1213-1252.
Levi, S., & Segal, B. (2015). The impact of debt-equity reporting classifications on the firm's decision to issue hybrid securities. *European Accounting Review*, *24*(4), 801-822.
Li, D. (2011). Financial constraints, R&D investment, and stock returns. *Review of Financial Studies*, *24*(9), 2974-3007.
Li, G., Chen, L. J., Chen, Q., & Zhang, R. J. (2009). 经营租赁的真实动机——基于东方航空公司的案例研究 [The real motivation of operating lease: Based on the case study of China Eastern Airlines]. *Journal of Management World*, (S1), 121-128+134.
Li, J. (2020). 浅论国有企业永续债现状、发行动因与风险防范 [Brief discussion on the status quo, issuing motivation and risk prevention of perpetual bonds of state-owned enterprises]. *Money China*, (04), 53-54.
Li, J., Li, S. H., & Chen, B. (2024). 美联储货币政策对中国非金融企业债务风险的溢出效应研究 [Spillover effect of Federal Reserve monetary policy on debt risk of Chinese non-financial firms]. *Studies of International Finance*, (08), 85-96.
Li, L. (2019). 永续债助力银行扩充资本正当时 [Perpetual bonds helped banks build capital at the right time]. *Rural Finance Research*, (02), 4-5.
Li, L., & Wang, Z. X. (2019). How does capital structure change product-market competitiveness? Evidence from Chinese firms. *PLoS One*, *14*(2), 106-118.
Li, Q. (2018). Perpetual capital securities: The issurance status of China and the Issues of finance and taxation. *Management &Technology of SME*, *11*, 54-55.

Li, W., Xu, G. H., & Ren, X. Y. (2021). 企业金融化与数字技术应用：促进还是抑制? [Corporate financialization and the application of digital technology: Promoting or inhibiting?]. *Reform of Economic System*, (06), 142-147.

Li, X. Y. (2018). 保利地产财务报表分析报告[Analysis report on financial statements of poly real estate]. *Co-Operative Economy & Science*, (21), 174-175.

Li, Z., & Wang, S. N. (2021). 国有企业提升产业链现代化水平的理论逻辑与实现路径 [The theoretical logic and realization path of state-owned enterprises to promote the modernization level of industrial chain]. *Study & Exploration*, (08), 112-120.

Liang, A. Q., & Wu, X. F. (2021). 企业去杠杆、投资效率和企业绩效 [Firm deleveraging, investment efficiency, and firm performance]. *Economy and Management*, *35*(01), 62-69.

Lim, C. Y., Wang, J. W., & Zeng, C. C. (2018). China's "mercantilist" government subsidies, the cost of debt and firm performance. *Journal of Banking & Finance*, *86*, 37-52.

Ling, X. T., & Wu, W. Q. (2022). Leverage and investment efficiency: Evidence from China's deleveraging policy. *Finance Research Letters*, *47*, 102629.

Liu, B. (2022). 永续债融资方的财税处理及条款设计探析 [Analysis on the financial and tax treatment and clause design of the financing party of perpetual bond]. *Finance and Accounting Monthly*, (02), 85-90.

Liu, D., You, J., & Zhang, L. Y. (2023). 金融科技对农村商业银行绩效的影响："契机"还是"阻力"——以江苏省为例 [The impact of fintech on the performance of rural commercial banks: "Opportunity" or "resistance": A case study of Jiangsu province]. *Chinese Rural Economy*, (11), 122-139.

Liu, F. (2020). 永续债融资对企业的影响分析——以有色行业 SKS 集团公司为例 [An analysis of the impact of perpetual debt financing on enterprises-A case study of nonferrous industry SKS group corporation]. *Enterprise Reform and Management*, (23), 45-46.

Liu, H. H., Wang, T. K., & Li, W. (2019). Dynamical volatility and correlation among us stock and treasury bond cash and futures markets in presence of financial crisis: A copula approach. *Research in International Business and Finance*, *48*, 381-396.

Liu, J. H., Zou, Z. D., & Qiu, G. Y. (2021). 环境规制对工业绿色全要素生产率的影响——短期偿债能力的中介效应 [The impact of environmental regulation on industrial green TFP: The mediating effect of short-term solvency]. *Acta Scientiarum Naturalium Universitatis Pekinensis*, *57*(01), 189-198.

Liu, R. M. (2011). *How state-owned enterprises have dragged down economic growth: Theory and empirical evidence from China* [Doctoral dissertation]. Fudan University.

Liu, X. N., & Liu, G. C. (2021). Does the market accept the perpetual bonds issued by commercial banks? Evidence from China. *Applied Economics Letters*, *28*(12), 990-994.

Liu, X. Q. (2019). 永续债优化资本结构 [Perpetual debt optimize capital structure]. *China Finance*, (14), 62-64.

Liu, Y. (2020). 建筑行业永续债融资的动因和经济后果浅析 [A brief analysis of the motivation and economic consequences of perpetual debt financing in construction industry]. *Finance & Accounting*, (19), 78-79.

Livdan, D., Sapriza, H., & Zhang, L. U. (2009). Financially constrained stock returns. *Journal of Finance (Wiley-Blackwell)*, *64*(4), 1827-1862.

Love, I., Preve, L. A., & Sarria-Allende, V. (2007). Trade credit and bank credit: Evidence from recent financial crises. *Journal of Financial Economics*, *83*(2), 453-469.

Lu, L., & Yang, W. H. (2020). 供给侧结构性改革与企业杠杆率调整——基于上市工业企业数据的实证研究 [Supply-side structural reform and leverage adjustment: An empirical study based on the data of listed industrial firms]. *Contemporary Finance & Economics*, (07), 15-27.

Luo, S. (2021). 永续债的机制设计与财务效果影响分析 [Mechanism design and financial effect analysis of perpetual debt]. *Accountant*, (06), 49-50.

Luo, W. T. (2019). 永续债的发行与会计确认探究 [Study on the issuance and accounting recognition of perpetual bonds]. *Finance & Accounting*, (15), 34-37.

Lv, P., & Qiu, Y. H. (2019). 永续债定价分析与风险研判 [Pricing analysis and risk judgment of perpetual bonds]. *China Bond*, (06), 25-30.

Lynch, D. E., & Reeves, C. R. (2019). Statistical analysis of the effect of a single OH hydrogen-bonding interaction on carbonyl bond lengths. *Journal of Molecular Structure*, *1180*, 158-162.

Ma, C. Y., & Zhu, Y. F. (2020). 去杠杆、最优资本结构与实体企业生产率 [Deleveraging, optimal capital structure and real firm productivity]. *Finance & Trade Economics*, *41*(07), 99-113.

Ma, H. G. (2016). 永续债的隐形风险 [The hidden risks of perpetual bonds]. *Modern Auditing and Economy*, (06), 16-17.

Ma, H. X., & Yao, Y. F. (2021). “去杠杆”政策压力下企业偿还债务还是隐藏债务? [Do enterprises repay debts or hide debts under the pressure of "deleveraging" policy?]. *Economic Review*, (04), 145-162.

Ma, S. C., Shen, J., & Peng, Y. C. (2022). 杠杆率变动、固定资产投资与研发活动——兼论金融赋能高质量发展 [Leverage ratio change, fixed asset investment and R&D activities: and on financial enabling high-quality development]. *Journal of Financial Research*, (05), 1-19.

Mahmood, Y., Rashid, A., Rizwan, F., & Ahmad, M. (2021). The role of macroeconomic and institutional factors in creating corporate financial flexibility. *Management Decision*, *59*(4), 732-746.

Mande, V., Park, Y. K., & Son, M. (2012). Equity or debt financing: Does good corporate governance matter? *Corporate Governance: An International Review*, *20*(2), 195-211.

Margaritis, D., & Psillaki, M. (2010). Capital structure, equity ownership and firm performance. *Journal of Banking & Finance*, *34*(3), 621-632.

Marques, T. A., De Sousa Ribeiro, K. C., & Barboza, F. (2018). Corporate governance and debt securities issued in Brazil and India: A multi-case study. *Research in International Business and Finance*, *45*, 257-270.

Meckling, W. H., & Jensen, M. C. (1976). Theory of the firm：Managerial behavior, agency costs and ownership structure. In C. A. Mallin (Ed.), *Corporate Governance* (pp. 56). Taylor & Francis Group.

Megginson, W. L., & Netter, J. M. (2001). From state to market: A survey of empirical studies on privatization. *Journal of Economic Literature*, *39*(2), 321-389.

Megginson, W. L., Ullah, B., & Wei, Z. B. (2014). State ownership, soft-budget constraints, and cash holdings: Evidence from China’s privatized firms. *Journal of Banking & Finance*, *48*, 276-291.

Mhedhbi, K., & Zeghal, D. (2016). Adoption of international accounting standards and performance of emerging capital markets. *Review of Accounting & Finance*, *15*(2), 252-272.

Miao, J. J., & Wang, P. F. (2018). Asset bubbles and credit constraints. *American Economic Review*, *108*(9), 2590-2628.

Miller, M. H. (1977). Debt and taxes. *The Journal of Finance*, *32*(2), 261-275.

Mjøs, A., & Persson, S. A. (2010). Callable risky perpetual debt with protection period. *European Journal of Operational Research*, *207*(1), 391-400.

Mocanu, M., Constantin, L. G., & Cernat-Gruici, B. (2021). Sustainability bonds: An international event study. *Journal of Business Economics & Management*, *22*(6), 1551-

1576.
Modigliani, F., & Miller, M. H. (1958). The cost of capital, corporation finance and the theory of investment. *The American Economic Review*, *48*(3), 261-297.
Modigliani, F., & Miller, M. H. (1963). Corporate income taxes and the cost of capital: A correction. *The American Economic Review*, *53*(3), 433-443.
Morck, R., Shleifer, A., & Vishny, R. W. (1988). Management ownership and market valuation: An empirical analysis. *Journal of Financial Economics*, *20*, 293-315.
Myers, S. C., & Majluf, N. S. (1984). Corporate financing and investment decisions when firms have information that investors do not have. *Journal of Financial Economics*, *13*(2), 187-221.
O'brien, J. P. (2003). The capital structure implications of pursuing a strategy of innovation. *Strategic Management Journal*, *24*(5), 415-431.
Öncü, T. S. (2017). Bad bank proposal for India: A partial jubilee financed by zero coupon perpetual bonds. *Economic and Political Weekly*, *10*, 12-15.
Pan, A. L., Liu, X., & Wu, Q. (2019). 跨所有制并购、制度环境与民营企业债务融资成本 [Cross-ownership M&A, institutional environment and debt financing cost of private enterprises]. *Accounting Research*, (05), 3-10.
Pedrosa, Í., & Lang, D. (2021). To what extent does aggregate leverage determine financial fragility? New insights from an agent-based stock-flow consistent model. *Journal of Evolutionary Economics*, *31*(4), 1221-1275.
Petersen, K. J., Handfield, R. B., Lawson, B., & Cousins, P. D. (2008). Buyer dependency and relational capital formation: The mediating effects of socialization processes and supplier integration. *Journal of Supply Chain Management*, *44*(4), 53-65.
Petras, M. (2022). Increasing profitability through contingent convertible capital: Empirical evidence from European banks. *Global Finance Journal*, *52*, 1-21.
Phelan, C. E., Marazzina, D., & Germano, G. (2020). Pricing methods for α-quantile and perpetual early exercise options based on Spitzer identities. *Quantitative Finance*, *20*(6), 899-918.
Pinegar, J. M., & Wilbricht, L. (1989). What managers think of capital structure theory: A survey. *Financial Management*, *18*(4), 82-91.
Pittman, J. A., & Fortin, S. (2004). Auditor choice and the cost of debt capital for newly public firms. *Journal of Accounting and Economics*, *37*(1), 113-136.
Priftis, R., & Theofilakou, A. (2021). Growth effects of corporate balance sheet adjustments in the EU. *Empirical Economics*, *60*, 773-801.
Qi, Y., Dong, W. Q., & Qin, Y. (2020). 建设多元化融资体系下永续债利率研究——基于中国银行股份有限公司银行永续债的分析 [Research on the interest rate of perpetual bonds under the construction of diversified financing system -- Based on the analysis of Bank of China Limited Bank perpetual bonds]. *Modernization of Management*, *40*(02), 24-29.
Qian, X. F., Zhang, J., & Mao, H. T. (2019). 垂直结构、资源误置与产业政策 [Vertical structure, resource misallocation and industrial policy]. *Economic Research Journal*, *54*(02), 54-67.
Qian, Y. Y. (1994). A theory of shortage in socialist economies based on the "soft budget constraint". *American Economic Review*, *84*, 145-156.
Qiu, B. Y., & Cheng, B. (2022). Is a deleveraging policy effective? Evidence from China. *International Review of Economics & Finance*, *77*, 471-480.
Qiu, J. P. (2020). 永续债视角下金融负债与权益工具的区分探讨 [Discussion on the distinction between financial liabilities and equity instruments from the perspective of perpetual debt]. *Communication of Finance and Accounting*, (09), 89-92.
Rajan, R. G., & Zingales, L. (1995). What do we know about capital structure? Some evidence from international data. *The Journal of Finance*, *50*(5), 1421-1460.

Reinhart, C. M., & Rogoff, K. S. (2010). Growth in a time of debt. *American Economic Review*, *100*(2), 573-578.

Reinhart, C. M., & Rogoff, K. S. (2011). From financial crash to debt crisis. *American Economic Review*, *101*(5), 1676-1706.

Ren, M., & Zhang, X. (2016). 永续债对企业财务和税务的影响 [The financial and tax impact of perpetual debt]. *Finance & Accounting*, (22), 46-47.

Ren, Y. P., & Zhai, S. (2020). 新金融工具准则下的永续债分类研究——基于 IA SB 最新讨论稿 [Research on the classification of perpetual debt under the new financial instrument criteria-Based on the latest discussion paper of IA SB]. *Friends of Accounting*, (15), 9-13.

Repullo, R., & Suarez, J. (2004). Venture capital finance: A security design approach. *Review of Finance*, *8*(1), 75-108.

Robichek, A. A., & Myers, S. C. (1966). Problems in the theory of optimal capital structure. *Journal of Financial and Quantitative Analysis*, *1*(2), 1-35.

Romei, F. (2015). *Need for (the right) speed: The timing and composition of public debt deleveraging*. Europe University Institute.

Ross, S. A. (1973). The economic theory of agency: The principal's problem. *The American Economic Review*, *63*(2), 134-139.

Ross, S. A. (1977). The determination of financial structure: The incentive-signalling approach. *The Bell Journal of Economics*, *8*, 23-40.

Rozkosz, A. (2022). On perpetual American options in a multidimensional Black–Scholes model. *Stochastics: An International Journal of Probability & Stochastic Processes*, *94*(5), 723-744.

Russo, C., Weatherspoon, D., Peterson, C., & Sabbatini, M. (2000). Effects of managers' power on capital structure: A study of Italian agricultural cooperatives. *The International Food and Agribusiness Management Review*, *3*(1), 27-39.

Sarkar, S. (2001). Probability of call and likelihood of the call feature in a corporate bond. *Journal of Banking & Finance*, *25*(3), 505-533.

Sarkar, S., & Hong, G. (2004). Effective duration of callable corporate bonds: Theory and evidence. *Journal of Banking & Finance*, *28*(3), 499-521.

Schmidt, M. (2018). A note on the proprietary and entity perspectives in financial statements: The implications for two current controversial issues. *Accounting in Europe*, *15*(1), 134-147.

Schularick, M., & Taylor, A. M. (2012). Credit booms gone bust: Monetary policy, leverage cycles, and financial crises, 1870–2008. *American Economic Review*, *102*(2), 1029-1061.

Scott, T. W., Wiedman, C. I., & Wier, H. A. (2011). Transaction structuring and canadian convertible debt. *Contemporary Accounting Research*, *28*(3), 1046-1071.

Shan, H. Y. (2019). Analysis and discussion on the tax issues of perpetual bonds. *Journal of Finance and Accounting*, *7*(2), 56-59.

Shan, J. J. (2020). 全球永续债发行经验及启示 [Global perpetual bond issuance experience and enlightenment]. *Journal of Jilin Financial Research*, (03), 39-45.

Shangguan, M., Zhou, W., & Bai, M. M. (2015). 基于永续债视角的恒大地产财报分析——以恒大地产 2013 年年报为例 [Analysis of Hengda's real estate financial report from the perspective of perpetual bonds: Taking evergrande real estate's 2013 annual report as an example]. *Finance and Accounting Monthly*, (04), 74-76.

Shen, D. Y., & He, W. J. (2022). Research on the impact of deleveraging policy on enterprise green innovation: An empirical study in China. *Frontiers in Environmental Science*, *10*, 86-95.

Shen, X. P. (2021). 加速中小银行永续债扩容 [Accelerating the expansion of perpetual bonds of small and medium-sized banks]. *China Finance*, (10), 39-41.

Shleifer, A., & Vishny, R. W. (1994). The politics of market socialism. *Journal of Economic Perspectives*, *8*(2), 165-176.

Shyam-Sunder, L., & Myers, S. C. (1999). Testing static tradeoff against pecking order models of capital structure. *Journal of Financial Economics*, *51*(2), 219-244.

Song, J. X. (2023). Announcement effect study of issuing tier 2 capital bonds on the stock price of China Construction Bank. *Journal of Applied Finance & Banking*, *13*(6), 63-87.

Stiglitz, J. E. (1993). The role of the state in financial markets. *The World Bank Economic Review*, *7*(S1), 19-52.

Sun, F. X., Dang, S. T., & Yuan, R. L. (2020). 永续债发行方会税处理存在的问题及完善建议 [The issuer of perpetual bonds will deal with the existing problems and suggestions for improvement]. *Finance & Accounting*, (24), 46-49.

Sun, G. F., & Luan, X. (2021). 补充银行资本能调节贷款供给吗？[Can replenishment of bank capital regulate the supply of loans?]. *Studies of International Finance*, (08), 53-63.

Sun, J. C. (2019, May 18). *A brief analysis on perpetual bond development in China*. 2019 3rd International Conference on Economics, Management Engineering and Education Technology, Suzhou, Jiangsu, China.

Sun, Q., & Tong, W. H. S. (2003). China share issue privatization: The extent of its success. *Journal of Financial Economics*, *70*(2), 183-222.

Sunderland, T. L., & Berry, J. F. (2016). Metal-metal single bonds with the magnetic anisotropy of quadruple bonds: A systematic series of heterobimetallic bismuth(ii)-rhodium(ii) formamidinate complexes. *Chemistry*, *22*(51), 18564-18571.

Taggart, R. A. (1977). A model of corporate financing decisions. *The Journal of Finance*, *32*(5), 1467-1484.

Tan, C. P., Qin, X. Z., Shang, Q., Wang, L., & Lin, X. W. (2022). 基于永续债置换及权益再融资的财务困境纾解方法 [A financial distress relief method based on perpetual bond replacement and equity refinancing]. *Journal of Systems & Management*, *31*(03), 467-475.

Tan, X., & He, C. H. (2021). 永续债会计确认难点及解决对策 [Difficulties and solutions of accounting confirmation of perpetual debt]. *Commercial Accounting*, (19), 69-71.

Tian, M. J. (2019). 我国企业发行永续债会计属性问题分析 [Our country enterprise issues perpetual debt accounting attribute problem analysis]. *Friends of Accounting*, (22), 85-88.

Tsuji, H., & Nakamura, E. (2019). Carbon-bridged oligo (phenylene vinylene)s: A de novo designed, flat, rigid, and stable π-conjugated system. *Accounts of Chemical Research*, *52*(10), 2939-2949.

Van Der Hoog, S., & Dawid, H. (2019). Bubbles, crashes, and the financial cycle: The impact of banking regulation on deep recessions. *Macroeconomic Dynamics*, *23*(3), 1205-1246.

Vesala, M. (2019). *Examining the structure of corporate hybrid bonds and the stock market reaction to their announcement in Finland* [Master's thesis]. Aalto University.

Wagner, W. (2010). Diversification at financial institutions and systemic crises. *Journal of Financial Intermediation*, *19*(3), 373-386.

Walentin, K. (2014). Business cycle implications of mortgage spreads. *Journal of Monetary Economics*, *67*, 62-77.

Wang, D. (2021). Innovation and exploration on perpetual bonds as a capital supplement path of Chinese commercial banks. *Frontiers in Economics and Management*, *2*(6), 158-164.

Wang, F. P. (2020). 基于财政部新规的企业永续债及其会计处理思路与措施分析 [Based on the new regulations of the ministry of finance of the enterprise sustainable debt and its accounting treatment ideas and measures analysis]. *Enterprise Reform and Management*, (09), 136-137.

Wang, H. B. (2023). 永续债与国有企业资产负债管控研究 [Study on perpetual debt and asset liability control of state-owned enterprises]. *Auditing Research*, (01), 57-64.

Wang, H. Y., Xue, S., & Zhang, W. G. (2023). 会计准则变迁对永续债分类和发展的影响——基于财政部永续债新规执行结果 [The impact of accounting standards change on the classification and development of perpetual debt: Based on the results of the implementation of the new regulations of the ministry of finance on perpetual debt]. *Finance and Accounting Monthly*, *44*(03), 3-14.

Wang, J. Z., Chen, X., Li, X. X., Yu, J., & Zhong, R. (2020). The market reaction to green bond issuance: Evidence from China. *Pacific-Basin Finance Journal*, *60*, 101294.

Wang, K., & Nie, X. X. (2019). 永续债赎回权定价研究——基于发行人续期行为的实证分析 [Research on the pricing of perpetual bond call: Based on the empirical analysis of issuer's renewal behavior]. *China Bond*, (10), 79-86.

Wang, L., Chen, Y. T., & Cui, S. S. (2023). 供给侧结构性改革、化解过剩产能与企业盈利能力 [Supply-side structural reform, reducing overcapacity and corporate profitability]. *Journal of Social Sciences*, (07), 122-135.

Wang, S. H., & Li, S. (2016). 商业银行在大资管转型中的机会——基于国企改革视角 [Opportunities for commercial banks in the transformation of large asset management - Based on the perspective of state-owned enterprise reform]. *Modern Management Science*, (05), 109-111.

Wang, S. N., & Wang, C., P. (2023). 国有企业提升产业链韧性的演进历程、内在逻辑与路径选择 [The evolution process, internal logic and path selection of state-owned enterprises to enhance the resilience of industrial chain]. *Comparative Economic & Social Systems*, (05), 75-84.

Wang, X. G., Xu, C., & Liu, S. T. (2019). 永续债投资应关注哪些方面？——兼论续期的若干情景 [What should we focus on in perpetual bond investment? Also on some scenarios of renewal]. *Financial Market Research*, (09), 109-117.

Wang, Y. J., & Liu, C. L. (2016). 国有企业上游垄断阻碍了中国的经济增长?——基于制造业数据的微观考察 [Is the upstream monopoly of state-owned enterprises hindering China's economic growth? Micro investigation based on manufacturing data]. *Journal of Management World*, (06), 10-21+187.

Wang, Z. J., Wang, Z. Q., & Su, X. H. (2020). Are banks misled by leverage misestimate of Chinese listed companies? *Nankai Business Review International*, *11*(4), 507-535.

Wei, Q. W. (2020). *Research on the influence of upstream monopoly of state-owned enterprises on the efficiency of resource allocation in China* [Doctoral dissertation]. Shandong University.

Whited, T. M., & Wu, G. J. (2006). Financial constraints risk. *Review of Financial Studies*, *19*(2), 531-559.

Wišniewski, M. (2018). Innovative bonds in financing public tasks. *Proceedings of the Faculty of Economics & Business in Zagreb / Zbornik Ekonomskog Fakulteta u Zagrebu*, *17*(2), 59-72.

Wolski, R. (2017). Risk and return in the real estate, bond and stock markets. *Real Estate Management and Valuation*, *25*(3), 15-22.

Wu, F. M. (2020). 例解建筑央企降杠杆、去负债之路径 [Example of the construction of central enterprises deleveraging, deleveraging path]. *Finance and Accounting Monthly*, (S1), 88-90.

Wu, J. (2018). How do coco bonds impact a bank's shareholder wealth? *SSRN Electronic Journal*, *24*, 1-28.

Wu, X. F., & Li, X. Y. (2023). 工业互联网对制造企业创新绩效的影响机制 [The influencing mechanism of industrial Internet on innovation performance of manufacturing enterprises]. *Science & Technology Progress and Policy*, *40*(23), 92-102.

Xie, F. S., & Wang, S. (2020). 在协同竞争中推动公有制经济与非公有制经济共同发展 [Promote the common development of public and non-public economy in coordinated competition]. *Teaching and Research*, (12), 26-38.

Xing, J., Wu, Z. W., & Dong, X. L. (2024). 数字化转型能提升农村商业银行的盈利能力吗 [Can digital transformation improve the profitability of rural commercial banks]. *Journal of Nanjing Agricultural University (Social Sciences Edition)*, *24*(04), 174-186.

Xu, F., & Zhou, S. W. (2019). Pricing of perpetual American put option with sub-mixed fractional brownian motion. *Fractional Calculus & Applied Analysis*, *22*(4), 1145-1154.

Xu, X. F., & Lu, Z. F. (2020). 我国企业杠杆操纵的动机、手段及潜在影响 [The motivation, means and potential influence of leverage manipulation in our country]. *Accounting Research*, (01), 92-99.

Xu, X. F., Lu, Z. F., & Tang, T. J. (2020). 我国上市公司杠杆操纵的手段、测度与诱因研究 [Research on means measurement and inducement of leverage manipulation in listed company of our country]. *Journal of Management Sciences in China*, *23*(07), 1-26.

Xu, Y. S., Guo, S. Y., & Li, W. (2023). 实体企业金融化与投资效率:蓄水池效应还是挤出效应？[Financialization of real firms and investment efficiency: Reservoir effect or crowding-out effect?]. *Modern Management Science*, (05), 89-99.

Yang, Y., Jiang, C., & Nie, C. (2022). 上游行业垄断对企业全要素生产率的影响——来自中国制造业企业的微观证据 [The impact of monopoly in upstream industries on total factor productivity: Micro evidence from Chinese manufacturing firms]. *Humanities & Social Sciences Journal of Hainan University*, *40*(05), 191-200.

Yang, Y. W. (2020). 论永续债新规对发行方会计分类的影响 [On the impact of the new regulation of perpetual bonds on the accounting classification of issuers]. *China Chief Financial Officer*, (04), 165-167.

Yazdanfar, D., & Öhman, P. (2015). Debt financing and firm performance: An empirical study based on Swedish data. *The Journal of Risk Finance*, *16*(1), 102-118.

Yu, Q. L., Chen, D. D., Wang, X. P., & Peng, W. L. (2024). The impact of penalty interest provisions on the issuance costs of perpetual bonds. *International Review of Economics & Finance*, *93*, 935-943.

Yu, Y. (2024). 会税差异、税收风险管理与企业短期偿债能力 [Tax differences, tax risk management and short-term solvency of enterprises]. *Communication of Finance and Accounting*, (11), 34-39.

Yusniar, M. W., & Hadi, A. (2018). Pengaruh tingkat suku bunga, bond rating, ukuran perusahaan, debt to equity ratio (der) terhadap yield to maturity obligasi korporasi di bei periode tahun 2010-2012. *Jurnal Wawasan Manajemen*, *6*(3), 295-309.

Zeitun, R., & Saleh, A. S. (2015). Dynamic performance, financial leverage and financial crisis: evidence from GCC countries. *EuroMed Journal of Business*, *10*(2), 147-162.

Zhai, L. J. (2018). 我国优先股与永续债比较研究 [Comparative study of preferred stock and perpetual debt in our country]. *Finance Economy*, (22), 100-102.

Zhang, J. (2020). 房企永续债的发行动因及信用风险防范 [Issuance motivation and credit risk prevention of perpetual bonds of real estate enterprises]. *China Bond*, (07), 75-78.

Zhang, X. Q., Yu, M. Q., & Chen, G. Q. (2020). Does mixed-ownership reform improve SOEs' innovation? Evidence from state ownership. *China Economic Review*, *61*, 101450.

Zhao, Y. P., Qin, L. C., & Huang, Y. X. (2020). 中国企业去杠杆需考虑美联储货币政策变化吗？——加息和缩表的比较分析 [Should Chinese enterprises consider the Federal Reserve's monetary policy changes when deleveraging? Comparative analysis of interest rate hike and balance sheet reduction]. *Studies of International Finance*, (03), 23-34.

Zhu, D., & Liu, X. (2023). 永续债融资的会计处理、经济后果与相关建议 [Accounting

treatment, economic consequences and related suggestions of perpetual debt financing]. *Finance & Accounting*, (01), 33-36.

Zhu, S. P., & Chen, W. T. (2011). Pricing perpetual American options under a stochastic-volatility model with fast mean reversion. *Applied Mathematics Letters*, *24*(10), 1663-1669.

Zong, W. J., Zhang, Q. S., & Liu, D. (2017). 永续债融资财务效应研究——基于上市公司财务数据 [Research on the financial effect of perpetual bond financing-Based on the financial data of listed companies]. *Communication of Finance and Accounting*, (20), 45-47.

Webliography

Ren, S. L. (2019, March 13). *China counting perpetual bonds as debt will burden balance sheets*. Bloomberg. Retrieved July 10, 2019, from https://search.ebscohost.com/login.aspx?direct=true&db=bth&AN=140632491&lang=zh-cn&site=ehost-live

[This page is deliberately left blank.]

Other References

SASAC. (2021). *Guiding opinions on strengthening the control of debt risks in local state-owned enterprises* (Guozi Fa Cai Ping Cui [2021] No. 18).

SASAC. (2023). *Measures for the administration of bond issuance by central enterprises* (Guozi Fa Chan Quan Gui [2023] No. 34).