Optimal Term Rates for Supply Chain Finance

Extended Abstract

A challenge for many small suppliers is the access to financing. In particular, they find it difficult to finance their production cycle, since after goods are delivered most buyers demand 30 to 90 days to pay (Esty et al. (2016)). The unpaid invoices appear as accounts receivable on the supplier’s balance sheet, which is not a liquid asset. Since the small suppliers already have their limited capital tied up by their inventory, work-in-process and raw materials, the delayed payment could be financially harmful during their operations. Meanwhile, they usually face high borrowing rates due to low credit ratings. On the contrary, their buyers, possibly larger and more solvent, tend to enjoy a higher credit rating than them. The small suppliers hope to shorten the payment period, but the large buyers prefer a longer payment period to free up their own cash, resulting in a dilemma in choosing the appropriate payment period.

To resolve the above dilemma, Reverse Factoring (RF) has become increasingly popular as a solution to take advantage of the credit arbitrage between buyers and suppliers (Yang and Birge (2013)). Reverse Factoring, also referred as Supply Chain Finance (SCF), is a form of supplier financing that involves a third party, such as a bank. The sequence of events under the RF arrangement are as the followings: 1) after the supplier delivers goods and invoice to buyer, the buyer sends the approved invoice with the amount of its accounts payable and the due date to a selected technology platform; 2) the supplier views the approved invoice on the platform and decides whether
or not to request an early payment of all or portion of its accounts receivable; 3) if an early payment is requested by the supplier, the bank will review and approve the payment request; 4) upon approval of the request, the bank sends the discounted amount of payment to the supplier at the pre-negotiated interest rate, i.e., charging the supplier an interest payment; and finally, 5) at the payment due date, the buyer remits the financed portion of the supplier’s accounts receivable to the bank and the remaining portion (if any) to the supplier.

Clearly, the premise for the RF arrangement to work is that the interest rate charged by the bank under the RF arrangement should be lower than the supplier’s own per period bank borrowing rate; otherwise, the supplier has no incentive to participate. On the other hand, since the buyer is liable to the bank for the financed portion of the supplier’s accounts receivable at the payment due date, it would be profitable for the bank to offer the service as long as the RF interest rate is higher than the buyer’s per period bank borrowing rate. A question of interest is to determine the optimal range of the RF interest rate that will ensure the participation of both the supplier and the bank under RF. In order to determine the optimal range of the RF interest rate, we need to analyze the supplier’s dynamic cash management problem.

Specifically, we consider an infinite-horizon cash management problem for the supplier. In each period, the supplier experiences a random cash shock. We assume the supplier is holding a cash account with the bank. Before the cash shock realization, the supplier can adjust the cash level up or down to a new level by either taking a short-term loan (paying its own interest rate) or making a short-term investment (earning risk-free interest rate). At the end of each period, if the cash position is negative, then the supplier pays an interest cost at its own rate (e.g., interest charged on the business revolver account). If the cash position ends positive, there is no cost incurred, nor is interest earned (supplier needs to make an investment decision at the beginning of a period to earn an interest). Because the interest cost of an ending negative cash position is the same as the interest cost of the short-term loan for the supplier, it effectively rules out the option of taking a short-term loan at the beginning of a period as the supplier can always do better without using it.
After netting out the cash flow in each period, we then calculate the supplier’s cash gain in that period. The supplier’s goal will be maximizing its accumulated cash gain.

We have elaborated that: (1) the supplier’s dynamic cash flow problem is concave in its cash decision in each period; (2) the optimal cash policy of the supplier, similar to the policy in Eppen and Fama (1969), has an invest-down-to level and a borrow-up-to level in each period, and the cash borrowing amount is capacitated by the current available amount from RF; (3) the levels depend on the supplier’s initial cash level in each period, therefore the optimal policy is not a threshold policy. Moreover, the optimal RF interest rate hinges on three factors: (1) the interest rate gap between the supplier and the buyer; (2) the financial status of the supplier, which is its initial cash and the scale of the outstanding accounts receivable from the buyer; (3) the targeted payment term extension as opposed to the original fixed-term arrangement.

References


Yang, S Alex, John R Birge. 2013. How inventory is (should be) financed: Trade credit in supply chains with demand uncertainty and costs of financial distress. *Available at SSRN 1734682*.