EXPLORATORY RESEARCH ON VALUATION PROCESS MECHANISM OF ENTERPRISE PATENT RIGHT PLEDGE FINANCING

Jing Zhang  
Ao Chen  

Panyapiwat Institute of Management, Nonthaburi, Thailand

The qualitative research method is used in this paper to investigate the valuation behavior mechanism of FRRH patent pledge financing in Guangxi and the ASEAN High-tech Zone, China. It is found that evaluative behavior is intertwined with banking behavior and evaluative behavior. Behind the successful qualitative behavior in accordance with the process is the mechanism of the behavior process, consisting of a risk control mechanism, a market transaction mechanism, and an evaluation mechanism. Unlike the previous assessment of the intrinsic value of the patent right, from the perspective of the pledge financing situation, the paper integrates the market forces into the asymmetric relationship between risk and profitability formed by information asymmetry, explores the key behavior of the enterprise pledge patent right through the valuation process and constructs the process mechanism model. Not only is the patent characteristics and more importantly, the characteristics of pledged enterprises should be used for comprehensive value evaluation through the comprehensive service platform of patent pledge financing. Establish a fair and reasonable market value evaluation system of the patent right, so that the enterprise can obtain the price reflecting the market value of its patent transaction with patent right.

Keywords: valuation process; patent value evaluation; patent pledge financing; risk control mechanism; evaluation mechanism; market trading mechanism

Jing Zhang  
Chinese Graduate School, Panyapiwat Institute of Management, Nonthaburi, Thailand  
Research Interests: business management  
E-mail: zhangjing_flying@163.com

Ao Chen  
Assistant Professor, Chinese Graduate School, Panyapiwat Institute of Management, Nonthaburi, Thailand  
Research Interest: knowledge management, power relation, innovation, organizational studies  
E-mail: freedom_cha@msn.com
Introduction

In the context of the international development of science and technology and the accelerated development of China's strategic emerging industries, reform measures for innovation and entrepreneurship have been introduced intensively, which have stimulated the innovation vitality of the whole society.

Today, China's small and medium-sized technology innovation enterprises have become the main force for national innovation, and are an important force for China to implement innovation-driven development strategy, optimize economic structure and transform economic development mode (Chen & Wang, 2019).

Their development and growth are crucial to the healthy and sustainable development of China's economy. However, the financial difficulties of small and medium-sized enterprises, especially start-up funds, and the lack of adequate collateral in the form of fixed assets (Williamson & Olivere, 1998) make their "knowledge into productivity" an obstacle to real development. It is difficult to pledge or integrate funds in a bank corresponding to the value of the collateral. The key link in whether enterprises can pledge the patent right for funding lies in the difficulty in the evaluation of the patent right value. Therefore, it is necessary to estimate the cost of patent rights in a pledge financing situation.

Scholars' research on the valuation of patent pledge financing focuses on the government policy, legal system, and other information level, and also mostly discuss the evaluation value and index system construction of patent pledge financing through information technology upgrading around the rapid development of science and technology. The value evaluation of the patent right is mostly the monetary quantification of the patent right value based on the value itself, which belongs to the estimation of the intrinsic value of the intangible assets and is based on the concept of the income method rather than the reflection of the market price.

The above theoretical research has formed the rich research results of the valuation theory of patent pledge financing (Lai & Che, 2009; Gao et al., 2017; Liu, 2012; Lu, 2017).

However, market trading is the most consistent with the law of trading. When the required information is sufficient, the market method is operable, logical, and adaptable to all types of intangible assets. For example, when obtaining reliable transaction data, the evaluation results can be adjusted necessary at any time (Liu, 2017).

Liu et al. (2021) take the market method as the concept, and automatically evaluate the patent price with the recurrent neural network (RNN).

The maturity of the patent trading market is the key to patent pledge financing (Bezant, 1997; Edwards, 2001).

Therefore, based on the concept of a market transaction, the paper starts from the initial evaluation stage and explores the overall process of evaluating the financing of an enterprise patent pledge.

This paper consists of the literature review, research methods, research results, discussion, and conclusions respectively.

Literature review

Fishman (2003) notes that patents are characterized by originality and lack of historical data, making it difficult to establish standard valuation methods. In accordance with the
Methodological Standards for Asset Valuation - Intangible Assets, a method for quantifying the value of intangible assets is defined: market, income and cost methods and methods derived from them. Although the above methods have their advantages and disadvantages, they cannot reasonably estimate the cost of patent pledge financing. With the continuous development of technology around the valuation of patents, more advanced measurement and valuation methods have emerged.

We are improving the traditional valuation method and its applicability. For example, Yi et al. (2009) extracted 65 valid samples from U.S. District Court patent disputes, summarized 17 patent metrics describing an aspect of a patent, and built a patent valuation model.

Gao et al. (2017) used the Monte Carlo simulation method for quantitative analysis, and the results showed that the valuation of patent pledge financing considering risk is lower than that of the traditional income method. In addition, the traditional option market value evaluation method based on the Black-Scholes model has found wide innovative application in the valuation of a patent (Bloom & Van Reenen, 2002; Worner & Grupp, 2003; Agliardi & Agliardi, 2011).

A qualitative study of the assessment to a greater extent reflects the construction of the index system to determine the purpose of indicating the loan amount. As early as 1970, The American Science and Technology Indicators report, compiled and published by the US National Science Foundation, adopted the patent rights index system of the US CHI Intellectual Property Consulting Company, including the number of patents (Number of patents), the average number of patents cited (Number of patent citations), the current impact index (Current impact index), technical power (Technological power), technical life cycle (Technological cycle time), scientific significance (Scientific communication), scientific intensity (Scientific Strength).

In 2012, the State Intellectual Property Office of China and the China Technology Exchange released the “Operation Manual of the Patent Value Analysis Index System”, which built the patent value analysis index system at the legal, technical, and economic levels, which has become an important criterion for patent value evaluation in China.

However, market trading is the most consistent with the law of trading. The maturity of the patent trading market is the key to patent pledge financing (Bezant, 1997; Edwards, 2001).

Liu et al. (2021) use the market method as the concept, and automatically evaluate the patent price with the recurrent neural network (RNN). From the perspective of market concept, while there are significant differences between patents and market transactions such as patents and financial assets, they have similarities to some extent, providing an effective reference for examining the evaluation of enterprise patent pledge from the perspective of market transactions.

For example, patent rights and financial assets are equally intangible, and their value is linked to physical assets. Financial assets, such as the stock value, are linked to the operating conditions of the enterprise, and the option value of the enterprise to the value of the underlying assets, which are somewhat similar to the product value of the patent value or the value of its technological contribution to the society, and they also have the uncertainty of future benefits and risks. However, financial assets can be quickly sold on the financial trading market, which is the biggest difference between them and patent market.
EXPLORATORY RESEARCH ON VALUATION PROCESS

It is proposed in this research that the process of evaluating the pledge financing should be studied systematically and comprehensively, in accordance with the patent market transaction, from the perspective of market.

Thus, according to the research question: what is the process for evaluating the financing of an enterprise patent pledge under a market transaction? The qualitative research method paradigm is chosen to examine the whole valuation process in order to provide a reference for the subsequent evaluation of patent pledge financing in accordance with the concept of market value.

Research framework and research issues

Different value theories, if applied in practice, can lead to different value distribution results (Luo, 2004). However, the traditional value theory does not adapt to the valuation of a special commodity of purely patent rights. Since the asset portfolio theory and capital asset pricing model (Feldman, 1992; Sharpe, 1963) asset pricing theory has been developing in the West for more than half a century.

Classical finance starts from the assumption of an efficient market and takes the market price of a transaction as the theoretical value of assets (Markowitz, 1991). One of the most intriguing assumptions in this theory is sufficient information, but in reality, it is difficult to reach the theoretical state, that is, there is an information asymmetry between the supply of capital and the demand (Wang, 2016). The theoretical basis of this paper is based on the information asymmetry of one of the manifestations of the discrepancy between profit and risk. This is introduced into the patent trading market, and the theory is used to interpret the theoretical root of the credit barrier.

In a market transaction, what is the process of evaluating enterprise patent pledge financing? Based on the preliminary study, the paper traces the process of evaluating the financing of an enterprise patent pledge and corresponds to the research framework, consisting of three research sub-problems.

What is the process for evaluating a patent pledge loan through bank loan audit? This process is subject to the risk control mechanism of banks. Therefore, sub-question 1 is raised: What is the mechanism for managing risks in a market transaction with patent rights?

If an enterprise defaults or misbehaves, what is the market transaction of the pledged patent assets as non-performing assets in the market under the patent market transaction? Therefore, sub-question 2 is proposed: What is the market trading mechanism under the market trading of patent rights?

The enterprise and the pledged patent assets are subject to a comprehensive assessment. What is the evaluation mechanism? To this end, sub-question 3 is proposed: What is the valuation mechanism in a market transaction with patent rights?

Valuation research process

From a methodological point of view, the research paradigm needs to address the question: "How do researchers discover what they think can be discovered?" The discussion of methodology is limited to both ontology and epistemology (Chen, 1998). Quality research is mainly based on post-positivism, critical theory, and constructivism (Denzin & Lincoln, 1994).
Since the 1980s, theorists have borrowed from the theoretical category of post-positivism, creating phenomenology, hermeneutics, constructivism, etc., and the development and demonstration of these theories are the philosophical basis of qualitative research (Chen, 2016).

Based on the paradigm of constructivism as the philosophy, this paper examines the patent right in the situation of pledge financing, and builds a risk control mechanism, a market transaction mechanism and a valuation mechanism by participating in a continuous dialectical dialogue between the market transaction parties in the valuation process of the enterprise patent pledge financing.

The research problem of this paper relates to the "procedural" valuation research, which focuses on the study of the process of patent right in the situation of pledge financing. Therefore, it is more appropriate to choose qualitative research as a research method paradigm.

Specific data collection and analysis are performed as follows:

**Data collection**

Data collection for the article was based on a combination of fieldwork and participatory observation, while semi-structured interviews were used to collect first-hand data. First of all, the ASEAN enterprise base in Guangxi Zhuang Autonomous Region of China was chosen as a field site for participation in field research. Although Guangxi Zhuang Autonomous Region is the western region of China, its patent pledge financing work started a little later, and there is still a certain distance from Beijing, Shanghai and Guangzhou.

However, due to location advantages and experimental patent-backed funding, its patent pledge financing is unique and regional. The FRRH patent pledge funding cost estimate chosen in this paper is typical. Secondly, in order to have a deep understanding of the evaluation process, the paper adopts participatory observation to understand the financing process of enterprise patent pledge. Finally, according to the interview plan and the research sub-questions, respectively, conduct detailed interviews with the manager of the target enterprise X1, the bank manager X2, the President X3, and evaluate the manager of the company X4.

**Selection of interview subjects**

The FRRH science and technology innovation small and medium-sized enterprises involved in this paper serve as a model of the successful pledge financing of the industry in Guangxi and the ASEAN High-tech Zone, China: the science and technology innovation small and medium-sized enterprises where the patent pledge financing comprehensive service platform obtains the patent pledge loan. In order to better analyze the sub-issues, FRRH Enterprise Business Manager (X1, female, 36), BH Banking Business Manager, President (X2, male, 32, X3, male, 38) and ZDGM Evaluation Company Manager (X4, male, 35) were selected for in-depth interviews.

**Data analysis**

This chapter comprehensively uses the relevant principles of management and valuation of intangible assets based on the theory of value and the theory of information asymmetry, and based on preliminary research, with the study of sub-questions one, two and
three as the main line to transmit data through field research and in-depth interviews, and codes and analyzes the interview text data.

Research using Nvivo12.0 qualitative data analysis software, coding auxiliary analysis, the analysis process consists of two stages: first, the case of FRRH enterprise business manager X1, BH bank business manager X2, President X3 and ZDGM evaluation company manager X4 interview, and the interview data into text data, one by one using theme analysis for coding analysis. Secondly, based on the separate analysis, the above respondents are classified as one, and the overall textual data is analyzed to form a theoretical model of the evaluation process.

Finally, to ensure the validity and authenticity of the study, the interview text was "triangular verified" in combination with policy text, literature data, and respondent identification.

**Findings**

Through research, not only the key behavior of the success of an enterprise in the field of quality is formed. In addition, according to the whole process of pledge financing, the theoretical model of the risk control mechanism, the risk control mechanism itself, the market transaction mechanism and evaluation mechanism stage alternation has been built.

Based on the interview with X5 and the business process of the Nanning Agency of the Patent Office of the State Intellectual Property Office, this article summarizes the whole process of enterprise pledge patent financing for reference.

First, the enterprise offers the bank financing secured by a patent. The bank will conduct a comprehensive assessment after understanding the financing needs of the enterprise, and the valuation company will help the bank to issue a pre-assessment report. Secondly, make a loan extension according to the preliminary assessment. Once the loan extension is completed, the evaluation company will issue an official assessment report.

Then, after the evaluation company issues an assessment report, the bank and the enterprise sign the corresponding agreement. We applied to the Intellectual Property Office for pledge registration, and, finally, the enterprise received a loan from the bank.

First of all, enterprises submit their pledge patent right financing demand behavior through the patent pledge financing comprehensive service platform, and the valuation process starts in the stage of market trading mechanism. The essence of the process of evaluating the financing of small and medium-sized enterprises against the security of patents in market transactions is to compensate for the asymmetry of risk and return caused by the asymmetry of information. This is the theoretical root of whether the enterprise can successfully pledge the patent rights. From the perspective of the limited financing channels of small and medium-sized enterprises, we theoretically hope to conduct a "single-layer transaction structure".

"Market-oriented transaction structure" is a transaction formed by financial transactions formed by market supply and demand and under the spontaneous market regulation of both parties following the contract principle of voluntary transaction. (Mao & Mao, 2015). This corresponds to the "return-risk-liquidity" of financial assets. Borrowing enterprises pledge financing, purely market transactions are trade through banks and enterprises, and both parties use "return-risk-liquidity".
Compared to the ordinary loan business, it is more risky and complex, which makes the banks that accept the business bear the risk of not matching the return of obtaining the loan interest rate, resulting in the imbalance of "return-risk-liquidity". To this end, government loan is embedded in this structure to make the structure balanced to facilitate financial transactions under market transactions. "Government embedded transaction structure" makes the small and medium-sized enterprises and banks have their own risks and returns match.

Secondly, enterprises will choose banks, evaluation companies, guarantee companies, insurance companies and other intermediary service agencies in order to conduct risk-sharing for their financing behavior, which is based on the requirements of the risk control mechanism stage. Even if the enterprise can successfully obtain loan financing in the early stage, due to poor management and other reasons, the principal and interest cannot be repaid on time in the later stage. Unless the loan amount obtained by the enterprise pledged patent right can be timely obtained for risk compensation through the fair value evaluation of the trading market, then the bank's control based on the policy non-performing loan ratio will make the enterprise fail in the early transaction.

The high financing cost formed by the enterprise pledged patent right loan financing can be compensated through the discount interest subsidy of the enterprise after the successful pledge patent right, which helps the enterprises to be successfully pledged (Weng & Huang, 2017; Yang, 2017; Song & Liao, 2018; Nan & Tian, 2020).

On the one hand, the discount interest subsidy received by enterprises will have a positive impact on the market transaction behavior; on the other hand, the policy discrimination will lead to a negative effect on the market transaction behavior. Through patent pledge and release registration management, patent assets are standardized, and pledge activities are orderly.

In a market transaction, an enterprise that has chosen a valuation method will effectively act in accordance with the general valuation situation of the valuation company. Five experts evaluated the mechanism of financial, legal, technological, economic points of view of a patent agent in accordance with a single standard for the enterprise to receive a reliable evaluation report. In terms of the valuation process, the traditional valuation method follows that the enterprise pledges the patent right to accept the valuation of the company, accepts the commission for issuing the valuation report, and the bank reviews the reference valuation.

With the help of the informational resource, the platform is centralized, the patent pledge financing transaction between the bank and the enterprise has created a new balance mechanism through information symmetry and relatively balanced patent market transaction. Understand the basic behavior of small and medium-sized enterprises when applying for pledge patent financing, accept the review and control by the bank and lending institution, and then obtain the successful enterprise loans.

Finally, the appraisal company is entrusted by the bank to conduct patent pledge financing, and the evaluation report issued by the valuation is conducted according to the evaluation mechanism. At this time, if the evaluation related information provided by the enterprise is symmetrical and its financing behavior can make the risk and return of the bank accepting the pledged patent right to lend equal, the enterprise will be able to sign loan and pledge contracts with the bank, otherwise the enterprise's pledge financing transaction fails.
Although the application for financing the enterprise's demand for a patent right pledge occurs at the beginning of the evaluation process, regardless of whether a smooth transaction is based on a risk control mechanism as a precondition.

Ultimately, it depends on whether the pledged patent right can get the price that matches the market value.

**Discussion**

The patent valuation discussed in this article is carried out by enterprises under the situation of pledge financing, and has the regional characteristics of Guangxi, China. The market-value-oriented internal mechanism of the valuation process of patent pledge financing is established. Although the valuation process formation mechanism of enterprise FRRH is discussed, SMEs with light assets, similar to their own development status and regional system policies, also have theoretical applicability when determining the evaluation value of patent pledge financing and exploring the internal formation mechanism of the valuation process.

At present, the research on the valuation of patent pledge financing mainly focuses on:

1. starting from the actual observation of enterprise patent pledge financing—bank—enterprise transaction barrier and evaluation issues;
2. many studies are still in the government, politics, legal system and other information level;
3. the amount of monetary patent value based on the value itself, and the calculation of patent pledge financing evaluation value with the rapid development of information technology upgrading (Lai & Che, 2009; Liu, 2017).

Therefore, the paper is based on the experience and practice, on the basis of preliminary research, on the perspective of marketization. The value theory and information asymmetry theory of patent pledge financing, which lay a theoretical foundation for the subsequent quantitative research of patent right market value evaluation, are systematically and comprehensively analyzed in this paper.

**Research limitations and deficiencies**

This paper focuses on the qualitative research of the process of evaluating the financing of the pledge of enterprise patents in the framework of market transactions. Through targeted sampling, FRRH, BH Bank and ZDGM valuation companies of China Guangxi enterprises with successful patent pledge financing are selected as typical examples to study the internal mechanism of behavior in the enterprise valuation process.

Based on the value theory, the theory of information asymmetry is introduced into the evaluation research of the patent pledge financing. Also, the risk control mechanism, the evaluation mechanism and the market transaction mechanism of the valuation process of the enterprise patent pledge financing are studied as well.

The mechanism of internal behavior in the financing of the enterprise patent pledge under the market transaction is the overall influence of the behavior of the enterprise, the behavior of the bank, the behavior of the valuation and other multi-interest behavior of the community, and the mechanism of the behavior process described above is complex.
While this paper attempts to use qualitative research to analyze the entire assessment process systematically and comprehensively, there is a lack of statistical data, and the research samples and theoretical models have not been widely adopted.

In addition, the lack of time for research, research data and personal research ability, there are still many shortcomings in this study. In order to give a complete and universal interpretation of the theoretical model, we will continue to improve and explore in the future research and conduct a quantitative analysis of enterprise patent pledge financing under market transactions.

References:


---

Paper submitted 26 October 2022
Paper accepted for publishing 10 January 2023
Paper published online 30 May 2023