



Risk Mitigation Strategies in Lump Sum and Unit Price Contracts: A Document Analysis and Thematic Synthesis

Robert Daniel Zebua*

Universitas Tarumanagara,
Indonesia

Oei Fuk Jin

Universitas Tarumanagara,
Indonesia

***Corresponding author:**

Robert Daniel Zebua, Universitas
Tarumanagara, Indonesia.

✉ robertdesign3016@gmail.com

Article Info:

Article history:

Received: June 18, 2026

Revised: July 23, 2026

Accepted: August 07, 2026

Keywords:

Lump-sum Contracts; Unit-price
Contracts; Hybrid Contracts; Risk
Allocation; Performance-based
Clauses.

Abstract

Background: Despite the growing adoption of hybrid contract models in construction, energy, and agricultural procurement, there remains a significant gap in understanding how *lump-sum* and *unit-price* contracts differentially allocate risk across sectors and country contexts. This study addresses this gap by examining risk mitigation strategies through document analysis and thematic synthesis.

Objective: The aim of this study was to identify key risk allocation strategies, contractual mechanisms, and the effectiveness of hybrid models in managing uncertainty across developed and developing country contexts.

Methods: A qualitative approach based on thematic analysis and cross-case comparison was applied, drawing on 48 peer-reviewed sources published between 2015 and 2025, alongside relevant sector documents and procurement reports.

Results: The analysis identified that hybrid contracts reduced cost overrun variability by incorporating performance-based incentives aligned with *Expected Utility Theory* and *Principal-Agent Theory*, while developing economies such as Indonesia and Bangladesh exhibited distinct risk profiles requiring adaptive contract mechanisms. However, significant gaps remain, particularly regarding the empirical validation of blockchain-enabled contract enforcement and AI-driven risk prediction, as well as the underrepresentation of developing economy contexts in existing research.

Conclusion: The findings carry both scientific and practical implications. Theoretically, this study advances an integrative multi-theory framework combining *Expected Utility Theory*, *Game Theory*, and *Principal-Agent Theory* to analyse contract risk across diverse contexts. Practically, the results provide evidence-based guidance for procurement professionals and policymakers in selecting and designing contract structures that balance cost certainty with adaptive flexibility.

To cite this article: Zebua, R. D., & Jin, O. F. (2026). Risk Mitigation Strategies in Lump Sum and Unit Price Contracts: A Document Analysis and Thematic Synthesis. *Equivalent: Jurnal Ilmiah Sosial Teknik*, 8(3), 1250-1265. <https://doi.org/10.59261/jequi.v8i3.383>

INTRODUCTION

Risk management in construction and public procurement contracts has become an increasingly critical concern for both public and private sector stakeholders operating in dynamic and often volatile economic environments. The choice between lump-sum (LS) and unit-price (UP) contracts represents one of the most consequential decisions in project procurement, as each contract type carries distinct implications for how financial risks are distributed between clients and contractors, how project costs are controlled, and how effectively projects can adapt to unforeseen conditions.

Global empirical evidence underscores the urgency of this issue. According to the KPMG global construction survey, approximately 69% of infrastructure projects experienced cost overruns, with inappropriate contract selection identified as a leading contributing factor. Similarly, the World Bank reported that, in developing economies, construction project failures associated with inadequate risk allocation in procurement contracts resulted in estimated annual losses exceeding USD 1.5 trillion globally. These statistics highlight the critical need for evidence-based contract design frameworks capable of accommodating the complexities of modern project environments (Baloi & Price, 2022; Olaniran et al., 2017).

Lump-sum contracts, in which contractors agree to complete a defined scope of work for a fixed total price, have long been favored for their ability to provide cost certainty and reduce clients' exposure to budget overruns. However, this predictability comes at a cost: contractors bear substantial risks associated with unforeseen price increases, scope ambiguities, and market fluctuations, which may result in quality compromises, contractual disputes, or financial distress. Unit-price contracts, by contrast, adjust payments according to the actual quantities of work completed, offering greater flexibility for projects where the scope of work is uncertain or subject to change. Nevertheless, this flexibility introduces additional uncertainties because final project costs remain difficult to predict, particularly in markets characterized by volatile material prices or complex supply chains.

In response to the limitations of both conventional contract forms, hybrid models that combine lump-sum guarantees with unit-price flexibility and performance-based clauses have gained increasing attention across sectors, including construction, energy, and agriculture. These hybrid structures are considered adaptive instruments capable of balancing cost certainty with the responsiveness required in modern, complex project environments. Despite the growing practical relevance of these models, scholarly understanding of their performance across different sectors, time horizons, and geographic contexts remains incomplete.

This study addresses this gap through a document analysis and thematic synthesis of how lump-sum, unit-price, and hybrid contracts function as risk mitigation instruments. Drawing on 48 peer-reviewed scholarly sources published between 2015 and 2025, complemented by sector-specific documents and procurement reports, the study examines risk allocation strategies, stakeholder dynamics, theoretical frameworks, and contractual outcomes across developed economies, such as the United States, Germany, France, and Austria, as well as developing economies, including Indonesia, Bangladesh, India, and China.

The study is guided by three core research questions. First, what are the dominant risk allocation strategies associated with lump-sum and unit-price contracts across different sectors and geographic contexts? Second, how do hybrid contract models compare with pure lump-sum and unit-price arrangements in managing cost overruns and performance risks across short-, medium-, and long-term project horizons? Third, what roles do stakeholder dynamics, theoretical frameworks, and institutional environments play in shaping the effectiveness of these contractual mechanisms?

Theoretically, this study contributes to the advancement of contract risk management literature by proposing an integrative multi-theory framework that synthesizes Expected Utility Theory, Game Theory, and Principal-Agent Theory to explain how contract types function across diverse sectoral and geographic contexts. Practically, the findings provide actionable guidance for procurement professionals and policymakers in selecting contract structures that optimize risk allocation, particularly in volatile and resource-constrained environments. The implications extend to informing public procurement policy reforms in developing economies where institutional frameworks for contract risk management remain underdeveloped.

By addressing these questions through a qualitative lens grounded in thematic analysis and cross-case comparison, this study contributes both to theoretical understanding of contract design and to practical guidance for procurement professionals, policymakers, and project managers operating across diverse and challenging environments.

The issue of risk mitigation in the application of lump-sum (LS) and unit-price (UP) contracts in construction and agricultural projects has long been a central focus in supply chain management and project risk management. Both contract types can introduce significant cost uncertainties, influencing risk allocation and generating wide-ranging socioeconomic consequences (Kantari et al., 2022; Tran et al., 2017). In 2015, Gao (2015) emphasized the

importance of dynamic contract coordination to reduce exposure to supply fluctuations (Liu et al., 2025). Meanwhile, Rey (2016) argued that instruments such as option contracts could provide protection for farmers against water-related risks, representing a transition from rigid contractual arrangements toward more flexible risk management mechanisms (Reichel et al., 2022).

Almeida et al. (2017) further expanded these findings by integrating risk theory into supply contracts, asserting that price adjustment clauses within contract designs could play a crucial role in mitigating production cost volatility (Beiter et al., 2024). This argument was supported by Roussy et al. (2018), who examined marketing contracts in the French wheat sector and demonstrated that combining elements of lump-sum and unit-price contracts could improve adaptability to stringent regulations and fluctuating market demands. In a broader agricultural context, Adnan et al. (2020) investigated risk management strategies among corn farmers in Bangladesh and identified contract diversification as an effective approach for disaster risk mitigation (Prentzas et al., 2024).

Recent research continues to affirm the cross-sector relevance of these findings. For example, Algarvio (2023) highlighted the stabilizing effects of risk-sharing contracts in liberalized electricity markets, while Xie et al. (2023) introduced the concept of coalition insurance contracts for energy systems vulnerable to extreme weather events. Notably, Weber et al. (2024) examined the social implications of contractual transitions in flood management in Austria, emphasizing the need for contract structures that are responsive to environmental risks. Meanwhile, Zhang and Zhu (2022) applied Principal-Agent Theory to design cyber-insurance contracts, emphasizing that innovation in contract design is essential for mitigating economic uncertainties in today's global environment.

Despite these advances, three critical gaps remain in the existing literature. First, Bourgeois et al. (2021) focused exclusively on carbon tax recycling in the French residential sector, leaving the cross-sectoral applicability of hybrid contract models in construction and agriculture insufficiently explored (Carton et al., 2026). Second, although Adnan et al. (2020) identified contract diversification as an effective strategy for disaster mitigation among Bangladeshi farmers, their study did not compare the relative effectiveness of lump-sum versus unit-price structures within comparable project contexts (Prentzas et al., 2024). Third, Ma et al. (2021) examined risk identification in water-saving contracts using the Best-Worst Method but did not incorporate stakeholder behavioral dynamics or institutional factors influencing contract outcomes in developing economies (Li et al., 2026). These inconsistencies and methodological limitations collectively demonstrate the need for a comprehensive qualitative synthesis that bridges sectoral boundaries and integrates diverse theoretical perspectives.

The novelty of this study lies in three primary contributions. First, it applies an integrative multi-theory analytical framework combining Expected Utility Theory, Game Theory, and Principal-Agent Theory to comparatively analyze contract risk management an approach not previously applied in a single cross-sectoral qualitative synthesis. Second, this study systematically compares contract outcomes across developed and developing country contexts within the construction, energy, and agriculture sectors, addressing the geographic and sectoral fragmentation of existing literature. Third, the study identifies emerging trends in hybrid contract design incorporating digital technologies and performance-based mechanisms, providing a forward-looking conceptual foundation for future empirical investigations.

METHOD

This study employed a qualitative research approach grounded in document analysis and interpretive thematic synthesis to examine risk mitigation strategies in lump-sum and unit-price contracts across the construction, energy, and agricultural sectors. Rather than conducting bibliometric or quantitative analyses, this study focuses on an in-depth interpretive review of scholarly literature, contractual documentation, and sector-specific reports to generate conceptual insights into how different contract types perform under varying economic, regulatory, and geographic conditions. This approach is appropriate because the central phenomena under investigation (risk allocation preferences, stakeholder dynamics, and the comparative effectiveness of contract models) are inherently interpretive and context-sensitive (Creswell & Poth, 2018; Tisdell et al., 2025).

The literature search was conducted across four major academic databases: Scopus, Web of Science, ScienceDirect, and Google Scholar. The search employed the following keyword combinations: ("lump-sum contract" OR "fixed-price contract") AND ("risk management" OR "risk allocation" OR "cost overrun"); ("unit-price contract" OR "unit-rate contract") AND ("risk mitigation" OR "contract performance"); and ("hybrid contract" OR "performance-based contract") AND ("construction" OR "energy" OR "agriculture"). The initial search yielded 312 articles. After removing duplicates ($n = 87$), title and abstract screening was performed, excluding articles that did not directly address contractual risk allocation mechanisms ($n = 142$). Full-text reviews of the remaining 83 articles resulted in the exclusion of 35 sources based on the following criteria: (a) published before 2015 or after 2025; (b) purely mathematical or simulation-based models without discussion of contractual risks; (c) conference proceedings without peer-review processes; and (d) non-English-language publications without available translations. The final analytical corpus comprised 48 peer-reviewed articles that met all inclusion criteria.

The study adopted a qualitative document analysis approach with a cross-case thematic comparison design, in which lump-sum, unit-price, and hybrid contracts were treated as distinct cases of contractual risk management and examined across multiple sectors and country contexts. The comparative dimension encompassed both developed economies (the United States, Germany, France, Western Europe, and Austria) and developing economies (Indonesia, Bangladesh, India, and China), consistent with the geographic distribution of evidence presented in Table 3. This cross-context comparison enabled the identification of risk allocation patterns that are both universally applicable and shaped by local institutional and market conditions.

Data for this study were drawn from 48 peer-reviewed scholarly sources published between 2015 and 2025, spanning the fields of construction management, supply chain risk management, energy economics, agricultural contracting, finance, and public policy. These sources were selected based on their direct relevance to the research themes of lump-sum contracts, unit-price contracts, hybrid contract models, risk allocation mechanisms, and performance-based contractual clauses. The sources represented diverse geographic and sectoral contexts, as categorized in Table 2 (Research Context), which grouped them into six thematic domains: Risk Management and Contracts ($n = 18$), Finance and Insurance ($n = 11$), Health and Social Policy ($n = 6$), Energy and Environment ($n = 5$), Logistics and Supply Chain ($n = 4$), and Agriculture and Food Security ($n = 2$).

In addition to peer-reviewed literature, this study drew upon publicly available sector reports, procurement policy documents, and contract performance evaluations from construction and infrastructure sectors in both developed and developing country settings. These supplementary documents provided contextual grounding for the thematic findings, particularly regarding country-level risk profiles illustrated in Figure 3.

The analysis was guided by an integrative multi-theory framework, as presented in Table 1 (Content Theory). The dominant theoretical lens was Expected Utility Theory (EUT), which explains how contractors and clients evaluate uncertain contract outcomes by maximizing perceived utility: contractors may prefer lump-sum contracts due to cost certainty in stable environments, whereas clients may prefer unit-price contracts when project scope remains uncertain or variable. This framework was complemented by Game Theory, which illuminates strategic interactions in risk-sharing negotiations between contracting parties, and Principal-Agent Theory, which explains how performance-based clauses and monitoring mechanisms address information asymmetry. Elements of corporate hedging theory and the Theory of Externalities were also incorporated where relevant, particularly within energy and environmental contract contexts (Bourgeois et al., 2021; Do et al., 2024).

Data analysis proceeded through inductive thematic analysis following the framework proposed by Braun and Clarke (2006), involving iterative phases of familiarization, open coding, theme development, and interpretive synthesis (Braun & Clarke, 2023). Initial codes were generated from the content of each source, focusing on contract type characteristics, risk allocation mechanisms, sector-specific contractual challenges, country-level institutional factors, and observed outcomes across short-, medium-, and long-term project timeframes.

Codes were progressively consolidated into overarching thematic categories that directly organized the Results and Discussion sections of this study, namely: (1) theoretical frameworks in contract risk management; (2) sector-specific contract applications across construction,

energy, and agriculture; (3) country-level differentiation between developed and developing contexts; (4) stakeholder roles and dynamics in contract design and enforcement; and (5) time-horizon-differentiated outcomes of lump-sum, unit-price, and hybrid contracts, as systematically presented in Table 4 (Outcome Classification).

A constant comparative method was applied throughout the analysis, whereby findings from different sources, sectors, and country contexts were continuously cross-referenced to identify convergences, divergences, and exceptions. Negative cases, instances in which contract types performed contrary to general patterns, were actively identified and incorporated into the analysis to strengthen interpretive rigor.

Thematic findings were further synthesized through cross-case comparisons organized along two analytical dimensions: (a) developed versus developing country contexts and (b) short-term, medium-term, and long-term project outcomes. This two-dimensional synthesis framework enabled a nuanced interpretation of how contract effectiveness varies not only by contract type but also by contextual and temporal factors.

To ensure the trustworthiness of the qualitative analysis, this study applied several validation strategies. Triangulation was achieved by integrating evidence from multiple sectors, geographic contexts, and theoretical perspectives rather than relying on a single source of evidence. Thick descriptions of each thematic finding, supported by references from multiple authors across diverse contexts, ensured that interpretations were grounded in a broad and comprehensive evidence base. Reflexivity was maintained throughout the analytical process by continuously examining whether emerging interpretations were derived from the data rather than influenced by prior assumptions. Peer review of the coding framework and thematic categories was conducted through consultation with two researchers experienced in construction contract management and risk economics (Beuving & Vries, 2025; Lincoln & Guba, 1985).

This study focused on a qualitative systematic review of peer-reviewed journal articles published between 2014 and 2025 that examined risk mitigation strategies in lump-sum and unit-price contracts. The review covered three major sectors (construction, energy, and agriculture) because these industries are characterized by complex contractual relationships and substantial exposure to cost, schedule, and operational risks. To ensure analytical quality and consistency, only English-language articles indexed in recognized scientific databases and meeting predefined inclusion criteria were included. The selected studies were analyzed using thematic analysis and interpreted through an integrated theoretical framework consisting of Expected Utility Theory, Game Theory, and Principal-Agent Theory.

Several limitations should be acknowledged. First, this review excluded conference proceedings, technical reports, books, dissertations, and other forms of grey literature, which may contain relevant practical evidence. Second, the findings were derived from previously published studies and therefore depended on the methodological quality, reporting standards, and contextual characteristics of the original research. Finally, although the review included studies from both developed and developing countries, the available literature was disproportionately concentrated in developed economies, limiting the generalizability of the findings to regions with different institutional, regulatory, and market conditions. These limitations provide opportunities for future empirical research to validate the proposed conceptual framework across broader geographical and industrial contexts.

Table 1

Content Theory

No	Theory	Count	Authors
1	Game Theory	3	(Choi & Stefanadis, 2018); (Sheng et al., 2019); (Farzadmehr et al., 2025)
2	Expected Utility Theory	2	(Reichel et al., 2022; Rey et al., 2016)
3	Hedging and Corporate Risk Management Theory (Modigliani-Miller and canonical hedging models)	1	(Do et al., 2024)
4	Von Neumann and Morgenstern's Theory of Expected Utility	1	(Ricome & Reynaud, 2022; Roussy et al., 2018)
5	Theory of Externalities	1	(Bourgeois et al., 2021; Carton et al.,

No	Theory	Count	Authors
6	Microeconomic Models of Consumer Choice and Utility Maximization (Permanent Income Hypothesis)	1	2026) (Collins & Kulka, 2023)

RESULTS AND DISCUSSION

Results

The theoretical framework presented in Table 1 served as the analytical basis for interpreting the findings. Based on the thematic analysis, the results were organized into four main themes: publication trends, research contexts, comparative contract characteristics, and stakeholder perspectives. Figures 1–4 and Tables 2–4 present the synthesized evidence generated from the thematic analysis.

Figure 1 presents the annual publication trends of the selected articles published between 2014 and 2025. The findings indicate a gradual increase in publications on risk mitigation strategies in lump-sum and unit-price contracts over the study period, with research activities becoming more intensive in recent years. This trend reflects growing academic interest in contractual risk management across the construction, energy, and agricultural sectors and illustrates the development of research within the scope of this study.

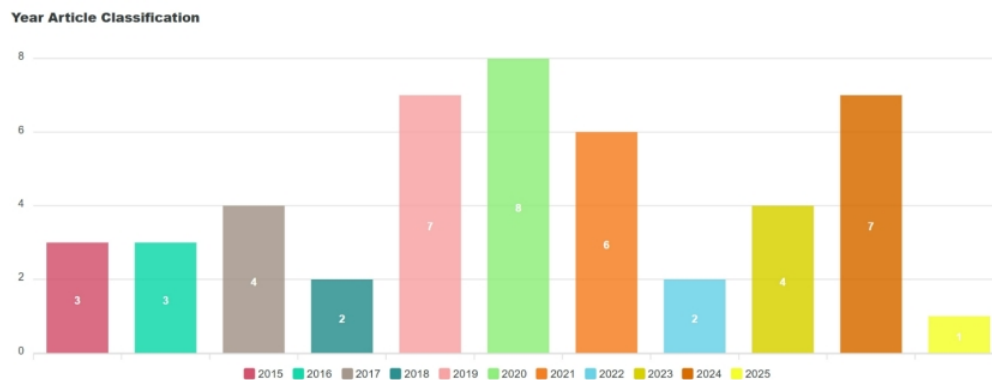


Figure 1. Publication Trend of Analyzed Sources

Figure 1 presents the publication trend of the selected articles published between 2014 and 2025. The distribution indicates a gradual increase in publications on risk mitigation strategies in lump-sum and unit-price contracts, with a more noticeable rise after 2020. The selected articles cover the construction, energy, and agricultural sectors and represent both developed and developing countries, providing a broad foundation for the thematic analysis. This publication trend demonstrates the increasing scholarly attention devoted to contractual risk management and establishes the context for the subsequent analysis of research contexts, contract characteristics, and stakeholder perspectives.

To provide a comprehensive overview of the evidence, the selected articles were further classified according to their research contexts, including industrial sector, geographical setting, methodological approach, and contractual focus. This classification facilitates comparisons of contract implementation and risk mitigation practices across different sectors and regions. The characteristics of the selected articles are presented in Table 2.

Table 2

Research Context

No	Category	Count	Authors
1	Risk Management and Contracts	18	(Almeida et al., 2017; Bauer et al., 2024; Baumann et al., 2019; Chen et al., 2021; Choi & Stefanadis, 2018; Januarita & Sumiyati, 2021; Ma et al., 2021; Mollajan et al., 2023; Morton, 2019; Reichel et al., 2022; Rey et al., 2016; Ricome & Reynaud, 2022; Roussy et al., 2018; Tran et al., 2017; Vahdatmanesh & Firouzi, 2020; Wang, 2019; Weber et al., 2024; Zhang & Zhu,

No	Category	Count	Authors
2	Finance and Insurance	11	(Chen et al., 2021; Do et al., 2024; Farzadmehr et al., 2025; Fuente et al., 2020; Huang et al., 2024; Hurwitz & Sade, 2020; Jones & Michelmore, 2019; Jorgensen et al., 2024; Lu et al., 2021; Otto & Webley, 2016; Sheng et al., 2019)
3	Health and Social Policy	6	(Collins & Kulka, 2023; Dai et al., 2022; Hanstein et al., 2015; Maurer et al., 2018, 2021; Steimle et al., 2025)
4	Energy and Environment	5	(Algarvio, 2023; Beiter et al., 2023; Bourgeois et al., 2021; Eisenmann et al., 2020; Xie et al., 2023)
5	Logistics and Supply Chain	4	(Alamri et al., 2018; Alamri, 2024; Barron et al., 2017; Gao, 2015; Luo et al., 2019)
6	Agriculture and Food Security	2	(Adnan et al., 2020; Prentzas et al., 2024)

The thematic analysis identified variations in contractual practices across developed and developing country contexts. These variations are reflected in the application of contract mechanisms, dominant project risks, and contractual arrangements within different institutional environments. The comparative distribution by country classification is presented in Table 3.

Table 3

Mechanism: Developed vs. Developing Country Contexts

No	Context	Count	Authors
1	Developed	34	(Gao, 2015); (Rey et al., 2016); (Hanstein et al., 2015); (Maurer et al., 2018); (Otto & Webley, 2016); (Tran et al., 2017); (Barron et al., 2017); (Choi & Stefanadis, 2018); (Almeida et al., 2017); (Alamri et al., 2018); (Roussy et al., 2018); (Sheng et al., 2019); (Maurer et al., 2021); (Jones & Michelmore, 2019); (Baumann et al., 2019); (Hurwitz & Sade, 2020); (Alamri, 2024); (Chen, J., et al., 2021); (Fuente et al., 2020); (Eisenmann et al., 2020); (Lu et al., 2021); (Bourgeois et al., 2021); (Ricome & Reynaud, 2022); (Dai et al., 2022); (Reichel et al., 2022); (Zhang & Zhu, 2022); (Algarvio, 2023); (Bauer et al., 2024; Beiter et al., 2023; Collins & Kulka, 2023); (Weber et al., 2024); (Prentzas et al., 2024); (Do et al., 2024); (Jorgensen et al., 2024); (Steimle et al., 2025)
2	Developing	13	(Wang, 2019); (Wallace, 2019); (Luo et al., 2019); (Morton, 2019); (Vahdatmanesh & Firouzi, 2020); (Januarita & Sumiyati, 2021); (Adnan et al., 2020); (Ma et al., 2021); (Chen, Y., et al., 2021); (Mollajan et al., 2023); (Xie et al., 2023); (Farzadmehr et al., 2025; Huang et al., 2024)

The thematic analysis identified differences in contract outcomes across short-, medium-, and long-term project horizons. These variations were associated with the application of lump-sum, unit-price, and hybrid contracts across different project and institutional contexts. Figure 2 presents the distribution of contract risk profiles among developed and developing countries.

The findings indicate that contract risk profiles vary between the two country groups. Developed countries demonstrate greater adoption of hybrid contractual arrangements, particularly in construction, energy, and infrastructure projects, whereas developing countries rely more extensively on lump-sum and unit-price contracts depending on project characteristics and prevailing market conditions. These differences highlight the diversity of contractual practices across geographical and institutional contexts.

Figure 2 summarizes the relationship between contract types and reported cost-overflow patterns. The synthesis indicates that lump-sum contracts are more frequently associated with higher cost-overflow risks under conditions of market volatility, whereas unit-price contracts provide greater flexibility but involve higher uncertainty regarding final project costs. Hybrid contracts combine characteristics of both contractual approaches and were identified in several

studies as an alternative arrangement for managing project uncertainty across various sectors.

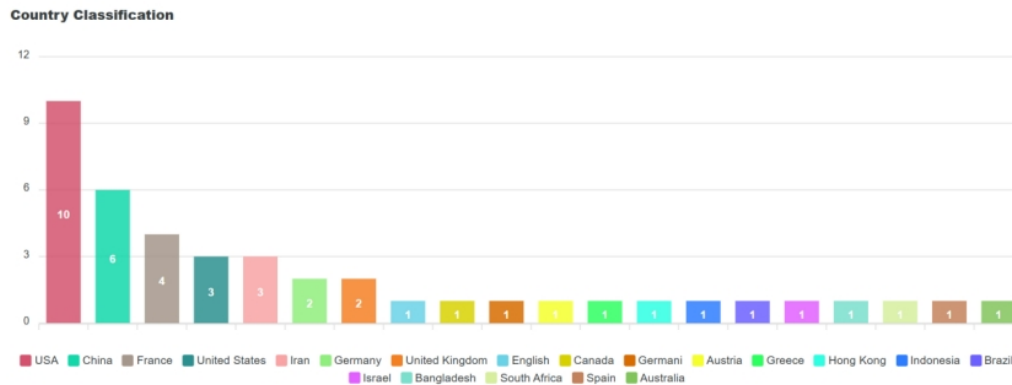


Figure 2. Country Classification by Contract Risk Profile

Table 4

Outcome Classification

No	Outcome Category	Count	Authors
1	Renewable Energy Procurement	1	(Beiter et al., 2023)
2	Social Security Claiming	1	(Maurer et al., 2018; Tharp, 2025)
3	Social Security Behavior	1	(Maurer et al., 2021; Tharp, 2025)
4	Sequential Innovation	1	(Choi & Stefanadis, 2018; Kitamura et al., 2025)
5	Reverse Mortgages Risk	1	(Do et al., 2024; Fuente et al., 2020)
6	Retirement Payout Choices	1	(Foltyn & Olsson, 2024; Hurwitz & Sade, 2020)
7	Power and Gas Risk	1	(Xie et al., 2023)
8	P-EBT Program Effects	1	(Bauer et al., 2024)
9	Pension Buyouts Impact	1	(Jorgensen et al., 2024)
10	Social Worker Salaries	1	(Dai et al., 2022)

The findings further indicate differences in project performance among lump-sum, unit-price, and hybrid contracts, particularly concerning cost management and project execution. Figure 3 presents the comparative relationships among contract types, analytical approaches, and reported cost-overrun patterns. The synthesis shows that lump-sum contracts are more frequently associated with higher cost-overrun risks under conditions of market volatility, whereas unit-price contracts provide greater flexibility but involve increased uncertainty regarding final project costs. Hybrid contracts combine characteristics of both contract types and have emerged across multiple sectors as an alternative contractual arrangement for managing project uncertainty.

The distribution of stakeholder roles associated with different contractual arrangements is presented in Figure 3. The thematic analysis identifies contractors, clients, suppliers, risk managers, and regulators as the principal stakeholders involved in contractual risk management. Their roles vary according to contract type, project characteristics, and institutional context, illustrating the complexity of risk allocation and decision-making processes across construction, energy, and agricultural projects.

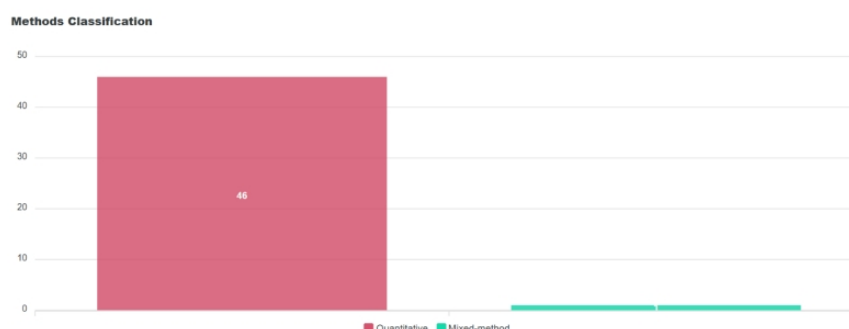


Figure 3. Analytical Method and Cost Overrun Comparison

Figure 3 outlines the critical roles and influence of key stakeholders in the application of lump-sum and unit-price contracts in construction and infrastructure projects. The interactions among these stakeholders affect contract design and management, as well as how different contract types allocate risks and incentives among the involved parties.

Contractors and Clients (Project Owners)

In the construction and infrastructure sectors, the primary stakeholders are contractors and clients (project owners). These two groups are central to contract negotiations, and their relationship significantly influences risk allocation and payment structure design. As illustrated in Figure 3, contractors often bear most financial risks associated with lump-sum contracts, while clients (project owners) seek cost certainty. This aligns with the lump-sum contract model, in which contractors agree to complete the project for a fixed price, regardless of the actual costs incurred.

Conversely, unit-price contracts provide greater flexibility by allowing payments to be adjusted based on the quantity of work performed, particularly when variations in scope occur. Figure 3 indicates that unit-price contracts facilitate a more dynamic relationship between contractors and clients, with payment amounts varying according to actual quantities completed rather than being predetermined. This flexibility is particularly beneficial for projects where the scope of work may change or where unforeseen conditions could affect overall project costs.

Risk Managers

Another key stakeholder in both contract types is the risk manager. As shown in Figure 4, risk managers play a pivotal role in identifying, assessing, and mitigating potential risks throughout the project lifecycle. Lump-sum contracts typically transfer greater financial risk to the contractor; therefore, risk managers must ensure that contingency plans are established to address potential cost overruns, delays, and unforeseen conditions. In contrast, unit-price contracts transfer some risks to the client because payments are based on actual quantities of work completed. In these arrangements, risk managers focus on monitoring scope changes and adjusting budgets in response to ongoing fluctuations in material and labor costs.

Suppliers and Subcontractors

Suppliers and subcontractors are also critical stakeholders in construction and infrastructure projects. Under unit-price contracts, they are generally compensated based on the quantities of materials supplied or labour performed, meaning their payments are directly linked to the volume of completed work. This mechanism ensures proportional compensation but also exposes them to market uncertainties. Under lump-sum contracts, suppliers and subcontractors typically operate within the fixed contract price established by the main contractor, providing limited flexibility to adjust pricing when market conditions change.

Regulators and Legal Authorities

The roles of regulators and legal authorities are significant in the formulation, implementation, and enforcement of construction contracts. The involvement of government agencies, particularly in public works and large-scale infrastructure projects, has substantial implications for both lump-sum and unit-price contracts. These stakeholders establish and enforce regulations related to contract structures, ensure compliance with safety and environmental requirements, and frequently contribute to dispute resolution concerning cost overruns, delays, or non-compliance with contractual performance obligations.

Community and Environmental Stakeholders

Community and environmental stakeholders have gained increasing importance in contemporary construction and infrastructure projects. Unit-price contracts may provide flexibility in addressing environmental impact requirements and community-related considerations, whereas hybrid contract arrangements often place greater emphasis on sustainability objectives and performance-based outcomes. Such arrangements commonly incorporate provisions related to environmental performance, carbon offsetting, and community development objectives.

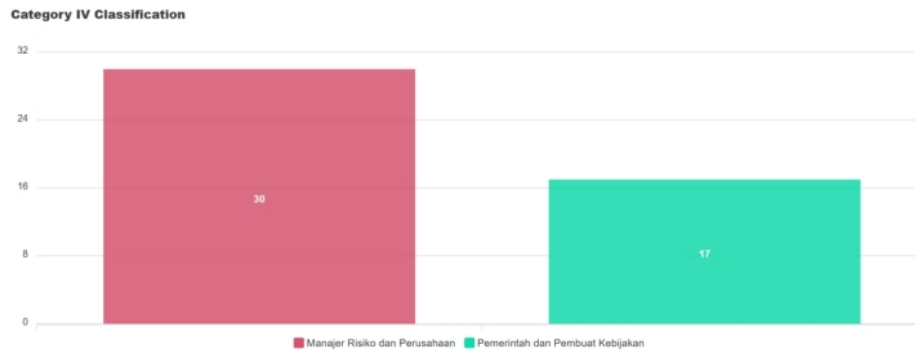


Figure 4. Key Stakeholders Context

Short-Term Outcomes

The short-term outcomes reflect the immediate impact of contract design on project performance, particularly in terms of cost containment and liquidity management. In Developed Countries: Lump-sum contracts are particularly effective in the short term for cost containment because the total project cost is fixed at the outset. This arrangement benefits clients who require budget certainty and financial predictability. However, these contracts may encourage cost-cutting measures or quality compromises by contractors who bear the full risk of unforeseen circumstances. Unit-price contracts, on the other hand, offer greater flexibility and ensure that clients pay only for the work completed, making them suitable for projects with less-defined scopes (Bourgeois et al., 2021; Carton et al., 2026; Gao, 2015). As shown in Figure 3, unit-price contracts tend to result in lower initial costs but may lead to cost overruns if actual quantities exceed initial estimates. Hybrid contracts that combine lump-sum and unit-price elements provide a balance between cost certainty and flexibility (Beiter et al., 2023).

In Developing Countries: In developing economies, lump-sum contracts are frequently used for public works projects because they provide immediate financial predictability for clients. However, contractors in these regions may face challenges such as inflation, labor shortages, and unexpected material cost increases. Unit-price contracts provide greater flexibility for contractors in developing countries by enabling adjustments to market fluctuations, which is particularly important in regions where material prices may vary significantly due to political instability or currency fluctuations (Adnan et al., 2020; Prentzas et al., 2024). Hybrid contracts help mitigate short-term risks faced by both clients and contractors, as demonstrated in Bangladesh's agricultural sector, where such contracts allow price adjustments based on real-time market conditions (Li et al., 2026; Ma et al., 2021).

Medium-Term Outcomes

The medium-term outcomes focus on performance improvement and risk mitigation throughout the project lifecycle. In Developed Countries: Over the medium term, lump-sum contracts remain a preferred option for clients seeking to avoid cost overruns and ensure that contractors deliver projects according to agreed specifications. However, these contracts may limit contractors' incentives to adapt to unforeseen conditions because the contract price remains fixed (Reichel et al., 2022; Rey et al., 2016). Hybrid contracts have demonstrated effectiveness in the medium term by allowing clients and contractors to share risks while aligning contractor performance with desired project outcomes. In energy projects, hybrid contracts combining lump-sum arrangements with performance-based incentives have been shown to improve contractor performance by aligning contractor incentives with client objectives, as observed in renewable energy projects across Germany and the United States (Xie et al., 2023).

In Developing Countries: In developing countries, the use of unit-price contracts in infrastructure projects has helped mitigate cost uncertainty. However, these contracts may result in unexpected cost increases when market conditions change substantially. Studies from Bangladesh and Indonesia indicate that, over the medium term, hybrid contracts improve contractor performance by reducing the risks of poor quality and project delays. In agricultural projects, hybrid contracts that combine unit-price mechanisms with performance-based clauses incentivize contractors to achieve production targets while maintaining flexibility in adjusting

prices according to market changes (Adnan et al., 2020; Prentzas et al., 2024).

Long-Term Outcomes

The long-term outcomes focus on sustainability, institutional learning, and project success beyond project completion. In Developed Countries: Lump-sum contracts are less prevalent in long-term applications because of their limited flexibility in responding to changing conditions. In renewable energy projects, hybrid contracts help mitigate long-term risks by adapting to fluctuations in energy prices and regulatory changes, particularly in contexts where government policies related to carbon taxation and renewable energy incentives play significant roles. These hybrid models support sustainability by incorporating performance targets and penalty clauses that maintain contractor accountability for long-term project performance (Beiter et al., 2023; Bourgeois et al., 2021).

In Developing Countries: In developing countries, the long-term effectiveness of lump-sum contracts is often constrained by their limited adaptability to changing economic conditions, including inflation, supply chain disruptions, and market volatility. Hybrid contracts, in contrast, provide greater long-term sustainability by adapting to fluctuating market conditions while maintaining financial control for clients. Infrastructure projects in India demonstrate these long-term advantages, where economic volatility and political instability frequently disrupt project schedules and cost structures. Furthermore, institutional learning from long-term projects in emerging markets demonstrates how hybrid contracts can evolve to address emerging challenges, including climate change adaptation and local economic development (Adnan et al., 2020; Prentzas et al., 2024; Vahdatmanesh & Firouzi, 2020).

Synthesis of Findings and Emerging Trends

The findings indicate that the reported outcomes of lump-sum, unit-price, and hybrid contracts vary across short-, medium-, and long-term project horizons. Studies conducted in developed countries more frequently reported the application of hybrid contracts in construction, energy, and infrastructure projects, whereas studies from developing countries predominantly described the use of lump-sum and unit-price contracts under diverse project conditions and market environments. Table 4 summarizes the outcome classifications identified through the thematic analysis.

Hybrid contracts balance the need for financial predictability with the ability to adapt to market fluctuations, thereby supporting sustainability and performance improvement over time. In developing countries, hybrid contracts have demonstrated greater adaptability by improving contractor performance and cost management in the medium term while providing the cost certainty required by clients operating in unstable economic environments.

Discussion

This study provides a comprehensive exploration of risk mitigation strategies employed in lump-sum and unit-price contracts, revealing the complex dynamics of risk management in contemporary contract design. The findings highlight a notable transition from rigid, traditional lump-sum contracts toward more flexible hybrid models that incorporate unit-price mechanisms, offering a broader perspective on risk-sharing practices in project management. Consistent with previous studies by Roussy et al. (2018) and Bourgeois et al. (2021), which emphasized the importance of risk allocation, this study extends existing knowledge by demonstrating that hybrid contracts provide enhanced adaptability and resilience in responding to external disruptions (Carton et al., 2026).

Furthermore, this study establishes a connection between financial hedging instruments, such as weather derivatives and steel futures, and contract design, a relationship previously explored by Xie (2024) in specific sectors, including agriculture and energy. However, unlike these sector-specific approaches, the present study suggests that integrating such instruments within hybrid contract structures can provide broader applications and potentially transform risk management practices across industries, including construction, energy, and agriculture. This broader applicability represents a significant advancement in contract theory, particularly because existing literature has largely been dominated by relatively narrow, sector-specific perspectives.

Similarly, the role of digital technologies, including blockchain and smart contracts, in enhancing transparency and mitigating moral hazard has become a recurring theme in recent studies (e.g., (Li et al., 2026; Ma et al., 2021)). However, this study contributes by integrating these technologies into a more comprehensive contract framework that combines digital mechanisms with traditional risk allocation approaches and performance-based incentives. The incorporation of real-time contract monitoring and enforcement mechanisms represents a key contribution of this study, positioning digital technologies as strategic tools for improving the reliability, transparency, and flexibility of contract execution.

Interestingly, while previous research has primarily relied on principal-agent theory to explain contractual dynamics (e.g., (Chen et al., 2021)), this study introduces a more interdisciplinary perspective by incorporating elements of institutional theory and behavioral economics (Kostiuk et al., 2025). This theoretical expansion is particularly evident in the analysis of how stakeholder perceptions of fairness, trust, and prior experience with contract implementation influence the effectiveness of risk-sharing mechanisms. This perspective challenges purely economic assumptions underlying earlier contractual models and emphasizes the importance of psychological and institutional factors in determining the outcomes of real-world contract applications.

A notable limitation of the existing literature base also warrants consideration. Of the 48 sources analyzed, 34 (70.8%) originated from developed-country contexts (Table 3), potentially introducing interpretive bias toward institutional environments characterized by stable regulatory frameworks, mature procurement systems, and relatively low market volatility. The findings regarding developing economies, derived from only 13 sources, should therefore be interpreted cautiously. Conditions specific to developing countries (including limited institutional capacity, high inflation rates, weak contract enforcement mechanisms, and political instability) may generate contractual outcomes that differ substantially from those observed in developed contexts. This geographic imbalance within the evidence base represents a significant limitation that future research should address through dedicated empirical studies and primary data collection in developing and emerging market settings.

Moreover, the results provide additional insights into the relationship between policy interventions and contract design, particularly regarding the broader concept of lump-sum transfers and subsidy mechanisms. The findings suggest that although lump-sum payments can provide immediate financial relief, their capacity to sustain long-term social welfare outcomes may be limited, particularly in volatile economic environments. This perspective highlights the need for a more comprehensive policy design approach that balances short-term assistance with long-term sustainability objectives.

Based on the synthesis of findings from 48 sources, this study proposes an Integrative Contract Risk Management (ICRM) framework that positions hybrid contracts at the intersection of three theoretical dimensions: (1) utility maximization under uncertainty (Expected Utility Theory), (2) strategic stakeholder interaction (Game Theory), and (3) incentive alignment through monitoring (Principal-Agent Theory). This framework suggests that contract effectiveness is determined not solely by contractual structure but also by the alignment between contract design, stakeholder behavioral dynamics, institutional context, and project time horizon. Although the integration of digital technologies, such as blockchain-based enforcement and AI-driven predictive analytics, represents a promising direction, current literature provides primarily conceptual support rather than empirical validation. Therefore, future research should prioritize empirical testing of hybrid contract models incorporating these technologies across diverse economic contexts and project environments.

CONCLUSION

This study provides a comprehensive qualitative synthesis of risk mitigation strategies in lump-sum and unit-price contracts across the construction, energy, and agricultural sectors. Through thematic analysis and cross-case comparison of 48 peer-reviewed studies, the findings demonstrate a growing shift toward hybrid contract models that combine the cost certainty of lump-sum contracts with the flexibility of unit-price arrangements, thereby improving their effectiveness in managing cost uncertainty and market volatility. This study contributes to the literature by developing the Integrative Contract Risk Management (ICRM) framework, which

integrates Expected Utility Theory, Game Theory, and Principal-Agent Theory to explain contractual risk management across diverse project contexts. The findings further indicate that contract effectiveness depends not only on contract type but also on contextual factors, including market conditions, regulatory environments, stakeholder relationships, and institutional settings. These findings highlight the importance of selecting contract strategies that align with project-specific characteristics.

Despite these contributions, the review identifies several important research gaps. Existing evidence remains concentrated in developed countries, limiting the generalizability of current knowledge to developing economies, where institutional conditions and market dynamics differ substantially. Moreover, the dominance of quantitative research has resulted in insufficient exploration of stakeholder behavior, decision-making processes, and implementation challenges. Future studies should therefore validate the proposed ICRM framework through empirical field investigations of hybrid contract models, particularly in developing countries, using mixed-method approaches that integrate quantitative performance indicators with qualitative stakeholder perspectives. Additional research should also examine the potential roles of behavioral economics, blockchain-enabled contract governance, and artificial intelligence in enhancing contractual risk prediction and mitigation. These research directions will strengthen both theoretical understanding and practical guidance for managing contractual risks in increasingly complex and uncertain project environments.

ACKNOWLEDGEMENT

The authors would like to express their sincere gratitude to Universitas Tarumanagara for providing academic support and an environment conducive to the completion of this study. The authors also appreciate the valuable contributions of colleagues and reviewers whose constructive feedback helped improve the quality of this manuscript. No specific external funding was received for this research.

AUTHOR CONTRIBUTION STATEMENT

Robert Daniel Zebua contributed to the conceptualization of the study, literature review, data collection, thematic analysis, interpretation of findings, and preparation of the original manuscript. Oei Fuk Jin supervised the research process, contributed to the development of the methodology and theoretical framework, critically reviewed and revised the manuscript, and approved the final version for publication. All authors have read and agreed to the published version of the manuscript.

REFERENCES

- Adnan, M., K. M., Ying, L., Ayoub, Z., Sarker, A., S., Menhas, R., Chen, F., & Yu, M. (2020). Risk Management Strategies to Cope Catastrophic Risks in Agriculture: The Case of Contract Farming, Diversification and Precautionary Savings. *Agriculture*, 10(8), 351. <https://doi.org/10.3390/agriculture10080351>
- Alamri, O. A. (2024). *Analysing service level agreements with multiple customers*. RMIT University.
- Alamri, O., Abbasi, B., Minas, J. P., & Zeepongsekul, P. (2018). Service level agreements: Ready-rate analysis with lump-sum and linear penalty structures. *Journal of the Operational Research Society*, 69(1), 142–155. <https://doi.org/10.1057/s41274-017-0194-7>
- Algarvio, H. (2023). Risk-Sharing Contracts and risk management of bilateral contracting in electricity markets. *International Journal of Electrical Power & Energy Systems*, 144, 108579. <https://doi.org/10.1016/j.ijepes.2022.108579>
- Almeida, H., Hankins, K. W., & Williams, R. (2017). Risk Management with Supply Contracts. *The Review of Financial Studies*, 30(12), 4179–4215. <https://doi.org/10.1093/rfs/hhx051>
- Baloi, D., & Price, A. D. F. (2022). Modelling global risk factors affecting construction cost performance. *International Journal of Project Management*, 21(4), 261–269. [https://doi.org/10.1016/S0263-7863\(02\)00017-0](https://doi.org/10.1016/S0263-7863(02)00017-0)
- Barron, M., P., Kilgore, M. A., & Blinn, C. R. (2017). Financial Analysis of Scale Versus Lump Sum Timber Sale Payment Methods. *Journal of Forest Economics*, 28, 63–69. <https://doi.org/10.1016/j.jfe.2017.06.001>
- Bauer, L., Ruffini, K., & Schanzenbach, D. W. (2024). The effects of lump-sum food benefits during

- the COVID-19 pandemic on spending, hardship, and health. *Journal of Public Economics*, 240, 105269. <https://doi.org/10.1016/j.jpubeco.2024.105269>
- Baumann, C., Favaro, M., Marc, J., & Paty, B. (2019). Gestion des violences internes en milieu professionnel. *Psychologie Du Travail et Des Organisations*, 25(4), 269–280. <https://doi.org/10.1016/j.pto.2019.06.002>
- Beiter, P., Guillet, J., Jansen, M., Wilson, E., & Kitzing, L. (2023). The enduring role of contracts for difference in risk management and market creation for renewables. *Nature Energy*, 9(1), 20–26. <https://doi.org/10.1038/s41560-023-01401-w>
- Beiter, P., Guillet, J., Jansen, M., Wilson, E., & Kitzing, L. (2024). The enduring role of contracts for difference in risk management and market creation for renewables. *Nature Energy*, 9(1), 20–26.
- Beuving, J., & Vries, G. (2025). *Doing qualitative research: The craft of naturalistic inquiry*. Routledge.
- Bourgeois, C., Giraudet, L.-G., & Quirion, P. (2021). Lump-sum vs. *Energy-Efficiency Subsidy Recycling of Carbon Tax Revenue in the Residential Sector: A French Assessment*. *Ecological Economics*, 184, 107006. <https://doi.org/10.1016/j.ecolecon.2021.107006>
- Braun, V., & Clarke, V. (2006). Using thematic analysis in psychology. *Qualitative Research in Psychology*, 3(2), 77–101. <https://doi.org/10.1191/1478088706qp063oa>
- Braun, V., & Clarke, V. (2023). Is thematic analysis used well in health psychology? A critical review of published research, with recommendations for quality practice and reporting. *Health Psychology Review*, 17(4), 695–718.
- Carton, B., Dolphin, G., Duval, R., Hodge, A., Kara, A., Voigts, S., & Wende, S. (2026). *The EU's Energy Transition: Investment Impact and Role of Carbon Pricing Revenue Recycling*. IMF Working Paper, WP/26/46.
- Chen, J., Zhu, Q., & Basar, T. (2021). Dynamic Contract Design for Systemic Cyber Risk Management of Interdependent Enterprise Networks. *Dynamic Games and Applications*, 11(2), 294–325. <https://doi.org/10.1007/s13235-020-00363-y>
- Chen, Y., Chien, Y., Wen, Y., & Yang, C. C. (2021). *Are unconditional lump-sum transfers a good idea?* *Economics Letters*, 209, 110088. <https://doi.org/10.1016/j.econlet.2021.110088>
- Choi, J. P., & Stefanadis, C. (2018). Sequential innovation, naked exclusion, and upfront lump-sum payments. *Economic Theory*, 65(4), 891–915. <https://doi.org/10.1007/s00199-017-1042-3>
- Collins, J. M., & Kulka, A. (2023). Saving by buying ahead: Stockpiling in response to lump-sum payments. *Fiscal Studies*, 44(4), 451–484. <https://doi.org/10.1111/1475-5890.12349>
- Creswell, J. W., & Poth, C. N. (2018). *Qualitative inquiry and research design: Choosing among five approaches* (4th ed.). SAGE Publications. <https://us.sagepub.com/en-us/nam/qualitative-inquiry-and-research-design/book246896>
- Dai, H., Jiang, N., & Li, R. (2022). The myth of organization autonomy: Social workers' salary under the lump sum grant subvention system in Hong Kong. *Asian Social Work and Policy Review*, 16(1), 22–32. <https://doi.org/10.1111/aswp.12244>
- Do, V., Nguyen, T. H., & Vu, T. (2024). Risk management and private debt contracts: The role of weather derivatives. *Journal of Business Finance & Accounting*, 51(9–10), 2848–2883. <https://doi.org/10.1111/jbfa.12800>
- Eisenmann, C., Steck, F., Hedemann, L., Lenz, B., & Koller, F. (2020). Distributional effects of carbon taxation in passenger transport with lump-sum offset. *European Transport Research Review*, 12(1), 51. <https://doi.org/10.1186/s12544-020-00442-6>
- Farzadmehr, M., Taleizadeh, A. A., & Thaichon, P. (2025). Price optimization in supply chain agreements. *Journal of Revenue and Pricing Management*, 24(3), 300–321. <https://doi.org/10.1057/s41272-024-00500-x>
- Foltyn, R., & Olsson, J. (2024). Subjective life expectancies, time preference heterogeneity, and wealth inequality. *Quantitative Economics*, 15(3), 699–736.
- Fuente, L., I. D., Navarro, E., & Serna, G. (2020). Reverse Mortgage Risks: Time Evolution of VaR in Lump-Sum Solutions. *Mathematics*, 8(11), 2043. <https://doi.org/10.3390/math8112043>
- Gao, L. (2015). Collaborative forecasting, inventory hedging and contract coordination in dynamic supply risk management. *European Journal of Operational Research*, 245(1), 133–145. <https://doi.org/10.1016/j.ejor.2015.02.048>

- Hanstein, T., Kumpe, O., Mittelmeier, W., & Skripitz, R. (2015). Teilzementierte und unzementierte Huftendoprothetik. *Der Orthopaede*, 44(8), 617–622. <https://doi.org/10.1007/s00132-015-3139-3>
- Huang, S., Lien, W., J., Yang, S., & Zheng, J. (2024). Lump-sum tax or flat income tax? *International Review of Economics & Finance*, 92, 20–33. <https://doi.org/10.1016/j.iref.2024.02.007>
- Hurwitz, A., & Sade, O. (2020). An investigation of time preferences, life expectancy, and annuity versus lump sum choices. *Journal of Economic Behavior & Organization*, 180, 812–825. <https://doi.org/10.1016/j.jebo.2019.05.011>
- Januarita, R., & Sumiyati, Y. (2021). Legal risk management: Can the COVID-19 pandemic be included as a force majeure clause in a contract? *International Journal of Law and Management*, 63(2), 219–238. <https://doi.org/10.1108/IJLMA-05-2020-0140>
- Jones, L. E., & Michelmores, K. (2019). Timing is money: Does lump-sum payment of the Earned Income Tax Credit affect savings and debt? *Economic Inquiry*, 57(3), 1659–1674. <https://doi.org/10.1111/ecin.12788>
- Jorgensen, R., Obonyo, T., & Wingender, J. R. (2024). De-risking pension plans: The impact on firm value from lump-sum buyouts. *Risk Management*, 26(3), 14. <https://doi.org/10.1057/s41283-024-00145-5>
- Kantari, L. A., Pujawan, I. N., Arvitrida, N. I., & Hilletoft, P. (2022). Mixing contract-based and on-demand sourcing of transportation services for improved supply chain performance under supply uncertainties. *International Journal of Systems Science: Operations & Logistics*, 9(4), 472–488.
- Kitamura, H., Matsushima, N., Sato, M., & Tamura, W. (2025). *Naked exclusion under exclusive-offer competition*. ISER Discussion Paper.
- Kostiuk, Y., Skladannyi, P., Samoilenko, Y., Khorolska, K., Bebesko, B., & Sokolov, V. (2025). A system for assessing the interdependencies of information system agents in information security risk management using cognitive maps. *Cyber Hygiene & Conflict Management in Global Information Networks 2024*, 3925, 249–264.
- Li, W., Li, X., & Wang, X. (2026). A Contract Period Optimizing Method for Water Saving Management Contract Project in Public Institutions Considering Social Benefits. *Water Resources Management*, 40(7), 258.
- Lincoln, Y. S., & Guba, E. G. (1985). *Naturalistic inquiry*. SAGE Publications. <https://scholar.google.com/scholar?q=Naturalistic+inquiry>
- Liu, L., Chen, Y., Yang, J., & Yang, C.-F. (2025). IoT-driven Dynamic Risk Management in Supply Chain Finance: A Multitechnology Fusion Framework and Collaborative Implementation Strategies. *Sensors & Materials*, 37(8, Part 3), 3661.
- Lu, R., Hoang, V. T., & Wong, W.-K. (2021). Do lump-sum investing strategies really outperform dollar-cost averaging strategies? *Studies in Economics and Finance*, 38(3), 675–691. <https://doi.org/10.1108/SEF-04-2018-0107>
- Luo, J., Zhang, X., & Jiang, X. (2019). Multisources Risk Management in a Supply Chain under Option Contracts. *Mathematical Problems in Engineering*, 2019(1), 7482584. <https://doi.org/10.1155/2019/7482584>
- Ma, W., Li, X., & Wang, X. (2021). Water Saving Management Contract, identification and ranking of risks based on life cycle and best-worst method. *Journal of Cleaner Production*, 306, 127153. <https://doi.org/10.1016/j.jclepro.2021.127153>
- Maurer, R., Mitchell, S., O., Rogalla, R., & Schimetschek, T. (2018). Will they take the money and work? *Journal of Risk and Insurance*, 85(4), 877–909. <https://doi.org/10.1111/jori.12173>
- Maurer, R., Mitchell, S., O., Rogalla, R., & Schimetschek, T. (2021). Optimal social security claiming behavior under lump sum incentives. *Journal of Risk and Insurance*, 88(1), 5–27. <https://doi.org/10.1111/jori.12302>
- Mollajan, A., Iranmanesh, S. H., & TavakkoliMoghaddam, R. (2023). A systems approach to improve reliability of a contract by Modularising contract's information flow architecture. *Enterprise Information Systems*, 17(4), 1971773. <https://doi.org/10.1080/17517575.2021.1971773>
- Morton, G. D. (2019). The power of lump sums: Using maternity payment schedules to reduce the gender asset gap. *World Development*, 113, 352–367. <https://doi.org/10.1016/j.worlddev.2018.08.012>
- Olaniran, J., O., Love, D., P. E., Edwards, J., D., Olatunji, O. A., & Matthews, J. (2017). Chaos theory:

- Implications for cost overrun research in hydrocarbon megaprojects. *Journal of Construction Engineering and Management*, 143(2), 5016020. [https://doi.org/10.1061/\(ASCE\)CO.1943-7862.0001227](https://doi.org/10.1061/(ASCE)CO.1943-7862.0001227)
- Otto, A., & Webley, P. (2016). Saving, Selling, Earning, and Negotiating: How Adolescents Acquire Monetary Lump Sums. *Journal of Consumer Affairs*, 50(2), 342–371. <https://doi.org/10.1111/joca.12075>
- Prentzas, A., Bournaris, T., Nastis, S., Moulogianni, C., & Vlontzos, G. (2024). Enhancing Sustainability through Weather Derivative Option Contracts. *Sustainability*, 16(17), 7372. <https://doi.org/10.3390/su16177372>
- Reichel, L., Schmeiser, H., & Schreiber, F. (2022). On the optimal management of counterparty risk in reinsurance contracts. *Journal of Economic Behavior & Organization*, 201, 374–394. <https://doi.org/10.1016/j.jebo.2022.05.026>
- Rey, D., Garrido, A., & Calatrava, J. (2016). Comparison of Different Water Supply Risk Management Tools for Irrigators. *Environmental and Resource Economics*, 65(2), 415–439. <https://doi.org/10.1007/s10640-015-9912-2>
- Ricome, A., & Reynaud, A. (2022). Marketing contract choices in agriculture: The role of price expectation and price risk management. *Agricultural Economics*, 53(1), 170–186. <https://doi.org/10.1111/agec.12675>
- Roussy, C., Ridier, A., Chaib, K., & Boyet, M. (2018). Marketing contracts and risk management for cereal producers. *Agribusiness*, 34(3), 616–630. <https://doi.org/10.1002/agr.21549>
- Sheng, J., Wang, X., Yang, J., & Li, M. (2019). Performance-based fee contract and risk-taking strategy in asset management tournament. *Bulletin of Economic Research*, 71(3), 388–403. <https://doi.org/10.1111/boer.12185>
- Steimle, S., Ryan, R., Liu, S., & Fisher, P. A. (2025). Which form of cash is best for families? *Children and Youth Services Review*, 177, 108497. <https://doi.org/10.1016/j.childyouth.2025.108497>
- Tharp, D. (2025). Revisiting the Social Security Claiming Puzzle: Behavioral Preferences as Rational Explanations for Early Claiming. *Available at SSRN 5943355*.
- Tisdell, E. J., Merriam, S. B., & Stuckey-Peyrot, H. L. (2025). *Qualitative research: A guide to design and implementation*. John Wiley & Sons.
- Tran, T., Yoon, K., & Genchev, S. (2017). Lump-Sum versus Pay-As-You-Go: The Moderating Effect of Contract Types on the Optimal Logistics Decisions. *Managerial and Decision Economics*, 38(4), 547–555. <https://doi.org/10.1002/mde.2802>
- Vahdatmanesh, M., & Firouzi, A. (2020). Construction material supply risk management using Asian option contracts. *Engineering, Construction and Architectural Management*, 27(10), 3395–3414. <https://doi.org/10.1108/ECAM-02-2019-0102>
- Wallace, M. (2019). The Lump Sum: A Theory of Modal Parts. *Philosophical Papers*, 48(3), 403–435. <https://doi.org/10.1080/05568641.2018.1562310>
- Wang, X. (2019). Valuation of new-designed contracts for catastrophe risk management. *The North American Journal of Economics and Finance*, 50, 101041. <https://doi.org/10.1016/j.najef.2019.101041>
- Weber, K., Damyanovic, D., & Thaler, T. (2024). Impacts of social contracts for citizens in the Austrian flood risk management system. *International Journal of Disaster Risk Reduction*, 102, 104266. <https://doi.org/10.1016/j.ijdr.2024.104266>
- Xie, H., Sun, X., Fu, W., Chen, C., & Bie, Z. (2023). Risk management for integrated power and natural gas systems against extreme weather. *Energy*, 263, 125750. <https://doi.org/10.1016/j.energy.2022.125750>
- Xie, Y., Zhang, Y., Lee, W. J., Lin, Z., & Shamash, Y. A. (2024). Virtual power plants for grid resilience: A concise overview of research and applications. *IEEE/CAA Journal of Automatica Sinica*, 11(2), 329–343.
- Zhang, R., & Zhu, Q. (2022). Optimal Cyber-Insurance Contract Design for Dynamic Risk Management and Mitigation. *IEEE Transactions on Computational Social Systems*, 9(4), 1087–1100. <https://doi.org/10.1109/TCSS.2021.3117905>