

Operational Risk and Gold Price Volatility Mitigation in E-Rahn Services: A Case Study of PT Pegadaian Syariah Madiun Branch Under Pojk No. 29/2025

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Abstract :

The surge in global gold price volatility demands the implementation of a more prudent sharia financial management for gold pawn products (e-Rahn). This study aims to qualitatively analyze the reconstruction of operational and market risk mitigation strategies for PT Aneka Tambang (Antam) gold collateral at PT Pegadaian Syariah Madiun Branch, specifically following the enactment of POJK No. 29 of 2025. Utilizing a descriptive qualitative method with a case study approach, primary data were gathered through in-depth interviews with the Branch Manager, Collateral Estimators, and e-Rahn customers utilizing CertiCard-packaged Antam gold. The findings indicate that PT Pegadaian Syariah Madiun Branch has successfully mitigated the operational risk of untampering CertiCard packaging through advanced non-destructive testing (NDT) technologies, while reducing market risk from extreme price fluctuations of Antam gold by utilizing a dynamic-adaptive Loan to Value (LTV) calibration restricted between 80% and 85%. This research proves that tightening risk management governance in compliance with the latest OJK regulations and DSN-MUI Fatwa No. 25/DSN-MUI/III/2002 preserves business profitability while fostering the economic resilience of local micro-entrepreneurs in Madiun.

Keywords : *e-Rahn, Antam Gold, POJK No. 29/2025, Risk Management, Pegadaian Syariah Madiun.*

Abstrak :

Lonjakan volatilitas harga emas global menuntut penerapan manajemen keuangan syariah yang lebih hati-hati untuk produk gadai emas (e-Rahn). Penelitian ini bertujuan untuk menganalisis secara kualitatif rekonstruksi strategi mitigasi risiko operasional dan risiko pasar terhadap agunan emas PT Aneka Tambang (Antam) di PT Pegadaian Syariah Cabang Madiun, khususnya pasca-pemberlakuan POJK No. 29 Tahun 2025. Dengan menggunakan metode kualitatif deskriptif dan pendekatan studi kasus, data primer dikumpulkan melalui wawancara mendalam dengan Manajer Cabang, penaksir agunan, serta nasabah e-Rahn yang menggunakan emas Antam dalam kemasan CertiCard. Hasil penelitian menunjukkan bahwa PT Pegadaian Syariah Cabang Madiun telah berhasil memitigasi risiko operasional terkait integritas kemasan CertiCard melalui teknologi *non-destructive testing* (NDT) yang canggih, sekaligus

mengurangi risiko pasar akibat fluktuasi harga ekstrem emas Antam dengan menerapkan kalibrasi *Loan to Value* (LTV) yang dinamis-adaptif pada kisaran 80% hingga 85%. Penelitian ini membuktikan bahwa pengetatan tata kelola manajemen risiko yang mematuhi peraturan OJK terkini dan Fatwa DSN-MUI No. 25/DSN-MUI/III/2002 mampu menjaga profitabilitas bisnis sembari memperkuat ketahanan ekonomi pelaku usaha mikro lokal di Madiun.

Kata Kunci: *e-Rahn, Emas Antam, POJK No. 29/2025, Manajemen Risiko, Pegadaian Syariah Madiun.*

INTRODUCTION

The Islamic social-commercial financial sector in Indonesia is currently undergoing a dynamic transformation. On one hand, accelerated digitalization is disrupting conventional business models through the integration of smart technology platforms ([Kohtamäki, et al., 2024](#)). On the other hand, global macroeconomic uncertainties have increased market sensitivity toward safe-haven assets ([Li, F., & Yin, Y. 2026](#)). Gold bullion produced by PT Aneka Tambang (Antam) has become both a premier investment choice and the most dominant collateral commodity in Islamic pawn financing (Rahn) activities ([Bianka, et al., 2025](#)). The phenomenon of Antam's gold price rising significantly to surpass a new psychological level has triggered an exponential increase in the demand for fast liquidity through digital pawn products (e-Rahn).

In the local context, PT Pegadaian Syariah Madiun Branch, located within the economic corridor of Jalan H.O.S Cokroaminoto, serves as one of the epicenters for integrated micro-pawn services in the ex-Madiun Residency area. The majority of customers, dominated by micro, small, and medium enterprises (MSMEs) and domestic retail investors, utilize Antam gold with CertiCard media (high-security laminated card packaging) as collateral (marhun) ([Dela Cruz, et al., 2025](#)). However, the high appraised value of Antam gold brings highly complex financial and operational risk consequences for the branch office's internal management.

The primary operational risk arises from the technical limitations of the appraisal process ([Karkoszka, 2023](#)). Modern Antam gold packaged in CertiCard media carries a premium buyback value that heavily depends on the integrity of the card packaging seal ([Gottlieb, R. 2026](#)). If appraisers damage or scratch the physical packaging to perform traditional nitric acid scratch tests, it will drastically degrade the economic value of the customer's gold, thereby triggering customer resistance and legal disputes ([Hirani, H. 2025](#)). Conversely, if the appraisal is conducted without in-depth physical testing, Pegadaian Syariah faces the threat of high-tech counterfeiting (advanced gold counterfeiting), such as tungsten core filling inside pure Antam gold plates.

In addition to these operational risks, extreme daily gold price volatility creates significant market risk exposure ([Bloss, et al., 2025](#); [Basofitrah, A. 2025](#)). Should a drastic trend reversal (market correction) occur, the market appraised value could plummet below the principal loan value disbursed to the customer (under-collateralized loans), which in turn would multiply the Non-Performing Financing (NPF) ratio ([Jang, J. 2026](#)). Responding to this complexity, the Financial Services Authority (OJK) released Financial Services Authority Regulation (Peraturan Otoritas Jasa Keuangan / POJK) Number 29 of 2025. This new

regulation emphasizes the obligation of all pawnbroking institutions to strengthen capital resilience, restructure information technology-based risk management, improve the standardization quality of appraisers, and implement a strict consumer protection system. Under Islamic financial management principles oriented toward achieving collective well-being (falah) and sharia compliance, digital financing innovations must not neglect prudence and the principle of justice ('adl).

Although literature studies on conventional gold pawning are abundant, the majority of previous research remains confined to quantitative customer satisfaction analysis or macro-level service efficiency. There is a lack of in-depth qualitative research addressing the strategic engineering of dual-risk mitigation—namely the operational risk of verifying Antam CertiCard packaging without breaking the seal and the market risk of contemporary Antam gold price volatility—contextualized post-implementation of POJK No. 29 of 2025. Based on this research gap, this qualitative case study research aims to comprehensively analyze the implementation of Islamic financial management and the reconstruction of operational and market risk mitigation for e-Rahn products at PT Pegadaian Syariah Madiun Branch.

RESEARCH METHOD (Written in bold capital, Book Antiqua 12)

This study is designed using a descriptive qualitative method with a case study research approach (Akhyar, et al., 2024; Mbanaso, et al., 2023). This approach was selected because the researcher aims to explore, in a deep and detailed manner, real risk management operational phenomena that cannot be accommodated solely through quantitative statistical data testing (Im, et al., 2023; Lane, et al., 2025). The research locus is specifically positioned at PT Pegadaian Syariah Madiun Branch, East Java, located at Jalan H.O.S Cokroaminoto No. 45.

Research informants were selected using a purposive sampling technique to obtain high-quality data from actors who possess expertise in their respective fields (Gobezie, et al., 2025; Schlunegger, et al., 2024):

1. Informant 1 (I-1): Branch Manager of PT Pegadaian Syariah Madiun (holds ultimate authority over POJK No. 29/2025 compliance and the management of the branch's liquidity portfolio).
2. Informant 2 (I-2): Chief Collateral Appraiser of the Madiun Branch (technical practitioner for quality testing of Antam gold and CertiCard).
3. Informant 3 (I-3): Two active customers utilizing e-Rahn products who collateralize CertiCard-type Antam gold bullion.

Data were collected through three methods (technical triangulation), namely in-depth interviews using semi-structured guidelines, direct operational observation in the gold appraisal room and the branch's storage vault (khazanah) in Madiun, as well as documentation studies of NPF level reports, daily Antam gold price registers, and internal sharia audit documents.

The qualitative data analysis process adopts the interactive condensation model by Miles, Huberman, & Saldaña (2014), which encompasses three simultaneous stages: data reduction/condensation (focusing on the themes of Antam gold risk mitigation, packaging verification, LTV dynamization, and

POJK 2025 compliance), data display (using tables and flowcharts), and conclusion drawing, which is validated through source and method triangulation techniques to ensure data validity (trustworthiness).

FINDINGS AND DISCUSSION

Transparency of Sharia Algorithm-Based Ujrah Calculation in E-Rahn

PT Pegadaian Syariah Madiun Branch has successfully implemented the digitalization of Islamic financial processes in an accountable manner. Through the Pegadaian Syariah Digital application system, customers holding Antam gold bullion savings can project their funding needs transparently.

Compliance with Fatwa DSN-MUI

In its digital implementation, one of the greatest challenges is ensuring that the application's algorithm does not show signs of hidden fee inflation that resembles the characteristics of conventional interest. Informant 1 (Branch Manager) explained:

"Our e-Rahn system is designed with absolute sharia compliance as its foundation. The pure ujrah (rental fee) value is calculated strictly from the appraised value of the Antam gold collateralized by the customer. The application algorithm automatically rejects any fee percentage input that is based on the amount of loan drawn. Customers can view these breakdown fees in detail on their mobile screens before authorizing the loan contract." (Interview with I-1, April 2026).

To demonstrate the accuracy of this sharia compliance, the following is a comparative simulation visualization of an e-Rahn product submission using a 10-gram denomination of Antam gold bullion at a market appraised price level of Rp 2,600,000 per gram (Total Appraised Value Nt = Rp 26.000.000):

Table 1. Simulation Visualization of an E-Rahn Product

Financial Analysis Component	Submission Scenario A	Submission Scenario B	Sharia Analysis	Compliance
Antam Gold Appraised Value (N _t)	Rp 26,000,000	Rp 26,000,000	Identical collateral value.	initial
Maximum Financing Plafond (85%)	Rp 22,100,000	Rp 22,100,000	Safe LTV limit.	
Loan Disbursed Amount to Customer (M _b)	Rp 22,100,000	Rp 15,000,000	Scenario B borrows below the maximum plafond.	

Storage Service Rate (T _s) per 10 Days		Rp 95	Rp 95	Flat rate per Rp 10,000 of the appraised value.	
Financial Component	Analysis	Submission Scenario A	Submission Scenario B	Sharia Analysis	Compliance
Ujrah Fee per 10 Days (U _j)	Burden	Rp 247,000	Rp 247,000	Sharia Compliant: The U _j value remains identical because it is based on N _t , not M _b .	

The empirical mathematical data above strongly proves that the storage rental fee burden (ujrah) in Scenario B does not experience any reduction, even though the principal loan amount drawn is significantly smaller (Mb: Rp 15,000,000). This indicates absolute adherence to sharia principles that strictly separate the maintenance costs of collateral from benevolent loans (qardh), ensuring the transaction remains clear of any elements of usury (riba).

Operational Risk Mitigation: Packaging Verification of Antam Gold CertiCard

Modern Antam gold incorporates a packaging protection technology called CertiCard, where the certificate of authenticity and the gold bar are integrated into a single high-tech plastic laminated card. The integrity of this packaging is highly critical because if the plastic lamination peels, tears, or gets scratched, the buyback value of the gold in the secondary market will depreciate by Rp 5,000 to Rp 15,000 per gram from the base market price (Haque, A. 2024). This triggers a significant operational dilemma for the appraisal staff at PT Pegadaian Syariah Madiun Branch.

Implementation of Non-Destructive Testing (NDT) Protocols

To align operational risk management standards with POJK No. 29 of 2025 without neglecting customer satisfaction and asset ownership rights, Pegadaian Syariah Madiun Branch reconstructed its physical verification protocols. Mrs. Asih (Chief Appraiser) outlined the technical transformation:

"We are no longer permitted to use chemical acid scratch tests or test needle scratching on Antam CertiCard gold, as such actions damage the laminated seal and disadvantage the customer. Instead, following the enforcement of POJK 2025, we have been equipped with Non-Destructive Testing (NDT) technology, including portable X-Ray Fluorescence (XRF) spectrometers and digital hydrostatic density testers. We can measure the gold carat purity up to the deepest layer precisely through the CertiCard plastic packaging without damaging the seal at all." (Interview with I-2, April 2026).

Furthermore, the authenticity of the physical CertiCard packaging is verified through a dedicated scanning application called CertiEye. Appraisers scan the encrypted barcode (QR Code) on the back of the packaging to ensure

that the gold bar's serial number is officially registered in the global database of PT Antam Tbk. The synergy among density sensor technology, XRF, and CertiEye scanning successfully reduced the risk of accepting counterfeit or plated gold to 0% (zero cases) throughout the current operational year.

Market Risk Mitigation: Adaptive LTV (Loan to Value) Dynamization against Antam Price Fluctuations

The price movement of Antam gold has recorded extreme volatility, driven by geopolitical tensions in the Middle East and interest rate adjustments by global central banks (Suprpto, et al., 2026). As a hedging asset, the fluctuation of Antam gold prices in the domestic market can vary within a range of 2.5% to 4% per week. To protect corporate working capital from the depreciation risk of collateral, PT Pegadaian Syariah Madiun Branch implements an integrated market risk control system through an Adaptive LTV Dynamization mechanism.

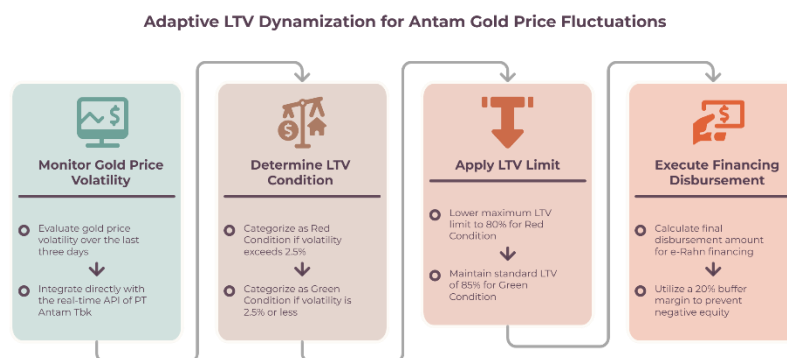


Figure 1: Adaptive LTV Dynamization for Antam Gold Price Fluctuations

Source: Authors' own work

The daily Antam gold price monitoring system—which is directly integrated with the real-time API of PT Antam Tbk—evaluates gold price volatility over the last three days to determine financing limits. If the evaluation shows that gold price volatility within that three-day window exceeds 2.5%, the system categorizes it as a "Red Condition" and automatically lowers the maximum Loan-to-Value (LTV) limit to 80%. Conversely, if the volatility value is less than or equal to 2.5%, the system sets it to a "Green Condition" and maintains the standard LTV of 85%. Once the LTV condition is determined based on market volatility, the system executes the final calculation to determine the disbursement amount for the e-Rahn financing to be distributed to the customer.

Through this data visualization, the information technology system at Pegadaian Syariah Madiun Branch automatically calibrates the safe loan limit. If daily gold price volatility is normal, the LTV rate is pegged at 85%. However, if volatility indicators show a deviation above 2.5% for three consecutive days, the system immediately drops the maximum LTV parameter to 80%. This 20% safety margin (buffer margin) has proven highly effective in preventing instances where a customer's debt value exceeds the market value of the collateral gold (negative equity) in the event of a default.

Good Governance of Non-Performing Financing (NPF) and Equitable Electronic Auctions (e-Auction)

In accordance with the mandate of POJK No. 29 of 2025 and the principles

of socio-economic justice in Islam, the handling of defaulting customers in Antam gold e-Rahn products is managed by prioritizing collective well-being (maslahah) and information transparency without financial injustice.

If a customer is unable to redeem their gold or extend the contract period after passing the standard 120-day contract limit, PT Pegadaian Syariah Madiun Branch is not permitted to conduct unilateral, repressive foreclosures. The NPF mitigation procedure is executed in stages:

1. **Digital Restructuring Notification:** The Pegadaian Syariah Digital application system sends scheduled automated alerts on T-7, T-3, and T-1 before maturity, offering installment options or independent pawn contract extensions via the app.
2. **Grace Period:** Customers are granted a temporary extension for execution delays of at least 14 working days after passing the contract maturity date.
3. **Electronic Sharia Auction Execution (e-Auction):** If the customer is ultimately declared to be in default, their Antam gold collateral will be auctioned transparently through an electronic auction system openly accessible to the public to ensure the best market selling price is achieved.

In alignment with trustworthy (amanah) sharia compliance values, the financial allocation process from the Antam gold auction proceeds is mathematically formulated as follows:

$$S_k = H_t - (M_b + U_\alpha + B_t)$$

Where:

- S_k = The remaining surplus money from the auction proceeds, which constitutes the absolute right of the customer.
- H_t = The total real revenue value obtained from the Antam gold auction sale.
- M_b = The nominal principal loan (*marhun bih*) that must be repaid by the customer.
- U_α = The accumulated real storage service rental fee (*ujrah*) invoices during the loan period.
- B_t = The real operational costs of organizing the auction in accordance with administrative standards.

Mr. Rega (an active e-Rahn customer from Madiun) shared his testimony:

"I feel at peace transacting at Pegadaian Syariah because all procedures are very clear. My Antam CertiCard gold was valued highly in accordance with official market prices. When I was late in making a redemption yesterday due to business cash flow constraints, the staff contacted me very politely to offer an extension option through the mobile app, and I was guaranteed not to be charged ambiguous, compounding interest penalties." (Interview with I-3, April 2026).

This principle of justice proves that the operations of PT Pegadaian Syariah Madiun Branch do not merely focus on material profit acquisition (maddiyah), but rather act as an institution protecting the public from the traps of illegal online loans (pinjol) and conventional loan sharks that exploit the emergency liquidity needs of lower-middle-class communities in Madiun City.

CONCLUSION

This study concludes that the implementation of e-Rahn financing at PT Pegadaian Syariah Madiun Branch demonstrates an integrated approach to sharia compliance and risk management within contemporary Islamic pawnbroking services. The findings indicate that the calculation of the *ujrah* for gold storage is anchored to the appraised value of Antam gold rather than the amount of financing, thereby maintaining consistency with the principles stipulated in DSN-MUI Fatwa No. 25/DSN-MUI/III/2002 and avoiding the application of interest-based charges (*riba al-qardh*). This finding highlights the operational relevance of sharia principles in the design and implementation of technology-enabled rahn services.

The study further identifies the adaptation of risk-management practices as a critical mechanism for maintaining operational and financial resilience following the implementation of POJK No. 29/2025. Operational risks associated with the opening or verification of Antam gold CertiCard packaging are addressed through non-destructive testing (NDT), including portable X-ray fluorescence (XRF) analysis and digital hydrostatic balance testing. Meanwhile, exposure to gold price fluctuations is managed through adaptive loan-to-value (LTV) calibration within the observed range of 80–85%. Rather than treating sharia compliance and risk control as separate functions, the findings suggest that their integration can strengthen service reliability, asset protection, and institutional credibility. In the local context, this integrated governance approach may support broader financial inclusion and contribute to the resilience of micro-entrepreneurs who rely on gold-based financing. The study therefore contributes to the literature by demonstrating how sharia governance, technology-supported risk mitigation, and adaptive financial controls can be operationalized simultaneously within e-Rahn services.

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