Research on Patent Value Analysis System based on P2P Lending

Kun Qian[1,a], Ling Xiong[1,b,*] and Zhong-quan Huang[2,c]

[1]School of Accounting, Nanjing University of Finance and Economics, Nanjing Jiangsu 210023, China;
[2]Jiang Wuxing Asset Appraisal Co.,ltd, Nanjing Jiangsu 210008, China;
[a]woshiqiankun2000@126.com, [b]18051965082@163.com, [c]850177930@qq.com
*Corresponding author

Abstract—**Patent backed financing has become a common mechanism for innovative firms. As valuation is a bottleneck in patent financing application. The construction of evaluation factor system can be used to screen out valuable patents. Based on patent analysis system of National Intellectual Property Administration in China, this paper designed an evaluation factor system for P2P patent financing. The analysis system includes four main dimensions: law, technology, market and licensee. The analysis system can help P2P lender to make well-founded decision as to patent collateral financing.**

Keywords—P2P lending, Patent as Collateral, Analysis System

I. INTRODUCTION

In recent years, the mode of P2P lending has developed rapidly, especially since 2015, various news reports about the financing of intellectual property pledge in P2P lending have emerged one after another. However, it is undeniable that the biggest bottleneck that affects the development of patent P2P financing is the valuation exercise, because not all of patents have economic value. At present, most patent evaluation methods are based on income method, because patent analysis is a forward-looking procedure (Mikael Collan,2013), cost method and market method are sometimes not suitable for the evaluation of intellectual property assets. Timo Fischer(2014) studied characteristic like patent scope related to patent value and the number of forward citation matters for patent collateralization. De Rassenfosse, G (2012), after studying the financing behavior of enterprises in their life cycle, pointed out that intellectual property is a financing tool that can be used in growing SMEs, and specifically discusses the feasibility of using patents, copyrights and trademarks as financing guarantees. Griliches (1998) pointed out that patents can be regarded as tangible outputs of enterprise innovation process, which is an effective robust signal for enterprises to integrate different types of knowledge and develop technology that can be applied in industry. However, a unified value type for patent pledge evaluation has not yet formed, and most scholars consider it as liquidation value. In the analysis of influencing factors of intellectual property value, Lanjouw and J O (1998) studied the impact of patent renewal years and family size on the characterization of patent value. Harhoff D. Narin F. and Scherer F. M. (1999) studied the relationship between annual maintenance fees and citation frequency of patents. Harhoff D, Scherer F M, Vopel K (2003) tried to characterize the value model of a patent by studying the information of patent declaration, test report and invalid procedure of a patent. Matsuura J H (2004) reviewed the economic models of intellectual property rights, pointing out that the most significant problem of these models is that they do not integrate legal rights into the calculation model, which will reduce the accuracy and practicability of the model results. As to P2P lending research, Zhang (2012) analyzed the panel data of Prosper.com and found that lenders of funds did not passively imitate peer lending behavior, but showed the characteristics of rational herding with positive observation behavior. Lee (2012) collected data from Korea's largest P2P platform (Pop funding) and found that lending behavior in the P2P market was significantly herding behavior. As so far, the combination research of P2P online loan and patent pledge financing is relatively rare and patent valuation analysis is the key issue of patent backed financing. This article aim to study patent analysis system based on P2P lending.

II. PATENT VALUE ANALYSIS SYSTEM

At present, there are three famous patent analysis systems which are Patent Analysis Factor System, Ocean Tom 300 index and Patent Scorecard.

A. Patent Analysis System-State Intellectual Property Office

In 2011, the State Intellectual Property Office entrusted China Technology Exchange (hereinafter referred to as "China Institute of Technology") with the task of "Patent Value Analysis System and Operational Manual Research". Under the guidance of the State Intellectual Property Office, CITIC has studied and established a patent value analysis system. The system can be divided into two levels: from the perspective of patent's own attributes, it can be divided into three indicators: legal, technical and economic and the whole item factor is decomposed into 18 supporting indicators. According to the search report, industry analysis report and other reserve materials, the candidate experts score the second level indices one by one. After weighted aggregation, these scores form a standardized and unified measurement of patent, Patent Value Degree (PVD).

B. Ocean Tom 300 index

The Ocean Tom 300 index is the world's first patent evaluation index based on the value of intellectual property issued by Ocean Tomo and American Stock Exchange in 2006. The system is a computer automatic classification tool based on artificial intelligence algorithm. It uses pre-intervention method to pre-set the weight of each patent index. Firstly, the patents are grouped, and then through computer preset algorithm and rules, according to more than 50 evaluation indicators of each patent, the ranking of enterprise stock index is realized. The main value of OT300 patent index is to forecast the value of technological innovation before the market recognizes the patented technology. In terms of index design, It has not only some basic indicators such as the number of effective patents, the average duration of patent maintenance, the proportion of patent abandonment, but also some indicators reflecting patent quality, such as one-way patent citation rate, accumulated patent citation rate, and other indicators reflecting patent market value.

C. Patent Scorecard

The patent scorecard has been issued by IPIQ Global since 1992. It includes seven lists, including Industry Scorecard and Global Patent Scorecard. For each industry, industry scorecard ranks companies based on patent quality, technology intensity and impact breadth. The specific indicators designed in the industry scorecard are technology Strength, industry impact, science strength research intensity and so on. From the perspective of patent portfolio, technology intensity is used to evaluate the company's innovation strength; Industry influence is used to quantify the impact of a company's patent portfolio in the industry; Scientific intensity is used to measure a company's patent portfolio as a whole and research intensity is used to evaluate a company's level of basic research in a particular industry compared to other companies.

III. DIFFICULTIES IN PATENT VALUE ANALYSIS WITH P2P LENDING

A. In the face of P2P lending, the difficulties of patent value evaluation are:

(1) Compared with tangible assets, the individual value of patents varies greatly. Some studies have pointed out that the distribution of patent value is a long tail, and only a few patents will produce high returns (Yu-Jing Chiu,2007); (2) The existing evaluation indicators are not easy to quantify and most of them relying on expert scoring. (3) Compared with financial institutions such as banks, P2P investors pay more attention to the first repayment ability of borrowing enterprises, lacking of understanding of the pledge value of patents, and rely more on the information provided by the partners of P2P platform to understand the pledge value of patents. The lender cannot obtain effective decision-making information.

B. In the Face of the above Problem, We Give the Corresponding Solutions:

(1) In the field of Internet finance, due to the decentralization and non-professionalism of investors, the analysis of patent pledge value should be as concise as possible,

avoid complications, so that investors can understand and make decisions; (2) The analysis of patent value should consider the impact of the licensee on the patent value. As the success rate of commercialization of enterprise patents is generally higher than that of University patents; (3) Patent value should be analyzed by objective indicators as far as possible, and when determining the weight of indicators, the analysis deviation caused by subjective judgment should be reduced as much as possible.

IV. ESTABLISHMENT OF PATENT VALUE ANALYSIS SYSTEM BASED ON P2P LENDING

As for P2P lending, intellectual property assets such as patents are the core asset of innovative firms. At present, the indicators in "Patent Analysis System" of National Intellectual Property Administration in China are not directly related to P2P lending. Moreover, the traditional patent evaluation model mainly calculates the economic value and the risk factors behind the economics value (especially legal and technical risks) are not disclosed enough. Furthermore, P2P lenders are more concerned about the first repayment ability of patent owner. Thus the credit of licensee has to be included in the analysis system. Based on the patent value analysis factor system of the State Intellectual Property Office, a new comprehensive evaluation factor system is established, which is divided into four levels: legal characteristic factor, technical characteristic market characteristic and license characteristic.

A. Indicators of Legal Characteristics

Patent is first and foremost a legal right. In order to make the evaluation of legal value operable, the legal indicators are subdivided into four supporting indicators, including: patent stability, number of claims(Lanjouw&Putnam,1998), Term of validity and Patent Family.

B. Technical Characteristic Indicators

The value of technology is to evaluate a patent from the dimension of technology quality. The indicators affecting the value of technology are divided into three supporting indicators, including: technological scope(Dang&Motohashi, 2013), technological innovation(Gambardella et al, 2008) and technological substitutability.

C. Market Characteristic Indicators

Economic value is to evaluate a patent from the perspective of market economic benefits. The value of patents will ultimately be reflected in the process of products and products, and the value of products and processes will be affected by market conditions, competitors, policy orientation and other factors. Thus the indicators affecting the economic value are identified as following: market application, market size(Yu-Jing Chiu,2007) and policy adaptability.

D. Licensee Characteristic Indicators

P2P lenders are more concerned about the first repayment ability of patent owner. The value of license is to evaluate a patent from the dimension of licensee resource(Chiu Y J,2007), The indicators affecting the value of technology are divided

into three supporting indicators: business scale, R&D strength of enterprises, corporate credit.

TABLE I.   PATENT ANALYSIS SYSTEM BASED ON P2P LENDING

Target	Criteria	Factor	Remarks
Patent value analysis	Legal A_1	Patent stability B_{11}	The length of time between the date of patent authorization and the date of patent application
		Number of claims B_{12}	Number of claims contained in the application for patent authorization
		Term of validity B_{13}	Patent Remaining Protection Time
		Patent Family B_{14}	Number of Patent Documents with Common Priority
	Technical A_2	Technological Scope B_{21}	International Patent Classifications(IPCs)
		Technological Innovation B_{22}	Patent citation(Forward citation/Backward citation)
		Technological substitutability B_{23}	Retrieval of other technical solutions to the same or similar problems
	Market A_3	Market Application B_{31}	Maturity of Patent
		Market Size B_{32}	The total possible sales revenue of the patented products
		Policy Adaptability B_{33}	Technologies Encouraged and Supported by Policies
	Licensee A_4	Business Scale B_{41}	Scale of registered capital of enterprises
		R&D Strength B_{42}	Number of authorized invention patents (rights) owned by enterprises
		Corporate Credit B_{43}	Credit situation of enterprises

V. SUMMARY

This paper constructed an evaluation factor system for patent value based on the four factors that affecting the value of patent; they are law, technology, market and licensee. The patent analysis system designed in this paper takes full account of the characteristics of P2P lending, aims to improve the objectivity and accuracy results of the patent value analysis. Finally, in the later stage, according to the further development of the national intellectual property database, the selected factors should be further expanded for forthcoming research.

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