The Theory of Internet Finance

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Abstract: Internet based technologies, such as mobile payments, social networks, search engines and cloud computation, will lead to a paradigm shift in financial sector. Beside indirect financing via commercial banks and direct financing through security markets, a third way to conduct financial activities will emerge, which we call “internet finance”. This paper presents a detailed analysis of payment, information processing and resource allocation under internet finance.

Key words: internet finance, mobile payments, social networks, search engines, cloud computation

1. Introduction

The basic function of financial sector is to intermediate funds between those in need of money and those with extra money. However, financial intermediaries don’t exist in the classic version of general equilibrium theory (Mas-Colell et al., 1995). Mishkin (1995) suggests two reasons why financial intermediaries do exist in the real world. First, financial intermediaries have special technologies and economy of scale to reduce transaction costs. Second, financial intermediaries are professional in information processing, thus alleviating adverse selection and moral hazard caused by information asymmetry.

Traditionally, there are two types of financial intermediaries, commercial banks (indirect financing) and security markets (direct financing). They play an important role in resource allocation and promote economic growth, but also incur huge costs.

Internet based technologies, such as mobile payments, social networks, search engines and cloud computation, will lead to a paradigm shift in financial sector. Beside indirect financing via commercial banks and direct financing through security markets, a third way to conduct financial activities will emerge, which we call “internet finance”. Over the past ten years, similar paradigm shifts driven by internet have occurred in areas such as bookstores, music and retail sales.

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1 For instance, physical bookstores such as Borders have gone bankrupt under competition from electronic books and online bookstores. MP3 and music sharing websites have reshaped the
Under internet finance, mobile payments of individuals will be efficiently integrated with central payment systems managed by central banks. Information processing and risk assessment will be conducted on internet and information will be highly transparent. Costs of maturity matching and risk sharing will be so low that financial intermediaries will be useless and the issuance and trading of stocks, bonds and loans will be carried out smoothly on internet. Market will be so efficient that it highly resembles the world without financial intermediaries described by general equilibrium theory. Furthermore, internet finance will be able to achieve the same resource allocation efficiency while greatly reducing transaction costs.

More importantly, under internet finance, the division of labor of modern financial industry will be meaningless and replaced by internet related technologies. Companies and ordinary people will be able to conduct various financial transactions on internet. Complicated jobs such as risk sharing and maturity matching will be substantially simplified and more user-friendly. Financial services will be available to all and everyone will enjoy the benefits derived. In this way, internet finance is more democratic instead of controlled by professional elites.

Internet finance is still in the nascent stage of development. Currently, most prominent examples of internet finance include mobile banking and peer-to-peer (P2P) lending. Internet finance will generate great opportunities and challenges. For governments, internet finance can be employed to address the problem of SME financing, promote the transparency and safety of informal financing and increase availability of financial services. However, internet finance will also bring about lots of regulatory challenges\(^2\). For financial and IT companies, internet finance will generate tremendous opportunities but also induce fierce competition. For academia, payment revolution will shed new light into monetary policy.

We are the first to introduce the concept of internet finance and present an in-depth analysis of this new concept based on case study, economic modeling, sociological study and IT know-how. Our study focuses on three pillars of internet finance. The first pillar is payment. Payment is the most important infrastructure of financial system and greatly influences the form of financial activities. The second pillar is information processing. Information is at the heart of financial activities and lays the foundation for resource allocation. For internet finance, information processing marks business model of music industry. Amazon and Taobao have seriously eroded the traditional retail industry.

\(^2\) Under internet finance, prudential regulation on financial institutions (such as commercial banks, securities firms and insurance firms) may cease to exist and to an extent be replaced by behavioral regulation and financial consumer protection.
the greatest divergence from commercial banks and security markets. The third pillar is resource allocation. Internet finance is justified by its allocation efficiency.

2. Payment under Internet Finance

Under internet finance, money and securities will be transferred through mobile communication networks.

The foundation for mobile payments is the development of mobile communication technologies, especially the high penetration of smart phones and tablets. According to Goldman Sachs (2012), mobile payments reached USD 105.9 billion in 2011 and are expected to grow at 42% annually in the coming five years to reach USD 616.9 billion by 2016. The share of mobile payments in global payment market was 1.0% in 2011 and will reach 2.2% by 2015.

Backed by Wi-Fi and 4G technologies, internet and mobile communication networks are increasingly integrated with each other and cable telephone, radio and TV networks will also be incorporated in the near future. On such a basis, mobile payments will be further combined with credit cards, online banking and e-payments and become more available, convenient and user-friendly. With the development of security software such as identity authentication and digital signature, mobile payments will be applied not only to small sum payments in daily life but also to large sum payments between companies, totally replacing payment instruments such as cash and checks.

Cloud computation ensures the storage and computing capabilities necessary for mobile payments. Despite increasingly smart, mobile communication devices can’t match PC in terms of storage capacities and computing speed due to requirements on portability and size. Cloud computation can overcome such shortcomings and transfer storage and computation from mobile communication terminals to could computation servers.

Under internet finance, payment system will have the following characteristics. First, all individuals and institutions will open accounts at the payment center of central banks for registration of deposits and securities. Second, transfer of money and securities will be conducted through mobile internet networks. Third, payment and settlement will be done electronically. The need for cash circulation will be greatly eliminated. Fourth, the division of labor between commercial banks and central banks (or the two-tier banking system) will cease to exist. If deposit accounts are all located at central banks, the theory and practice of monetary policy will be fundamentally changed (Xie, Yin, 2001). For instance, current deposits reserved for payment will
diminish and the proportion of time deposits will increase. But such a payment system won’t challenge central banks’ role in money supply. The relationship between money and price of goods won’t be fundamentally changed, either.

3. Information Processing under Internet Finance

3.1 General Views

Information about capital suppliers and more essentially capital demanders is imperative in financial activities. Mishkin (1995) points out that there are two types of information processing under direct and indirect financing. The first type is the production and sales of information by private entities. Lots of specialized institutions are established to produce information that can differentiate the quality of capital demanders, such as credit rating agencies and research teams in investment banks. Commercial banks are information producers and users at the same time and also belong to this category. The second type is information disclosure required or encouraged by governments, such as financial statements released by listed companies.

Compared with commercial banks and security markets, internet finance will differ most in its information processing. First, social networks will generate and spread information, especially information without disclosure obligations. Second, search engines will structure, sequence and index information to alleviate overload problem. Third, cloud computation will ensure rapid processing capabilities for mass information. Thus the overall picture is that, with the help of cloud computation, diverse information of capital suppliers and demanders will be revealed and spread though social networks, concentrated and standardized by search engines to produce a dynamic information sequence. With such processed information, risk assessment of any capital demander will be carried out at an extremely low cost. Thus information needs in financial activities will be satisfied in a way similar to CDS market. According to Xie and Zou (2011), CDS creates a time series of default probability via transaction mechanisms similar to social networks and search engines and is more effective than credit rating agencies. The following paragraphs will discuss the roles of social networks, search engines and cloud computation respectively.

First, social networks digitize and map social relationships into internet and serve as platforms to release, spread and share information. Social networks are based on two foundations. First, networking behaviors are intrinsic to human beings and
characterized by the attributes of exchangeability\textsuperscript{3}, consistency\textsuperscript{4}, contagiousness\textsuperscript{5} and transmissibility\textsuperscript{6} (Mungo and Contractor, 2003). Second, the development of internet and other communication technologies has reduced individuals’ costs to release information and contact with strangers, leading to new types of collaboration such as Chinese phenomenon of “Cyber Manhunt” and editing of Wikipedia (Shirky, 2008). Social networks also contain lots of relational data, i.e. information about contact, connection, community attachment and gathering (Scott, 2003).

Second, from mass information, search engines can identify contents that best match the needs of information users. Integration between search engines and social networks is inevitable\textsuperscript{7}, which is embodied in the development of social search.

Third, with the performance of IC approaching physical limits, cloud computation employs a large number of PCs to share computational tasks with great extendibility, fault tolerance and consistency of multiple backup data, producing huge computational capabilities and storage space. Cloud computation thus facilitates the processing of mass information and is instrumental in the development of search engines\textsuperscript{8}. Financial sector, as one of the biggest users of computation power, will also be influenced by the development of cloud computation.

We use a simple example to demonstrate information processing under internet finance. Individuals (or institution) have lots of stakeholders, who all have some information about their wealth, employment status, personality, etc. If all stakeholders’ information is released and pooled on social networks, and inaccurate information is disputed or filtered through social networks and search engines, we will get a reliable picture of their creditworthy. Social networks also enable the accumulation of “social capital” among people, with which costs of financial activities will drop considerably and opportunistic behaviors will be greatly constrained.

\textsuperscript{3} Conditions for people to establish relationships and access precious resources, i.e. the concepts, “courtesy demands reciprocity” and “return a favor with a favor.”

\textsuperscript{4} People have the tendency to establish communication networks with others who have similar traits, i.e. “birds of a feather flock together.”

\textsuperscript{5} How ideas, information and views are exchanged among people in a communication network, i.e. “if you live with a lame person, you will learn to limp.”

\textsuperscript{6} If individual A has a relationship with individual B and individual B has a relationship with individual C, then individual A has a relationship with individual C, i.e. “a friend’s friend is a friend and an enemy’s enemy is a friend.”

\textsuperscript{7} Technically speaking, processing of relational data has always been a major component of search engines. For instance, the “crawler” algorithm for capturing web pages and link analysis method for web page sequencing have all employed the linkage between web pages that belong to relational data. Recently, Facebook has launched Graph Search.

\textsuperscript{8} For instance, real-time search involves a tremendous quantity of computation. Google is a forerunner in the development of cloud computation.
3.2 Model

3.2.1 Assumptions

Suppose there are $n$ persons, who express their views on default probability of a person or entity (“reference entity”) by trading a financial product similar to CDS. This financial product is essentially a two-period contract with two types of participants, i.e. sellers and buyers. For one unit of financial product, in the first period, the buyer pays to the seller a premium of $s$ (also the financial product’s price); in the second period, if reference entity defaults, the seller compensates the buyer an amount of $l$. Suppose $l$ is determined beforehand and $s$ by market equilibrium. Our target is to explore the information content of $s$.

Suppose all persons have an initial wealth in the first period which exists in the form of risk-free bonds with zero risk-free rate. In the first period, every person decides whether to buy or sell the financial product and by what amount based on his information, wealth and risk preference. In the second period, if reference entity defaults, compensations between buyers and sellers are triggered. Suppose that the utility of all persons is a CARA function of second-period wealth with absolute risk aversion coefficient $\alpha$, i.e.:

$$u(w) = -\alpha \exp(-\alpha \cdot w)$$ (1)

Let’s use $Y$ to denote the fundamentals of reference entity, such as credit record, income, liabilities, etc. Suppose default of reference entity is characterized by Logistic model. If $Y + e > 0$, default occurs; otherwise, no default. $e$ is random disturbance term and follows Logit distribution with cumulative probability distribution function $F(e) = \frac{\exp(e)}{1 + \exp(e)}$. Hence, default probability of reference entity is:

$$P = \Pr(Y + e > 0) = 1 - \Pr(e \leq -Y) = \frac{\exp(Y)}{1 + \exp(Y)}$$ (2)

Suppose there are two types of information in $Y$. The first is public information, denoted by $X$. The second is private information acquired by every person, with private information of No. $i$ person denoted by $Z_i$. We introduce five assumptions on information structure.

I. $Y = X + \sum_{i=1}^{n} Z_i$, i.e. simple linear addition between public and private information;
II. For any \( i \), \( E(Z_i) = 0 \);

III. For any \( i \neq j \), \( E(Z_i | Z_j) = 0 \) i.e. private information of different persons has no correlation;

IV. For any \( i \), \( E(Z_i | X) = 0 \) i.e. public and private information has no correlation;

V. Assumption I-IV are public knowledge.

3.2.2 Model Solution

(1) Representative Person’s Utility Maximization Problem

Take No. \( i \) person for example. Based on his estimation of default probability, he decides how to buy or sell financial product in the first period to maximize expected utility.

First, No. \( i \) person has public information \( X \) and private information \( Z_i \) and his estimation of the fundamentals of reference entity is \( Y_i = E[Y | X, Z_i] \). Based on the above-mentioned assumptions, \( Y_i = X + Z_i \). Hence, his estimation of default probability is:

\[
P_i = \Pr(Y_i + e > 0) = \frac{\exp(X + Z_i)}{1 + \exp(X + Z_i)}
\]  

(3)

Second, Let’s use \( w_{i1} \) to denote the initial wealth of No. \( i \) person and \( \theta_i \) to denote financial product bought in the first period, with \( \theta_i > 0 \) meaning buy and \( \theta_i < 0 \) meaning sales. Hence, second-period wealth is \( w_{i2} = w_{i1} - \theta_i \cdot s + \theta_i \cdot l \cdot 1_{[\text{default}]} \), where \( 1_{[\text{default}]} \) indicates whether reference entity defaults.

Therefore, the utility maximization problem for No. \( i \) person is:

\[
\max_{\theta_i} E_i \left[U \left(w_{i2} \right) \right] \\
\text{s.t.} \quad w_{i2} = w_{i1} - \theta_i \cdot s + \theta_i \cdot l \cdot 1_{[\text{default}]} 
\]  

(4)

where \( E_i \) denotes conditional expectation based on the information set of No. \( i \) person.

FOC is

\[
P_i \cdot \exp(-\alpha (w_{i1} - \theta_i \cdot s + \theta_i \cdot l)) \cdot (1-s) - (1-P_i) \cdot \exp(-\alpha (w_{i1} - \theta_i \cdot s)) \cdot s = 0, \text{ thus:}
\]
\[
\theta_i = \frac{1}{\alpha l} \ln \left( \frac{P_i}{1 - P_i} \left( \frac{l}{s} - 1 \right) \right)
\]  

(5)

Monotonic increasing transformation \( S = -\ln \left( \frac{l}{s} - 1 \right) \) is introduced (or equivalently \( s = \frac{1}{1 + \exp(S)} \)). Since \( S \) has the same information content as \( s \), we will focus on \( S \) in the following analysis. Based on equation (3), \( \theta_i \) can be equivalently expressed as:

\[
\theta_i = \frac{X + Z_i - S}{\alpha l}
\]

(6)

(2) Model Equilibrium

At equilibrium, market clears, i.e. the buy and sale orders of financial product offset each other exactly.

\[
\sum_{i=1}^{n} \theta_i = 0
\]

(7)

Based on equations (6) and (7), equilibrium price of financial product is:

\[
S = X + \frac{1}{n} \sum_{i=1}^{n} Z_i
\]

(8)

(3) The Information Content of Equilibrium Price

Equilibrium price (8) embodies major attributes of information processing under internet finance. First, private information is reflected and concentrated in equilibrium price through the channel of \( Z_i \rightarrow P_i \rightarrow \theta_i \rightarrow S \). Second, in the real world, a lot of private information belongs to soft information and is difficult to be transferred to others without distortion (Petersen, 2004). However, after every person converts his private information into buy or sale of financial product, whether the information is positive or negative is revealed, thus turning soft information into hard information that is understandable to others. These two points mainly demonstrate the role of social networks in information processing.

Third, there is a relationship between equilibrium price and the fundamentals of

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9 Strictly speaking, due to the one-to-one correspondence between \( S \) and \( s \), \( \sigma \)-algebras induced by \( S \) and \( s \) are the same.
reference entity: \( Y = X + n(S - X) \). Obviously

\[
E[Y|S, X] = Y
\]  

(9)

Therefore, the fundamentals of reference entity can be correctly deduced based on public information and equilibrium price, leading to accurate estimation of default probability based on equation (2). Hence, equilibrium price can reflect all the information available. This mainly demonstrates the role of search engines in information processing, which produce indicators that contain information in a condensed and effective way (like “sufficient statistics”).

(4) The Spread of Information in Social Networks

Suppose that during a certain period, the risk aversion coefficient, private and public information all remain constant. Consider the scenario that one person spreads private information in social networks. For simplicity, assume No. \( i \) person spreads his private information \( Z_i \).

Suppose that at a certain time \( t \), the proportion of persons who know \( Z_i \) (“the informed”) is \( v_i \in (0,1) \) and who are unaware of \( Z_i \) (“the uninformed”) is \( 1 - v_i \).

Suppose that during a short moment with a length of \( dt \), the informed increase by the following proportion:

\[
dv_i = \lambda v_i (1 - v_i) dt
\]

(10)

\( \lambda \) reflects the interconnectedness of social networks. With other conditions constant, the higher interconnectedness of social networks is (higher value of \( \lambda \)), the faster information spreads. Based on equation (10), we get

\[
v_i = \frac{v_0 \exp(\lambda t)}{1 - v_0 + v_0 \exp(\lambda t)}
\]

(11)

Where \( v_0 \) is the initial proportion of the informed. When \( t \to \infty \), \( v_i \to 1 \), i.e. after a sufficiently long time, almost everyone will become informed.

Based on equations (8) and (11), the relationship between equilibrium price and time is:

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10 Under current model setting, people may deduce others’ private information from equilibrium price and adjust their estimation of default probability and trade decision, thus affecting market equilibrium. This scenario belongs to rational expected equilibrium (Huang, Litzenberger, 1988).
\[ S_i = X + Z_i \cdot v_i + \frac{1}{n} \sum_{j=1}^{n} Z_j \] (12)

Obviously, when \( t \to \infty \), \( S_i \to X + Z_i + \frac{1}{n} \sum_{j=1}^{n} Z_j \). So the spread of information is essentially a process of private information becoming public. This demonstrates the sharing and communication of information in social networks.

4. Resource Allocation under Internet Finance

4.1 General Views

Under internet finance, capital supply and demand information will be released on internet and smoothly matched. Capital suppliers and demanders will contact each other directly and conduct transactions without the help of any financial intermediary.

An example is peer-to-peer (P2P) lending such as Lending Club, which provides deposit and loan services similar to commercial banks. Lending Club is a US company founded in 2007. For qualified loan applications, Lending Club assigns internal credit ratings. Different ratings are associated with different loan interest rates. The lower the rating is, the higher the loan interest rate is. Lending Club refers to each loan as a note and publishes information of the loan and the borrower on its website for potential investors to select. For each note, the minimum amount an investor can buy is USD 25, which is small enough to ensure risk diversification. Lending Club provides instruments for investors to construct loan portfolios and trade loans. Lending Club is also responsible of loan administration, such as receiving principal and interest payments from borrowers and transferring them to investors, handling payment delay or default, etc.

Another example is crowd funding such as Kickstarter, which functions similar to security markets. Kickstarter is a US company founded in 2009. It helps creative projects to raise funds through an innovative online platform. Return to investors is in the form of project products, such as music CDs and movie posters. Investors can also recommend projects to their friends on Facebook. In April 2012, US passed Jumpstart Our Business Startups Act (JOBS Act), allowing small companies to raise equity through crowd funding.

To better explain resource allocation under internet finance, we compare P2P lending represented by Lending Club with Rotating Savings and Credit Association (ROSCA) in the following paragraphs.

ROSCA is an informal financial organization that exists almost worldwide.
Typically, an originator invites several friends or relatives to participate and meet every month or quarter for mutual assistance. For example, in coastal regions of southeast China, the number of participants is usually around 30. At every meeting, participants will lend a certain amount of money to one person on a rotational basis. According to Zhang and Zou (2007), ROSCA can be considered as a collection of P2P lending between participants who receive funds early and participants who receive funds later. Although many researchers find that ROSCA plays an important role in promoting credit availability, crashes of ROSCA do occur every so often. Zhang and Zou (2007, 2011) point out that ROSCA mainly relies on networks of acquaintances and has a safety frontier. Once ROSCA expands beyond the circle of friends or relatives, it becomes very difficult to control participants’ moral hazard, usually in the form of arbitrage among different ROSCAs. ROSCA has multiple rounds and it is almost impossible for participants to transfer their shares to others or withdraw early. When ROSCA encounters any problem, participants’ utility maximizing behaviors usually lead to “fallacy of composition”.

We can arrive at two conclusions. First, essentially, both P2P lending and ROSCA are direct lending between two individuals. In fact, according to SmartMoney Magazine\textsuperscript{11}, the founder of Prosper, the first P2P lending company, was deeply inspired by ROSCA. Hence, P2P lending can be considered as an integration between internet based technologies and informal financial organizations.

Second, in P2P lending, an investor may extend loans as small as a few dozen dollars to hundreds of borrowers, which would be unimaginable in ROSCA. This is made possible by two factors. First, in P2P lending, borrowers’ credit risk is evaluated by independent third parties. This greatly alleviates information asymmetry problem and makes transactions between strangers possible. Second, investment and loan administration are carried out by modern technologies, which reduce transaction costs substantially.

By an extension of the above logic, we believe that driven by internet based technologies, such as mobile payments, social networks, search engines and cloud computation, direct financing among people (the oldest type of financial activities in human society) will reach beyond the traditional frontier of safety and commercial viability. With little information asymmetry and extremely low transaction costs, internet finance will generate a sufficiently large “transaction possibility set” where bilateral or multilateral transactions can be carried out simultaneously, quickly and

\textsuperscript{11} “Global Lessons for Better Savings Habits”, SmartMoney, Nov 18 2011.
efficiently. Resource allocation under internet finance will maximize social welfare and promote social equality. Everyone will have transparent and fair opportunities to invest or raise money. People who have never met before will become acquaintances through internet finance, which will facilitate their cooperation in other activities.

A key concept here is “transaction possibility set”. Below is an explanation of this concept and how it is influenced by information asymmetry and transaction costs.

4.2 “Transaction Possibility Set”

We define “Transaction possibility set” as a set of one or multiple pairs of capital demander and supplier, where among each pair, the highest funding cost affordable to the capital demander is higher than the minimum investment yield required by the capital supplier. “Transaction possibility set” emphasizes that based on the price of financing, capital demander and supplier have the possibility to reach deals. But in the real world, capital suppliers usually have budgetary constraints and multiple investment opportunities. Whether a deal can be reached with a certain capital demander depends on complex conditions, which is not covered by “transaction possibility set.”

4.2.1 Highest Funding Cost Affordable to Capital Demanders

Let’s use $I$ to denote the set of capital demanders. Suppose all capital demanders are risk neutral and consider a representative capital demander $i \in I$. Assume he has an initial wealth of $E_i$ and needs a loan $L_i$ to start an investment project. The project has an expected yield of $\mu_i$, a success probability of $\theta_i$ and revenue in case of success $(E_i + L_i)\mu_i + \theta_i$ and 0 in case of failure. Assume that when the capital demander does not apply for a loan, his wealth will stay at $E_i$.

Let’s use $f_i$ to denote loan interest rate and $l_i = \frac{L_i}{E_i}$ to denote the capital demander’s debt-to-equity ratio.

Whenever expected net profit of the project $(1+\mu_i)(E_i + L_i) - \theta_i(1+f_i)L_i$ exceeds $E_i$, the capital demander will apply for a loan. This is equivalent to:

12 In other words, financing takes the form of loans. However, similar logic also applies to other forms of financing such as preferred stocks, ordinary stocks and convertible bonds.
\[
1 + f_i \leq \frac{1 + \mu_i + \mu_i / l_i}{\theta_i}
\]  

(13) gives the highest funding cost affordable to the capital demander. The higher expected yield is (higher \(\mu_i\)), the higher project risk is (lower \(\theta_i\)) or the lower leverage ratio is (lower \(l_i\)), the higher funding cost the capital demander can afford.

### 4.2.2 Minimum Investment Yield Required by Capital Supplier

Let’s use \(J\) to denote the set of capital suppliers. Assume that all capital suppliers are risk neutral and consider a representative capital supplier \(j \in J\). Suppose his capital cost (or opportunity cost) is \(r_j\). Assume that there exists transaction costs and information asymmetry between capital supplier \(j\) and capital demander \(i\).

Assume transaction costs (credit assessment cost included) equal \(c_y\) times the loan amount, where \(c_y > 0\) and higher \(c_y\) indicates higher transaction costs. Assume that even after credit assessment, capital supplier \(j\) still can’t accurately evaluate the success probability of capital demander \(i\) and underestimate it to be \((1 - \lambda_i)\theta_i\), where \(\lambda_i \in (0, 1)\) and higher \(\lambda_i\) indicates higher degree of information asymmetry.

The capital supplier’s condition to extend a loan is that, loan yield (adjusted for possible loss caused by loan default) \((1 - \lambda_i)\theta_i (1 + f_i) - c_y\) is higher than his opportunity cost, which is equivalent to:

\[
1 + f_i \geq \frac{c_y + 1 + r_j}{(1 - \lambda_i)\theta_i}
\]

(14) gives the minimum investment yield required by the capital supplier. It needs to compensate for capital cost, transaction costs, credit risk of the capital demander and information asymmetry.

### 4.2.3 Expression of “Transaction Possibility Set”

The necessary condition for a pair of capital demander and supplier to reach a deal is that the highest funding cost affordable to the capital demander is higher than the minimum investment yield required by the capital supplier, which according to (13) and (14) is equivalent to:
\[ c_{ij} + (1 + \mu_i + \mu_i / l_i) \lambda_{ij} \leq \mu_i + \mu_i / l_i - r_j \] (15)

In (15), only \( c_{ij} \) and \( \lambda_{ij} \) are determined by the relationship between the capital demander and supplier. With other parameters constant, the lower transaction costs are, or the lower degree of information asymmetry becomes, (15) is more likely to be satisfied. So the “transaction possibility set” is:

\[ \{(i, j) | i \in I, j \in J, c_{ij} + (1 + \mu_i + \mu_i / l_i) \lambda_{ij} \leq \mu_i + \mu_i / l_i - r_j\} \] (16)

The “transaction possibility set” has the following characteristics. First, it is determined by transaction costs and information asymmetry. Different levels of transaction costs or information asymmetry correspond to different “transaction possibility sets”.

Second, with other conditions held constant, lower transaction costs or information asymmetry are associated with larger “transaction possibility sets”. Under such circumstances, capital suppliers and demanders are more likely to reach deals, which is “financial deepening” in some sense.

Third, assuming transaction costs and information asymmetry cease to exist (\( c_{ij} \rightarrow 0, \lambda_{ij} \rightarrow 0 \)), the “transaction possibility set” will approach:

\[ \{(i, j) | i \in I, j \in J, \mu_i + \mu_i / l_i \geq r_j\} \] (17)

Under this scenario, as long as the expected return of a capital demander (adjusted for leverage) exceeds the opportunity cost of a capital supplier, a deal between them is possible.

5. Concluding Remarks

We have introduced the concept of internet finance and discussed its payment, information processing and resource allocation. We believe that internet finance can promote economic growth and generate considerable social benefits by increasing resource allocation efficiency, reducing transaction costs and promoting availability of financial services.

Currently, China has made the following progresses in internet finance. First, the central bank (People’s Bank of China) issues third-party payment licenses to the top three mobile operators. Second, several P2P lending companies have been established. Third, some institutions such as Alibaba have employed information on social networks to facilitate SME financing. However, lots of problems also emerge and the banking regulator (China Banking Regulatory Commission) alerted banks of P2P
lending’s risk in 2011.

We believe internet finance will become more and more important in the future. It is inevitable that internet finance will face many technological, commercial and regulatory challenges in early stages of development. But we should never deny, overlook or underestimate its huge potentials.

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