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A Supportive Decision-Making Methodology Incorporating a Cost-Accounting System Tailored to Import Firms

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ABSTRACT

Import firms bound by long-term, fixed-price agreements are exposed to considerable risks arising from cost fluctuations over time, particularly within unstable global markets. This research seeks to design a systematic decision-support methodology that assists such firms in determining whether to accept or decline prospective delivery contracts. The proposed framework comprises two stages. The first stage involves the development of a cost-accounting system specifically aligned with import activities. This system integrates dynamic factors, including exchange rate variations, freight charges, and commodity price changes, in order to estimate both the anticipated profit and its associated standard deviation for each contract. The second stage introduces a mathematical decision-support model that applies a probability-based acceptance criterion. This criterion is established through a risk-preference survey completed by the firm's decision-makers. The framework is demonstrated through a practical case study of a major Israeli import company (hereafter referred to as Tile-Art), which specialises in importing porcelain tiles and sanitary ware. Drawing on historical contract records, scenario simulations are conducted under different levels of forecasting precision, enabling a comparison between the proposed methodology, conventional approaches, and idealised benchmarks. The findings indicate that the suggested model substantially lowers the number of unprofitable agreements accepted by the firm, particularly when market volatility is high and contracts extend over longer periods. Overall, the evidence reveals that the tool produces more stable and dependable outcomes than models that overlook either risk preferences or cost variability. This study therefore contributes a novel and adaptable instrument for enhancing risk-conscious decision-making in import-oriented sectors.

1. Introduction

In recent years, the global economic landscape has imposed considerable challenges on importers across multiple industries. The COVID-19 pandemic, coupled with the Russia–Ukraine conflict, has disrupted international supply chains and intensified price volatility. Sanctions on major Russian raw material suppliers, including Rusal, which produces nearly 20% of the world's aluminium, and Evraz,

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a leading steel manufacturer, are anticipated to generate long-term increases in the prices of these commodities [29]. Similarly, Zhang et al. [37] observe that the war contributed to a $37.14 rise in WTI crude oil prices, representing a 52.33% increase, and a $41.49 rise in Brent crude oil prices, equivalent to a 56.33% surge. These developments have created severe financial pressures for importers, particularly for those bound by long-term supply contracts with pre-crisis fixed prices. Agreements that were traditionally perceived as stable have instead become burdensome liabilities, as fulfilment costs have escalated unpredictably. Consequently, a critical issue facing importers in volatile markets is how to determine pricing and contract strategies amid uncertainty about future expenses.

Import costs are shaped by numerous factors, including geopolitical events and natural disasters. For instance, Hurricane Katrina in 2005 led to the closure of several major oil facilities in the Gulf region of the United States, causing petrol prices to increase rapidly from $2.60 to over $3.00 per gallon within a week [25]. Commodity markets also exhibit recurrent instability, as demonstrated by Narayan and Narayan [26] in their analysis of oil price fluctuations and by [23] in their examination of natural-gas price dynamics. Despite this, limited scholarship addresses the translation of such volatility into the final unit costs of imported goods or its impact on contractual obligations involving future delivery. This represents a significant knowledge gap, as firms engaging in forward-looking contracts must comprehend how variable input costs flow through the supply chain and shape pricing decisions. Moheb-Alizadeh and Handfield [24] proposed models to estimate how raw material volatility affects future selling prices. However, their approach does not integrate a decision-making mechanism to assist firms in evaluating whether a deal should be accepted or rejected based on these projections. The present study addresses this limitation by modelling anticipated costs and linking these projections to a structured decision-support framework.

To maintain competitiveness in volatile environments, firms often implement cost-accounting systems to allocate direct and indirect costs to products. Such systems serve essential purposes, including guiding pricing strategies, conducting profitability assessments, and informing budget planning [33]. As Araujo and Costa [5] highlight, the selected accounting approach can significantly influence corporate strategy. Conventional accounting systems, however, are typically oriented towards manufacturing and fail to capture challenges unique to import operations, such as currency fluctuations, freight variability, and tariffs. Inadequate accounting practices not only undermine financial forecasting but have also been linked to corporate failures [7; 31]. A notable example is the collapse of WorldCom, where insufficient accounting transparency contributed to one of the largest corporate frauds in history [4; 8].

The implications of inadequate cost-accounting systems extend beyond fraud, as they can also result in poor strategic choices. One of Israel’s largest import companies, which is examined as the case study in this research, recently entered into a long-term contract that initially appeared profitable. Yet, due to underestimated input costs, the actual profit declined considerably over time. Such misjudgements are widespread in the import sector, where cost variability is greater and less predictable than in manufacturing. Even when corrections are made, conventional accounting frameworks often undervalue the long-term cost risks faced by importers under multi-year fixed-price agreements [20]. This underestimation is particularly concerning given the growing use of such contracts in markets such as liquefied natural gas (LNG) [34], renewable energy procurement [11], and aircraft leasing [38], all of which carry significant financial exposure if cost variability is not accurately accounted for.

To address these issues, this paper presents a novel two-stage methodology designed to assist import firms in managing financial risks inherent in long-term contracts. The first stage involves the construction of a cost-accounting model that incorporates future uncertainties, such as commodity price changes, shipping expenses, and exchange rate movements, thereby enabling firms to more accurately forecast deal profitability. The second stage introduces a decision-support instrument that converts these profitability estimates into practical recommendations by applying a probability-based threshold U. This threshold is defined through a structured survey that captures the firm's risk tolerance. By integrating quantitative cost modelling with behavioral insights, the framework provides a comprehensive foundation for informed managerial decisions.

The contributions of this study are threefold. First, it offers a cost-accounting model specifically adapted to the operational characteristics of import firms. Second, it incorporates risk-sensitive logic into a decision-support tool that reflects firm-specific preferences. Third, it validates the model by applying it to a large Israeli import company, demonstrating that it consistently outperforms conventional approaches, particularly in identifying unprofitable contracts, while also performing effectively relative to idealised benchmarks and alternative strategies. The remainder of this paper is organised as follows. Section 2 reviews the relevant literature on cost-accounting approaches, long-term contracts under price volatility, and decision-making tools. Section 3 presents the proposed cost-accounting model and the risk-based decision-support mechanism, followed by its implementation in a real-world case study. Section 4 provides empirical analysis and a discussion of the findings. Section 5 concludes by summarising the key results, outlining managerial implications, and suggesting directions for future research.

2. Literature Review

The literature review is organized around three core themes. These themes establish the basis for comprehending the multifaceted challenges encountered by importers and thereby support the rationale for the approach advanced in this study.

2.1 Cost-Accounting Systems

Cost-accounting systems play a crucial role in allocating expenditures and establishing product pricing structures. These systems generally divide costs into direct and indirect categories: direct costs are linked to production and delivery processes, whereas indirect costs support organisational functions without directly influencing the product. For example, office rent and administrative salaries fall under indirect costs. While manufacturing enterprises tend to emphasise cost allocation within production, import firms encounter a distinct cost structure in which transportation, customs procedures, and logistics account for a substantial proportion of overall expenses [20]. Conventional cost-accounting techniques, such as job-order and process-order costing Swan [33], were originally designed for manufacturing contexts. These methods typically assign overheads based on single cost drivers, such as labour hours, but fail to incorporate essential ancillary expenditures, including marketing, logistics, and international shipping. This limitation is particularly problematic for import firms, where non-production costs represent a significant share of total expenses. Consequently, reliance on such traditional models often results in misallocated costs and poorly informed pricing decisions.

To overcome these limitations, more advanced methods have been developed, including Activity-Based Costing (ABC), Target Costing, and Lean Costing [3; 15]. ABC, for instance, employs multiple cost drivers to allocate overheads with greater accuracy and to identify potential cost-efficiency opportunities. Nevertheless, these frameworks remain primarily focused on manufacturing operations and frequently neglect the complexities of global trade, such as international transport, customs clearance, and warehousing. Although Lin et al. [21] suggested extending ABC to logistics, [19] highlight that its application in import-oriented activities remains limited. As a result, import firms are often required either to adapt manufacturing-based models or to depend on manual calculations that are prone to error. To address this shortcoming, the present study introduces a cost-accounting framework tailored to the operational realities of import firms. By explicitly incorporating logistics, customs, and transportation costs into the accounting process, the proposed system aims to generate a more precise and comprehensive representation of import-related expenditures compared with manufacturing-focused models.

2.2 Long-Term Contracts under Price Volatility

In contrast to the production sector, where short-term contractual arrangements are prevalent, many import firms operate under long-term agreements [34]. This practice is particularly widespread in the importation of construction materials and liquefied natural gas (LNG). Long-term contracts typically span several years, with prices determined at the outset, leaving importers vulnerable to fluctuations in supply-chain costs [9]. Such volatility may erode profit margins or even result in financial losses. Rising price instability, driven by factors such as political unrest and natural disasters, has led to the introduction of contractual mechanisms intended to manage pricing risks. For example, Xing et al. [36] examined index-based and fixed-price agreements designed to shield firms from commodity price variability. Feng et al. [10] analysed adjustable contracts, which distribute price fluctuation risks between buyers and sellers. These approaches are commonly applied in commodity procurement industries. Nonetheless, many of these models fail to adequately incorporate the complexity of global supply-chain volatility, which is a critical issue for import firms operating in international markets.

Alongside contractual solutions, hedging strategies have also been considered as a means of addressing price volatility, though such approaches often entail significant costs [6]. Garcia [13] and Grover [17] examined hedging practices within energy markets, but their focus was limited. Garcia concentrated on a regulated domestic context, whereas Grover emphasised macro-level transitions rather than firm-specific risks. Consequently, such models provide limited applicability to the circumstances of import firms. To address these challenges, the cost-accounting framework advanced in this study integrates dynamic pricing models that explicitly consider potential cost fluctuations. This approach enables import firms to incorporate risk into their financial assessments with improved precision, thereby supporting more informed decisions on whether to accept or reject long-term contractual commitments.

2.3 Binary Decision-Making Models

Binary decision-making models support the selection between two alternatives, such as acceptance or rejection, on the basis of predefined criteria. Within the context of import operations, such decisions may involve evaluating whether to enter into a long-term contractual arrangement or to purchase through the spot market. These models have been applied widely in international trade, particularly in firm-level procurement and strategic choices. The literature on binary decision-making can be categorised into two main streams: statistical approaches, including logit and probit models, and optimisation-based methods. The first category utilises statistical techniques to predict binary outcomes, such as whether to conduct freight inspections [32] or to enter specific markets [2]. These models typically estimate the probability of each potential decision outcome using observed data, for instance, the likelihood of accepting or rejecting a shipment. However, their direct application to import-related decisions is limited, as such choices are shaped by dynamic pricing conditions, risk attitudes, and external shocks. The second category includes optimisation-focused frameworks, such as that proposed by Herasymovych et al. [18], which established thresholds to determine loan acceptance or rejection, and the work of [30], who applied optimisation methods to make-or-buy decisions within supply chains. While informative, these approaches often fail to incorporate real-time risks frequently encountered by import firms, including exchange rate fluctuations, port delays, and volatility in commodity markets.

In contrast, the present study introduces a dynamic decision-support framework that integrates subjective risk perceptions through structured questionnaires. This approach allows firms to embed individual risk preferences into the decision process and to calibrate decision thresholds according to anticipated uncertainties. By combining cost-accounting systems with decision models that explicitly reflect dynamic pricing conditions, the framework offers a more comprehensive and adaptable basis for addressing import-related decision challenges. In conclusion, conventional cost-accounting frameworks do not adequately capture costs specific to import activities, such as customs and international transport. Although price volatility has been explored extensively in commodity markets, relatively little attention has been paid to its implications for international trade, which faces additional risks, including disruptions to supply chains. Furthermore, existing decision-making models lack mechanisms that reflect the evolving complexities of global trade. This review therefore underscores the necessity of developing both a cost-accounting approach and a decision-support framework that are specifically suited to the operational realities of import firms, which this study seeks to address.

3. Data and Methods

3.1 Cost Identification and Profit Estimation

This study adopts a top-down approach for the allocation of costs incurred by the firm throughout the importation process. The principal cost components are classified and presented in Table 1. The direct costs listed in Table 1 contribute directly to the value of the final product and are primarily linked to logistics functions, such as the transportation and storage of purchased goods. By contrast, the indirect costs shown in Table 1 are not directly related to the physical transfer of the product but instead facilitate broader business activities and constitute part of the company's overall operational framework. Expenditures classified under the "general" and "selling" categories (see Column 2 of Table 1) are considered indirect costs, whereas the remaining categories are treated as direct costs. The indirect cost rate, ρ, is defined as the proportion of total indirect expenses relative to total direct expenses.

Table 1
Importation Costs and their Clustering

Cost Pool (#1)	Layer (#2)	Domestic/Foreign Currency (#3)	Direct/ Indirect (#4)
Cost of Product	Net Product Cost	Foreign	Direct
Purchasing Fees (e.g., Clearance Fee for Shipments, Agent/Broker Fee, Storage/Handling Expenditures, Costs of Physical Inspection) Packaging Costs	Clearance Fee for Shipments, Agent/Broker Fee	Foreign	
Freight Costs within the Foreign Country	Inland Transportation	Foreign	
Levies at the Port Costs Charged by the Port to Store and Handle the Cargo Origin Receiving Charges (ORC) (Paid to Container Handlers at the Port of Origin) Terminal Handling Charges (THC) (Paid to the Terminal Authorities at the Port for the Services they Provide)	Clearance Costs at the Port of Origin	Foreign	
Shipping/Airline Company Levies Fuel Surcharge	Intercontinental Transportation	Foreign	
Levies at the Port of Destination Duties and Taxes Charged by the Domestic Authorities (e.g., Customs, VAT, Purchase Tax, Computer/Security Toll) Payments for Permissions from Authorities and Government Ministries (e.g., Ministry of Health Permit, Veterinary Permit)	Clearance Costs at the Port of Destination	Domestic	

Table 1
Importation Costs and their Clustering (cont…)

Freight Costs within the Domestic Country (i.e., for Transportation from the Port to the Importer's Warehouse)	Storage and Logistics Costs	Domestic	
Storage Costs			
Warehousemen Salaries			
Expenditures Associated with Delivering the Product from the Importer's Warehouse to the Domestic Customer			
Expenditures Associated with Displays and Exhibitions	Selling Costs	Domestic	Indirect
Flights of Procurement Personnel	General	Domestic	
Salaries of Procurement Personnel			
Fixed Costs of Procurement Division			
Communication and Computing Costs			
Fixed Organizational Costs			
Management Costs			

This section presents the first stage of the proposed two-phase methodology, as depicted in Figure 1.

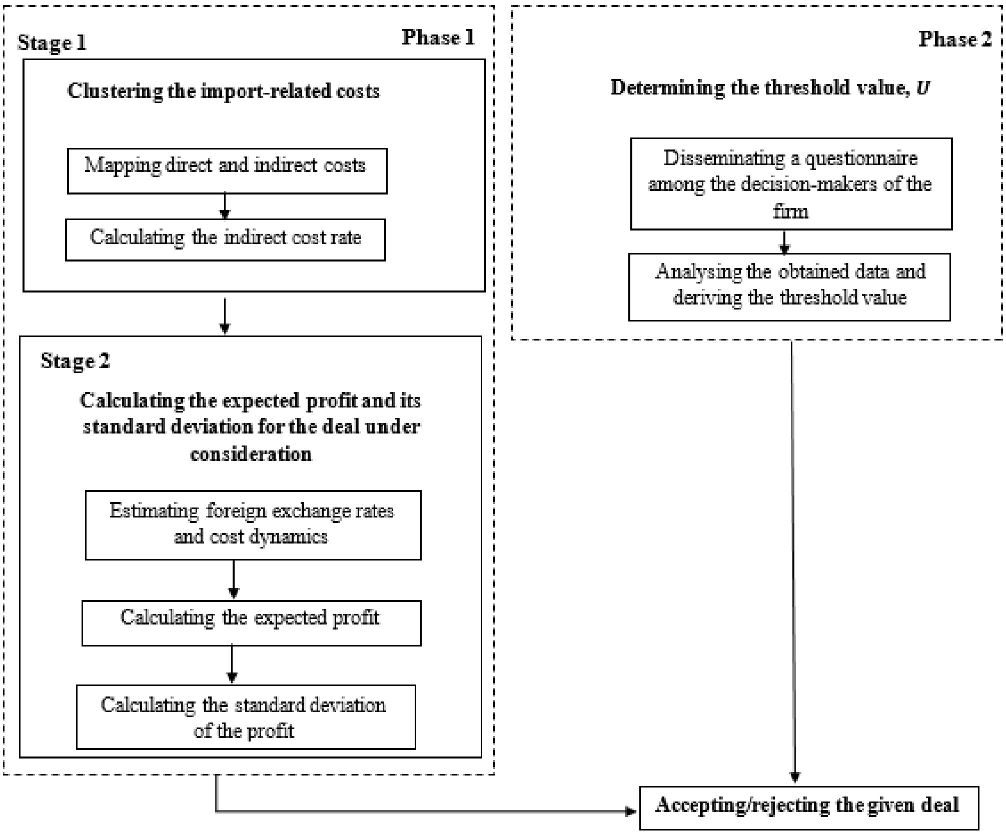

Fig.1: Flowchart of the Overall Methodology

The process begins with the identification and quantification of all direct and indirect costs associated with import operations (Stage 1, Phase 1). Once these costs are established, the expected profit of the contract, $\breve{\mu}(t)$, along with its standard deviation, $\breve{\sigma}(t)$, can be estimated (Stage 2, Phase 1). The subsequent phase, described in Subsection 3.2, determines the threshold value U. In combination with $\breve{\mu}(t)$ and $\breve{\sigma}(t)$, this threshold provides the basis for the final decision on whether the contract should be accepted or declined.

In this work, we adopt the approach used in Greene and Schoof [16] in which $\rho = \frac{\sum Ind}{\sum Dir}$, where

$\sum Ind$ and $\sum Dir$ denote the total indirect and total direct expenditures, respectively. Prior to proceeding with the calculation of the total direct costs, the following list of notations is presented.

Indices:

i - Product type, $i = 1,2,\dots,I$

j - Overseas supplier, $j = 1,2,\dots,J$

h - Cargo unit, $h = 1,2,\dots,H_{ij}$

t - Time units, $t = 1,2,\dots,T$

Parameters:

T - Duration of the contract (in years)

ρ - Rate of indirect costs

Q_{ij} - Quantity of product type i purchased from overseas supplier j

P_{ij} - agreed fixed price for selling product type i purchased from overseas supplier j

C_{ij} - Average cost of clearing product i from supplier j at the port

V_{ij} - Tax rate for product i bought from supplier j

D_{ij} - Bank fees applicable to product i bought from supplier j

L_{ij} - Insurance costs for product i bought from supplier j

E_{ij} - Agent commission for product i bought from supplier j (covers tasks such as document preparation, insurance arrangement, and transportation coordination)

c_{ij} - cost per unit of product i purchased from supplier j (in foreign currency)

S_{ijh} - cost of delivering one cargo unit h of product i purchased from foreign supplier j (in foreign currency)

A_{ijh} - Average port storage cost for cargo unit h of product i bought from supplier j over the standard storage period

K_{ijh} - Logistics cost per cargo unit h of product i from supplier j (includes inland transportation in the destination country, off-port storage, and packaging costs)

B_{ijh} - Terminal handling fees for cargo unit h of product i from supplier j (includes port access, labour, equipment use, and loading/unloading containers, as well as transport to and from the vessel)

Y_d - Interest rate for the domestic currency

Y_f - Interest rate for the foreign currency

$S_{f|d}$ - Spot exchange rate, expressed as the amount of domestic currency d per unit of foreign currency f

M - The total monetary value (average profit) of the contract

Variables:

$\delta_{ij}(t)$ - Time-dependent cost multiplier for product i purchased from supplier j, where $\delta_{ij}(0) = 1$

$F_j^{(1)}(t)$ - Forecasted foreign exchange rate (in local currency) for products bought from supplier j at time t

$\beta_h(t)$ - Time-dependent transportation cost multiplier for cargo unit h, where $\beta_h(0) = 1$

$F_h^{(2)}(t)$ - Forecasted foreign exchange rate (in local currency) for the transportation costs of cargo unit h at time t

$F_{f|d}$ - Forward exchange rate, expressed as the amount of domestic currency d per unit of foreign currency f

$\check{\mu}(t), \check{\sigma}(t)$ - expected profit/loss from the transaction and its standard deviation, respectively, at time t

Decision Variable:

U - The threshold value for any deal under consideration (and accordingly, $X = 1$ or $X = 0$ for accepting or rejecting the deal under consideration, respectively)

The purpose of the cost-accounting algorithm is to estimate the expected profit of the transaction, μ̌(t), together with its associated standard deviation, σ̌(t). In particular, μ̌(t) is derived by subtracting the anticipated future expenditures from the projected revenues, expressed as

$$\check{\mu}(t) = \sum_{i=1}^{I} \sum_{j=1}^{J} Q_{ij} P_{ij} - DTC(t), \tag{1}$$

Where $\sum_{i=1}^{I} \sum_{j=1}^{J} Q_{ij} P_{ij}$ represents the total revenue obtained from selling quantity Q_{ij} at fixed price P_{ij} (agreed on the day of signing the contract). The expected dynamic total cost, DTC(t), represents the overall expenditures and is formulated in equation (2). For simplicity, it is assumed that both revenues and costs are discounted to the reference time t. Given that the payments made to the importer firm are based on fixed prices settled on the day of signing the contract, the term $\sum_{i=1}^{I} \sum_{j=1}^{J} Q_{ij} P_{ij}$ in (1) is time invariant. Conversely, because the importing firm must deliver goods at future time intervals and lacks the capacity to stock all items in advance, upcoming expenditures are highly sensitive to fluctuations in market prices. Consequently, as indicated in equation (2), the dynamic total cost, DTC(t), varies over time. The computation of DTC(t) is performed in the following manner:

$$DTC(t) = (1+\rho)\left\{\sum_{i=1}^{I} \sum_{j=1}^{J} \left[C_{ij} + Q_{ij}\left(1 + V_{ij} + D_{ij} + L_{ij} + E_{ij}\right)c_{ij}\delta_{ij}(t)F_j^{(1)}(t) + \sum_{h=1}^{H_{ij}}\left(S_{ijh}\beta_h(t)F_h^{(2)}(t) + A_{ijh} + K_{ijh} + B_{ijh}\right)\right]\right\}. \tag{2}$$

Formula (2) incorporates dynamic multipliers, such as $\delta_{ij}(t)$ and $\beta_h(t)$, which reflect possible changes over the contract horizon in the prices of the purchased products and in the freight costs, respectively. In line with μ̌(t), the standard deviation, σ̌(t), is also expressed in monetary units. The value of σ̌(t) is determined as follows:

$$\check{\sigma}(t) = \sqrt{\sigma_0^2 + t\lambda^2}\,. \tag{3}$$

Expression (3) represents error propagation through a random walk process, in which the variance expands progressively over time (Srivastava, 2008). The temporal dimension is expressed in years, with λ denoting the annual standard deviation. The profit at future timepoint t from a given deal under consideration is denoted by the random variable $R(t)$, with a general probability distribution function $\psi_t(r)$, $r \in R(t)$. Assuming a normal distribution of future profit/loss, as in Bergman et al. (2019), we may write that $R(t) \sim N(\check{\mu}(t), \check{\sigma}(t))$, where $\check{\mu}(t)$ and $\check{\sigma}(t)$ are defined by (1) and (3), respectively.

3.2 Risk-Based Acceptance Threshold

The second stage (see Figure 1) focuses on establishing the acceptance threshold U. This threshold, used alongside μ̌(t) and σ̌(t) defined in equations (1) and (3), serves to evaluate whether a proposed deal should be accepted or declined. U represents the minimum probability of achieving a profit that the firm considers sufficient for undertaking the deal. Its value is influenced by risk attitudes and therefore differs across decision-makers depending on their perception of risk. For example, risk-averse decision-makers generally require U to exceed 0.5 before agreeing to a deal. The probability that a deal produces a positive return is formulated as follows:

$$P(R(t) > 0) = \int_0^\infty \psi_t(r)dr \tag{4}$$

Each deal satisfying the condition $\int_0^\infty \psi_t(r)dr \geq U$ will be accepted; otherwise, it will be rejected. Since $R(t) \sim N\left(\check{\mu}(t), \check{\sigma}(t)\right)$ (see Subsection 3.1), expression (4) transforms into:

$$P(R(t) > 0) = 1 - \Phi\left(\frac{-\check{\mu}(t)}{\check{\sigma}(t)}\right) = \Phi\left(\frac{\check{\mu}(t)}{\check{\sigma}(t)}\right). \tag{5}$$

It should be emphasised that U does not pertain to any individual transaction; rather, it represents a characteristic of the organisation as a whole. Several approaches can be employed to determine the value of U. These include, for instance, the application of optimisation models Herasymovych et al. [18] or eliciting expert assessments within the firm to approximate the threshold probability [27]. In this study, U is identified through specifically designed questionnaires directed at decision-makers. The survey targets mid-level and senior managers, as these groups are most frequently responsible for making strategic decisions in firms.

From the suppliers' perspective, short-term contracts are generally preferred, as they limit exposure to price volatility and other uncertainties (see, for example, [14; 28]). Consequently, longer-term contracts are expected to require a higher acceptance threshold. Furthermore, when the overall contract value increases, the associated risk of financial loss, should the deal prove unprofitable, also rises. Such losses may be considerable in absolute terms and could lead to severe financial distress or even bankruptcy. Hence, firms are likely to impose a higher threshold for contracts involving larger amounts. This behavior is consistent with the tendencies of risk-averse decision-makers, who represent the majority within the corporate environment (see [22]). In light of these considerations, the threshold U is assumed to be a function of both the contract duration, T, and the total contract value, M (measured as average profit). The notation applied for defining U is outlined as follows:

Auxiliary Variables and Functions

$E(loss)$ - expected loss from the deal

$P(loss)$ - Probability of a loss from the deal

U^0 - Threshold value of the firm's decision-makers associated with the "standard" deal

$f(T)$ - A multiplier function for U^0 given contract length T

$g(M)$ - A multiplier function for U^0 given total contact amount (average profit) M

The following approach is used to estimate the threshold value, $U = U(T, M)$, for any deal under consideration. Let$U(T, M) = U^0 f(T) g(M)$. The "standard" deal refers to an average deal reflecting the company's core business contracts, based on analysis of the firm's historical transactions. Without losing generality, we assume an average deal with a contract length of $T = 2$ years and a profit of $M = 100{,}000\ NIS$. Accordingly, $U(2; 100{,}000) = U^0$, $f(T = 2) = 1$ and $g(M = 100{,}000) = 1$. The questionnaire is structured into three groups of questions. Illustrative extracts are presented below in italics. The first set of questions, denoted by Q1, is dedicated to determining the threshold value for acceptance of the "standard" deal, U^0. The other two sets of questions, denoted by Q2 and Q3, are used to estimate the functions $f(T)$ and $g(M)$, respectively. The participants are considered to be the decision-makers within an international import enterprise.

Q1: *You are offered a "standard" 2-year contract with a total contract value (average profit) of NIS 100,000. The profit is uncertain (due to an unstable future business environment), as detailed in the following table. For each row in the table below, please decide, in Column #4, whether you would accept this "standard" contract (Yes or No) under the condition that there is a certain percentage likelihood, shown in Column #2, of losing the expected amount (in NIS) presented in Column #3. For example, answering "YES" in line 28 would mean that you are willing to accept, today, a deal under which the expected profit in 2 years' time is NIS 100,000, with a 28% chance that the outcome will instead constitute a loss of NIS 106,270.*

Table 2
Data for Set of Questions Q1

Line # (#1)	Probability of Loss (in %) (#2)	The Expected Loss (in NIS) Given that a Loss Occurs (#3)	Accept Contract? (Yes/No) (#4)
0	0%	0	

1	1%	14,566
28	28%	106,270
49	49%	3,146,700

The expected loss, represented as E (loss), in the case where a loss occurs (refer to Column #3 in Table 2), is computed as follows:

$$E(loss) = \frac{\left|\int_{-\infty}^{0} r\psi(r,\mu_r,\sigma_r)dr\right|}{\int_{-\infty}^{0}\psi(r,\mu_r,\sigma_r)dr}, \quad (6)$$

Where μ_r is the mean profit associated with the standard deal (set at NIS 100,000), while σ_r is the standard deviation of the profit (which depends on the probability of loss). The denominator in (6), i.e., $\int_{-\infty}^{0}\psi(r,\mu_r,\sigma_r)dr$, represents the probability of a loss and is denoted by $P(loss)$. The procedure for computing $E(loss)$ for each specified value of $P(loss)$, and for an expectation $\mu_r = NIS\ 100{,}000$, is described below.

Procedure for Calculating $E(loss)$

Step 1. Given $P(loss)$, find the value of the standard deviation σ_r by solving the following equation:

$$P(loss) = \int_{-\infty}^{0}\psi(r,\mu_r,\sigma_r)dr\ . \quad (7)$$

Step 2. Substitute the value of σ_r into (6) to obtain the expected loss from the deal, $E(loss)$.

The threshold value of the "standard" deal for Respondent z, denoted by U_z^0, is calculated as $U_z^0 = 1 - P^z(loss)$. Accordingly, the threshold value U^0 of the firm's decision-makers is computed as

$$U^0 = \frac{\sum_{z=1}^{Z} U_z^0}{Z}. \quad (8)$$

The subsequent stage involves identifying the multipliers (functions) f(T) and g(M), which represent the influence of contract length (T) and total contract amount (M) on the threshold value. These functions are derived from the responses of the Z decision-makers to two additional sets of questions, Q2 and Q3, each comprising four separate items.

Based on your response to Q1, you have agreed to accept the "standard" deal, i.e., a two-year contract with an average profit of NIS 100,000, when it is associated with a likelihood $P^z(loss)$ of experiencing an average loss of $E^z(loss)$ NIS.

Q2: *Given the same standard contract with average profit NIS 100,000, how would your previously accepted maximal likelihood* $P^z(loss)$ *change if the contract duration were to become 0; 1; 3; and 4 years (assume that the interest gained from alternative investments, i.e., the risk-free return, is 0%)? Please provide your answers in the following table*.

Q3: *Given the same standard contract length of 2 years, how would you change your previous response* $P^z(loss)$*, i.e., your accepted maximal likelihood of the given loss, if the contract value were to be changed to: NIS 25,000 with an average loss of 0.25**$E^z(loss)$*; NIS 50,000 with an average loss of 0.5**$E^z(loss)$*; NIS 200,000 with an average loss of 2**$E^z(loss)$*; NIS 400,000 with an average loss of 4**$E^z(loss)$*? Please provide your answers in the following table*.

For tractability, the functions f(T) and g(M) are modelled as linear, and a constrained linear regression is therefore applied [12]. This approach can readily be extended to accommodate more sophisticated regression models in cases where the functions exhibit strict concavity or convexity, such as polynomial forms. Once the data from the Q2 and Q3 question sets are collected, the following procedure is employed to estimate f(T) and g(M).

Procedure for Constructing Functions $f(T)$ and $g(M)$

Step 0. Define the sets of points $\{T_n, n = 1,2,3,4,5\} = \{0,1,2,3,4\}$ and $\{M_n, n = 1,2,3,4,5\} = \{25{,}000, 50{,}000, 100{,}000, 200{,}000, 400{,}000\}$. Set $z = 1$.

Step 1. For each respondent z, $z = 1,\dots,Z$, define the points (T_n, $[1 - P_{T_n}^z(loss)]/U_z^0$) and the points ($M_n$, $[1 - P_{M_n}^z(loss)]/U_z^0$) for $n = 1,2,3,4,5$.

Step 2. For Respondent z, construct the corresponding function $f_z(T) = a_z^f T + b_z^f$ passing through the point (2,1), where

$$a_z^f = \frac{\sum_{n=1}^{5}(T_n - 2)\left(\frac{1-P_{T_n}^z(loss)}{U_z^0} - 1\right)}{\sum_{n=1}^{5}(T_n - 2)^2} \quad (9)$$

And

$$b_z^f = 1 - 2a_z^f. \quad (10)$$

Step 3. For Respondent z, construct the corresponding function $g_z(M) = a_z^g M + b_z^g$ passing through (100,000,1), where

$$a_z^g = \frac{\sum_{n=1}^{5}(M_n - 100{,}000)\left(\frac{1-P_{M_n}^z(loss)}{U_z^0} - 1\right)}{\sum_{n=1}^{5}(M_n - 100{,}000)^2} \quad (11)$$

And

$$b_z^g = 1 - 100{,}000 a_z^g . \quad (12)$$

Step 4. If $z < Z$, then $z = z + 1$. Go to Step 2.

Step 5. Construct function $f(T) = a^f T + b^f$ passing through (2,1), where

$$a^f = \frac{\sum_{z=1}^{Z} a_z^f}{Z} \text{ and } b^f = \frac{\sum_{z=1}^{Z} b_z^f}{Z}. \quad (13)$$

Step 6. Construct function $g(M) = a^g M + b^g$ passing through (100,000,1), where

$$a^g = \frac{\sum_{z=1}^{Z} a_z^g}{Z} \text{ and } b^g = \frac{\sum_{z=1}^{Z} b_z^g}{Z}. \quad (14)$$

Step 7. The threshold value is $U(T,M) = U^0 f(T) g(M)$, where U^0 is defined by Equation (8), while functions $f(T)$ and $g(M)$ are found in Steps 5 and 6, respectively.

Step 8. End

3.3 Case Study: Implementation of the Decision Tool in the Construction Industry

To demonstrate the practical application of the proposed two-phase methodology, a case study is presented involving a major Israeli import company, hereafter referred to as "Tile-Art". The company is engaged in the production of ceramic decorative tiles and the importation of porcelain tiles and sanitary ware for the domestic construction sector. Tile-Art operates under long-term contractual arrangements within a highly volatile market, making structured and data-driven decision-making a critical necessity. The case study illustrates the methodology's implementation, including the computation of both direct and indirect costs, the estimation of expected profit and risk, and the determination of the threshold value U(T, M) used for contract acceptance or rejection. In line with the company's confidentiality requirements, the identities of specific products and suppliers are not disclosed.

Data for the case study were compiled from diverse sources to ensure a comprehensive and accurate representation of operational realities. The core quantitative information was obtained from Tile-Art's internal Enterprise Resource Planning (ERP) system, which incorporates historical sales, procurement activities, and financial records. Additional data relating to contract terms and project-level delivery schedules were collected from the firm's project management and contract databases. Furthermore, official exchange rate data were retrieved from the Bank of Israel to capture the effects of currency fluctuations over the study horizon. To account for managerial risk preferences in the decision-making framework, qualitative evidence was gathered through structured questionnaires completed by senior executives. These questionnaires elicited individual risk attitudes under uncertainty, which were subsequently employed to derive the probability-based threshold U incorporated into the binary decision tool. All datasets were cleaned, harmonised, and integrated into a consolidated database, with systematic documentation of pre-processing procedures to ensure transparency and replicability of the empirical analysis. Table 3 presents a summary of the products, the required quantities, and the identified suppliers.

Table 3
Data on the Supplied Items, Suppliers, and Manner of Delivery

Product	$i = 1$	$i = 1$	$i = 2$	$i = 3$
Supplier (#1)	AA (Italy) $j = 1$	BB (China) $j = 2$	CC (Italy) $j = 3$	DD (Turkey) $j = 4$
Delivery Unit (#2)	Cargo	Cargo	Cargo	Euro pallet
Number of Units Required (Q_{ij}) (#3)	300	300	500	50
Fixed Selling Price (per unit, in NIS) (P_{ij}) (#4)	200	200	151	199
Cargo Capacity* (G_{ijh}) (#5)	200 $h = 1,2$	200 $h = 1,2$	250 $h = 1,2$	300 $h = 1$

* The cargo capacity is the same for each cargo index.

We begin by examining the costs directly associated with acquiring the product. To take account of possible price changes over time that may significantly affect the product price during the contract period (two years), the dynamic multipliers $\delta_{ij}(t)$ and $F_j^{(1)}(t)$ are invoked (Rows #4 and #5, respectively, of Table 4). The values of $\delta_{ij}(t)$ are estimated based on historical company records, while the values of $F_j^{(1)}(t)$ are computed according to the forward exchange rate formula (see Investopedia). The estimated unit cost of the product, as shown in Row #6 of Table 4, is derived from the data in Rows #1–5, after converting the foreign currency values (USD and EUR) into NIS using the relevant exchange rates.

Table 4
Direct Costs Related to Product Purchasing

Product-Supplier Couple (i, j)	(1,1)	(1,2)	(2,3)	(3,4)
Product Unit Cost (c_{ij}) (#1)	18 Euro	$18	7 Euro	$10
Customs Rate (V_{ij}) (#2)	-	12%	-	-
Bank Fee Rate (D_{ij}) (#3)	0.5%	1.5%	0.5%	1.4%
Expected Foreign Exchange Rate ($F_i^{(1)}(2)$)* (#4)	5.14	4.09	5.14	4.09
Expected Multiplier of the Product's Cost ($\delta_{ij}(2)$) (#5)	1.08	1.05	1.0	1.02
Estimated Product Unit Cost in Local Currency (NIS) $(1 + V_{ij} + D_{ij})c_{ij}\delta_{ij}(2)F_j^{(1)}(2)$ (#6)	100.42 NIS	87.74 NIS	36.16 NIS	42.30 NIS

* 1 EUR=5 NIS, $1=4 NIS (on the day of contract signing).

The subsequent step involves calculating the direct costs associated with packaging and delivery, as detailed in Table 5.

Table 5
Direct Costs Related to Packaging and Delivery

Product-Supplier-Cargo Triple (i, j, h)	(1,1,1) (1,1,2)	(1,2,1) (1,2,2)	(2,3,1) (2,3,2)	(3,4,1)
Delivery Cost from Abroad (S_{ijh}) (#1)	$1,400	$1,800	$1,400	$900
Logistics Cost (K_{ijh}) (#2)	2,300 NIS	2,300 NIS	3,300 NIS	2,000 NIS
Average Cost Charged by the Port (A_{ijh}) (#3)	500 NIS	500 NIS	500 NIS	500 NIS
Terminal Handling Charges (B_{ijh}) (#4)	800 NIS	800 NIS	800 NIS	800 NIS
Expected Foreign Exchange Rate ($F_i^{(1)}(2)$) (#5)	4.09	4.09	4.09	4.09
Expected Multiplier of the Transportation Cost ($\beta_h(2)$) (#6)	0.96	1.13	0.96	1.02
Total Cost Per Delivery $S_{ijh}\beta_h(2)F_h^{(2)}(2) + A_{ijh} + K_{ijh} + B_{ijh}$ (#7)	9,096.96 NIS	11,919.06 NIS	10,096.96 NIS	7,054.62 NIS
Number of Cargo Units (#8)	2	2	2	1
Total Shipping Freight Costs (#9)	18,193.92 NIS	23,838.12 NIS	20,193.92 NIS	7,054.62 NIS

The number of cargo units in Row #8 is computed according to $\left\lceil \frac{Q_{ij}}{G_{ijh}} \right\rceil$, where Q_{ij} and G_{ijh} are given in Rows #3 and #5 of Table 3, respectively. Since products i=1 and i=2 each require two cargo units for delivery, two triples (i,j,h) are generated in Row #1 of Table 5 for every pair (1,1), (1,2), and (2,3) specified in Table 3. Conversely, for pair (3,4), which requires only a single cargo unit, only one corresponding triple is included. Based on the information in Tables 3–5, the firm's total direct costs (in NIS) at t=2 are consolidated in Table 6. An additional expenditure of 1,300 NIS, denoted by C_{ij}, is assumed due to customs regulations (see Row #4). This cost reflects the mandatory inspection of two units from each shipment prior to clearance.

Table 6
Total Direct Costs

Product-Supplier Couple (i, j)	(1,1)	(1,2)	(2,3)	(3,4)
Total Purchasing Cost (see Tables 3-4) (#1)	30,126	26,321	18,080	2,115
Total Delivery Cost (see Table 5) (#2)	18,194	23,838	20,194	7,055
Total Purchasing and Delivery Cost (#3)	48,320	50,159	38,274	9,170
Inspection Cost (C_{ij}) (#4)	1,300	1,300	1,300	1,300
Total Direct Costs (#5)	49,620	51,459	39,574	10,470

4. Results and Discussion

This section reports the findings of the case study and evaluates the effectiveness of the proposed approach through statistical analysis and computational experiments. The threshold value U^0 is first calculated from expert responses to question set Q1 (Table 2). The findings show that $P^{experts}(loss) = 15\%$ and $E^{experts}(loss) = \text{NIS } 49{,}975$. Therefore, the threshold value of the firm's decision-makers is $U^0 = 1 - P^{experts}(loss) = 0.85$. This outcome indicates that the decision-makers exhibit a strong tendency toward risk aversion. Such behavior is consistent with earlier studies on decision-making, which demonstrate that decision-makers are generally inclined to avoid risk [1]. The subsequent section provides a summary of the responses to questions Q2 and Q3, presented in Tables 7 and 8, respectively. In these tables, the information supplied to respondents to guide their answers is displayed in bold, while their responses are shown in italics.

Table 7
Response to Set of Questions Q2

Contract Length (In Years)	0	1	2	3	4
$P_T^{experts}(Loss)$ (in %)	*26%*	*20%*	15%	*12%*	*5%*

Table 8
Response to Set of Questions Q3

Contract Value (in NIS)	25,000	50,000	100,000	200,000	400,000
Average Loss (in NIS)	12,494	24,987	49,975	99,950	199,900
$P_M^{experts}(Loss)$ (In %)	*22%*	*18%*	15%	*11%*	*7%*

Drawing on the results reported in Tables 7 and 8, and applying the procedure for estimating the functions f(T) and g(M) as specified in equations (9)–(14), the threshold value is derived according to the following expression:

Step 2. $f(T) = 0.059\, T + 0.882$.

Step 3. $g(M) = 3.8 * 10^{-7}\, M + 0.962$.

Step 7. The threshold value is calculated as

$$U(T, M) = 0.85 * [0.059\, T + 0.882] * [3.8 * 10^{-7}\, M + 0.962]. \quad (15)$$

The derived expression for the threshold value provides a structured basis for the firm's decision-making, enabling it to evaluate deals across varying contract lengths T and total contract amounts (average profit) M.

Next, the expected profit μ̌(t) and its corresponding standard deviation σ̌(t) are computed using

Formulas (1) and (3), respectively. In this case, the import company (i.e., the decision-maker) is presented with a two-year contract from a major construction company in Israel, a longstanding client of the importer. Under the contract terms, the firm is obliged to deliver all required products to the construction company at the end of the contract horizon (T=2). Drawing on historical data for this client, the parameter is set at ρ=0.36. Incorporating this value of ρ and the total direct costs reported in Row #5 of Table 6, the expected total cost, as defined by Formula (2), is obtained as DTC(2)=135,543 NIS. Using this result, the expected profit or loss of the contract, $\check{\mu}(t)$, is subsequently determined through Formula (1). From the data presented in Rows #3 and #4 of Table 3, i.e., the values Q_{ij} and P_{ij}, we obtain $\sum_{i=1}^{I}\sum_{j=1}^{J} Q_{ij}P_{ij} = 145{,}450$ NIS. By substituting the given values into Formula (1), together with DTC(2)=135,543 NIS, the expected profit is calculated as $\check{\mu}(2)$=9,907 NIS. To evaluate $\check{\sigma}(t)$, Formula (3) is applied, which first requires the determination of the non-zero case-based initial standard deviation, σ_0, and the average annual standard deviation, λ. Based on the historical data analysis, these parameters are identified as σ_0=2,010 NIS and λ=2,705.5 NIS. Substituting these values into Formula (3) for t=2 yields $\check{\sigma}(2)$=4,322 NIS. The threshold value characterizing the firm's decision-makers for the deal under consideration is calculated using (15), where $M = \check{\mu}(2) = 9{,}907$ and $T = 2$. Specifically, $U(2{,}9{,}907) = 0.85 * [0.059 * 2 + 0.882] * [3.8 * 10^{-7} * 9{,}907 + 0.962] = 0.82$. This means that if $P(R(2) > 0) \geq 0.82$, where $R(2) \sim N(9{,}907, 4{,}322)$, the deal is accepted; otherwise, it is rejected. Accounting for the normal distribution of the future profit/loss, i.e., $R(2)$, we find that the probability of gaining a profit is $P(R(2) > 0) = 1 - \Phi\left(\frac{-\check{\mu}(t)}{\check{\sigma}(t)}\right) = \Phi\left(\frac{\check{\mu}(t)}{\check{\sigma}(t)}\right) = \Phi\left(\frac{9{,}907}{4{,}322}\right) = 0.989$. Since $0.989 > 0.82$, the deal, according to the suggested approach, should be accepted by the firm.

Recall that while the revenue from the deal is independent of the contract length (due to the fixed, pre-agreed price), i.e., $\sum_{i=1}^{I}\sum_{j=1}^{J} Q_{ij}P_{ij} = 145{,}450$ NIS, the total cost $DTC(t)$ may vary with T due to price volatility. To examine how the decision to accept or reject the contract varies with the contract length T, the following analysis is conducted and summarised in Table 9. Using the firm's historical records, the dynamic multipliers $\delta_{ij}(t)$ and $\beta_h(t)$ are first calculated for different values of t. The corresponding results are provided in Tables A2 and A3 of Appendix A. Using these values, as well as the currency exchange rates $F_j^{(1)}(t)$ and $F_h^{(2)}(t)$ (presented in Table A1 of Appendix A), we calculate $\check{\mu}(T)$ and $\check{\sigma}(T)$ for $T = 1,..,6$. These values are then used to calculate the threshold function U(T,M) and the probability of achieving a profit, R(T). The final decision on whether to accept the contract is determined by comparing U with R(T).

Table 9
Acceptance/Rejection Decision as a Function of the Contract Period

Contract Period (T) (#1)	Expected Total Cost (in NIS) (#2)	Expected Profit/Loss (in NIS) (#3)	Standard Deviation (in NIS) (#4)	Threshold Value (U) for the Suggested Approach (#5)	Probability of Gaining a Profit ($R(T)$) (#6)	Acceptance/Rejection of the Deal (#7)
0	131,036.8	14,413	2,010	0.725	1	Accept
1	133,228.2	12,222	3,370	0.773	0.999	Accept
2	135,543.0	9,907	4,322	0.821	0.989	Accept
3	137,887.3	7,563	5,099	0.869	0.933	Accept
4	140,409.0	5,041	5,772	0.916	0.808	Reject
5	142,824.4	2,626	6,375	0.963	0.659	Reject
6	145,892.0	-442	6,925	1	0.474	Reject

Table 9 indicates that the expected total cost of a given contract rises with the contract length, primarily due to the increase in most dynamic multipliers linked to the firm's business environment (see Tables A1–A3 in Appendix A). As revenue remains fixed, the rise in expected cost leads to a decline in expected profit (Column #3). This decline, in turn, reduces the probability of achieving a profit as T increases (Column #6). The table also demonstrates a rise in the threshold value U (Column #5), which represents the decision-makers' adjustment to the heightened risk associated with longer contract durations. A comparable outcome was reported by Whalley [35], who observed that risk-averse entrepreneurs require a higher net present value (NPV) to pursue a project, with the required NPV increasing further as technical risks escalate.

A closer examination of the results indicates that as contract length increases, the dynamic multiplier g(M) declines, although this decline occurs at a slower rate than the corresponding rise in the multiplier f(T). This finding suggests that decision-makers within the firm exhibit heightened risk aversion when contracts are extended in duration. The evidence further shows that neglecting the influence of market dynamics may expose the firm to adverse consequences. Specifically, if market dynamics are disregarded, the expected profit would remain constant at μ̌(0)=14,413 NIS with a standard deviation of σ̌(0)=2,010 NIS (see Table 9, row for T=0), irrespective of contract length. Given that μ̌(0)=14,413 and σ̌(0)=2,010 produce P(R(0)>0)=1, a firm that fails to account for market dynamics would accept all the transactions listed in Table 9. Consequently, it would also engage in loss-making deals, which could place the firm at considerable financial risk.

Since no decision-support tool can fully predict fluctuations in the business environment, the proposed model, similar to other tools, may be prone to errors in estimating both the expected profit or loss and its variability, represented by μ̌(t) and σ̌(t). To assess the robustness of the proposed method (hereafter referred to as the "suggested" approach), it is evaluated against an anticipative method (referred to as the "ideal" approach). Unlike the suggested method, the ideal approach assumes perfect foresight of environmental dynamics, such as changes in exchange rates and prices. This computer-based model is free from human subjectivity, thereby enabling accurate prediction of the probability distribution of future profits and their variability. Hence, it serves as an upper-bound benchmark. However, since it does not incorporate the firm's risk attitude, it mirrors the behaviour of a risk-neutral decision-maker, where deals with a positive expected profit are accepted and those with a negative expectation are rejected. In contrast, under the suggested approach, deal acceptance or rejection depends on the firm's risk perceptions. A third benchmark, the "traditional" approach, incorporates risk preferences but ignores environmental dynamics.

The comparison across these three approaches is conducted using the seven deals (T=0,1,2,3,4,5,6) summarized in Table 9. The level of inaccuracy in forecasting the expected profit is denoted by d_{μ} and it can take on the value of 0.1, 0.3, or 0.5, reflecting low, medium, or high erroneousness, respectively. For each of these inaccuracy levels, we generate $10{,}000$ random scenarios. Let SU, TR, and ID denote the three approaches: suggested, traditional and ideal, respectively. They are compared using the following performance measures: PM_1 – The number of "losing" (unprofitable) deals accepted by the firm out of the total number of deals evaluated (in %); PM_2 - The proportion of profitable deals out of all accepted deals (in %). Figures 2 and 3 illustrate the comparative performance of the approaches across contract length groups, where each group is defined by a specific contract duration. The scenarios are denoted in the format "XX-Y", where "XX" refers to the approach (SU, TR, or ID) and "Y" corresponds to the forecasting error level: low (L), medium (M), or high (H). From Figure 2, it is evident that the traditional approach, which does not incorporate dynamic considerations, has a significant limitation.

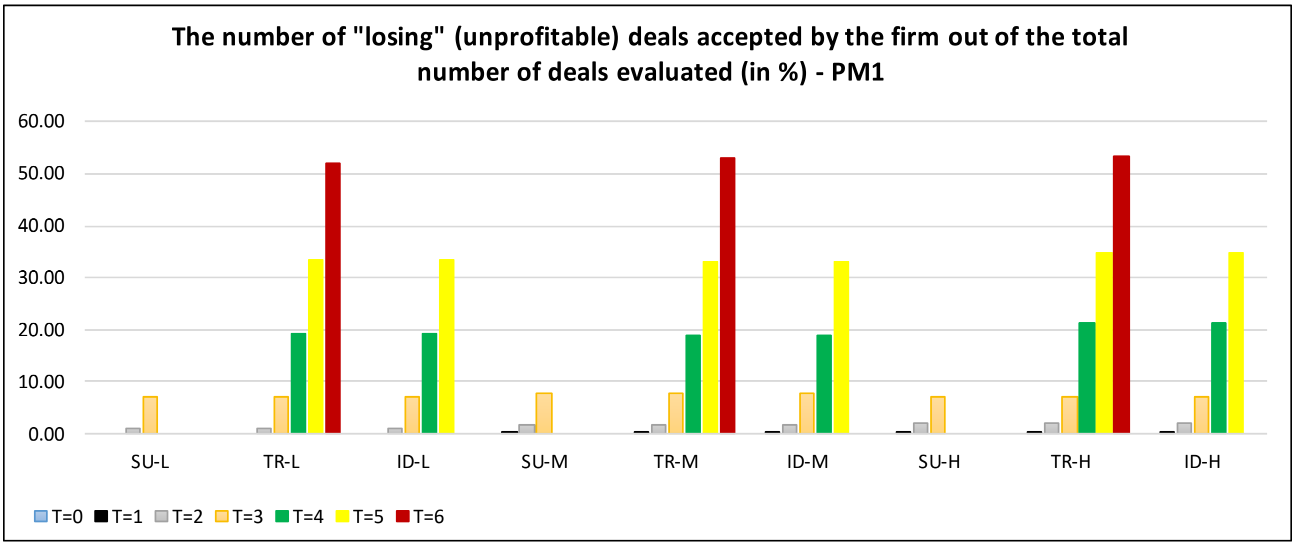

Fig.2: Values of PM_1 (in %) under the Suggested, Traditional, and Ideal Approaches, for Various Erroneousness Levels and Contract Lengths

In this method, the proportion of unprofitable deals rises consistently with contract length, eventually surpassing 50%, a level that would be deemed unacceptable in practical decision-making. By contrast, the proposed approach, in which the threshold value U adjusts upward as the contract length increases, adopts a more cautious stance. This leads to a lower probability of incurring losses, even outperforming the ideal approach in this respect. A similar reasoning accounts for the behaviour of the performance measure PM2 depicted in Figure 3.

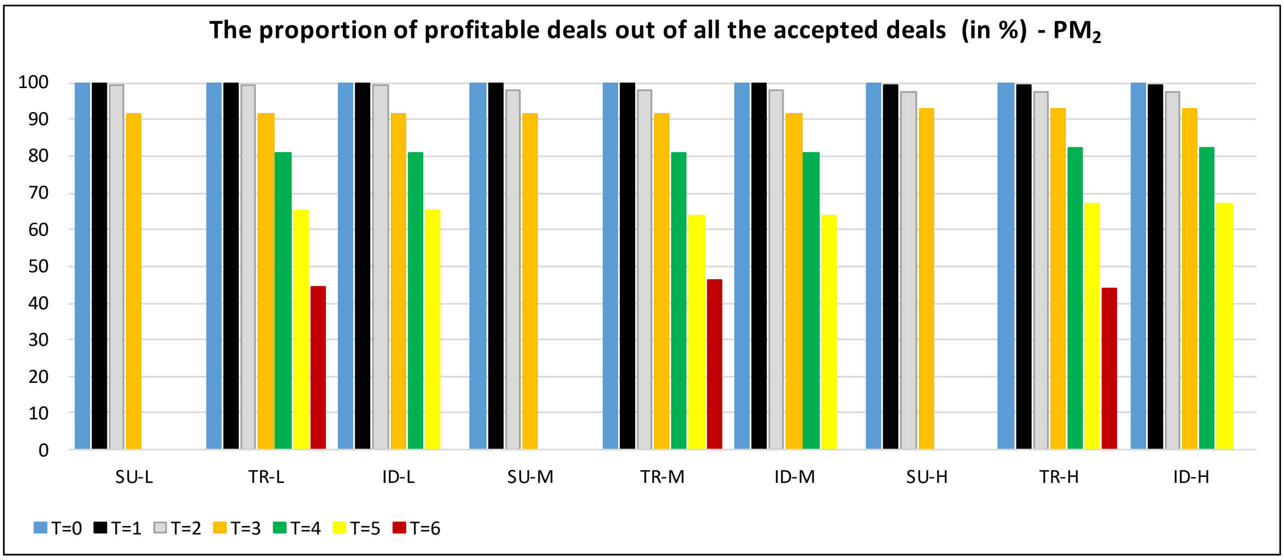

Fig.3: Values of PM_2 (in %) under the Suggested, Traditional, and Ideal Approaches, for Various Erroneousness Levels and Contract Lengths

5. Conclusion

Decision-making under fixed, promised prices is a particularly challenging task, especially when contract durations are long or when the value of the deal is high. The main difficulties stem from the firm's limited ability to accurately forecast deal profitability and the absence of cost-accounting systems specifically designed for the importation process. To address these challenges, this research develops a two-phase methodology. In the first phase, the expected costs of the deal and their volatility are computed. In the second phase, a questionnaire is designed to characterize the decision-makers' risk attitudes and derive a threshold value that guides the accept/reject decision. The methodology is applied to a large Israeli firm, Tile-Art, and validated through extensive computational experiments. The case study reveals that firms adhering to the "traditional" approach—ignoring market dynamics—face considerable risks, as they are likely to accept high-risk deals with low expected profits and substantial variability. More generally, the computational experiments demonstrate that the traditional approach can result in a large proportion of losing deals among those accepted. A comparison with an idealized "perfect foresight" approach shows that the suggested methodology consistently outperforms both benchmarks. Specifically, it reduces the percentage of losing deals (PM1) and increases the share of profitable deals among accepted ones (PM2). Moreover, the advantage of the suggested approach grows with contract length, making it particularly appealing in industries where long-term agreements are common. Several managerial insights and research directions emerge from this study:

(1) Extensive experiments indicate that forecasting accuracy has minimal influence on the performance of all three decision-making approaches. This suggests that investing heavily in precise forecasts of cost and index dynamics may be unnecessary.

(2) The proposed methodology could be further improved by introducing nonlinear relationships between the threshold value U, contract length (T), and average profit (M), as well as by incorporating additional parameters that affect U.

(3) While the current approach relies on a questionnaire to determine the threshold, an alternative would be to construct a mathematical optimization model based on the firm's historical data. Such a model could potentially outperform the questionnaire method.

(4) The findings were obtained under the assumption that the importer pays the full cost of containers regardless of loading. Relaxing this assumption to include partial-payment shipping contracts could provide valuable insights and strengthen the applicability of the approach.

In conclusion, the proposed approach offers strong potential for guiding importers in making informed decisions on deal acceptance or rejection. It may also serve as a foundation for developing a broader decision-support framework applicable to various industries operating under long-term contracts and fixed prices.

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Appendix A. Estimating the Dynamic Parameters in $DTC(t)$

Table A1
The calculated exchange rates $F_j^{(1)}(t)$ and $F_h^{(2)}(t)$

Contract period (T)	1 USD = [value in column] NIS. Applies to $F_j^{(1)}(t)$, $j = 1,..,4$ and $F_h^{(2)}(t)$, $h = 1,2$	1 Euro = [value in column] NIS. Applies to $F_j^{(1)}(t)$, $j = 1,..,4$
0	4	5
1	4.04	5.07
2	4.09	5.14
3	4.14	5.21
4	4.19	5.28
5	4.23	5.34
6	4.27	5.41

Table A2
The values of the product cost multiplier $\delta_{ij}(t)$

Contract period (T)	$\delta_{11}(t)$	$\delta_{12}(t)$	$\delta_{23}(t)$	$\delta_{34}(t)$
0	1	1	1	1
1	1.04	1.02	1	1.01
2	1.08	1.05	1	1.02
3	1.12	1.07	1	1.03
4	1.17	1.10	1	1.04
5	1.21	1.13	1	1.05
6	1.26	1.15	1	1.06

Table A3
The values of the transportation cost multiplier $\beta_h(t)$

Contract period (T)	Italy ($j = 1$)	China ($j = 2$)	Italy ($j = 3$)	Turkey ($j = 4$)
0	1		1	1
1	0.98	1.06	0.98	1.01
2	0.96	1.13	0.96	1.02
3	0.94	1.20	0.94	1.03
4	0.92	1.28	0.92	1.04
5	0.90	1.36	0.90	1.05
6	0.89	1.44	0.89	1.06