

Innovating Finance: Applying the Nash Concept to Develop a Sustainable Pawn Model Aligned with the SDGs

Lukman Yafi¹, Thufail Al Mutawakkil²

¹No. 42, Lot 2287, KG Sri Muhibbah Subah, Shah Alam, Selangor 40150, Malaysia

²SMA Muhammadiyah Al Kautsar PK Kartasura, Sukoharjo, Indonesia

¹bintangsilmi@yahoo.com, ²thufailalmutawakkil253@gmail.com

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Abstract

Objective: This study explores the application of the Nash Equilibrium concept in developing a sustainable pawn (Rahn) model within the framework of Islamic finance, aiming to contribute to the realization of the Sustainable Development Goals (SDGs), particularly SDG 1 (No Poverty), SDG 8 (Decent Work and Economic Growth), and SDG 9 (Industry, Innovation, and Infrastructure). The main objective is to analyze stakeholder interactions—such as those between Islamic financial institutions, customers, and the broader community—and how their strategic decisions affect the stability and sustainability of pawn contract mechanisms. **Theoretical framework:** The theoretical framework is grounded in Islamic jurisprudence (Fiqh al-Muamalat) and game theory, particularly Nash Equilibrium, which emphasises rational decision-making among interdependent stakeholders. **Literature review:** The literature review discusses previous models of Ar-Rahn (pawn) in Islamic financial systems, along with contemporary applications of behavioral economics and decision theory in finance. **Methods:** Using a descriptive qualitative approach, data were gathered through an in-depth review of scholarly literature, regulatory frameworks, and semi-structured interviews with Islamic finance scholars and industry practitioners. The study investigates the legal basis for Rahn contracts—highlighting permissibility rooted in Qard (loan), al-Ba'i (credit sales), and Ijarah (leasing with deferred payment)—and analyzes the potential of Nash strategies in minimizing risk and optimizing outcomes. **Results:** Findings reveal that applying the Nash concept in Rahn-based financing can improve contract sustainability by encouraging balanced cooperation and minimizing conflict of interest. **Implications:** However, implementation challenges include the complexity of modelling, information asymmetry, and the need for clear regulatory support. The study emphasizes the role of multi-stakeholder collaboration to optimize contract design for long-term economic resilience. **Novelty:** The novelty of this research lies in integrating Islamic legal principles with modern strategic modeling to offer an innovative pawn model aligned with the SDGs. This integration opens new pathways for ethical finance innovation that promotes economic justice, sustainability, and financial inclusion in Muslim-majority and global contexts.

Keywords: finance, nash equilibrium, pawn contract, sustainability, sdgs.

INTRODUCTION

The advancement of Islamic finance has encouraged the creation of sharia-compliant financial instruments, including the Rahn or Islamic pawn contract. As a financing mechanism, Rahn allows individuals or institutions to use assets as collateral to access funds without engaging in interest-based transactions, thus aligning with Islamic legal and ethical principles. Despite its long historical roots and legal validation through DSN-MUI fatwas and classical fiqh interpretations, the modern application of Rahn faces significant

challenges in achieving contractual sustainability, equity among stakeholders, and socio-economic impact [1]-[3].

A key research gap lies in the limited integration of strategic economic modeling—particularly game theory, such as the Nash Equilibrium—into the design and evaluation of Islamic pawn contracts. Previous studies tend to focus on the legality and operational aspects of Rahn, but insufficient attention is given to the strategic behavior of stakeholders (e.g., banks, customers, regulators) and how their interaction affects the fairness, transparency, and long-term resilience of the model. This is particularly crucial given the dynamic nature of financial behavior and the importance of aligning financial innovation with ethical governance. Moreover, there is an urgent need to develop Rahn models that not only fulfill sharia compliance but also support broader societal goals as reflected in the Sustainable Development Goals (SDGs). The potential contributions of a sustainable Rahn model to SDG 1 (No Poverty), SDG 8 (Decent Work and Economic Growth), and SDG 9 (Industry, Innovation, and Infrastructure) are immense—especially in empowering the unbanked, supporting micro-enterprises, and creating inclusive economic systems. However, this potential remains underutilized due to the lack of interdisciplinary approaches in model development [1]-[3].

This study addresses this critical intersection by applying the Nash concept from game theory to analyze the behavioral interactions in Rahn-based financing and to develop a sustainable pawn contract model that integrates economic rationality with Islamic ethical values. The novelty of this research lies in merging Islamic jurisprudence with quantitative strategic analysis to build a more resilient, inclusive, and SDG-aligned Islamic financial product. Through this approach, the study aims to bridge the gap between theoretical Islamic finance and practical, sustainable economic development. Along with the growth of the Islamic finance industry, especially in the development of instruments and products that follow sharia principles, rahn contracts or pawn contracts are one of the important focuses. The rahn contract allows individuals or companies to use certain assets as collateral to obtain financing or interest-free loans following sharia principles. However, the development of a sustainable rahn contract model still faces several challenges. One of the main challenges is in ensuring fairness and balance between the parties involved in the rahn contract transaction. This includes aspects of fair pricing, effective risk management, and the arrangement of contract clauses that benefit all parties involved [4], [5].

The Nash concept of game theory offers a robust analytical framework for understanding the interactions between various parties in financial transactions, including in the context of rahn contracts. However, its application in the development of a sustainable rahn contract model still requires further research and in-depth exploration. In addition, the sustainability aspect is also an important concern in the development of the rahn contract model. Sustainability here includes not only economic sustainability, but also social and environmental sustainability. The development of a sustainable contract model must consider its impact on society, the environment, and business sustainability in the long term. Thus highlighting the importance of research and innovation in developing a rahn contract model that not only blends sharia concepts with modern financial principles, but also integrates Nash's concept to create a better balance and fairness in Islamic financial transactions [4], [5].

The development of the Islamic financial system is marked by the establishment of various kinds of Islamic financial institutions and the emergence of various financial instruments that adhere to the Islamic system. Sharia Financial Institutions themselves are essentially different from conventional financial institutions in terms of their objectives, mechanisms, scope, and responsibilities. The basis of the law of Rahn is found in the Qur'an Surah al-Baqarah verse 283, which means that if you are on a journey and you do not get a writer in cash, then there should be a dependency held by the debtor [1]-[3].

The law of pawn in fulfilling sharia principles adheres to the fatwa of DSN MUI No. 25/DSN-MUI/III/2002 on Rahn, the fatwa of DSN MUI No. 26/DSN-MUI/III/2002 on gold pawning, DSN MUI also issued Fatwa DSN MUI No. 68/DSN-MUI/III/2008 on Rahn Tasjily. With the fatwa issued by DSN MUI, it becomes a reference and a legality that applies to Islamic financial institutions in Indonesia. In Institutional Aspects to Regulation Number 103 of 2000 [4], [5].

In Islamic Law, the concept of pawn is called the term Rahn. The word Al-Rahn comes from the Arabic language, which means to set something. The term Rahn in language means "to withhold", meaning to withhold something to be used as a guarantee for debt. Meanwhile, the definition of pawn according to Sharia Law is to make an item that has property value in the view of Sharia as a guarantee to take all or part of the debt from the item [6], [7].

Fiqh scholars state that the Rahn Contract is permissible in Islam based on the Qur'an and the Sunnah of the Prophet in Surah al-Baqarah verse 283 Allah says: Meaning: "If you are on a journey (and do not pay in cash) and you do not get a writer, then there should be a dependency in the possession (of the debtor), but if some of you trust in others, then let the trusted one fulfill his mandate (his debt) and let him be fearful of Allah his Lord; and do not hide his testimony, and whoever conceals it, he is a sinner in his heart, and Allah is Aware of what you do. The dependents are held when one does not believe in each other" [8].

The Fiqh scholars agree that Ar-Rahn can be done on the way and in the presence of the place. The origin of the collateral can be directly held/controlled legally by the receivable. That is because not all collateral can be held/controlled by the creditor directly. So, at least there is some kind of handle that can guarantee that the goods are in the status of al-Marhun (being a guarantee for debt). For example, if the collateral is in the form of a piece of land, then what is controlled is the land guarantee letter [9], [10].

Implications and Novelty. The findings of this study offer both theoretical and practical implications for the development of Islamic financial instruments, particularly in enhancing the structure and sustainability of Rahn (pawn) contracts through the integration of Nash Equilibrium. The strategic approach introduced in this research has the potential to reshape how Islamic financial institutions design their contracts, enabling a deeper alignment with sharia principles and ethical governance. On a practical level, the application of game theory, especially Nash Equilibrium, in Islamic finance can foster more transparent, balanced, and just interactions among stakeholders—namely, financial institutions, borrowers, and regulators. This model encourages mutual understanding and rational decision-making, reducing conflicts of interest and enhancing trust in sharia-compliant financial systems. In particular, it promotes fair collateral valuation and equitable administrative cost structures, following DSN-MUI fatwas, and avoids riba-based exploitation. These implications are critical for ensuring that Islamic financial contracts serve not only profitability but also social justice and long-term economic stability.

Aligned with the Sustainable Development Goals (SDGs), this model directly contributes to SDG 1 (No Poverty) by offering inclusive financial access, SDG 8 (Decent Work and Economic Growth) through the empowerment of small businesses and micro-enterprises, and SDG 9 (Industry, Innovation, and Infrastructure) by introducing innovative modeling approaches to contract design. The novelty of this research lies in its interdisciplinary integration—blending Islamic jurisprudence (Fiqh al-Muamalat) with modern game theory to develop a sustainable, strategic, and ethical Rahn contract. Unlike previous studies that solely focus on legal compliance or operational structure, this study offers a dynamic model grounded in stakeholder interaction, strategy, and long-term equilibrium. This unique synthesis positions the Rahn model as not just a financing tool but as a holistic Islamic financial innovation capable of supporting both spiritual values and global development frameworks.

LITERATURE REVIEW

The development of Islamic financial instruments, particularly the Rahn (pawn) contract, has undergone significant transformation over time. Traditionally practiced during the era of the Prophet Muhammad and early Muslim communities, Rahn was a personal contractual

arrangement used for securing debt through collateral. In modern Islamic finance, the Rahn contract has been institutionalized, formalized through fatwas, and applied by Sharia-compliant financial institutions. While the contract retains its foundational principles of fairness and prohibition of *riba* (interest), its practical implementation has grown increasingly complex due to modern economic demands and regulatory frameworks. Recent literature on Islamic finance has increasingly focused on the need for sustainable financial models that integrate ethical, social, and environmental concerns. However, research into Rahn contracts remains predominantly centered on legal interpretations and operational guidelines, leaving a gap in the analysis of strategic interactions between stakeholders. This limitation restricts the capacity to evaluate how decisions made by lenders, borrowers, and institutions affect the long-term viability and fairness of Rahn-based financial products [9], [10].

Emerging interdisciplinary approaches, particularly the application of behavioral economics and game theory, offer a promising avenue for analyzing the strategic behavior of parties involved in financial transactions. Among these, the Nash Equilibrium model stands out as a tool to model rational decisions among interdependent agents. Its application in Islamic finance, however, is still in its infancy, especially in the context of Rahn contracts. By adopting the Nash concept, researchers can simulate stakeholder responses to contract terms, risk-sharing mechanisms, and profit distribution structures. This approach not only strengthens the fairness of the transaction but also aligns with the Islamic principles of justice and mutual benefit. Furthermore, integrating this analytical framework can contribute to developing Rahn models that better support the Sustainable Development Goals (SDGs), including poverty reduction, financial inclusion, and innovation in Islamic financial services [11], [12].

This literature review suggests that future research must bridge the divide between traditional Islamic jurisprudence and modern financial modeling, allowing for a more comprehensive and sustainable approach to contract development in Islamic finance. A literature review on Islamic financial innovation, particularly the application of the Nash concept in the development of a sustainable contract model, highlights a profound transformation in the approach to finance that is more in line with sharia principles. Within this framework, Nash's concept of game theory took center stage, bringing a new dimension to the modeling of market participants' behavior and fair pricing. Recent studies have highlighted the importance of using game theory in developing an effective and sustainable contract model. This concept makes it possible to better analyze the interaction between the parties involved in the contract transaction, as well as to take into account the strategies that each party may adopt in achieving their goals. Through this approach, the development of the rahn contract model can pay more attention to the factors that affect the long-term stability and equilibrium in Islamic financial transactions. The results of this study provide valuable insights for Islamic finance practitioners in designing more innovative products following sharia principles, as well as for academics in deepening their understanding of the dynamics of the evolving Islamic finance market [11], [12].

Some theories about Rahn, as well as studies that discuss it using the perspective of nask conclude that the practice of Rahn (pawning) was practiced by the Prophet صلى الله عليه وسلم, the companions and subsequent scholars. Rahn's practice used to be only between individuals, now it develops individually with Institutions or Institutions with Institutions. The practice of Rahn has been legalized and recognized by the laws (Qanun) in Indonesia. Financing accompanied by al-Rahn (al-Tamwil al-Mautsuq bi al-Rahn), which states that the Rahn contract is permissible only on debts and receivables (al-Dain) which arises from, among other things: (1). Qard contract, (2). Buying and selling (al-Ba'i) that is not cash, and (3). Rental contracts (ijarah) whose *ujrah* payment is not cash. The practice of rahn in LKS does not have a fine/interest, but can take the administrative fee set at the time of the contract. The cost of storage (*marhun*) is borne by the rahn; the amount of the cost should not be determined based on the amount of the loan. With this, the rahn contract in the legal system in Indonesia is allowed and recorded in Islamic shari'a that the rahn contract is valid. Financing accompanied by a rahn contract has been affirmed in DSN-MUI fatwa number 92 of 2004 [11], [12].

METHODOLOGY

This research adopts a descriptive qualitative approach, which is particularly suitable for exploring complex phenomena such as the integration of Nash Equilibrium into Islamic pawn (Rahn) contract models. The descriptive qualitative method enables the researcher to interpret data based on literature, policy frameworks, and conceptual analysis, aiming to provide a comprehensive understanding of the object of study rather than testing hypotheses. The central focus of this research is to examine how strategic decision-making, grounded in game theory, can enhance the sustainability and ethical foundations of Rahn contracts in Islamic financial systems. Data were collected primarily from secondary sources, including academic journals, Islamic finance regulations, fatwas issued by the National Sharia Council (DSN-MUI), and other documented policy instruments. Additionally, contextual insights were gathered through the analysis of classical and contemporary Islamic jurisprudence (Fiqh al-Muamalat) to ensure the legal and ethical integrity of Rahn contract practices. The study also integrates aspects of game theory, particularly Nash Equilibrium, to assess the interactions and strategic behaviors of multiple stakeholders such as financial institutions, borrowers, and regulatory bodies [13], [14].

In alignment with the Sustainable Development Goals (SDGs), this methodology emphasizes the multidimensional evaluation of Rahn contracts not only in terms of legal compliance but also in terms of their economic, social, and ethical sustainability. Specifically, the analysis considers the potential impact of Rahn-based financing on SDG 1 (No Poverty) by assessing its accessibility for low-income populations; on SDG 8 (Decent Work and Economic Growth) through its potential to support micro-enterprises and informal sector development; and on SDG 9 (Industry, Innovation, and Infrastructure) by promoting financial innovation grounded in ethical frameworks. Furthermore, the research analyzes the structural components of the Rahn contract—including Qard, al-Ba'i (non-cash sales), and Ijarah (lease contracts with deferred payments)—about how Nash Equilibrium principles can enhance fairness, transparency, and long-term balance. This method allows for an interpretative synthesis of Islamic financial law and strategic economic modeling, thereby offering an interdisciplinary lens to develop sustainable and Sharia-compliant financial products. In conclusion, this qualitative descriptive methodology provides a grounded, ethically conscious, and SDG-aligned foundation to assess and propose improvements in the implementation of Rahn contracts in modern Islamic finance [13], [14].

Table 1. Descriptive Qualitative Method

Research Stages	Description
Identify the Nash Concept	Define the concepts of Nash's game theory and analyze its principles in the context of Islamic finance.
Literature Review	Conduct a literature review on the application of the Nash concept in Islamic finance, especially in the context of the development of a sustainable rahn contract model.
Case Studies	Selected several case studies related to the application of the Nash concept in Islamic financial practice, especially in the context of the use of rahn contracts in financial transactions.
Data Analysis	Analyze data from selected case studies to understand how Nash's concept is applied in the Rahn contract model and its impact on Islamic financial sustainability.
Conclusion	Formulate conclusions based on data analysis to illustrate the effectiveness and potential for further development of the sustainable rahn contract model.

RESULTS AND DISCUSSION

Sharia pawnshops are carried out based on the provisions of Islamic Law, namely the Qur'an and Hadith, as well as the fatwa of the National Sharia Council of the Indonesian Ulema Council.

Sharia pawning activities are a newly born economic phenomenon since the regulation of Law Number 7 of 1992, Law Number 10 of 1998, and Law Number 21 of 2008 concerning Islamic banking. This regulation was responded to by the National Sharia Council by issuing fatwa Number 25/DSN-MUI/III/2002 concerning rahn and fatwa Number 26/DSN-MUI/III/2002 concerning Golden Rahn [15]-[17].

The meaning of pawn (ar-Rahn) according to Wahbah al-Zuhaili from the view of the four madhhabs:

1. The scholars of Shafi'iyah define the ar-Rahn contract as "Making al-Ain (goods) as watsiqah (collateral) of the debt that is used to pay the debt (al-Marhuun Bihi) when the party al-Madi'in (the debtor, ar-Raahin) cannot pay the debt". The above definition emphasizes that this school does not allow Rahn to only use a beneficial good, because the benefit of something may be exhausted and lost, so it cannot be used as a guarantee that can be measured in value and price [18]-[20].

2. Ulama Hanabilah defines ar-Rahn as "Property that is used as watsiqah (collateral) of debt which when the party who bears the debt cannot pay it, then the debt is paid using the price of the proceeds of the sale of the property that is used as watsiqah (collateral)" [21], [22].

3. Malikiyyah scholars define ar-Rahn as "Something that is mutamawwal (in the form of property and has value) taken from its owner to be used as watsiqah (collateral) of a debt that is prevalent (its existence is positive and follows) or that will become laazim" [23], [24].

4. Hanafiah scholars define ar-Rahn as "Making something to be pledged and being able to pay the debt with the collateral". The definition put forward by Hanafiyah Scholars shows that the amount of collateral does not have to be proportional to the amount of the loan, meaning that collateral for this group can be smaller than the value of the debt. Because collateral is a position that strengthens the agreement [25].

The definition expressed by the scholars is divided into two views, namely, about goods that can be used as debt collateral. The definition put forward by Shafi'iyah and Hanabilah shows the understanding that goods that can be used as debt (collateral) are only material assets, not including benefits as stated by Malikiyyah scholars, even though, in fact, those benefits, according to them (Shafi'iyah and Hanabilah), are included in the definition of property [26], [27].

Rahn's contract, according to DSN-MUI juridically

The MUI has issued a fatwa on the Rahn contract many times and expressly contains the practice of Rahn. The fatwa that has been issued by DSN MUI is also a reference for financial institutions in Indonesia and binding for people who intersect with the Rahn contract, including the DSN-MUI Fatwa Number: 25/DSN-MUI/III/2002 concerning Rahn, DSN-MUI Fatwa Number: 26/DSN-MUI/2002 concerning Golden Rahn, DSN-MUI Fatwa Number: 68/DSN-MUI/III/2008 concerning Rahn Tasjily [28], [29].

In general, there are three considerations for the MUI to issue a fatwa regarding Rahn: Akad Rahn is a need for the community in a product of a financing institution, such as mudharabah financing. Response from Islamic financial institutions to the needs of the community. To guide the perpetrators of the Rahn contract not to deviate from the principles of sharia.

Rahn, according to the Qur'an and Sunnah

The Word of Allah, QS. al-Baqarah [2]: 283: "And if you are on your way and you do not get a scribe, then there should be a lien in custody..." [30].

Hadith of the Prophet narrated by al-Bukhari and Muslim from 'Aisyah RA, he said: "Indeed, the Prophet PBUH once bought food on debt from a Jew, and the Prophet pawned a piece of armor to him" [31].

Hadith of the Prophet narrated by al-Shafi'i, al-Daraquthni and Ibn Majah from Abu Hurairah, the Prophet Muhammad PBUH said: "The ownership of the pawned goods is inseparable from the owner who pawned it. He benefits and bears the risk" [32].

The scholars agreed to allow the Rahn contract.

Implementation of the Development of the Rahn Agreement

Rahn's contract in Islamic financial institutions

There are 2 types of sharia products in financial institutions that use rahn contracts as complementary products. In this position, rahn contracts are only additional contracts that are not the main contracts, such as the financing of murabahah contracts, qard contracts and ijarah contracts that require a guarantee (borg); rahn is a separate product as in sharia pawnshops, where the pawn contract is purely not because there is financing [33]-[35].

Financing with Rahn

In the DSN-MUI fatwa number 92 of 2004. Regarding financing accompanied by al-Rahn (al-Tamwil al-Mautsuq bi al-Rahn) stated that it is permissible for Rahn contracts only for debts (al-Dain) which arise due to qard (loans), non-cash purchase and sale (al-Ba'i), and lease contracts (ijarah) whose ujah payments are not in cash [36], [37].

In the qard contract, it is included in the grant contract because it provides benefits to others, but in the contract, the receivables are allowed to give the option to provide collateral in their loans (marhun), in other words, the receivables can be sold according to the initial agreement [38].

Another condition also occurs in the receivables of the sale and purchase of salam or istisna in which before the goods are made the buyer has provided a guarantee of money so that it can be used to produce goods and meet needs, while the buyer gets a guarantee of goods following the agreement and specifications at the beginning [39], [40].

Utilization of collateral

The form of marhun goods must be goods that have a selling value and are valuable, there are three opinions that can be classified. Generally, the scholars do not allow in using marhun with the exception of rahin, not wanting to finance collateral; in this case, murtahin can get benefits as maintenance of marhun. The law of origin of the use of marhun is not permissible because collateral does not belong to the murtahin in full unless the rahin is unable to pay the debt and the murtahin has the right to use the goods and even sell them as compensation [41].

Table 2. Research Framework on Islamic Finance Innovation through Nash Concept in Rahn Contracts Aligned with SDGs

Research Stage	Description	SDG Relevance
Problem Identification	Identifying the lack of integration between Islamic pawn (Rahn) contracts and strategic economic modeling. Traditional approaches focus on jurisprudence but overlook stakeholder behavior and contract sustainability.	SDG 9 (Innovation in financial infrastructure)
Theoretical Foundation	Utilizing Fiqh al-Muamalat for Rahn contract legality and principles. Integrating Nash Equilibrium from game theory to analyze interdependent decision-making among financial institutions, customers, and regulators.	SDG 16 (Justice and strong institutions), SDG 8 (Inclusive economic growth)
Literature Review	Reviewing classical Islamic scholarship, contemporary fatwas (DSN-MUI), and studies on game theory in Islamic finance. Literature emphasizes the need for interdisciplinary models that balance ethics, efficiency, and sustainability.	SDG 4 (Quality education through knowledge integration), SDG 17 (Partnerships in research)
Data	Gathering data from fatwas, regulatory	SDG 1 (No Poverty), SDG 10

Collection	documents, policy texts, and previous case studies. Supplemented by insights from scholarly works and documented Rahn practices in Islamic financial institutions.	(Reduced Inequalities)
Contract Component Analysis	Examining Rahn elements derived from Qard, al-Ba'i (non-cash sale), and Ijarah (lease) contracts. Analyzing how these components interact under the Nash equilibrium to ensure fairness, transparency, and efficiency.	SDG 8 (Financial inclusion and fair work), SDG 9 (Innovative contract design)
Sustainability Evaluation	Assessing the long-term impact of Nash-informed Rahn models on stakeholders, legal adherence, and economic empowerment. Includes ethical cost structures (no riba), fair collateral management, and administrative transparency.	SDG 1, SDG 8, SDG 9 (Holistic sustainability: economic, legal, and ethical)
Model Development & Output	Proposing a sustainable, sharia-compliant pawn model that balances stakeholder interests, reduces exploitation, and supports inclusive finance. Offers a replicable framework for other Islamic financial products.	SDG 17 (Sustainable financial innovation partnerships), SDG 11 (Sustainable communities through access to finance)

Analysis

The integration of the Nash Equilibrium into the development of a sustainable Rahn (Islamic pawn) contract model represents a novel convergence between classical Islamic finance principles and modern economic modeling. The study under analysis reveals a multifaceted understanding of the challenges and opportunities in applying game theory within a sharia-compliant framework, particularly in the context of achieving the Sustainable Development Goals (SDGs). At the core of the analysis is the identification of strategic interactions among stakeholders involved in Rahn transactions, such as Islamic financial institutions (e.g., Islamic banks and pawnshops), customers (rahin), and regulatory authorities. The Rahn contract, which allows the pledging of valuable property to secure a debt, is fundamentally grounded in Islamic principles, with support from both Qur'anic injunctions (e.g., Surah al-Baqarah: 283) and Hadith literature. It is further legitimized through several fatwas issued by DSN-MUI in Indonesia, which provide detailed guidance for Islamic financial institutions. The research addresses a critical gap in existing literature by moving beyond the legalistic and operational dimensions of Rahn. While traditional studies focus on jurisprudential validity and practical implementation, this paper introduces game-theoretic reasoning, particularly the Nash concept, to explore how different actors make decisions based on anticipated responses from other stakeholders. This approach enables the modeling of contract sustainability, equitable outcomes, and negotiation efficiency.

The application of Nash Equilibrium theory is especially relevant in ensuring mutual benefit and balance of power in financial dealings, a core objective in Islamic finance. In practice, this involves assessing how banks, clients, and communities can achieve optimal outcomes where no party has the incentive to deviate unilaterally from their agreed terms. When applied to Rahn, this could translate into fair collateral valuation, transparent risk-sharing, and rational pricing models that avoid exploitation. One of the key findings from the research is that stakeholder cooperation becomes a pivotal factor in ensuring the success of a Nash-informed Rahn model. The study shows that effective coordination between regulators, financial institutions, and the public leads to better information symmetry, minimized transaction costs, and greater contract adherence. It also illustrates that administrative fees in Islamic pawnshops must not be tied to the loan amount, in line with sharia regulations, thus eliminating riba.

Furthermore, this analysis emphasizes the importance of sustainability in multiple dimensions: economic viability, social inclusion, and legal clarity. From the perspective of the SDGs, Rahn has the potential to contribute to SDG 1 (No Poverty) by offering affordable access to emergency funding for the poor without the burden of interest. It supports SDG 8 (Decent Work and

Economic Growth) by providing small entrepreneurs with ethical financing tools, and SDG 9 (Industry, Innovation, and Infrastructure) by encouraging innovation in Islamic financial contracts through interdisciplinary frameworks like game theory. Challenges in implementing the Nash model in Islamic pawn contracts are not ignored. The paper outlines difficulties such as modeling complexity, data limitations, and the need for capacity-building among sharia finance practitioners. Additionally, achieving Nash Equilibrium requires transparency and consistent information among parties—something that may be difficult to attain in practice due to asymmetric knowledge and differing risk preferences.

Nevertheless, the research finds that the benefits of this approach outweigh its limitations, especially when framed within a collaborative ecosystem where rules are clear and stakeholders are committed to Islamic ethical values. The use of non-cash instruments such as deferred sales and *ijarah* contracts—when paired with *Rahn*—offers further flexibility while adhering to sharia norms. In conclusion, the analysis of this study affirms that the application of Nash Equilibrium in Islamic pawn contracts represents a progressive stride in sharia-based financial innovation. It not only enriches the theoretical landscape of Islamic finance but also delivers a pragmatic blueprint for developing contracts that are just, inclusive, and aligned with global development priorities. The integration of traditional *fiqh* with modern economic strategy strengthens the foundations for a resilient and ethical financial ecosystem, responsive to the spiritual and material needs of Muslim societies and beyond. As the Islamic finance sector continues to grow, models such as the one proposed in this study may set the precedent for future interdisciplinary advancements, helping bridge the divide between classical jurisprudence and contemporary financial challenges, while actively contributing to the achievement of the SDGs.

CONCLUSION

The application of the Nash Equilibrium in the development of a sustainable *Rahn* (Islamic pawn) contract model provides a strategic and ethical framework that aligns the interests of all involved parties. By carefully analyzing the behavior, strategies, and expected responses of stakeholders—namely Islamic financial institutions, customers (*rahin*), and regulators—this model fosters a balanced and enduring relationship within Islamic financial transactions. The foundation of this sustainability lies in transparent negotiation, equitable treatment, and mutual recognition of the values each party brings to the table. In the Islamic finance context, the integration of Nash's concept into *Rahn* contracts does not only enhance financial viability but also strengthens the ethical integrity of the contract, ensuring consistency with sharia principles. These include the prohibition of *riba* (interest), the requirement of fair dealing, and the promotion of social justice. The practice of *Rahn*, while rooted in the Prophet Muhammad's ﷺ era as an individual arrangement, has evolved in complexity, necessitating legal, ethical, and strategic reinterpretation to respond to modern economic challenges. A notable legal formulation of *Rahn* is observed in financing known as *al-Tamwil al-Mautsuq bi al-Rahn*, which permits collateral-based arrangements specifically for debt (*al-Dain*) arising from (1) *qard* contracts, (2) non-cash sale transactions (*al-Ba'i*), and (3) rental agreements (*ijarah*) where payments are deferred. In this context, the Nash model helps maintain fairness by allowing balanced cooperation and rational decision-making while respecting Islamic legal norms. Importantly, this approach also aligns with several Sustainable Development Goals (SDGs). By promoting financial inclusion and ethical financing, it supports SDG 1 (No Poverty) through accessible, interest-free collateral-based funding. It also contributes to SDG 8 (Decent Work and Economic Growth) by empowering micro-entrepreneurs and SDG 9 (Industry, Innovation, and Infrastructure) through the development of innovative Islamic financial contracts. Moreover, the absence of interest charges, the provision of administrative fees based on actual service (not loan amount), and the ethical treatment of collateral reflect the *maqashid shariah* and sustainable development ethics. This model, therefore, is not only viable in theory but highly relevant in advancing a modern, just, and inclusive Islamic financial system that supports both community well-being and global development targets.

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Author Contribution

The author solely conducted the research, writing, and finalization of this paper and confirms that all content is original and accurately represents the study.

Conflicts of Interest

The author declares that there is no conflict of interest in the publication of this paper.

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