Structural De-leveraging of New Energy Enterprises and Corporate Risk-taking

Wang Juan
Shandong Women's University, Shandong, Jinan
E-mail:Wangjuan369@163.com

Abstract: the exploitation and utilization of new energy have lifted the predicament of human energy. In the passing years, thanks to the increasing investment in the area of new energy, new energy enterprises have developed into a vital force to boost China's economic development. However, currently, the success of investment projects of new energy enterprises is closely associated with the support of bank debt funds. In the context of "de-leveraging" of non-financial enterprises, does the de-leveraging of bank loans of new energy enterprises exert an impact on corporate risk-taking? With reference to Principal-agent Theory, Trade-off Theory and Heterogeneous Debt Theory, this paper explores the impact of deleveraging of bank loans on corporate risk-taking with A-share new energy listed companies from 2011 to 2019 as research samples. The research results suggest that: first of all, there exists a positive U-shaped relationship between deleveraging of bank loans of new energy enterprises and corporate risk-taking; besides, the deleveraging of bank loans of over-indebted enterprises will significantly alleviate corporate risk-taking; de-leveraging of bank loans of under-indebted enterprises will significantly increase corporate risk-taking.

1. Introduction
Since the financial crisis in 2008, with a view to boost the vigorous development of economy, the fiscal and monetary policies carried out in China are relatively slack, which results in the drastic growth of the financial leverage level of non-financial enterprises. By 2014, from the index of total debt to GDP, China has caught up with developed countries such as the United States and Britain[1], and is at a historically high level. Thus, in October 2015, General Secretary Xi Jinping demanded to "endeavor to reinforce supply-side structural reform and enhance the quality and efficiency of the supply system while moderately expanding aggregate demand," and regard de-leveraging as a priority task in financial work. Since then, "de-leveraging of non-financial enterprises" has been included in the reports on the work of the government for three consecutive years, which has become an urgent problem to be addressed in the financial area. The trend of drastic growth in leverage ratio has been effectively curbed. By the end of 2019, China's macroeconomic leverage ratio was 245.4%, and the effect of deleveraging policy was distinct. However, the impact of the COVID-19 epidemic in 2020 resulted in temporary difficulties in the real economy, and the leverage ratio of the real economy sector increased significantly, reaching up to 266.4% in June 2020. In 2019, China's report on the work of the government called for "continuing to insist on the supply-side structural reform as the main line" and "persisting in structural deleveraging". From this, it can be concluded that the task of deleveraging is still rather arduous.

China put a high premium on the development of new energy industry. The Strategic Action Plan for Energy Development (2014-2020) clearly indicated that it is essential to "emphatically perfect the
energy structure" and "enormously raise the proportion of renewable energy such as wind power, solar energy and geothermal energy and nuclear power consumption". In the passing years, China's new energy industry has advanced in leaps and bounds. The installed capacity of renewable energy takes up 30% of the global total and 44% of the increment, and the holding volume of new energy vehicles occupies more than 50%. Debt financing is an inevitable choice for enterprises to expand their production scale and enhance their management capability, new energy enterprises are no exception, and bank loans are a significant source of debt funds. In the context of supply-side reform, "deleveraging" has turned into an inevitable choice for new energy enterprises, then has the investment willingness of new energy enterprises changed? Risk taking is the result of investment behavior of enterprises, which can embody the risk level that enterprises are willing to assume in a bid to acquire investment income\[^2\]. By analyzing the impact of deleveraging of bank loans on corporate risk-taking in new energy enterprises will help clarify the impact of structural deleveraging on investment behavior of new energy enterprises, and then offer theoretical basis for the formulation and implementation of structural deleveraging policies.

2. Theoretical Analysis and Research Hypothesis

Referring to the Principal-agent Theory, for the sake of protecting their own rights and interests, creditors will restrict enterprises’ financing, investment, distribution and other behaviors by setting protective clauses when lending funds, thus producing external governance effects. When choosing investment projects, commercial banks, as creditors, like other creditors, wish enterprises to avoid high-risk investment as much as possible, so as to ensure the safety of enterprises’ funds\[^3\]. Moreover, banks’ professional capability makes them more advantageous in external governance. In the view of the Heterogeneous Debt Theory, commercial banks are comparatively special; besides lending funds, they also render services such as fund custody and financial consultation to enterprises, so they are relational creditors of enterprises\[^4\], and maintain long-term mutually beneficial cooperation with enterprises. To acquire higher returns, banks are also willing to offer financial support for high-risk and high-return investment projects such as technological innovation of enterprises, so as to stabilize future earnings expectations. For enterprises, banks are of the dual nature of "supervisor" and "cooperator". Along with the increasing deleveraging of bank loans, the "cooperator" relationship between banks and enterprises becomes indifferent, and their "supervisor" status gradually emerges.

As a result, high-risk behaviors such as innovative investment of enterprises become less, and the level of risk-taking of enterprises will be lowered. As deleveraging of bank loans further increases, the leverage ratio of bank loans is further decreased, the motivations for banks to supervise enterprises will be gradually weakened, the inefficient investment behavior of enterprises will gradually increase, and the risk-taking level of enterprises will be raised. Thus, this paper puts forward the following hypothesis:

Hypothesis 1: There exists a U-shaped relationship between deleveraging of bank loans and corporate risk-taking.

With reference to the Trade-off Theory, the optimal capital structure of an enterprise is an equilibrium point, which is the equilibrium point of the trade-off between marginal revenue and marginal cost of debt financing while considering the investment level and asset scale of the company. Hence, rational enterprises will carefully arrange the scale of debt financing and avoid taking excessive financial risks. However, there still exist differences among different enterprises. The financial leverage of risk-seeking enterprises may exceed this equilibrium point and they assume heavy financial burden, and thus they can be called over-indebted enterprises. The financial leverage of risk-evading enterprises is lower than the equilibrium point and they assume light financial burden, and thus they are called under-indebted enterprises.

Over-indebted enterprises are of high asset-liability ratio. Since they assume "limited liability" within the scope of capital contribution, their shareholders are faced with extremely limited losses in extremely unfavorable conditions, but they enjoy "unlimited claim right" to the residual income after deducting all the costs and expenses of the corporate operation, so that they can enjoy all the residual
income when the investment project achieves great success. Thus, based on the hypothesis of economic man, the shareholders of over-indebted enterprises have the motivation to implement high-risk and high-yield projects, and maximize their own profits while transferring the risks to creditors[5], which results in an increase in the fluctuation level of earnings and an increase in the level of risk-taking. De-leveraging the bank loans of these enterprises will result in a decrease in the asset-liability ratio of enterprises, an increase in the proportion of shareholders’ investment, a decrease in the investment motivation for projects with high risks and high returns, a decrease in the fluctuation level of earnings and a decrease in the risk-taking level of enterprises. Thus, this paper puts forward the following hypothesis:

Hypothesis 2a: over-indebtedness of new energy enterprises and de-leveraging of corporate bank loans will lower the level of corporate risk-taking.

The financial burden of under-indebted enterprises is relatively light, and the ratio of shareholders’ investment is relatively large. With a view to ensure that their own interests are not infringed, the board of shareholders will conduct stricter supervision and control over the operation and management behavior of enterprises, especially attach more importance to the long-term interests when making decisions on investment projects, and choose carefully in a bid to ensure the long-term stable development of enterprises. Hence, de-leveraging of bank loans of under-indebted enterprises will further increase the innovation investment of enterprises, and the long-term benefits of enterprises will take on an upward trend, and the level of risk-taking of enterprises will be raised as well. Thus, this paper puts forward the following hypothesis:

Hypothesis 2b: under-indebtedness of new energy enterprises and de-leveraging of corporate bank loans will raise the level of corporate risk-taking.

3. Research Design

3.1. Sample Selection

The sample data used in this paper are all from CSMAR financial database. In this paper, new energy A-share listed enterprises from 2011 to 2019 (including solar energy, wind energy, nuclear energy, biomass energy, ethanol gasoline, fuel cells and green energy-saving lighting industries) are selected as the research objects, and the following treatments are made: (1) ST enterprises are excluded; (2) enterprises with insolvency and lack of data are excluded; (3) enterprises that have been listed for less than three years are excluded. Finally, 406 valid data from 66 sample enterprises were gained. The software Stata15.1 and Excel 2016 are used for data processing.

This paper measures the debt burden of enterprises with the research results of Faulkender(2012) and Qi Haodong (2018) for reference (as shown in Model 1). Therein, Lev is solvency, Roa is profitability, Size is corporate scale, Tang is corporate mortgage capability, Depre is non-debt tax shield, Liquidity is current ratio, Growth is corporate growth capability, Idd is independent director scale, Board is board of supervisors scale, Holder is equity concentration, Feature is the feature of industry leverage ratio, State is control property, and virtual variables of year and industry are controlled.

\[Levi,t=a0+\beta1×Lev_{i,t-1}+\beta2×Roai,t-1+\beta3×Sizet_{i,t-1}+\beta4×Tang_{i,t-1}+\beta5×Depre_{i,t-1}+\beta6×Liquidity_{i,t-1}+\beta7×Growth_{i,t-1}+\beta8×Idd_{i,t-1}+\beta9×Board_{i,t-1}+\beta10×Holder_{i,t-1}+\beta11×Feature_{i,t-1}+\beta12×State_{i,t-1}+\beta13×Year_{i,t-1}+\beta14×Industry_{i,t-1}+\varepsilon_{i,t}\]

The above model is used for linear regression, and the prediction residuals (\(\hat{\varepsilon}_{i,t}\)), where those whose \(\varepsilon_{i,t}>0\) are over-invested enterprises, and the others are under-invested enterprises.

3.2. Definition of Variables

3.2.1 Measurement of dependent variable. By the method of John et al.(2008) for reference, the standard deviation of income/assets before interest, tax, depreciation and amortization after adjustment (with a period of 3 years) is used to measure corporate risk-taking (RISK)[6].
Formula 1

\[ E_{i,c,t} = \frac{EBIT_{i,c,t}}{A_{i,c,t}} - \frac{1}{N} \sum_{k=1}^{N} \frac{EBIT_{k,c,t}}{A_{k,c,t}} \]  

Formula 2

\[ RISK = \sqrt{\frac{1}{T-1} \sum_{t=1}^{T} \left( E_{i,c,t} - \frac{1}{T} \sum_{t=1}^{T} E_{i,c,t} \right)^2} \]  

3.2.2. Independent Variables and Control Variables. With comprehensive reference to the existing literature, select the deleveraging ratio of bank loans (BDClev, the previous bank loan/ asset - current bank loan/asset) as the independent variable; select profitability (ROA, net profit/total assets at the end of the period), management fee rate (OHR, management fees/current operating income), financial leverage level (Lev, total liabilities at the end of the period/total assets at the end of the period), corporate market value (TQ, Tobin Q value), and controller property (State, virtual variable) as control variables.

3.3. Model Building

In consideration of the characteristics of China's capital market, Model 2 is built to verify the U-shaped relationship between deleveraging of bank loans and corporate risk-taking in new energy enterprises:

\[ RISK = \alpha_0 + \beta_1 \times BDClev + \beta_2 \times BDClev^2 + \beta_3 \times ROA + \beta_4 \times OHR + \beta_5 \times Lev + \beta_6 \times TQ + \beta_7 \times State + \epsilon \]  

Model 2

Model 3 is built to verify the impact of debt degree of new energy enterprises on deleveraging of bank loans of new energy enterprises:

\[ RISK = \alpha_0 + \beta_1 \times BDClev + \beta_2 \times ROA + \beta_3 \times OHR + \beta_4 \times Lev + \beta_5 \times TQ + \beta_6 \times State + \epsilon \]  

Model 3

4. Empirical Test

4.1. Descriptive Statistics

| Variable  | N   | Minimum | Maximum | Mean value | Standard Deviation |
|-----------|-----|---------|---------|------------|--------------------|
| Risk      | 406 | 0.0004  | 0.4010  | 0.0292     | 0.0359             |
| BDClev    | 406 | -0.2283 | 0.3813  | 0.0010     | 0.0764             |
| ROA       | 406 | -0.4275 | 0.1454  | 0.0217     | 0.0634             |
| OHR       | 406 | 0.0167  | 0.4591  | 0.0947     | 0.0607             |
| Lev       | 406 | 0.0924  | 6.7109  | 0.4896     | 0.1734             |
| TQ        | 406 | 0.8319  | 8.2491  | 1.8392     | 0.8738             |
| State     | 406 | 0         | 1       | 0.3054     | 0.4612             |

The descriptive statistical characteristics of the main variables are listed in Table 1. The mean and standard deviation of risk-taking of new energy enterprises are 0.0292 and 0.0359 respectively, with a maximum of 0.4010 and a minimum of 0.0004; while the mean value of corporate risk-taking in the 2011-2018 period is 0.0274 (Wang Juan, Zhou Dayong, 2020); compared with it, new energy listed companies have slightly higher risk-taking. The average deleveraging ratio of bank loans of new energy enterprises is -0.0010, which reveals that in the general context of deleveraging of non-financial enterprises, the level of leverage ratio of bank loans of new energy enterprises does not fall but rises; the maximum value is 0.3813, and the minimum value is -0.2283. The deleveraging of bank loans varies tremendously among different enterprises.

4.2 Analysis of Empirical Results

| Variable | (1) Overall sample | (2) Over-indebted enterprises | Under-indebted enterprises |
|----------|--------------------|-----------------------------|---------------------------|
|          |                    |                             |                           |

Table 2 Empirical Analysis
The empirical test results are exhibited in Table 2. Result (1) verifies the relationship between deleveraging of bank loans and corporate risk-taking of new energy enterprises. The BDClev coefficient is \(-0.0607\), which is significant at 1% level, and the BDClev2 coefficient is 0.2763, which is significant at 5% level. This suggests that there exists a U-shaped relationship between the two, which verifies Hypothesis 1. That is to say, when the degree of deleveraging of bank loans is relatively small, it will lower corporate risk-taking. As the degree of deleveraging of bank loans increases, it will enhance the risk-taking of new energy enterprises.

Result (2) verifies the impact of debt degree on the deleveraging of new energy banks. The impact of over-indebted enterprises and under-indebted enterprises on corporate risk-taking is quite different: the higher the deleveraging degree of bank loans of over-indebted enterprises, the lower the risk-taking level of enterprises, with a coefficient of \(-0.0672\), which is significant at the level of 5%, thus verifying Hypothesis 2a; the higher the deleveraging degree of bank loans of under-indebted enterprises, the higher the risk degree of enterprises, with a coefficient of 0.0543, which is significant at the level of 1%, thus verifying Hypothesis 2b.

5. Conclusions and Recommendations

5.1. Conclusions

In light of Principal-agent Theory, Trade-off Theory, and Heterogeneous Debt Theory, this paper explores the impact of deleveraging of bank loans on corporate risk-taking with A-share new energy listed enterprises from 2011 to 2019 as research samples. The research results indicate that, firstly, there exists a positive U-shaped relationship between deleveraging of bank loans and corporate risk-taking of new energy enterprises; besides, the deleveraging of bank loans of over-indebted enterprises will significantly alleviate corporate risk-taking; de-leveraging of bank loans of under-indebted enterprises will significantly increase corporate risk-taking.

5.2. Recommendations

5.2.1. Make Reasonable Arrangement of Financing Structure of Bank Loans. In the context of deleveraging, enterprises should reasonably arrange the financing ratio of bank loans. On the one hand, they should increase the effect of banks as "cooperator" in boosting innovative investment of enterprises, and on the other hand, they should give play to the role of banks as "supervisor", enhance their external governance effects and avoid excessive investment behavior. It is required to encourage enterprises to rationally plan their investment behaviors by rationally allocating bank loans, and then promote shareholders and management to rationally adjust their risk-taking.
5.2.2. **Perfect the Debt Governance Mechanism.** Moreover, financial resources should be allocated based on the market mechanism, and the financial ecological environment should be continuously improved, so as to give full play to the external corporate governance mechanism and reasonably play the role of debt financing in corporate risk-taking. On the one hand, it is necessary to enhance the external governance rights of creditors such as banks, such as granting creditors, especially short-term creditors, the right to participate in major corporate decisions; on the other hand, reform the bankruptcy legal system, reinforce the participation rights of creditors such as commercial banks in bankruptcy proceedings, and protect the rights and interests of creditors. In this way, the governance effect of debt can be enhanced, and then shareholders and management can make rational use of debt financing and adjust corporate risk-taking.

**Acknowledgments**

This paper is sponsored by Shandong Province Social Science Planning Research Project *Research on De-leveraging of Non-financial Enterprises and Risk-taking of Enterprises in Shandong Province (17DGL05).*

**References**

[1] Huang Shaoan and Wang Weijia. 2019. Sectoral deleveraging and macroeconomic volatility: A perspective of expectations and monetary policy effectiveness. *J. The science of Finance and Economics* 1 16-26.

[2] Wright P, et al. 1996. Impact of corporate insider, blockholder and institutional equity ownership on firm risk taking. *J.Academy of management Journal* 39 441-458.

[3] Acharya V, et al. 2011. Creditor rights and corporate risk-taking. *J. Journal of Financial Economics* 102 150-166.

[4] Boot W A. 2000. Relationship banking: What do we know? *J.Journal of financial intermediation* 9 7-25.

[5] Ating N, et al. 2013. The governance role of multiple large shareholders: Evidence form the valuation of cash holdings. *J. Journal of Mangement & governance* 17 419-451

[6] John K, et al. 2008. Corporate governance and risk-taking. *J. The Journal of Finance* 63 1679-1728.