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Research on the Innovation of Financing Methods and Operation Mechanism of Low-Altitude Economy Enterprises

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Abstract

As an important carrier of new-type productivity, the low-altitude economy generally faces financing difficulties such as "high R&D investment, lagging profitability, and few collateral assets." Traditional bank lending, which focuses on fixed asset collateral and stable cash flow as its core evaluation logic, is inherently mismatched with the asset structure of low-altitude enterprises, which is mainly composed of intangible assets such as patents and flight data. This paper takes the "first national low-altitude economy ABS" and the first national dual "cross-border" intellectual property securitization project as core cases to systematically analyze the operation mechanism of two innovative financing methods: financial leasing ABS and intellectual property securitization. The study found that financial leasing ABS, through the transmission chain of "leasing receivables packaging - asset pool construction - structured stratification-exchange listing," transforms the future cash flow of low-altitude equipment leasing into tradable standardized securities. The first product issued by Science City Leasing reached a scale of 584 million yuan, with a priority A1 tranche interest rate of only 1.9%. Intellectual property securitization, through the path of "patent pledge - credit enhancement-securities issuance," transforms the most active intangible assets of enterprises into financing capabilities. Hailiang Technology successfully raised funds by pledging Hong Kong patents, with the funds being invested in low-altitude transportation projects. Both methods, empowered by digital technology, have enabled the discovery and transformation of asset value, providing a replicable path to solve the financing difficulties of "light-asset" enterprises in the low-altitude economy. This study provides a reference for low-altitude economy enterprises to broaden their financing channels and for financial institutions to innovate product supply.

Keywords: Low Altitude Economy; Financial Leasing ABS; Intellectual Property Securitization; Digital Technology

1. Introduction

General Secretary emphasized that “scientific and technological innovation and industrial innovation are the basic paths for developing new quality productive forces.” The low-altitude economy relies on low-altitude airspace and uses UAVs, electric vertical take-off and landing aircraft (eVTOL), general aviation aircraft, etc. as carriers to radiate and drive long-chain industries such as complete aircraft manufacturing, core components, operation services, and infrastructure, and has become an important position for cultivating new quality productive forces (Zhang, 2025) According to CCID Consulting’s Research Report on the Development of China’s Low-Altitude Economy (2024),the market size of my country's low-altitude economy reached 505.95 billion yuan in 2023 and increased to 670.25 billion yuan in 2024; the Civil Aviation Administration of China predicts that it will reach 1.5 trillion yuan in 2025 and is expected to exceed 3.5 trillion yuan in 2035.

In stark contrast to the industry’s enthusiasm, the financial support system for low-altitude economy enterprises is still in its initial stage. The low-altitude industry has typical characteristics such as large R&D investment, long verification cycle, complex airworthiness certification, delayed profitability and few collateral assets. Enterprises generally face the financing difficulties of “high R&D investment, delayed profitability and few collateral assets” (Yang and Xu, 2026). Traditional bank credit takes fixed asset mortgage and stable cash flow as the core evaluation logic, which is naturally mismatched with the asset structure of low-altitude enterprises, which is mainly based on intangible assets such as patents, software copyrights, and flight data. Sun et al. (2025) conducted a configuration analysis of 343 low-altitude concept listed companies based on the TOE framework and found that a single factor does not constitute a necessary condition for enterprise incubation, but there is a clear factor substitution effect between “capital injection” and “intellectual property” and “enterprise human resources” (Sun et al.,2025). Yang and Xu (2026) used the difference-in-differences method to find that science and technology finance policies have significantly improved the innovation quality of low-altitude related enterprises, and mainly played a role through improving R&D efficiency and financing efficiency (Liu et al.,2025).

Existing research mostly focuses on the macro-level industrial logic explanation and policy analysis, and lacks a systematic examination of the specific operation mechanism of low-altitude economy enterprise financing methods. Based on this, this paper takes two innovative financing methods, namely financial leasing ABS and intellectual property securitization, as the core research objects. Combining the typical cases of the first national low-altitude economy ABS and the first national “dual cross-border” intellectual property securitization project, it deeply analyzes their operation mechanism and practical effect, in order to provide a reference for low-altitude economy enterprises to broaden their financing channels.

2. Literature Review

2.1. Theoretical Explanation of Financing Constraints of Low-Altitude Economic Enterprises

Classical financing theory believes that information asymmetry is the root cause of financing

constraints for small and medium-sized enterprises. Stiglitz and Weiss(1981) pointed out that in the credit market with incomplete information, banks cannot achieve clearing by raising interest rates, and instead adopt credit rationing, resulting in high-risk, light-asset enterprises being systematically excluded from the credit market (Stiglitz and Weiss ,1981). Berger and Udell (1998)further proposed the “financial growth cycle” theory, believing that enterprises mainly rely on internal financing and angel investment in the early stage, and only gradually enter the bank credit and capital market as information transparency improves (Berger and Udell ,1998).

The financing difficulties of low-altitude economic enterprises are a typical reflection of the above theories. Zhang and Xu. (2024) pointed out that the main constraints affecting the development of the low-altitude economic industrial chain include the overall weak basic capabilities of the industrial chain, insufficient support of the industrial chain ecosystem, imperfect industrial chain coordination mechanism, and insufficient precision of industrial policy support (Zhang and Xu, 2024). Liu and Wu(2025)emphasized that a financial service system adapted to the characteristics of the low-altitude industry should be constructed (Liu and Wu,2025).

2.2. Research on the Application of Innovative Financing Tools

At the tool level, scholars have discussed science and technology innovation bills, intellectual property securitization, asset-backed securities (ABS), financial leasing and policy finance. Liu and Wu.(2025) discussed the development and financial support of the low-altitude economy, emphasizing the need to build a financial service system adapted to the characteristics of the low-altitude industry (Liu and Wu,2025). In terms of intellectual property securitization, existing research has pointed out that the patent portfolio valuation method is more suitable for R&D-intensive enterprises, while the issuance threshold and the dispersion of underlying assets are the main obstacles restricting the participation of small and medium-sized enterprises. In terms of data asset financing, Zhou et al.(2025) et al. found that data asset financing business has grown rapidly since 2024, but there are problems such as lack of unified policy guidance, single model, and bias towards state-owned enterprises (Zhou et al., 2025).

In summary, existing research has initially revealed the financing constraints and financial support direction of low-altitude economy enterprises, but there are still two shortcomings: First, there is a lack of systematic examination of the operation mechanism of specific financing methods, especially the insufficient discussion on the implementation path of financial leasing ABS and intellectual property securitization in the low-altitude economy scenario; Second, few studies use the latest enterprise cases for verification analysis. The above shortcomings are the starting point of this paper.

3. Financial Leasing ABS: The Operation Mechanism of Equipment Asset Securitization

3.1. Operation Mechanism

Financial leasing ABS refers to the process by which a leasing company packages its leased assets (i.e., the rental claims payable by the lessee) into an asset pool, enhances credit through

structured design, and issues tradable securities on a stock exchange. Its core logic is the substitution of "asset credit" for "subject credit"-investors are not concerned with the credit level of the leasing company itself, but with whether the underlying assets (lease claims) can generate stable and predictable cash flow.

In the low-altitude economy scenario, the operation process of financial leasing ABS can be summarized into four stages: First, the equipment deployment stage. The leasing company purchases low-altitude equipment such as eVTOL and drones, and delivers them to the operating company through financial leasing. The operating company pays rent in installments as agreed. Second, the asset collection stage. The leasing company packages multiple lease assets (rental receivables) into an asset pool. The asset package of the first product of Science City Leasing involves 17 lessees and 23 lease assets, with low-altitude economy lease assets accounting for 50.27%. Third, the structured design and credit enhancement stage. The asset pool was divided into senior A tranche, senior B tranche and subordinate tranche. The senior tranche enjoys priority repayment rights, and the subordinate tranche provides credit buffer for the senior tranche. At the same time, the shortfall compensation commitment and third-party guarantee were introduced. China Bond Credit Enhancement Investment Co., Ltd. provided AAA-level guarantee for this product. Fourth, the issuance and listing process. The securities were listed and traded on the Shenzhen Stock Exchange. After investors subscribed, the leasing company received a return of funds and could continue to invest in new leasing projects.

3.2. Typical Case: The First Low-Altitude Economy ABS in China

On June 19, 2025, the "Jinyuan-Guojun-Science City Leasing Greater Bay Area Intelligent Manufacturing Integration (Phase II) Asset-Backed Special Plan (Low-Altitude Economy)" issued by Science City (Guangzhou) Financial Leasing Co., Ltd. as the original rights holder was successfully established on the Shenzhen Stock Exchange, becoming the first low-altitude economy asset-backed special plan in the country.

The issuance scale of this product was RMB 584 million. The interest rates of senior A1-A3 tranches were 1.9%, 2.16% and 2.26% respectively, and the subscription multiples were 4.17, 4.97 and 4.15 respectively. Among them, the issuance interest rate of senior A1 tranche set a record for the lowest issuance rate of regional financial leasing in the country. The term of senior A3 tranche was "3+2" years, which is the first asset-backed special plan with a term structure of "3+2" years in the market. Huaxia Bank Guangzhou Branch participated in the investment business of this project, amounting to RMB 104 million. The project was listed on the Shenzhen Stock Exchange on July 8, 2025, and won the annual innovative financial leasing ABS/ABN award of the "Frontier Award" for financial leasing asset securitization in 2025.

From the perspective of operational effectiveness, Science City Leasing has formed a large-scale layout in the field of low-altitude economy: by 2025, the fleet size under management exceeded 20 aircraft, with a cumulative investment of over RMB1 billion, covering core application scenarios such as low-altitude sightseeing, emergency rescue, and agricultural and forestry spraying, and has built the largest and most comprehensive low-altitude economy financial leasing service network in South China. This practice shows that financial leasing ABS

not only provides leasing companies with a standardized channel for capital return, but also transforms low-altitude equipment from “heavy assets” into “tradable financial assets” through asset securitization, effectively reducing the entry threshold for operating companies (Table 1).

Table 1. Core Elements of the First National Low-Altitude Economic ABS

Elements	Content
Original Rights Holder	Science City (Guangzhou) Financial Leasing Co., Ltd.
Issuance Scale	RMB 584 million
Listing Exchange	Shenzhen Stock Exchange
Credit Rating	AAA (China Bond Credit Enhancement provides guarantee)
Priority A1 tranche interest rate	1.9% (lowest among regional financial leasing ABS nationwide)
Asset Pool Composition	17 lessees, 23 lease assets, low-altitude economic leasing assets account for 50.27%
Maturity Structure	Priority A3 tranche is "3+2" years (first in the market)
Investment Institutions	Huaxia Bank Guangzhou Branch (invested RMB 104 million)
Listing Date	July 8, 2025

Note: Compiled from publicly available information.

4. Intellectual Property Securitization: Exploring the Path of Intangible Asset Financing

4.1. Operation Mechanism

Intellectual property securitization refers to the financing method of issuing asset-backed securities by using the intellectual property rights such as patents, trademarks, and copyrights or their derivative claims owned by enterprises as the underlying assets through structured design. Unlike financial leasing ABS which uses equipment leasing claims as the underlying assets, the underlying assets of intellectual property securitization are “intangible knowledge value”, and its operation faces more complex valuation and disposal problems.

In the low-altitude economy scenario, the operational chain of intellectual property securitization includes: First, the rights identification and evaluation stage. Enterprises confirm the ownership and value of core patents, software copyrights, etc. Second, the pledge registration and credit enhancement stage. Enterprises pledge intellectual property to guarantee institutions (such as Shenzhen Guarantee Group), and the guarantee institutions provide credit enhancement support for enterprise financing. Third, the asset pool construction stage. The guarantee

institutions package multiple intellectual property pledge financing claims into an asset pool. Fourth, the securities issuance and subscription stage. The asset-backed special plan is issued on the exchange, investors subscribe to shares, and the financing funds are invested in projects designated by the enterprise.

The key innovation of this mechanism is that it does not rely on the fixed assets or operating history of enterprises, but uses “technological value” as the credit basis to transform the most active asset form of enterprises-intellectual property-into financing capabilities.

4.2. Typical Case: The First “Dual Cross-border” Intellectual Property Securitization Project in China

On October 24, 2025, “CITIC Securities-Shenzhen Guarantee Group-No. 3 Intellectual Property Asset-Backed Special Plan” was listed on the Shenzhen Stock Exchange with an issuance scale of RMB 42 million. The pooled enterprises cover cutting-edge fields such as biomedicine, intelligent construction, and information technology (Table 2).

Table 2. Core Elements of the First National "Dual Cross-Border" Intellectual Property Securitization Project

Elements	Content
Issuance Scale	RMB 42 million
Listing Exchange	Shenzhen Stock Exchange
Original Rights Holder	Shenzhen Guarantee Group Co., Ltd.
Core model	“Dual cross-border” - overseas intellectual property domestic pledge financing and overseas funds QFII subscription
Enterprises related to low-altitude economy	Shenzhen Hailiang Technology Co., Ltd.
Pledged patents	Patents authorized by the Hong Kong Intellectual Property Department of Hailiang Technology (Hong Kong)
Purpose of financing	Supporting facilities and charging equipment for the low-altitude transportation project of "Deep Space City" at Futian Port
Listing Date	October 24, 2025

Note: Compiled from publicly available information.

The core innovation of this project lies in the “dual cross-border” model. In terms of cross-border pledge of intellectual property rights, Shenzhen Hailiang Technology Co., Ltd., as one of the pooled companies, completed the pledge registration in Hong Kong for the patents authorized by the Hong Kong Intellectual Property Department of its subsidiary Hailiang Technology (Hong Kong) Co., Ltd., and then applied for financing from Shenzhen Guarantee Group as an effective credit enhancement basis for domestic financing. The financing funds were used for the

supporting infrastructure and charging equipment project of the "Deep Sky City" low-altitude transportation project at Futian Port. This is the first time in the country that overseas intellectual property rights have been introduced to provide credit enhancement in intellectual property securitization projects. In terms of cross-border subscription, Fosun International Securities Co., Ltd. participated in the subscription as a specially invited overseas institutional investor (QFII). This is the first time in the country that overseas qualified investors have been introduced to participate in domestic issuance through QFII in intellectual property securitization projects.

The significance of this project is that it has opened up the complete chain of "overseas intellectual property-domestic credit enhancement financing-targeted investment in low-altitude projects". Hailiang Technology became the first beneficiary of the cross-border pledge innovation model of intellectual property rights. Its financing funds directly served the construction of low-altitude transportation infrastructure, forming a closed loop ofintellectual property rights-financing-industrial landing.

5. Bank Credit Innovation: From "Heavy Collateral" to "Heavy Technology"

In addition to financial leasing ABS and intellectual property securitization, bank credit is also actively exploring innovative models in the low-altitude economy field. Its core logic has shifted from "heavy collateral" to "heavy technology credit", which complements the two financing methods mentioned above (Table 3).

Table 3. Comparison of Major Financing Methods for Low-Altitude Economy

Financing Methods	Core Logic	Typical Cases	Financing Scale	Applicable Enterprise Types	Main Advantages
Financial leasing ABS	Equipment Leasing Debt Securitization	Science City Leasing's first low-altitude economy ABS	RMB 584 million	Operating Enterprises	Low Interest Rates, Long Terms, Standardized Assets
Intellectual Property Securitizatio n	Intellectual Property Pledge + Securities Issuance	"Dual cross-border" intellectual property ABS	RMB 42 million	R&D Enterprises	Activating Intangible Assets, Not Relying on Fixed Assets
Bank Credit Innovation	Technology Credit Replaces Collateral Credit	Ziyan UAV Credit Loan	10 Million Yuan	Science and Technology Innovation Enterprises with Core Technologies	Fast Approval, No Collateral Requirements
Data Asset Financing	Data asset entry + pledge / ABS	Haining Low-Altitude Data Assets Listed	Valuation Exceeds 200 Million Yuan	Operational Enterprises with Data Accumulation	Activating the Value of Data Elements

China Construction Bank Guangzhou Branch provided RMB 1.26 billion in syndicated loans for Xiaopeng Huitian flying car mass production factory. China Construction Bank, Agricultural Bank of China and CITIC Bank served as joint lead banks, and together with Bank of China and Industrial Bank, they formed a syndicate. This loan innovatively completed the "three-in-one" application process for fixed asset loans in the low-altitude economy sector, and the approval was completed within two weeks. The first loan was successfully disbursed in March 2025.

More representative is the support provided by the Zhuhai branch of China Construction Bank to Zhuhai Ziyan Unmanned Aerial Vehicle Co., Ltd. The company is a national high-tech enterprise with 141 patents and 30 software copyrights. The Zhuhai branch of China Construction Bank conducted an in-depth assessment of its intellectual property assets, gave it an M4-level science and technology innovation rating, and provided a credit loan of RMB 10 million accordingly. This practice shows that banks are exploring the inclusion of "technology credit" into the credit evaluation system to make up for the shortcomings of traditional collateral logic.

6. Challenges and Optimization Suggestions

6.1. Challenges Faced by Financial Leasing ABS

The promotion of financial leasing ABS in the low-altitude economy field still faces three constraints. First, airworthiness compliance risk. Low-altitude aircraft need to obtain airworthiness certification before they can be commercially operated. The airworthiness certification period is as long as 2-4 years. During this period, the equipment may be idle or delayed in delivery, which may lead to unstable cash flow of lease receivables. Second, residual value assessment is difficult. At present, there is no liquid eVTOL secondary market in the world. It is difficult to accurately assess the residual value of the equipment at the end of the lease term, which affects the overall valuation of the asset pool. Third, the uncontrollability of airspace permits. Airspace use permits are essentially administrative licenses and cannot be transferred or disposed of by law. Changes in airspace control and airworthiness qualifications may directly affect the operating efficiency of leased assets and rental income recovery (Yang,2026).

6.2. Challenges Faced by Intellectual Property Securitization

The core difficulty of intellectual property securitization lies in valuation and disposal. On the one hand, the value of intellectual property is highly dependent on the technical route, market prospects and legal protection status, and the valuation standards are not yet unified. On the other hand, when enterprises default, the disposal channels for intellectual property are not smooth - the buyer market for patents is limited, the disposal cycle is long, and the discount rate is high. Tingting et al. pointed out that data asset financing business has problems such as lack of unified policy guidance, single model, and bias towards state-owned enterprises(Zhou et al., 2025). The success of Hailiang Technology's "dual cross-border" case depends to some extent on the special policy environment of the Shenzhen-Hong Kong Cooperation Zone and the strong credit enhancement support of Shenzhen Guarantee Group. Whether its model can be replicated on a large scale remains to be seen.

6.3. Optimization Suggestions

First, promote the standardization of intellectual property evaluation. It is recommended that industry associations take the lead, in conjunction with assessment agencies, financial institutions, and low-altitude enterprises, to formulate intellectual property valuation guidelines for the low-altitude economy sector. These guidelines should comprehensively adopt the cost approach, income approach, and market approach, and introduce adjustment coefficients based on factors such as technical quality, market prospects, and legal status.

Second, improve the risk-sharing mechanism. For financial leasing ABS, it is recommended to develop eVTOL residual value insurance products to provide a guarantee for the residual value of equipment; for intellectual property securitization, it is recommended to establish an intellectual property disposal fund, which will acquire the pledged intellectual property at the agreed price when the enterprise defaults, providing an enforceable relief channel for financial institutions.

Third, reshape the risk control system with digital technology. Utilize blockchain to achieve intellectual property evidence storage and traceability, and monitor the status of leased equipment. Use big data risk control to integrate non-financial information such as order receipts, operational data, and qualification certifications of enterprises, constructing an industry-specific credit evaluation model for the low-altitude economy to reduce information asymmetry.

7. Conclusion

This article focuses on two innovative financing methods: financial leasing ABS and intellectual property securitization. Combining typical cases of the first low-altitude economy ABS and the first “dual cross-border” intellectual property securitization project in China, it systematically analyzes their operation mechanism and practical effects. The main conclusions are as follows:

First, financial leasing ABS transforms the future cash flow of low-altitude equipment leasing into tradable standardized securities through the transmission chain of “leasing claims packaging - asset pool construction - structured layering - exchange listing”. The practice of the first product issuance scale of Science City Leasing with RMB 584 million and the interest rate of only 1.9% for the priority A1 tranche shows that this model can effectively reduce the financing cost of low-altitude economic operation enterprises and transform “heavy assets” into “tradable financial assets”.

Second, intellectual property securitization, through the path of “patent pledge—credit enhancement—securities issuance,” transforms the most active intangible assets of enterprises into financing capabilities. The case of Hailiang Technology, which successfully raised funds through Hong Kong patent pledge and invested in low-altitude transportation projects, demonstrates that this model provides R&D-oriented enterprises with a new financing channel that does not rely on fixed assets. Its “dual cross-border” innovation further diversifies financing sources.

Third, the effective operation of both financing methods relies on the empowerment of digital

technology-blockchain solves the problem of intellectual property rights confirmation and traceability, big data risk control replaces traditional mortgage logic, and the Internet of Things realizes the status monitoring of leased equipment. Digital technology is reshaping the credit production mechanism of low-altitude economic financing.

The limitations of this article are: first, the case analysis is mainly based on publicly available information and lacks first-hand interview verification of the details of financing scheme design; second, the applicability conditions and cost differences of the two financing methods in different types of low-altitude enterprises still need quantitative testing with a larger sample. Future research can construct a calculation model that includes financing costs, risk premiums, and technology empowerment coefficients to systematically compare the efficiency differences of different financing methods.

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