

The effect of reverse factoring financial changes on supply chain**Murad Ali Ahmad Al-Zaqeba^{a*}, Baker Akram Falah Jarah^a, Sakher A. I. Al-Bazaiah^b, Sari Sulaiman Malahim^c, Aiman Mahmoud Abu Hamour^d, Abdul Razzak Alshehadeh^e, Zeyad Almatarneh^a and Haneen A. Al-Khawaja^f**^aFaculty of Business, Amman Arab University, Amman, Jordan^bAl-Balqa Applied University, Faculty of business, the Hashemite Kingdom of Jordan, Jordan^cAl-Balqa Applied University, Amman University College for Financial and Administrative Sciences, Department of Banking and Financial Sciences, the Hashemite Kingdom of Jordan, Jordan^dAl-Balqa Applied University, Amman University College for Financial and Administrative Sciences, Accounting and Accounting Information System Department, the Hashemite Kingdom of Jordan^eAl-Zaytoonah University of Jordan, 11733 Amman, Jordan^fSwiss FinTech Innovation Lab, University of Zurich, Switzerland**ABSTRACT***Article history:*

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The consequences of reverse factoring in a supply chain are examined in this article. Reverse factoring occurs when a buying firm offers a reduced short-term borrowing rate to a supplier company in exchange for longer payment terms. From the standpoint of a supplier, this paper investigates the impact of rating changes, interest rate fluctuations, and business cycle position on the cost-benefit trade-off in the SMEs and manufacturing companies. However, the data was collected using a questionnaire. The main result is that changes in critical financial variables like ratings, news alerts and interest rates will shift former win-win circumstances for the supplier dependent on the business cycle into win-lose situations for the supplier. Overall, the reverse factoring results reveal sophisticated trade-offs, necessitating careful consideration in managerial decisions.

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1. Introduction

Providing financing to a supply chain partner is a typical event in many sectors. Supply chain requires coordination for all actions taken to increase profits and consider the impacts which would occur. Lack of good coordination will reduce the total profit. This is because all parties in the supply chain have their own goal of maximizing their own profits. However, extending trade credit is widely used to facilitate sales and a variety of other purposes (Spekman & Davis, 2004; Venkatesh et al., 2020; Di Vaio & Varriale, 2020; Lam & Zhane, 2021). Upstream funding such as prepayments is less widespread and limited to certain industries. The applicable capital cost is determined by the capital structure of the company, which includes both equity and debt. As a result, the weighted average of these components reflects the capital costs. The smaller related marginal and capital burdens interest bearing cost, the greater the trade credit offered by own suppliers. Net working capital is the difference between trade credit and short-term assets. As a result, if a supplier's trade credit is increased throughout the supply chain, a customer's net working capital is reduced (Ayoush & Rabayah, 2020; Jarah et al., 2022a; Almatarneh et al., 2022). The idea behind Supply Chain Finance (SCF) is to manage cash flows in trade agreements in a more intelligent and cost-effective way. However, supply chain finance leads to in win-win outcomes for all parties (Wang et al., 2021; Chen et al., 2022). Moreover, the financial consequences of supply chain financing, on the other hand, are dynamic and nonlinear. This form of upstream funding is possible because of a variety of modern instruments, including Reverse Factoring. In academic literature, the terms reverse factoring and supply chain finance are frequently interchanged (Wuttke et al., 2013). Reverse factoring accounts for around 3% of the total factoring market. Factors Chain International estimates that global factoring will increase dramatically over the next few years. The buyer is at the center of reverse factoring. Suppliers are given a

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financial tool by the buyer to pre-fund their receivables at the buyer's credit conditions (Safina & Oseni, 2021). The buyer must thus have a better credit rating and a lower interest rate than the provider for such plans to benefit the supply. However, two primary incentives can be recognized in order to be concurrently helpful to the buyer; to decrease one's own costs and risks of upstream financial supply chain (Heydari et al., 2018). In practice, extending the buyer's payment terms with suppliers is a common way to reduce one's own cost. It lowers the net working capital of the customer and, often, the supplier. In the literature, reverse factoring models have mostly been studied in very generic and stylized models. This paper focuses on reverse factoring in the manufacturing and SMEs (Mrayyen et al., 2018; Malkawi et al., 2019; Mohammad et al., 2020; Alzaqebah et al., 2021; Delventhal et al., 2021).

This paper investigates the influence of interest rates and ratings in triggering the cost–benefit distribution between parties involved in exchange for longer payment periods on the buy-side (Wuttki et al., 2019). Thus, this paper differs from the existing literature by addressing inverse factoring of the interest rate range useful throughout the business cycle. As well as addressing the impact of external and internal factors on benefit - cost trade off in term of supply chain, which is also related to interest rate differentials, company news, company ratings and central bank rates and is also particularly relevant in the era of COVID-19 and low interest rates as well as in SMEs (Alzaqebah et al., 2021a; Wiedmer & Griffis, 2021; Beyer & Herzog, 2021; Gupta & Soni, 2022).

2. Literature Review

Working capital optimization is the subject of a growing amount of supply chain finance literature. Under specific supply chain arrangements, previous literature examined the entire network and either buyer–supplier connections (Borodin et al., 2016; Wiedmer & Griffis, 2021; Sah et al., 2022; Tseng et al., 2022). The trade credit literature was reviewed in general by Fabbri and Klapper (2016); Dary and James (2019); Cheung and Pok (2019) and Zhang and Zhang (2022). In addition, Wetzel and Hofmann (2019) distinguished traditional, alternative, and progressive supply chain techniques to present an overview of the working-capital literature. On other hand, Chen and Liu (2021) performed a specific review on SCF and Blockchain. In the context of determining borrowing rates, reverse factoring has some advantages and the risk-cost differentials. Supply chain finance was defined by Legrand et al. (2022) as interest rate arbitrage, with the capital cost rate as the central starting point for optimization. El-Said (2020) emphasized that also the significance of payment term extensions in addition to the function of rate spreads and credit ratings as crucial considerations. Di Vaio et al. (2020) investigated the quantitative and qualitative benefits of complex working capital models. Lower borrowing costs, as determined by the weighted capital average cost, led to increased liquidity and cost reductions (Le et al., 2020; Begeau, 2020; Lopez et al., 2020; Alzaqebah et al., 2021b; Hossain et al., 2022).

In practice, there are various interpretations of reverse factoring (Wang et al., 2021). Advanced reverse factoring, for example, is defined by bringing together many buyers and suppliers to maximize flexibility. Wutke et al. (2014) investigated automated reverse factoring platforms based on information technology. With the added flexibility of automating participant data starting at cost, receivables can be discounted manually or automatically with the focal buyer. In addition, the potential for interest rate differentials within an optimized supply chain framework was investigated by Randall and Farris (2019) and discovered beneficial co-benefits, which is relevant to this paper. Similarly, Wetzel and Hofmann (2019) investigated win–win possibilities in supply chain finance in a generic inter organizational framework. Surprisingly, in research performed by Marche et al. (2020) interest rates are not explicitly considered in their analysis.

According to Wetzel and Hofmann (2019), the current low interest rates can be avoided by paying off debt early without obtaining payment terms with suppliers. As a result, there are a few studies on interest rate differentials over the business cycle in the literature. This paper examines the interest rate differential's role in bridging this gap. Zhao et al. (2021) used a simulation approach to investigate the win–win situation of reverse factoring and discovered that it is highly dependent on market factors, particularly interest rates; they regarded rates as if they were a constant exogenous variable. Similarly, Chabib et al. (2022) indicated the benefits and drawbacks of reverse factoring in great depth. In fact, they emphasize the benefits of SMEs, particularly the importance of interest rate arbitrage. On the other hand, Van der Vliet et al. (2016) examined the impact of reverse factoring on operational financial decisions. They said that, as long as the payment duration remains the same, reverse factoring is always superior to traditional debt finance from the supplier's perspective. Extended payment periods have a significant impact on the supplier's benefits. In that regard, this work investigates this idea empirically in light of the current low interest rate environment.

Pérez-Elizundia (2020) and Beyer and Herzog (2021) examined the advantages of reverse factoring, notably from the standpoint of suppliers. Some other variables such as cost structures, knowledge asymmetries and payment term extensions were investigated. This approach was expanded to automated and manual discounting by Xu et al. (2022); Abbasi et al. (2022) and Vander-Vliet et al. (2016). In the event of cash constraints, manual or selective discounting allows the provider to choose between selling and discounting receivables, whereas all receivables are sold at the earliest opportunity which indicates automatic discounting. Interest arbitrage discovered by Gruter and Wutke (2017) indicate that suppliers operate in a dynamic market; they examine price reductions and payment term extensions by suppliers, in addition to identify a range of benefits to the buyer, even if the customer's credit rating is bad. Suppliers, on the other hand, gain benefits in addition to

interest arbitrage through an additional liquidity option if other funding sources are limited. As a result, powerful suppliers are likely to refuse reverse factoring due to their own favorable financing terms (Lekkakos & Serrano 2016). However, most studies regard financial institutions to be a component of the supply chain. Similarly, research based on the literature reviews the research that based on market rates, observable risk spreads and rating spreads over the business cycle is sparse, according to. Indeed, by focusing on interest-bearing financing's marginal cost–benefit implications (Maudos & De Guevara, 2004; Boahene et al., 2012; Omar & Makori, 2018; Cheng et al., 2020; Cowling et al., 2020; Naili & Lahrichi, 2022).

3. Hypothesis Development

When companies aim to grow, they need capital. Two financial resources are generally used to meet the capital need. These resources are foreign resources and own resources. The foreign source refers to the obligations of the company to the creditors that require repayment in certain periods (Thakor, 2020). Revealed the information system provides financial information with a high predictive power which assists the users of the system (Jarah & Almatameh, 2021). On the other hand, equity is the portion of the company's assets remaining to the shareholders after meeting its liabilities to the creditors (Wooldridge, 2010; Berk et al., 2012: 29). While the foreign resource is provided only from outside the company, the equity can be obtained from within or outside the company (Harrigan & Wing, 2021; Jia et al., 2020). In addition, Chambers & Quiggin (2009) showed that financial and operating decisions are separable when the capital markets are frictionless. In this case, the source of funding does not affect the operational and investment plans. However, information asymmetry and current costs cause financial constraints when companies attempt to access the capital market. In addition, Omoregie et al. (2019) found that there is no evidence for the profitability and liquidity trade-off as a function of capital structure. Löfsten (2016) states that the trade-off between products is affected by some factors including business cycle. Moreover, Tanrisever (2009) investigated the effect of reverse factoring by considering the effect of reverse factoring on current expenses. However, Tanrisever (2009) modeled reverse factoring in a risk-insensitive framework and did not consider capital costs. Van der Vliet et al. (2016) showed that extended payment periods within the framework of reverse factoring can significantly reduce the economic benefits of reverse factoring. In addition, Lekkakos and Serrano (2016) discuss the inventory policies of firms under reverse factoring. Chen & Liu (2021) found that uncertainties in OEM' demands increase the demand for supply chain financing. In another empirical study, Kouvelis (2021) showed that there are two types of supply chain financing, reverse factoring and order financing, that are widely used. The same study reports that while reverse factoring reduces the companies' cost of capital, order financing has the opposite effect on the cost of capital, order financing issue and compared with reverse factoring (Tanrisever et al., 2015). Nonetheless, based on the above discussion, this paper assumes the following hypotheses:

H₁: *Business cycle position positively affects the benefit and trade-off.*

H₂: *Interest rate changes positively affect the benefit and trade-off.*

H₃: *Rating changes positively affect the benefit and trade-off.*

H₄: *Rating changes and central bank decisions positively affect the interest rate differential.*

H₅: Financial changes (news alerts, interest rates, ratings) positively affect supplier contingent.

4. Methodology

This paper aims to assess the effect of reverse factoring financial changes on supply chain in SMEs and manufacturing companies in Jordan. However, Descriptive analytical approach was used to the hypothesis of the study. 1853 questionnaires out of 2342 questionnaires were collected from respondents, working in Jordanian manufacturing companies as well as small and medium-sized companies.

5. Results

In this section, we present the results of the regression analysis for testing the first three hypotheses of the survey. Table 1 presents details of the survey.

Table 1
The results of regression analysis for testing the first three hypotheses

I.V	Model Summary		ANOVA		Coefficients			
	R	R ²	F	Sig F*	B	standard error	T	Sig T*
Business cycle	0.781	0.671	138.485	0.000	0.476	0.014	17.642	0.000
Interest rate change	0.761	0.632	184.684	0.000	0.451	0.027	16.421	0.000
rating changes	0.764	0.648	141.476	0.000	0.436	0.018	16.784	0.000

*The effect is statistically significant at the level ($\alpha \leq 0.05$)

Table 1 shows that the R-value of the first dimension was (0.781), which indicates a positive correlation between the dimension (Business cycle) and the dimension (the benefit and trade-off.). It turns out that the result of the coefficient of determination is ($R^2 = 0.671$), which means that the (Business cycle) domain explained (67.1%) of the variance in (the benefit and trade-off.) when all other variables remain constant. It was also proved that at the level of confidence (sig = 0.000), (F) value reached (138.485), which confirms the importance of the regression at the level of significance ($\alpha \leq 0.05$).

It also shows that the R-value of the second dimension was (0.761), which indicates a positive correlation between the dimension (interest rate change) and the dimension (the benefit and trade-off). It turns out that the result of the coefficient of determination is ($R^2 = 0.632$), which means that the (interest rate change) domain explained (63.2%) of the variance in (the benefit and trade-off) when all other variables remain constant. It was also proved that at the level of confidence ($\text{sig} = 0.000$), (F) value reached (184.684), which confirms the importance of the regression at the significance level at ($\alpha \leq 0.05$).

It also shows that the R-value of the third dimension was (0.764), which indicates a positive correlation between the dimension (rating changes) and the dimension (the benefit and trade-off). It turns out that the result of the coefficient of determination is ($R^2 = 648$), which means that the (rating changes) domain explained (64.8%) of the variance in (the benefit and trade-off) when all other variables remain constant. It was also proved that at the level of confidence ($\text{sig} = 0.000$), the (F) value reached (141.476), which confirms the importance of the regression at the level of significance ($\alpha \leq 0.05$).

The fourth hypothesis was calculated using a simple linear regression test:

Table 2
Impact test results H4

The fourth hypothesis	Model Summary		ANOVA		Coefficients			
	R	R ²	F	Sig F*	B	standard error	T	Sig T*
Rating the changes and central bank decisions	0.681	0.482	121.412	0.000	0.423	0.032	12.764	0.000

* Statistically significant effect at ($\alpha \leq 0.05$)

R value = 0.681, indicates that there is a positive relationship between (the interest rate differential) and (rating changes and central bank decisions). It turns out that the value of the coefficient of determination is ($R^2 = 0.482$), which means that the (rating changes and central bank decisions) field has explained (48.2%) of the variance in (the interest rate differential.) when all other variables remain constant. It was also proved that at the level of confidence ($\text{sig} = 0.000$), the value of (F) reached (121.412), which confirms the importance of the regression at significance level ($\alpha \leq 0.05$).

To test the fifth hypothesis, multiple linear regression analysis was performed.

Table 3
Results of Testing the Impact H5

The fifth hypothesis	Model Summary		ANOVA		Coefficients				
	R	R ²	F	Sig F*	variable	B	Standard error	T	Sig T*
Supplier contingent	0.763	0.574	43.651	0.000	News alerts	0.241	0.030	4.251	0.001
					Interest rates	0.213	0.027	2.315	0.003
					Ratings	0.187	0.031	3.684	0.000

*Statistically significant effect at the level ($\alpha \leq 0.05$)

Multiple linear regression shows that there is association between financial changes and supplier contingent ($R=0.763$), as well as the effect of the independent variable (financial changes) on the dependent variable (supplier contingent) is statistically significant, according to Table NO. (3) Where significance level ($\text{sig} = 0.000$) was less than (0.05), and the calculated value F was (43.651), in addition, the where the determination coefficient value ($R^2 = 0.574$) indicated that the variance in financial changes can explain (57.4%) of the variance in (supplier contingent).

6. Conclusions and Discussion

Supply chain financing or reverse factoring offers an alternative financing tool for companies. From a financial standpoint, reverse factoring arrangements reduce the company's cost of financing by reducing the informational problems between the companies and the bank and easing financial constraints (Al-Zaqeba & AL-Rashdan, 2020a). This paves the way for more effective capital investment and business decisions, as well as direct financial savings. The SMEs customer, the OEM, also strategically benefits from the high financial stability of its supplier, as this ensures that the OEM can supply cheaper. OEMs can directly benefit from reverse factoring by requesting an extension in the payment period in exchange for competitive external financing sources they provide to their companies' suppliers. This effectively reduces the working capital of OEMs. This is the main motivation for OEMs to implement reverse factoring arrangements with companies (Al-Zaqeba & AL-Rashdan, 2020).

Despite its rapid growth and wide fields of application, the number of theoretical and empirical academic studies on reverse factoring is very limited. A thorough understanding of reverse factoring practices is essential for SMEs and OEMs to design effective contracts. In this context, this paper presents an analytical model for analyzing the potential benefits and risks of supply chain finance. The model presented illustrates the operational and financial implications of supply chain financing for OEMs and SMEs. Specifically, the lower cost of unit capital and OEM financial transaction costs increase the benefits of reverse factoring for SMEs, while the increased payout period reduces these benefits. In addition, an increase in the quantity of inventory may increase the utility of inverse factoring depending on the parameters of the problem. In general, SMEs that hold large amounts of inventory for an extended period benefit from reverse factoring. Considering the operational benefits

of SMEs, it turns out that the payback periods in reverse factoring contracts will be much longer. The academic results obtained at the end of this research will greatly guide corporate managers in supply chain finance. In addition, regulatory and supervisory bodies can also benefit from the search results. However, in this paper, firms are assumed to be monopolistic. When this assumption is relaxed, the impact of supply chain finance on competition can be explored. For instance, can early participation in supply chain finance help SMEs increase market share by providing a horizontal competitive advantage for SMEs.

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