FACTORS INFLUENCING INDUSTRIAL WASTE APPLYING INFORMATION TECHNOLOGY AND MANAGING INFORMATION SYSTEMS TOWARDS MINIMIZING WASTE MANAGEMENT: A STUDY OF LOGISTIC COMPANY IN MALAYSIA

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ABSTRACT

This research paper tackles the pressing issue of managing industrial waste in the logistics sector, which remains a complex and serious problem in cities worldwide. It investigates how Information Technology (IT) and the management of Information Systems (MIS) can be utilized to address this challenge. The primary goal is to explore how integrating IT and MIS can reduce industrial waste. The research uses a quantitative method with a stratified random sampling technique to collect data from logistics companies. The study results show significant connections between waste production and various social, technical, and financial factors. Additionally, the research emphasizes the significance of technology in promoting sustainability and operational efficiency in the logistics industry. These findings provide valuable insights into how the industry can evolve and align with environmental and economic objectives.

Keywords: **Logistics Industry, Industrial Waste Management, IT, MIS, Sustainability**

INTRODUCTION

Waste poses a significant challenge within the realm of environmental management. It is a direct result of several factors, including the steady growth of the global population, particularly in urban areas due to urbanization, coupled with the impact of industrialization and people's lifestyles, all of which contribute to the generation of waste (Satori et al., 2018). Additionally, rivers and other water bodies bear the burden of waste disposal from various human activities conducted along their banks (Yustiani & Lidya, 2016). Both domestic and non-domestic activities contribute to waste discharge into urban rivers (Yustiani & Komariah, 2017). Historically, the logistics industry has contributed to

environmental destruction through various processes, including warehousing, packaging, transportation, and distribution. As the logistics sector expands to meet the increasing global demand, its ecological impact also grows. This footprint encompasses issues such as non-degradable packaging materials contaminating the environment and the greenhouse gas emissions produced by vehicles (Sharma et al., 2023). Historically, the logistics industry has contributed to environmental waste through various processes, including warehousing, packaging, transportation, and distribution. As the logistics sector expands to meet the increasing global demand, its ecological impact also grows. This footprint encompasses issues such as non-degradable packaging materials contaminating the environment and the greenhouse gas emissions produced by vehicles (Karaman et al., 2020). Historically, the logistics industry has contributed to environmental waste through various processes, including warehousing, packaging, transportation, and distribution. As the logistics sector expands to meet the increasing global demand, its ecological impact also grows. This footprint encompasses issues such as non-degradable packaging materials contaminating the environment and the greenhouse gas emissions produced by vehicles (Fraselle et al., 2021). Historically, the logistics industry has contributed to environmental waste through various processes, including warehousing, packaging, transportation, and distribution. As the logistics sector expands to meet the increasing global demand, its ecological impact also grows. This footprint encompasses issues such as non-degradable packaging materials contaminating the environment and the greenhouse gas emissions produced by vehicles (Ali et al., 2023), emphasizing the sector's rapid growth and the imperative for innovative solutions in industrial waste management. The logistics sector must incorporate environmentally friendly strategies, design methods, and best practices, using information technology to attain sustainable business operations. The logistics field is one where information technology has brought about transformative changes, from optimizing supply chains to tracking shipments in real time and optimizing transportation routes (Attaran, 2020). The logistics field is one where information technology has brought about transformative changes, from optimizing supply chains to tracking shipments in real-time and optimizing transportation routes.

Numerous studies have explored the broader integration of Information Technology (IT) and Management Information Systems (MIS) within the logistics framework, emphasizing their role in enhancing operational efficiency and effectiveness. However, regarding the critical issue of waste management, particularly in light of the logistics industry's significant environmental footprint, research has primarily focused on reverse logistics, recycling, and sustainable development (Islam et al., 2021). There is a need for

comprehensive research that specifically examines the role of IT and MIS in industrial waste reduction. Questions arise regarding how precisely these technologies can predict, reduce, and manage waste within logistics. Can MIS, for instance, be leveraged to anticipate waste generation at different stages of the logistical process or to design operational adjustments aimed at waste reduction? Additionally, there needs to be more real-world applications. While theoretical understanding is essential, the true measurable success lies in practical implementation. Furthermore, there is a need for more active studies that evaluate the effectiveness and challenges of IT and MIS applications in different geographical contexts, considering that the application and success of technology can vary. There needs to be comprehensive-benefit analyses for introducing new systems or modifying existing ones, which often involve substantial investments, which is also conspicuous. The need for rigorous research that provides precise cost-benefit assessments of integrating IT and MIS for waste management within the logistics sector is evident and represents a significant research gap. In light of these considerations, it becomes apparent that while the logistics industry is making strides in adopting technology for various purposes, there is an urgent need for a more profound exploration of its potential for industrial waste reduction through information technology and information systems. Addressing this research gap promises to yield actionable insights for the logistics industry and substantially contribute to global sustainability endeavors.

The research explores the intricate relationship between advanced Information Technology (IT) and Managing Information Systems (MIS) solutions, and the dressing waste management challenges the logistics industry faces. Specifically, this study seeks to answer the fundamental question: "How can the integration of Information Technology and Managing Information Systems contribute to minimizing industrial waste in the logistics industry?" This research will concentrate on comprehending the multifaceted challenges encountered by the industry in its pursuit of sustainable waste management, encompassing social, technical, and financial factors. Addressing this question is paramount as it paves the way for developing strategies that can facilitate the industry's evolution, ensuring its ability to meet its economic objectives and its responsibilities towards environmental sustainability. The inquiry will assess the logistics sector's sustainability and economic viability in a fiercely competitive global market. In this delicate balance between profitability and planetary well-being, IT and MIS have the potential to act as the pivotal point that enables the industry to strike the necessary equilibrium.

THEORETICAL BASIS

1. Impact of IT on Sustainable Development in Logistic Industry

The logistics industry recognizes sustainability as a critical concern, offering various advantages such as reduced environmental impact, resource conservation, regulatory compliance, meeting customer expectations, and risk mitigation (Izzatulloev, 2023). Prioritizing sustainability enhances resilience, demonstrates social responsibility, fosters innovation, and secures long-term competitiveness (Cogilniceanu, 2023). Sustainability is not just an ethical choice but a strategic imperative for logistics in today's environmentally conscious world (Hassan, 2019). Information Technology (IT) plays a pivotal role in sustainable development within logistics, transforming supply chain management in several key areas:

a) Transportation Efficiency

IT revolutionizes transportation efficiency in logistics (Bader Alanazi1, 2021).

b) Inventory Management

IT systems, such as warehouse management and inventory control software, empower logistics companies to optimize inventory levels (Mondol, 2021), improving demand forecasting and reducing waste (Pravin Malviya, 2023).

c) Warehouse Automation

Automation driven by IT minimizes energy consumption and reduces human error in warehouse operations, improving efficiency and lowering the carbon footprint (Soori, 2023).

d) Supply Chain Collaboration

IT enables end-to-end supply chain visibility, promoting stakeholder collaboration, reducing inefficiencies, and lowering environmental impact (Dr. Sundara Rajulu Navaneethakrishnan, 2023).

e) Reducing Empty Mileage

IT facilitates end-to-end supply chain visibility, collaboration, and efficiency, reducing inefficiencies and environmental impact (Moeckel, 2021).

f) Environmental Monitoring

IT systems monitor emissions, energy usage, and environmental factors, aiding informed decision-making to reduce environmental impact (Darius Antoni, 2020) and showcase commitment to sustainability (Rothfuß, 2023).

g) Fleet Management

Fleet management systems powered by IT monitor vehicle performance, optimize maintenance, and promote alternative fuels and electric vehicles, further reducing emissions and conserving energy (Skala, 2022).

In conclusion, Information Technology is pivotal in steering the logistics industry toward sustainable development by optimizing operations, enhancing transparency, reducing emissions, and supporting eco-friendly practices (Ivanov, 2021).

2. Challenges of Integrating IT on Sustainable Development in Logistic Industry

The integration of IT and sustainability in logistics poses significant challenges. It requires substantial upfront investments, which may be daunting for smaller logistics firms (Gupta, 2020). Developing and managing sustainable IT solutions demands specialized technical expertise (Tanveer Ahmadab, 2021), which can be a hurdle for some companies that lack in-house skills (Taofeeq D. Moshood, 2021). Data privacy and security concerns also arise when handling sustainability data (Syed Rafiul Hussain, 2023). Logistics companies need careful planning, investment, and commitment to change management to navigate these challenges. Successfully overcoming these obstacles can lead to efficiency gains and reduced environmental impact in the logistics industry.

3. Opportunities for Integrating IT on Sustainable Development in Logistic Industry

Integrating Information Technology (IT) with sustainable practices in logistics offers numerous benefits. It improves operational efficiency through real-time tracking, route optimization, and resource allocation, reducing waste and emissions (Zhang, 2023). Integrating Information Technology (IT) with sustainable practices in logistics offers numerous benefits. It improves operational efficiency through real-time tracking, route optimization, and resource allocation, reducing waste and emissions (Soori, 2023). Accurate demand forecasting helps optimize inventory management, reducing waste (Zixin Dou, 2021). Green technologies like electric vehicles and efficient routing cut carbon emissions (Christian Schuss, 2020). IT systems, including blockchain, ensure supply chain transparency and ethical sourcing (Santosh B. Rane, 2020). This innovation attracts eco-conscious customers and partners, providing a competitive edge (Sithole, 2023). In summary, IT integration drives logistics efficiency, sustainability, and competitiveness.

METHOD

1. Research Design

The research design outlines the fundamental framework and methodology for this study. In this project, we will adopt a quantitative research approach, which involves gathering and analyzing numerical data to uncover patterns, correlations, and trends. This

approach is well-suited for quantifying the influence of different factors on industrial waste management. Using a quantitative research design, our study aims to thoroughly understand the connection between Information Technology (IT), Managing Information Systems (MIS), and waste management practices within the logistics industry.

2. Sampling Strategy

In our research endeavor, we will utilize a stratified random sampling method. This methodology involves dividing the population of logistics companies into specific subgroups or strata, considering relevant criteria such as gender, years of operation, job position, educational background, and department. The primary goal of employing this technique is to ensure that each subgroup is represented in the sample in proportion to its presence in the overall population. This approach will enhance the precision and relevance of the study's outcomes. Consequently, a random selection will be drawn from each stratum, effectively reducing bias and augmenting the overall representativeness of the model.

3. Population and Sample Size

The study's population encompasses logistics firms that produce waste in industrial operations. We will aim to survey a minimum of 100 participants. Factors such as the confidence level, typically set at 95%, and the margin of error, for instance, 5%, will be considered. The determined sample size is designed to provide a high confidence that the study's findings can be reliably applied to the broader population of logistics companies within the selected region.

4. Data Collection Methods

An obligatory method was employed to encourage the involvement of experts from the field in an online survey (Olanrewaju & Ogunmakinde, 2020). To gather relevant data, we will utilize structured surveys or questionnaires, practical tools for collecting substantial quantitative data from survey participants. These surveys will consist of carefully designed closed-ended questions that align with our research goals. The questions will primarily focus on identifying the social, technical, and financial factors that impact waste management practices in the logistics industry. Participants will be asked to express their levels of agreement or disagreement using a Likert scale, allowing for quantitative data collection that can be subjected to statistical analysis. Developing the survey involves creating a well-structured questionnaire that effectively captures the necessary information. The questions aim to extract insights into participants' perceptions and experiences regarding waste management factors, the role of Information Technology (IT) and Managing Information Systems (MIS), and their effects. The questionnaire survey was created using Google Docs and distributed to the designated respondents to assess the importance of each factor in the field. After receiving sufficient responses from the field survey, the results were compiled and subjected to further analysis. The reliability of responses and the degree of agreement among the respondents were assessed using SPSS (Muzaffar et al., 2022).

5. Data Analysis Methods

We will utilize quantitative content analysis to examine the data collected through the surveys. This approach entails quantifying and categorizing responses to extract valuable insights. We will employ multiple regression analysis to discern connections between various variables, yielding a more profound comprehension of the factors that impact waste management practices within the logistics industry.

6. Ethical Considerations

Ethical considerations hold the utmost importance in any research involving human participants. We will seek informed consent from all respondents, clearly explaining the study's objectives, their rights, and the option to withdraw their participation at any stage. We will anonymize participants' responses and safeguard their identities to maintain confidentiality. Stringent measures will be implemented to secure sensitive information and protect participants' privacy throughout the research process.

7. Limitations

Recognizing and addressing potential limitations is crucial for upholding the transparency and credibility of the research. One limitation is the potential for respondent bias, resulting in participants offering responses that align with social desirability rather than their genuine perspectives. Furthermore, although the sample size will be determined through statistical methods, it may not comprehensively encompass the full spectrum of diversity within the logistics industry, raising some concerns about the extent to which findings can be generalized.

RESULTS AND DISCUSSION

Multiple Regression Analysis evaluates how these independent variables influence the dependent variable and measure their effects. Examining the coefficients enables researchers to ascertain these associations' strength, direction, and statistical significance, facilitating predictive modeling, hypothesis testing, and informed decision-making across diverse fields, including economics and the social sciences.

1. Correlation Analysis

Table 1: Correlation Analysis

		TIW	TFF	TTF	TSF
Pearson Correlation	Total Industrial Waste (TIW)	1.000	.516	.683	.728
	Total Financial Factors	.516	1.000	.596	.537
(TFF)		.683	.596	1.000	.730
	Total Technical Factors	.728	.537	.730	1.000
(TTF)					
	Total Social Factors (TSF)				
Sig. (1-tailed)	Total Industrial Waste (TIW)	.	.000	.000	.000
	Total Financial Factors	.000	.	.000	.000
(TFF)		.000	.000	.	.000
	Total Technical Factors	.000	.000	.000	.

(TTF)					
	Total Social Factors (TSF)				
N	Total Industrial Waste (TIW)	113	113	113	113
	Total Financial Factors	113	113	113	113
(TFF)		113	113	113	113
	Total Technical Factors	113	113	113	113
(TTF)					
	Total Social Factors (TSF)				

Table 1 depicts the correlations between Industrial Waste (TIW), Financial Factor (TFF), Technical Factor (TTF), and Social Factor (TSF). Notably, TIW has a strong positive correlation with TSF (0.728) and a moderate one with TTF (0.683), suggesting that TIW tends to rise as TSF and TTF increase. There is also a moderate positive correlation between TIW and TFF (0.516). These correlations highlight the interdependence of these factors and the need for comprehensive regression analysis to understand their collective impact on Industrial Waste.

2. Scatterplot Analysis

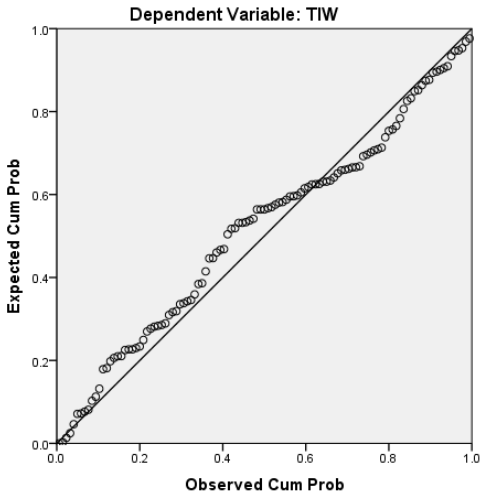

Figure 1. Standard P-Plot of Regression Standardized Residual

Figure 1, depicting residuals with a roughly rectangular distribution concentrated near zero, suggests a well-behaved multiple regression model. This pattern aligns with crucial assumptions like homoscedasticity and linearity, indicating consistent variance and a reasonable linear fit between the independent variables (Financial Factor, Technical Factor, and Social Factor) and the dependent variable (Industrial Waste). The proximity of residuals to zero indicates an unbiased model. However, potential outliers should be monitored to preserve model validity.

3. Casewise Diagnostics Analysis

Table 2: Casewise Diagnostics Analysis

Case Number	Std. Residual	TIW	Predicted Value	Residual
17	-4.910	1.000	3.8281	-2.828207

Case Number 17 stands out in the casewise diagnostics of the multiple regression analysis. It displays a substantial negative standardized residual (-4.910), indicating a significant disparity between the actual Industrial Waste value (1.00) and the model's predicted value (3.8281). With a large residual of -2.82807, this extreme outlier calls for further investigation to uncover the underlying factors or data quality issues, which could enhance the model's accuracy.

4. Model Summary Analysis

Table 3: Model Summary Analysis

Model	R	R Square	Adjusted R Square	Std. Error of the Estimate
1	.765	.585	.574	.57594

The Model Summary provides an overview of the multiple regression model's performance. The multiple correlation coefficient (R) of 0.765 indicates a moderately strong positive relationship between the combined independent variables (TSF, TFF, TTF) and the dependent variable (Industrial Waste, TIW). The model explains approximately 58.5% of the variance in TIW (R Square = 0.585), with an adjusted R Square of 0.574, considering the number of predictors, highlighting the model's robust explanatory power. The standard error of the estimate is 0.57594, indicating the typical prediction error. Further analysis of predictor significance and practical implications is necessary for informed decisions on industrial waste management.

5. ANOVA Analysis

Table 4: ANOVA Analysis

Model		Sum of Squares	df	Mean Square	F	Sig.
1	Regression	50.962	3	16.987	51.211	.000
	Residual	36.157	109	.332		
	Total	87.119	112			

The ANOVA table evaluates the significance of the regression model and its components in explaining Industrial Waste (TIW) variance. The regression sum of squares, with 3 degrees of freedom, is 50.962, resulting in a mean count of 16.987. A high F-statistic of 51.211 and a very low p-value of 0.000 signify the model's statistically solid significance, indicating that the combined influence of independent variables significantly explains TIW. The residual sum of squares is 36.157. In conclusion, the ANOVA results affirm the model's robustness and effectiveness in predicting TIW.

6. Coefficients

Table 5: Coefficients Analysis

Model	Unstandardized Coefficients	Standardized Coefficients	t	Sig.	95.0% Confidence Interval for B	Correlations	Collinearity Statistics

		B	Std. Error	Beta			Lower Bound	Upper Bound	Zero-order	Partial	Part	Tolerance	VIF
1		.057	.306		.185	.854	-.550	.663					
	(Contents	.118	.098	.094	1.205	.231	-.076	.312	.516	.115	.074	.622	1.607
)		.294	.101	.282	2.917	.004	.094	.494	.683	.269	.180	.409	2.448
	TFF	.539	.105	.472	5.144	.000	.331	.746	.728	.442	.317	.451	2.215
	TTF												
	TSF												

The multiple regression analysis explores the relationships between Industrial Waste (TIW) as the dependent variable and independent variables: Financial Factor (TFF), Technical Factor (TTF), and Social Factor (TSF). The constant term lacks statistical significance, suggesting no significant contribution to TIW variance. However, TTF and TSF exhibit strong positive linear relationships with TIW (Beta values of 0.282 and 0.472, respectively), indicating that higher Technical and Social factors correspond to increased Industrial Waste. In contrast, TFF does not significantly impact TIW. Practical implications and potential multicollinearity should be considered for decision-making in industrial waste management.

7. Discussion

This study investigates the Financial, Technical, and Social Factors of Industrial Waste. The results reveal a positive relationship between Financial Factors and Industrial Waste, as supported by previous research (Ni et al., 2023), underscoring the significance of economic incentives in encouraging e-waste logistics operators to adopt waste reduction technology. Furthermore, a positive correlation is observed between Technical Factors and Industrial Waste, a relationship elucidated by another research (Gruchmann et al., 2018), highlighting technology as the primary catalyst for sustainable economic growth in the medium to long term. Lastly, the study also establishes a positive link between Social Factors and Industrial Waste, with research concluding that factors like attitudes towards recycling, environmental awareness, perceived social norms, and convenience positively shape consumer behavior regarding e-waste logistics (Mohd Sharif & Soo, 2017).

CONCLUSION

Logistics is deeply intertwined with social, technological, and financial factors, each exerting a unique influence on waste generation and management. This study aimed to show how the elements affected logistic companies in waste reduction and resulted in a significant relationship. As society becomes more environmentally conscious, there's a pressing need for logistics firms to align with these values, not just for image and community relations but also for long-term viability. By integrating MIS and IT, companies can unlock long-term economic benefits, ranging from reduced operational costs to tapping into markets that value sustainability. Therefore, addressing logistics waste through these lenses ensures environmental protection and operational efficiency and guarantees a company's alignment with contemporary societal values and economic prudence..

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DO CONVENTIONAL OPEN MARKET OPERATIONS AND SHARIA OPEN MARKET OPERATIONS IMPACT THE STABILITY OF THE RUPIAH EXCHANGE RATE?

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ABSTRACT

Purpose: Monetary policy is one of the efforts made to control the economic situation so that it can run as desired. And the central bank is the authority that can regulate these policies. The conventional economic system has a different view of monetary policy than the Islamic one. The Islamic monetary system is a sub-system of the Islamic economic system with goals to achieve in Islamic monetary, including realizing justice and benefit. And both have instruments that can control a country's economy. Among them is the open market operation, one of the tools used to stabilize the economy by selling securities.
Methods: This research was conducted using cross-sectional analysis and panel data and estimating and forecasting time series data using reviews.
Conclusion: Conventional and sharia open market operations substantially impact exchange rate stability.

keywords: **Open Market Operation, exchange rate**

INTRODUCTION

The economy in Indonesia is full of uncertainty(Sakum & Ismamudi, 2022). Among them is the exchange rate which always experiences ups and downs(Ihwanudin & Febriani, 2022), sometimes the economic situation experiences good growth(Iromo, 2019)then it could also experience a decline which results in slowing economic growth (Cahya et al., 2018) therefore, this exchange rate greatly affects the economy and daily life(Zubaidah et al., 2021). Because when the rupiah becomes more valuable against foreign currencies(Iswardani et al., 2021)then export goods in Indonesia will become more expensive for foreign residents. One of the exchange rate risks is exchange rate volatility(Satriana et al., 2019), the greater the exchange rate means the more unstable and risky it will be, which will hamper the export and import sectors(Wiku & Ayuningtyas, 2021)Therefore, exchange rate instability has become a lot of attention, especially in

economic integration. Because trade integration is seen as inadequate to shape the current flow of economic globalization.(Irawan & Fachrezzy, 2021)Apart from trade integration, differences in the currencies used by each country also cause exchange rate volatility.(Reztrianti & Suparningsih, 2021)and the economy will experience instability both from the macro and micro side and that is where exchange rate volatility will have an impact on monetary policy. Therefore, one of the monetary policy tools emerged (Fitriani, 2018). Monetary control tools are monetary operation media tools.(Nasution & Batubara, 2023)used by the central bank to influence the operational targets set, one of the monetary policy tools is open market operations which are central bank operations in the financial market carried out by selling and buying securities. For example, an Indonesian Bank Certificate (SBI)(Jumiati, nd). Open market operations are one of the policies used by the government, including to regulate the current inflation. OMO is defined as the purchase or sale of securities by the central bank in both the primary and secondary markets with the aim of influencing money market liquidity conditions.(Andriani & Mohamad, 2022)Sharia open market operations do not apply interest rates as an incentive, this is what differentiates them from conventional open market operations, but instead use a profit sharing system to avoid usury. Apart from that, it's deep(Mulyadi & Suryanto, 2022)whereas in conventional open market operations are only suitable for conventional banks.(Rahmad Riho Zeen et al., 2022)

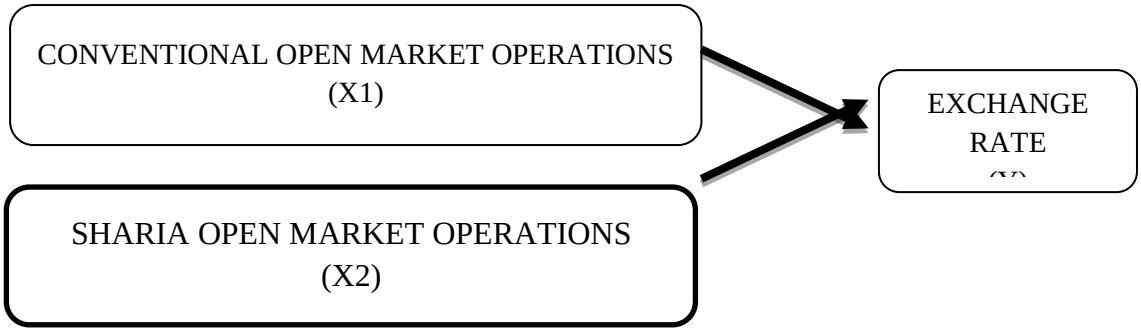
The conventional economic system has a different view of monetary policy from the Islamic economic system.(Nasution & Batubara, 2023)The Islamic monetary system is a sub-system of the Islamic economic system which has goals to be achieved in Islamic monetary terms(Mulyani, 2020)among them is to realize justice and benefit. Maqashid Syariah upholds justice (Iqamah al "Adl), namely realizing justice in all areas of human life and producing benefits(Mulyani, 2019), namely producing general benefit, not benefit aimed at certain parties(Novitasari, nd)Therefore, monetary policy is very synonymous with money, so the main task in understanding the contents of this article is to understand the concept of money.(Kurniawati, 2019)Our success in interpreting money in an Islamic way will bring a unanimous understanding of Islamic economic policy as well.(Parawansa, 2023)Remembering that the value of money is a reflection of price stability which has an impact on economic growth(Warkawani et al., 2020)and state development and other effects, it is important for us to first examine the concept of money in Islam (Ajuna, 2017). In general, this research aims to explain the influence of conventional open market operations and sharia open markets(Judge, 2019)on exchange rate stability.

THEORETICAL BASIS

Monetary policy is one of the efforts made to control macroeconomic conditions so that they can run as desired by regulating the amount of money circulating in the economy, the central bank as the authority that can implement these policies.(STAI An Nawawi Purworejo & Turmudi, 2019). There are several aspects that can be carried out by the central bank, including steps that influence interest rates and steps that influence the money supply, however, determining interest rate policy and the money supply cannot be done simultaneously because one change can affect other changes. other. Therefore, the central bank needs to supervise in deciding which variables to control, whether the interest rate or the money supply(Jannah, 2020). Monetary policy is also aimed at achieving economic stability, namely stable prices and balance of payments, as an effort to stabilize the economy. The Central Bank uses policy instruments that can be used, one of which is the open market operations (OPT) instrument.(Fitriyani et al., 2019). Open market operations are one of the monetary instruments that the government can use to stabilize the economy by selling or buying government securities (government security).(Latifah, 2015). The central bank can also purchase and sell securities in both the primary and secondary markets with the aim of influencing money market liquidity, such as government securities (treasury bills or T-Bills), central bank securities (central bank bills) and securities private (prime commercial papers)(Rahmad Riho Zeen et al., 2022). Apart from that, by using open market operations, the central bank can control the frequency of Opt and determine the desired auction amount/receipt so that Opt can be relied on to control the amount of money in circulation by adjusting liquidity in the banking system. The central bank can buy bonds if it wants to increase the money supply, and vice versa, if the central bank wants to reduce the amount of money supply in circulation then what it does is sell bonds.(Ajuna, 2017). The exchange rate is the exchange rate of foreign currency against another currency or it can be said to be the price of one unit of foreign currency against domestic currency or it can also be said to be the price of domestic currency against foreign currency.(Simorangkir, nd)The exchange rate is a very important economic indicator in a country. The exchange rate also plays a vital role in the level of trade, which is something that is most critical to the majority of free markets in the world. Meanwhile, every country will always want a stable exchange rate.(Reza Nurul Ichsan, 2019). Exchange rates can also be used to connect two countries that have two different currencies, so that two or more countries can carry out economic transactions. If the value of the rupiah weakens while the value of the dollar strengthens, investors will prefer to

invest in securities, this can reduce investors' interest in buying shares so that it will affect company returns.(Suriyani & Sudiartha, nd).

HYPOTHESIS



H1: Conventional open market operations have an effect on the exchange rate
H2: Sharia open market operations influence the exchange rate
H3: Conventional and sharia open market operations have an effect on the exchange rate

METHOD

This type of research is quantitative research. (Jannah, 2020) . This research uses the Vector Error Correction Model (VECM) to determine the relationship between conventional open market operations and sharia open market operations. The data used is monthly data from January 2018 to December 2022 which is secondary data from Bank Indonesia. The analysis carried out was using Eviews Software(Warkawani et al., 2020)12. The test stages used in the research are Data Stationarity Test, Optimum Lag Selection, Stability Test, Granger Causality, Cointegration Test, and Vector Error Correction Model (VECM) Estimation Test.

RESULTS AND DISCUSSION

Stationary Test Results

TestThis first step is to find out the results of the research whether each variable shows a level level or shows a level of difference. Proving that the level or level of difference is that if the Prob value is <0.05 then it is at the level level but if the prod value is >0.05 then it is at the difference level. The test results show that the difference level test is stationary.

Table 1. Stationarity Test Results

		t-Statistic	Prob.*
Augmented Dickey-Fuller test statistic		-2.093146	0.2482
Test critical values:	1% level	-3.550396	
	5% level	-2.913549	
	10% level	-2.594521	

*MacKinnon (1996) one-sided p-values.

		t-Statistic	Prob.*
Augmented Dickey-Fuller test statistic		-1.294264	0.6267
Test critical values:	1% level	-3.546099	
	5% level	-2.911730	
	10% level	-2.593551	

*MacKinnon (1996) one-sided p-values.

		t-Statistic	Prob.*
Augmented Dickey-Fuller test statistic		-0.956288	0.7629
Test critical values:	1% level	-3.548208	
	5% level	-2.912631	
	10% level	-2.594027	

*MacKinnon (1996) one-sided p-values.

Optimum Lag Test Results

This Optimum Lag Test is a test to eliminate the autocorrelation problem in the VAR system, so the optimum lag length test is carried out. Determining the optimum lag value is the smallest AIC value, therefore based on the test results the optimum lag is in the third lag.

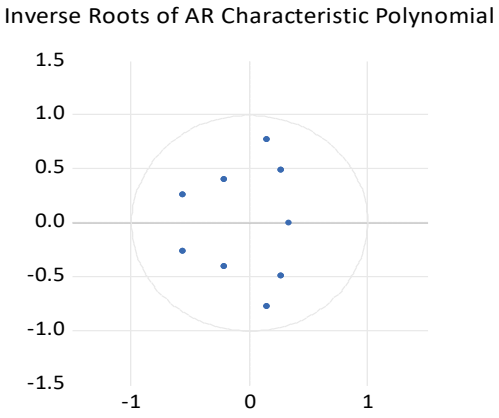
Table 2. Optimum Lag Test Results

Lag	LogL	LR	FPE	AIC	SC	HQ
0	-1637.877	NA	4.97e+22	60.77321	60.88370*	60.81582
1	-1623.043	27.47044	4.00e+22	60.55713	60.99913	60.72759
2	-1609.063	24.33542*	3.34e+22*	60.37269*	61.14618	60.67099*
3	-1604.794	6.956965	4.02e+22	60.54791	61.65290	60.97406
4	-1596.375	12.78411	4.17e+22	60.56943	62.00592	61.12343
5	-1587.804	12.06233	4.35e+22	60.58534	62.35332	61.26718

VAR Stability Test Results

The VAR stability test is said to be stationary if the roots value is smaller than one, or is located inside the circle. Based on the results of the VAR stability test, it was declared stable because the roots were <1 in the range 0.792793 – 0.335873. And it can be concluded that the VAR model is stable so that impulse response and variance decomposition tests can be carried out.

Table 3. VAR Stability Test Results



Granger Causality Test Results

The Granger Causality Test is said to be causal if the prob is less than <0.05. Based on the results of causality testing, only the OPTK variable has an effect on OPTS.

Table 5. Cointegration Test Results

Unrestricted Cointegration Rank Test (Trace)

Hypothesized No. of CE(s)	Eigenvalue	Trace Statistic	0.05 Critical Value	Prob.**
None *	0.549432	67.63194	29.79707	0.0000
At most 1 *	0.223154	23.78342	15.49471	0.0023
At most 2 *	0.164657	9.895191	3.841465	0.0017

VECM TEST Results

Based on the results of Vector Error Correction Model (VECM) testing on long-term results. that if the calculated t value > t table then it has an effect and if the calculated t value < t table then it has no effect, the t Table value = 2.002465. it can be concluded that the OPTK variable influences the KURS and the OPTS variable influences the KURS.

Table 5. Long Term VECM Test Results

Cointegrating Eq:	CointEq1
D(KURS(-1))	1.000000
D(OPTK(-1))	0.002067 (0.00056) [3.69396]
D(OPTS(-1))	0.041966 (0.00877) [4.78462]
C	-72.77390

CLOSING

Based on the results of the research that has been carried out, it is concluded that the VECM estimation results have a significant influence on 2 variables, namely Conventional Open Market Operations have a significant influence on the stability of the Exchange Rate of 3.69396, and Sharia Open Market Operations also have a significant influence on the stability of the Exchange Rate. amounting to 4.784621.

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