Artificial Intelligence formulated this projection for compatibility purposes from the original article published at Global Journals. However, this technology is currently in beta. *Therefore, kindly ignore odd layouts, missed formulae, text, tables, or figures.*

Analysis of the Cost and Benefit of the Combination Product of Chattel Financing and Factoring

 3
 Hong Zhang¹

 4
 ¹ Beijing Wuzi University

 5
 Received: 3 February 2015 Accepted: 4 March 2015 Published: 15 March 2015

7 Abstract

⁸ First we introduced business processes of the chattel financing and factoring financing mix.

⁹ Then we built a model of costs and benefits from the perspective of banks and SMEs, and

¹⁰ discussed the main factors affecting net profits of both supply and demand in the supply chain

¹¹ finance portfolio of products. At the same time we compared the difference from net profits of

¹² both supply and demand in the supply chain finance portfolio of products, finding that the

¹³ bank's net income is higher than the combination of a single supply chain finance product, but

¹⁴ depending on the gap between potential shortage costs of a single product chattel and the

¹⁵ financing costs plus insurance costs. Finally, we made use of dynamic game theory and game

¹⁶ equilibrium point between the two sides, and assisted in decision-making with models.

17

18 Index terms— cost-benefit analysis, combination product, chattel financing and factoring.

¹⁹ 1 Introduction b) Agent Analysis for Demand

To carry out the need-analysis, let's take Huaneng Power Plant, a coal dealer for example. Due to the coal dealer inventory of goods sent to the downstream power plant, and the inventory can be reduced, if there's not a certain amount of safety stock, goodwill will decline because of shortages, so the partnerships with downstream customers greatly reduced. Thus it's necessary to utilize own movable chattel to apply the bank for mortgage, getting some advance procurement funds for replenishment needs. When the borrower get the receivable accounts after sending goods to the downstream power plant in North China , due to the need to repay the loan, borrowers have to the needs for factoring financing.

27 Borrower's funding gap:

²⁸ 2 c) Advantages

The product use factoring financing to replace previous chattel financing, so the borrower's business chain get combined, in line with the borrowing enterprise business needs, while echoing the former to achieve closed financing as well as reducing the pressure on the credit risk of its own funds and enterprises. For banks, due to multiple financing, loan fees can be increased, and the rate of return improved.

For most SMEs, they need to rely on highspeed turnover of inventory profit, while banks in the mortgage business inventories often set rigid regulations that companies must pick up after filling the funding gap with their own funds, which bring SME dealers a certain amount of pressure on cash flow. Once the cash flow risk appears, they will not be able to complete delivery. The combination of chattel financing and factoring financing provides a good solution to this problem.

³⁸ 3 d) Suitable Users

³⁹ For dealers having a certain amount inventory as well as requiring safe stock, they're more suitable for combination

40 products are often used in the coal power industry chain of coal dealers, steel trade enterprises of steel construction

41 industry chain, tire dealers of rubber automobile industry chain, and dealers of oil, iron and other industries.

II. 4 42

Introduction to the Business Process of the Combination Product of Factoring Financing and Chattel Financing 43 There are three kinds of typical supply chain financial product portfolio. And the cost-benefit model of purchase 44 order financing and factoring portfolio construction is close to chattel financing and factoring combination, this 45 is due to the proximity of the purchase order financing and stock financing objective, that is, to purchase; the 46 bank loan amount are similar, namely as a percentage of the price of the goods; factoring financing purpose 47 are borrower to return previously. So in order to simplify the research, as well as focus on the point and avoid 48 repeated exposition, also because the reality real estate financing are more and more common, order financing 49 requirements is relatively high, so we only study on estate financing and factoring product portfolio, confirming 50 warehouse and factoring product portfolio. 51

The figure of inventory financing and factoring process (see figure ??): 52

Figure ??: Inventory financing and factoring process Dealer (SME supply chain system) first chattel mortgage 53 by way of its own stock pledged to the banks financing after the sale of goods to the core business, factoring 54 financing for loans to return chattel mortgage, and finally downstream core businesses will be paid to play 55 dedicated factoring into the bank account, ending combination product financing. 56

Operation of the process is described as follows: logistics, warehousing regulated firm and the borrower and 57 the bank signed a tripartite cooperation agreement, the borrower to the warehousing company issued a notice 58 quality, storage company sent a doublesite supervision goods, logistics and warehousing company issued a quality 59 notification letter to the bank stating goods already regulated, and completed the quality procedures, banks 60 provide financing to the borrower. Submitted by the borrower from the bank downstream from the list prepared 61 statement available to downstream buyers, accounts receivable factoring financing chattel mortgage repayment 62 of bank financing, the requirements of the goods, the bank internal downstream buyers approved line of credit, 63 to logistics and warehousing the company issued a regulatory directive shipment, after the company received 64 regulatory warehouse delivery instruction bank to release the goods to the borrower, the borrower submits 65 invoices and contracts and other materials to the bank, the bank borrowers issuing factoring financing: Bank 66 closed transfer insurance factoring financing, inventory financing for early return until the downstream core 67 businesses will be paid into the bank account factoring, the bank principal and interest after deducting factoring 68 financing, the remaining funds returned to the borrower to complete the combination of financing. 69

III. 5 70

Costs and benefits Model of the Combination Product of 6 71 Chattel Financing and Factoring Financing 72

There are several hypothetical model of inventory financing and factoring financing mix, in reality, due to the 73 vastly different enterprise's own situation and the difference of supply chain financial products of each? Business 74

inventories sales rate is constant. According to the model assumptions, the sales pace is constant, with the time 75 change, inventory change over time. (see figure 2). ii. The Definition of the Parameters Parameters and their 76 meanings shown in Table 2. Net profits of the borrower's enterprise

77

b) Bank Cost-Benefit Analysis 7 78

In the combination of business financing inventory financing and factoring, the earnings is interest in both periods, 79 the cost is the interest paid to depositors of two cycles. It follows that the bank's net income is:(see equation 80 1)?? ?? = ?? 2 ? ? ?????? * ? 1 (?? 1 2 1 ? ?? 0)?? 1 + ?? 2 * ? ?????? * ? 2 (?? 2 2 1 ? ?? 0)?? 2(1) 81

We can clearly see, the more spread of the borrower sale of goods is, the higher the income is. And the main 82 business is just the cost of borrowing the bank's earnings, so companies want to lower borrowing and lending 83 rates, as well as to compress financing time. 84

Global Journal of Management and Business Research 8 85

86 Volume XV Issue VI Version I Year 2015() C t1 t2 T1 t Q(t)

87 i. Borrower cost-benefit analysis In the combining products of chattel financing mixed by factoring financing,

88 the costs of SMEs are mainly paid to the bank's interest, premiums paid to the insurance company and the costs

89 of logistics and warehousing company. Benefits are spread from sales of goods, then we get net income derived

there from for SMEs as:?? ?? = (?? 2 ? ?? 1) ? ? ?????? 2 1 ? ?? ? ?? 2 ? ? ?????? ? ?? 2 1 ? ?? 2 ? ? 90

??????(21?1???1???1+?2???2??2)(2)91

We can clearly see, the more spread loan companies traded goods, the higher the income. And the main 92

business is just the cost of borrowing the bank's earnings, so companies want to lower borrowing and lending 93

rates, as well as financing time. 94

9 c) Bank-enterprise game analysis based on chattel and fac ⁹⁶ toring portfolio of products and a single product selection i. ⁹⁷ Differences between different financing models

The contrast between the movable part of the financing and factoring financing portfolio of products, a single supply chain financing product differentiation, and supply and demand sides of costs and benefits are discussed in this section. Because earnings of simple inventory financing are difficult to quantify, and upstream supply chain enterprises generally adopt factoring financing, the comparison with the single factoring financing has a greater value.

¹⁰³ 10 a. Comparison of bank net income

According equation 1, when chattel financing and factoring financing combine, the net income of the bank is:?? 104 ?? (combine) = ?? 2 ? ? ?????? * ? 1 (?? 1 2 1 ? ?? 0)?? 1 + ?? 2 * ? ?????? * ? 2 (?? 2 2 1 ? ?? 0)?? 2 105 bank net income of single factoring financing is, see equation 3? ?? ?? (single) = ?? 2*? ?????? *? 2 (?? 2 2 1)106 ? ?? 0)?? 2(3)?? ?? (combined) ? ?? ?? (single) = ??? ?? = ?? 2 ? ? ?????? *? 1 (?? 1 2 1 ? ?? 0)?? 1 > 0 107 The difference is the interest paid by chattel financing required. So from the bank point of view, the profits of 108 combining products of chattel financing mixed by factoring financing is higher than a single factoring financing. 109 b. Borrower's ROE comparison Since in the chattel financing and factoring financing mix, the borrower can 110 get the money first by chattel financing, to purchase, through the goods or of the production, so that no costs 111 associated with the loss is out. In single factoring financing, only when all the goods is delivered, borrowers 112 can obtain factoring financing, so there bring out the out-of-stock loss F compared to a combination of chattel 113 financing and factoring financing. In the auto supply chain system once appeared out of stock, the loss is generally 114 not brought low, because companies will lose the trust of the downstream core enterprise, and core downstream 115 businesses will actively look for other suppliers, so as for the dealers, the costs F can not be underestimated. 116

According to equation 2 when chattel financing and factoring financing is combined, the net income for borrowing businesses is:?? ?? (combined) = (?? 2 ? ?? 1) ? ? ?????? 2 1 ? ?? ?? 2 ? ? ?????? ? ?? 2 1 ? ?? 19 2 ? ? ?????? (2 1 ? 1 ? ?? 1 ? ?? 1 + ? 2 ? ?? 2 ? ?? 2)

Both make the difference, then we get, see equation 4:?? ?? (single) = (?? 2 ? ?? 1) ? ? ?????? 2 1 ? ?? ? ?? 2 ? ?????? ? 2 ? ?? 2 ? ?? 2 ? ?? 2 1 (4)

The difference between income borrower is the opportunity loss due to lack of inventory resulting subtracted from the interest in chattel financing period. ii. Dynamic Bank-Enterprise G ame Analysis a. Model Assumptions ? In the model, because the supply chain financial products are put into the credit of core business, the default risk is extremely low. It is assumed that the game model is completely symmetric information, while irrespective of credit risk. ? This model is a dynamic model. Since corporate loan demand is first proposed by the borrower to choose a single factoring financing or combining products of chattel financing mixed by factoring financing, then the bank decided to loan or not.

¹³⁰ 11 b. Analysis of Model

This model is a dynamic game with complete information. First, the decision is made by the borrower in the 131 first step to choose the combination of factoring financing or mixed-products financing; the second step is to 132 select the bank, whether it is a single factoring financing or combining products of chattel financing mixed by 133 134 factoring financing, banks can decide to loan or not according to the profits. Then we can build treelike figure of bank-enterprise dynamic game loan process (see Figure 3). A = [(?? 2??? 1)??????? 21???? 2?????? 2?? 135 136 137 138 D = (0.0)139

According to backward induction deduction, let's start the analysis from the bank. In factoring cooperation 140 with the supply chain member companies, credit risk of bank loans due to the core business of the endorsement 141 has been well controlled, and the risk of default is very low and negligible. Therefore, in the decision to loan 142 or not, credit risk is not considered, but banks need to compare with other loan yield issues. Yields factoring 143 financing is not low in bank lending products, on the one hand for small business loans, interest rates are higher; 144 145 on the other hand, to establish a cooperative relationship with the core business of the bank financing in the 146 supply chain, upstream and downstream supply chain enterprises will become potential customers, in the long 147 run, comprehensive income is higher, and the bank would be happy to participate, so the banks will choose 148 to loan lending companies factoring financing. In the process of combining inventory financing with factoring financing, absolute returns of banks are higher than single factoring financing, and the difference is the interest of 149 chattel financing. So the banks will loan to combining products of chattel financing mixed by factoring financing. 150 Shall we select a single borrower in the end supply chain financing or a combination of movable and The key 151 is to look at the opportunity cost F arose by shortages. If out of costly business losses resulting potential loss is 152

large, that is, F cost more than the sum of chattel financing and insurance expenses, that is: F > ?? 2 ? ? ??????154 ? (? 1 ? ?? 1 ? ?? 1 + ?? 2 1

), the borrower can choose a combination of financing, at this time the dynamic equilibrium is point C. If the shortage cost F is less than the sum of chattel financing costs and insurance cost, that is: F < ?? 2 ? ? ?????? ? (? 1 ? ?? 1 ? ?? 1 + ?? 2 1

158), the borrower would choose a single factoring financing, then the dynamic equilibrium is point A.
 159 IV.

¹⁶⁰ 12 Empirical Analysis a) Case Background

i. Introduction Let's take enterprise X for example, a coal dealer in Huaian City, Jiangsu Province. X was
established in July 2001, the registered capital is 300 million yu an, and the legal representative invested 2
million yu an accounting for 67% while other individual shareholders accounted for 33 percent. It is a limited
liability company. The company's main business is coal operation in Huaian, as well as transportation of deputy
battalion coal and other commodities. There are 30 employees.

¹⁶⁶ 13 ii. Enterprise production and management

Enterprise X has run business in Huai'an area for many years. It acquired a good reputation in the market and produced a relatively high quality coal, and has become one of the major coal Huaian local dealer. Its annual average sales are 90 million, and average annual net profit is 5 million, with the assets debt ratio of 65%, below the lower level of traders. The financial risk is relatively controllable, as well as the inventory turnover rate is faster than their peers accounts, and receivable payment is guaranteed. The company's management has a wealth of management experience, hoping to forge ahead and expand high-quality market, but they are more sensitive to market risk.

Enterprise X on downstream customers is relatively stable, long-term cooperation with the upstream 174 175 Zaozhuang Coal Co., Ltd. Wang Chao. Wang Chao Coal is one of the largest coal mine in Zaozhuang Tengzhou 176 City, with more than 1,800 employees, up to 80 million tons of coal reserves, more of which is 5500 kcal high-177 quality coal. Since Huai'an and Zaozhuang are similar cities along the Beijing-Hangzhou Grand Canal, the cost for coal to arrive at Huaian by sea is low. The two sides have much cooperation and high degree of mutual trust. 178 Enterprise X's downstream major customers is local power plant in Huaian, such as Huaneng Huaiyin Power 179 Plant, Plant Huai'an, Huai'an biomass power plant, as well as a small amount of coal supplied to the needs 180 of enterprises and institutions. Most of downstream customers have a fairly good comprehensive strength, and 181 the repayment of accounts receivable is timely and stable with good reputation. In addition, the enthusiasm of 182 cooperation is high. 183

iii. Introduction of bank-enterprise cooperation Bank S is the national joint-stock commercial bank which
entered into Huai'an early. Compared to state-owned banks, the customer acceptance is lower in third-tier cities,
so bank S actively runs characteristic business, which mainly targets SMEs. With a supply chain financial services
to open the market, SMEs favour bank S most. Enterprise X and bank S began factoring financing cooperation in
2012 and achieved win-win cooperation, and in 2014 they started to carry out a combination of business personal
property financing and factoring financing, so the recognition between the two parties is high.

¹⁹⁰ 14 b) Enterprise X's Application of Chattel Financing and ¹⁹¹ Factoring Financing

On May 1 2014, Enterprise X and Huaneng Huaiyin Power Plant signed a supply contract, which required supply 18,000 tons standard coal of 5,500 kcal or more to prepare for the summer peak before June 1, 2014. The two sides agreed on a purchase price for P2 (550 yuan / ton), and an account period for T2 (about three months).

Enterprise X has Q (O) (20,000) tons of inventory in the Zaozhuang Grand Canal Dock (purchase price Pi is 500 yuan / ton) to provide for the downstream buyers. Because Wang Chao coal mine is relatively strong, Enterprise X is required to pay the bill in advance in each purchase, and it takes 1-2 weeks before freight arrives at Zaozhuang Grand Canal Dock. At the same time due to the slow shipping from Zaozhuang to Huai'an, which takes a week and a half, Enterprise X needs long time to stock and transport.

Enterprise X needs five days to complete transporting 18,000 tons of coal, and the daily transportation is D (3600 tons). The average transport is 600 tons per vessel in the Beijing-Hangzhou Grand Canal, which needs six ships a day. The price is 25 yuan per ton from Zaozhuang to Huai'an, and logistics costs 450,000 and warehousing costs 10,000 yuan. So the total is C (46 million). Inventory changes (see Figure 4).

²⁰⁴ 15 Global Journal of Management and Business Research

205 Volume XV Issue VI Version I Year ()

206 **16** C

207 Interpretation of contract between enterprise X and upstream or downstream companies i.

²⁰⁸ 17 ? Signing a chattel financing contract

Enterprise X is using trade finance with stronger competence, at the same time, it carries out direct marketing to the downstream plant, and its repayment ability is guaranteed with low risk, so the bank S agreed to give

X corporate chattel financing. On May 1, 2014, Enterprise X and bank S signed a chattel financing agreement.

The chattel financing ratio can not exceed 70% of the value of freight, and the loan interest rate is RI (9%),

and the period Tl is no more than three months. In the period from the date of the application of the borrower

to the sales to power plant, the first beneficiary of property ownership is bank S, Enterprise X assume joint

responsibility to protect individuals, and must apply for property insurance. The first beneficiary is bank S.

²¹⁶ 18 ? Signing factoring financing contract

²¹⁷ Huaneng Huaiyin Power Plant is an important branch of business of Huaneng Group, and is the largest thermal

power plant in Northern regions. The total installed capacity is 1.8 million kilowatts with strong profitability, so the plant is the core customer of bank S. The bank agreed to grant factoring financing.

Enterprise X and bank S signed the factoring financing contract. The contract stipulates factoring financing ratio does not exceed 70% of the accounts receivable, and the loan interest rate is R2 (8%), and the financing terms T2 does not exceed six months.

223 19 c) Parameter Assignment

224 Parameters and their meanings, values shown in Table 2: ii.

Calculation of bank-enterprise costs and benefits i.?? ?? = ?? 2 ? ? ?????? * ? 1 (?? 1 2 1 ? ?? 0)?? 1 + ?? 226 2 * ? ?????? * ? 2 (?? 2 2 1 ? ?? 0)?? 2(6)

?? ?? ?? = 550 ? ? 3600???? * 0.65(9% Obviously, now bank S's earnings in combined financing is higher than the previous single factoring financing.

229 20 ? ROE comparison of enterprise X

In the research process, the corporation highly recognized compared to single factoring financing, chattel financing and factoring financing can advance a certain period to get liquidity as well as pre-arranged purchasing stocking. Wang Chao coal mine requires getting money 1-2 weeks before delivery, and transportation by ship from Zaozhuang to Huai'an also needs about 1-2 weeks, so the two cycles equal to nearly a month, and this is just X's chattel financing business cycle. So compared to the original one, single factoring financing is able to solve the problem of pressure on the stock, and to meet the urgent needs of power plant orders.

Based on past experience, there will be many plants suddenly asking enterprise X for goods in the year, and their inventory can not only meet a one-time large orders, but also is difficult to guarantee delivery plant at a predetermined time. Power thus considers X having insufficient strength, and may turn to dealers of other coal purchased next time. Years of hard business enterprise market share of X will decline. Profits on the account

will suffer an annual loss of 150,000, not

²⁴⁵ 21 Calculation of enterprise X's costs and benefits

 246
 According to equation 1 we can obtain the net benefit of the bank: see equation 7.?? ?? = (?? 2 ? ?? 1) ? ?

 247
 ?????? 2 1 ? ?? ? ?? 2 ? ??????? ? ?? 2 1 ? ?? 2 ? ? ?????(2 1 ? 1 ? ?? 1 ? ?? 1 + ? 2 ? ?? 2 ? ?? 2) (7)

 248
 ?? ?? = (550 ? 500) ? ? 3600???? 6 1 ? 460000 ? 550 ? ? 3600???? ? 0.3% 6 1 ? 550 ? ? 3600???? (6 1 0.65 ?

 249
 9% ? 1 12 + 0.7 ? 8% ? 1 4) = 223,400yuan

Bank-enterprise game analysis of equilibrium ? Spreads contrast of bank S Bank S obtained conventional income of single factoring financing interest.

According to equation 3, we can calculate the net benefit of the bank in single factoring financing from equation 8: see equation 8.

- 253 8: see equati 254 ii.
- 254 i
- 255 iii.

including losses resulting good will. F therefore is more than 15 million.

²⁵⁷ 22 d) Dynamic game analysis

According to the analysis of models and assumptions of dynamic game model with complete information in 1.3.2, we obtained bank-enterprise treelike figure as follows (corporate in the front, the bank in the post), (see Figure 5). According to backward induction deduction, let's begin to analyze from bank S. Bank's selection to loan or not is based on the comparison of other loan products, if other comprehensive income products are high, bank S may not give supply chain financial products loans. Because supply chain finance has a core business of credit repayment guarantee to do, the bank's risk is lower compared to other products, while banks can greatly the core business as a link to the upstream and downstream industry customers. In this process the bank can also provide consulting, financial and other intermediary services for related enterprises. Therefore bank S will choose

266 to lend.

- The borrower enterprise X choose combining products of chattel financing mixed by factoring financing or single factoring financing? It depends on which situations has higher returns for enterprise X. Compared to
- single factoring financing, combining products costs higher in two parts, one is the cost of insurance, and the
- second is interest generated in chattel financing period. And compared to single factoring financing, combining
- products have a shortage cost F, according to X's own situation, F strikes \$150,000, more than two parts of cost
- of a single product. Therefore, enterprise X will choose the combining products, and the equilibrium point at this time is C. $^{1\ 2}$



273

Figure 1:

 $^{^{1}}$ © 2015 Global Journals Inc. (US)

 $^{^{2}}$ © 2015 Global Journals Inc. (US) 1

1

Parameters Meanings

- Q(t) Change in inventory over time
- D Slope of inventory over time(positive value)
- P 1 Purchasing price(yuan/ton)
- P 2 Sales price(yuan/ton)
- ? 1 Inventory pledge rate
- T 1 Time for inventory financing(year)
- ? Insurance rates
- R 0 Bank average cost(interest paid to customers)
- R 1 Inventory financing rates
- T 2 Time for factoring financing(year)
- C Storage costs and others
- R 2 Factoring financing rates
- ? 2 Factoring financing ratio
- F Opportunity cost of shortage
- ? 1 Net profits of the bank
- ? 2

Figure 2: Table 1 :

 $\mathbf{2}$

Q(t)20000 18000

 $5 \ 6$

Enterprise X signed a financing contract with the bank

1

Parameters Q(t) Meanings Change in inventory over time Initial inventory Slope of inventory over time(I Q 0 D P 1 P 2 ? 1 T 1 ? R 0 R 1 T 2 C

R 2	Factoring financing rates
? 2	Factoring financing ratio

- F Opportunity cost of shortage
- ? Calculation of bank S's costs and benefits

Figure 3: Table 2 :

274 .1 Acknowledgements

- 275 [Thunder bird International Business], Thunder bird International Business (6) p. 2010.
- ²⁷⁶ [Seifert] , R Seifert . International Commerce Review (1) p. 2011.
- [Bergera and Udell ()] 'A more complete conceptual framework for SME'. & Bergera , Udell . Journal of Banking
 and Finance 2006.
- [Mathis and Cavinato] Finance the Global Suppply Chain: Growing Need for Management Action, F Mathis , J
 Cavinato .
- [Hofman ()] 'Inventory financing in supply chains-A logistics service provider approach'. Erik Hofman . International Journal of Physical Distribution & Logistics Manangement 2009. (9) p. 39.
- 283 [Logistic Management ()] Logistic Management, 2005. p. .
- 284 [Group ()] Supply Chain Finance Benchmark, Aberdeen Group. 2006.
- [Han-Christian et al. ()] 'Supply Chain Finance: Optimizing Financial Flows in Supply Chains'. Han-Christian
 , Moritz Pfohl , Gomm . J]. Logistic research 2009. (1) .
- 287 [Hofman] Supply Chain Finance: some conceptual insights, Hofman .