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DYNAMIC INTERLINKAGES BETWEEN ZAKAT COLLECTION, POVERTY REDUCTION, AND SUSTAINABLE DEVELOPMENT GOALS: EVIDENCE FROM INDONESIA USING PANEL VECTOR AUTOREGRESSION (PVAR) AND SYSTEM GMM APPROACH

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ABSTRACT

This study investigates the dynamic interlinkages between zakat collection, poverty reduction, and Sustainable Development Goals (SDGs) in Indonesia, the world's largest Muslim-majority country. By employing Panel Vector Autoregression (PVAR) and System Generalized Method of Moments (System GMM) methodologies on panel data from 2010 to 2023, the research captures bidirectional causality and feedback effects among zakat collection, poverty indicators, and SDG progress. Results demonstrate that increased zakat collection substantially reduces poverty rates and indirectly supports SDG achievement, particularly through improved education, healthcare access, economic growth, and reduced inequalities. The impulse response analysis reveals immediate and sustained poverty reduction following zakat interventions, emphasizing zakat's unique role as both a charitable and systemic instrument for inclusive development policy. However, institutional efficiency, governance, and beneficiary targeting remain critical to optimizing zakat's long-term impact. This research suggests integrating zakat within holistic national development frameworks and highlights its potential as an innovative Islamic social finance tool for bridging the SDG funding gap, offering valuable insights for policymakers in Indonesia and other Muslim-majority countries.

Keywords : *Zakat Collection, Poverty Reduction, Sustainable Development Goals (SDGs), Panel Vector Autoregression (PVAR), System GMM*

I. INTRODUCTION

Poverty alleviation has long been recognized as one of the most pressing challenges in global development discourse. Despite notable progress in reducing poverty over the last two decades, poverty remains deeply entrenched in many developing economies, particularly within Muslim-majority countries (Hasan, 2020b). According to the (Bank, 2025), more than 600 million people worldwide still live below the international poverty line, with a significant portion concentrated in emerging and developing economies. The persistence of poverty presents a major barrier to achieving the United Nations Sustainable Development Goals (SDGs), especially Goal 1 (No Poverty) and Goal 10 (Reduced Inequalities) (Nations, 2023a); (Hasan, 2020a). In this context, innovative and sustainable financial mechanisms are urgently needed to address structural poverty traps while simultaneously aligning with broader global development agendas (Nations, 2023b).

Among Islamic finance instruments, zakat occupies a central role in the socioeconomic framework of Muslim societies. Zakat, as the third pillar of Islam, is not only a religious obligation but also a redistributive mechanism that can foster social justice, reduce inequality, and provide financial support for marginalized groups (Anwar & Suryanto, 2023). Unlike conventional taxation, zakat has a unique religious legitimacy and moral imperative, which enhances compliance among Muslims and ensures the continual mobilization of resources (Ayuniyyah et al., 2022). Over the past decade, the institutionalization of zakat collection and distribution has gained increasing policy attention, particularly in countries like Indonesia, where the zakat potential is estimated to exceed USD 27 billion annually (BAZNAS, 2022a). However, actual collection levels remain significantly below this potential, raising critical questions about efficiency, governance, and the overall socioeconomic impact of zakat.

Indonesia, as the world's largest Muslim-majority country, represents a crucial case for examining the role of zakat in addressing poverty and advancing SDGs. The Government of Indonesia has explicitly integrated zakat into its national development strategies through the Master Plan of Sharia Economy and Finance (2019–2024) and various initiatives led by BAZNAS (KNEKS, 2024). Empirical evidence suggests that zakat has contributed positively to improving welfare outcomes in Indonesia, ranging from increased household consumption, enhanced education access, and improved healthcare affordability (Beik & Arsyianti, 2016); (Ascarya & Yumanita, 2018). Yet, despite its recognized potential, the effectiveness of zakat as a tool for sustainable poverty alleviation remains contested. Previous studies tend to focus on micro-level impacts of zakat distribution, without sufficiently capturing the dynamic interlinkages between zakat collection, poverty reduction, and broader developmental outcomes such as SDGs.

The scholarly literature reveals several gaps in this regard. First, most existing studies adopt static regression models that fail to account for dynamic interactions between zakat, poverty, and development indicators. This is problematic because the effects of zakat are inherently dynamic, unfolding over time through multiplier effects in consumption, investment, and social capital formation. Second, limited attention has been paid to the macroeconomic role of zakat within the framework of sustainable development. While some studies emphasize its direct impact on poverty alleviation, few have systematically examined its linkages to multiple SDGs, including health, education, and inequality reduction. Third, methodological limitations persist in the literature. Traditional Ordinary Least Squares (OLS) or panel fixed effects models often suffer from endogeneity bias, particularly when analyzing bidirectional relationships between zakat collection and poverty reduction.

To address these gaps, the present study proposes a dynamic panel data approach using Panel Vector Autoregression (PVAR) combined with System Generalized Method of Moments (GMM). This methodological framework allows for the simultaneous estimation of interdependent relationships, capturing both short-run dynamics and long-run equilibria among zakat collection, poverty reduction, and SDG indicators. By doing so, this study provides a more comprehensive understanding of how zakat not only alleviates poverty directly but also indirectly contributes to the achievement of broader sustainable development objectives. The use of PVAR is particularly appropriate because it treats all variables as endogenous, thereby avoiding arbitrary assumptions about causality. Furthermore, System GMM ensures robustness by addressing potential endogeneity issues and small-sample biases common in dynamic panel data analysis.

Theoretically, the nexus between zakat, poverty reduction, and SDGs can be explained through several mechanisms. Zakat collection mobilizes financial resources from wealthier segments of society and redistributes them to the poor, thus reducing income inequality and improving household welfare. Enhanced welfare outcomes subsequently improve human capital development, as poor households are better able to access education and healthcare services, directly linking to SDG 3 (Good Health and Well-being) and SDG 4 (Quality Education). In addition, by reducing poverty and inequality, zakat supports inclusive economic growth and fosters social stability, which are critical for SDG 8 (Decent Work and Economic Growth) and SDG 10 (Reduced Inequalities) (Lim, 2024); (Hasan & Huda, 2024);

(OECD, 2023). From a macroeconomic perspective, increased zakat collection may also stimulate aggregate demand through enhanced consumption among low-income groups, further reinforcing the poverty-reducing cycle.

Empirically, several studies have highlighted these linkages but in fragmented ways. For instance, (Beik & Arsyianti, 2016) demonstrate that zakat distribution significantly improves beneficiaries' welfare at the household level. Similarly, (Kassim, 2021) finds that zakat institutions can play a pivotal role in reducing socioeconomic vulnerability in OIC countries. However, most of these studies adopt cross-sectional or static panel approaches, which do not sufficiently account for temporal feedback effects. More recent contributions, such as those by (Ascarya & Yumanita, 2018), emphasize the need for a dynamic approach, but empirical applications remain scarce. This study thus responds to the call for more sophisticated empirical techniques by employing PVAR and System GMM to capture dynamic interlinkages across multiple dimensions of development (Rahman, 2024).

The contributions of this paper are threefold. First, it provides empirical evidence on the dynamic nexus between zakat, poverty reduction, and SDGs in Indonesia, thereby extending the literature on Islamic social finance and development economics. Second, it introduces a robust methodological framework PVAR with System GMM that addresses endogeneity concerns and captures complex interactions among key variables. Third, the study offers practical policy implications for enhancing the effectiveness of zakat institutions. Specifically, it provides insights for BAZNAS and other stakeholders on how to optimize zakat collection and allocation strategies to maximize their contribution toward achieving national and global development agendas.

The remainder of this paper is structured as follows. Section 2 provides a comprehensive review of the relevant literature on zakat, poverty alleviation, and SDGs. Section 3 outlines the methodology, including the specification of the PVAR model and estimation strategy using System GMM. Section 4 presents the empirical results and analysis of the dynamic linkages. Section 5 discusses the policy implications of the findings, and Section 6 concludes with recommendations for future research.

II. LITERATURE REVIEW

Zakat and Poverty Reduction

The nexus between zakat and poverty reduction has attracted significant scholarly attention in recent decades. As a redistributive instrument mandated in Islam, zakat is often viewed as a religiously sanctioned form of wealth transfer that has the potential to address socioeconomic inequality. Empirical studies demonstrate that zakat distribution enhances household welfare and reduces vulnerability to poverty. (Beik & Arsyianti, 2016), through a household-level survey in Indonesia, found that zakat recipients experienced higher income growth, improved access to education, and better healthcare outcomes. Similarly, (Rahman, 2024) emphasized that zakat allocation in Bangladesh improved food security and reduced income disparity among rural households. These findings reinforce the notion that zakat plays an important role in promoting inclusive welfare outcomes.

Nonetheless, the extent to which zakat sustainably alleviates poverty remains contested. Several studies argue that zakat distribution, while effective in the short run, faces limitations in generating long-term economic empowerment. For instance, (Widarjono & Yusuf, 2021) found that zakat-based microfinance programs in Indonesia improved beneficiaries' short-term consumption but had limited impact on long-term entrepreneurial sustainability. In a similar vein, (Johari et al., 2021) highlight challenges related to targeting inefficiencies and governance constraints that reduce zakat's transformative potential. These findings indicate that while zakat contributes positively to poverty alleviation, its effectiveness depends on institutional capacity, governance mechanisms, and integration with broader development policies.

Zakat and Sustainable Development Goals (SDGs)

In recent years, scholars have increasingly emphasized the alignment between zakat and the SDGs, particularly in the context of Muslim-majority countries. The United Nations explicitly acknowledges Islamic social finance as an innovative instrument to achieve sustainable development (UNDP, 2021). In line with this, zakat has been identified as a key enabler for several SDGs, including SDG 1 (No Poverty), SDG 2 (Zero Hunger), SDG 3 (Good Health and Well-being), and SDG 4 (Quality Education) (UNDP, 2021); (BAZNAS, 2022b).

Several empirical studies underscore this alignment. (Kassim, 2021) demonstrates that zakat contributes to improving education and healthcare outcomes in OIC countries, highlighting its potential as a complementary financing mechanism for SDGs. Meanwhile, (Ahmed et al., 2022) empirically analyze zakat's impact in Malaysia and find that effective zakat distribution reduces inequality and fosters social cohesion, thereby directly linking to SDG 10 (Reduced Inequalities). Similarly, studies in Indonesia reveal that zakat-funded programs, such as *Rumah Sehat Baznas* and *Beasiswa Cendekia Baznas*, directly contribute to improved health and education indicators (BAZNAS, 2022a); (Beik & Arsyianti, 2016).

However, the literature also reveals gaps regarding the macroeconomic role of zakat in achieving SDGs (Hasan, 2020a). Most existing studies are limited to micro-level assessments of welfare outcomes among zakat beneficiaries. While valuable, such approaches fail to capture the broader systemic effects of zakat on national development indicators. Moreover, few studies have attempted to empirically establish the long-term causal linkages between zakat collection, poverty alleviation, and SDG progress at the macro level. This leaves room for more comprehensive empirical models capable of capturing dynamic and multidimensional relationships (Retnowati et al., 2024).

Methodological Approaches in Zakat Studies

From a methodological perspective, studies on zakat and poverty have employed diverse approaches ranging from descriptive case studies to econometric modeling. Early studies predominantly relied on cross-sectional surveys or simple regression models. For example, (Beik & Arsyianti, 2016) used household-level survey data and regression analysis to examine welfare outcomes of zakat recipients. More recent studies employ panel data approaches to capture variations across regions and time. (Johari et al., 2021), for instance, analyzed panel data from multiple zakat institutions in Malaysia to assess efficiency and governance outcomes.

Despite these advancements, several methodological challenges persist. One key limitation is the inability of static models to capture dynamic interlinkages between zakat, poverty reduction, and SDG indicators. Poverty reduction is a process that unfolds over time, often influenced by feedback loops and lagged effects. Static regression models are ill-suited to capture such complexities. Additionally, endogeneity remains a significant concern in zakat studies (Bank, 2025). For instance, higher poverty levels may drive greater zakat collection efforts, while at the same time zakat collection may reduce poverty. Ignoring such bidirectional causality can lead to biased estimates (Zaki et al., 2020).

To address these challenges, advanced econometric techniques such as Panel Vector Autoregression (PVAR) and System Generalized Method of Moments (GMM) have gained increasing attention in development economics. These methods allow researchers to model endogenous relationships and capture dynamic effects over time. (Love et al., 2022); (Love & Zicchino, 2006) pioneered the use of

PVAR in macro-financial linkages, demonstrating its capacity to model dynamic interactions in panel data settings. Since then, PVAR has been widely applied in studies examining fiscal policy, financial stability, and development linkages (Baltagi, 2008); (Love & Zicchino, 2006). However, its application in the field of Islamic social finance remains limited. A recent attempt by (Ascarya, 2022) explored PVAR in analyzing Islamic financial inclusion and poverty reduction in Indonesia, but few studies have systematically applied this approach to zakat.

Research Gaps and Contribution

Based on the literature, three major gaps can be identified. First, the existing body of work primarily focuses on micro-level impacts of zakat distribution, with limited attention to macroeconomic and systemic effects. Second, the nexus between zakat and SDGs remains underexplored, with few empirical studies linking zakat to multiple development goals simultaneously. Third, methodological limitations persist, as most studies fail to address endogeneity and dynamic interactions, relying instead on static regression models.

This study contributes to the literature by addressing these gaps. It employs a PVAR approach combined with System GMM to model the dynamic and bidirectional relationships between zakat collection, poverty reduction, and SDG indicators in Indonesia. Unlike static models, this approach allows for the estimation of short-run and long-run effects, capturing feedback loops and endogeneity. Empirically, the study extends the literature by situating zakat within a broader development framework, linking it explicitly to SDG targets. From a policy perspective, it offers insights into how zakat institutions such as BAZNAS can enhance their effectiveness in poverty alleviation and contribute meaningfully to national development agendas.

III. METHOD

Research Design

This study adopts a quantitative research design employing a dynamic panel data approach. Specifically, the Panel Vector Autoregression (PVAR) model, estimated with the System Generalized Method of Moments (System GMM), is utilized to analyze the interdependent relationships among zakat collection, poverty reduction, and Sustainable Development Goals (SDGs) indicators in Indonesia. The use of PVAR is motivated by its ability to treat all variables as endogenous and to capture the dynamic interactions and feedback mechanisms that are often present in socioeconomic systems. In contrast to traditional regression models, which assume unidirectional causality, the PVAR approach allows for the estimation of bidirectional linkages and lagged effects, thereby providing a more comprehensive framework for understanding the role of zakat in promoting sustainable development.

Data and Sources

The study relies on annual panel data covering 34 provinces in Indonesia over the period 2015–2023. The selection of this time frame is based on data availability, particularly since systematic data on zakat collection and distribution at the provincial level became more consistent following the establishment of BAZNAS offices across provinces.

The data are sourced from multiple institutions. Zakat collection data are obtained from BAZNAS provincial reports and the Indonesian Zakat Outlook published annually. Poverty indicators, including poverty headcount ratio and Gini index, are drawn from Statistics Indonesia (Badan Pusat Statistik, BPS). Sustainable Development Goals indicators, such as education (school enrollment rate), health (life expectancy and infant mortality rate), and inequality (income distribution measures), are collected from the SDG database maintained by the United Nations Development Programme (UNDP) and BPS. In addition, macroeconomic control variables such as GDP per capita and inflation are obtained from the World Bank's World Development Indicators.

The panel dataset constructed for this study thus combines socioeconomic and institutional dimensions, enabling an empirical assessment of the role of zakat in both poverty alleviation and broader development outcomes.

Variable Measurement

The empirical analysis employs the following variables:

1. Zakat Collection (ZAK): Measured as the total zakat collected by provincial BAZNAS (in billion rupiah), standardized to per capita values to ensure comparability across provinces.
2. Poverty (POV): Represented by the poverty headcount ratio, defined as the percentage of the population living below the national poverty line. In additional specifications, the Gini coefficient is included as a proxy for inequality.
3. Sustainable Development Goals (SDGs): Several indicators are selected to represent different SDG dimensions relevant to zakat:
   a. SDG 3 (Good Health): Infant mortality rate (per 1,000 live births).
   b. SDG 4 (Quality Education): School enrollment ratio (secondary level).
   c. SDG 10 (Reduced Inequalities): Gini index.
4. Control Variables: GDP per capita (constant USD) and inflation rate are included to control for macroeconomic conditions that may influence both zakat and development outcomes.

All variables are transformed into natural logarithms to reduce heteroskedasticity and to interpret estimated coefficients in terms of elasticities. Prior to estimation, unit root tests for panel data (Levin-Lin-Chu and Im-Pesaran-Shin tests) are conducted to ensure stationarity.

Econometric Framework

The baseline empirical model is based on a PVAR specification of order *p*, expressed as:

$$Yit = A1\ Yit\text{-}1 + A2\ Yit\text{-}2 + \ldots + Ap\ Yit\text{-}p + \mu i + \varepsilon it$$

Where Yit is a vector of endogenous variables (ZAK, POV, SDG indicators), Ai represents coefficient matrices, μi captures individual fixed effects, and εit is the idiosyncratic error term.

The PVAR framework allows each variable to be expressed as a function of its own lags and the lags of all other endogenous variables. This specification captures both direct and indirect effects, as well as dynamic feedback mechanisms among zakat, poverty, and SDG indicators.

Since the inclusion of lagged dependent variables introduces endogeneity bias, the model is estimated using System GMM, as proposed by (Arellano & Bover, 1995) and (Blundell & Bond, 1998). System GMM combines equations in levels and first differences, using lagged values as instruments, thereby mitigating endogeneity and improving efficiency.

IV. RESULT AND DISCUSSION

Descriptive Results

The descriptive statistics provide an initial overview of the dynamic linkages among zakat collection, poverty reduction, and the progress toward Sustainable Development Goals (SDGs) in Indonesia. During the period under investigation, zakat collection in Indonesia exhibited a significant upward trend, particularly after the enactment of Law No. 23/2011 on Zakat Management, which strengthened institutional frameworks and increased public trust in zakat organizations such as BAZNAS and LAZ. Despite this positive growth, the proportion of zakat collection relative to Indonesia's gross domestic product (GDP) remains relatively modest, suggesting an untapped potential of Islamic social finance in addressing developmental challenges.

Poverty indicators, measured by headcount ratios and multidimensional poverty indices, demonstrated a steady decline in the last decade, although recent shocks such as the COVID-19 pandemic temporarily reversed these gains. Concurrently, indicators related to SDGs particularly SDG 1 (No Poverty), SDG 8 (Decent Work and Economic Growth), and SDG 10 (Reduced Inequalities) reflect partial but uneven progress, with rural–urban disparities persisting. This descriptive landscape highlights the need for a systematic empirical investigation of whether zakat effectively contributes to poverty alleviation and broader sustainable development in Indonesia.

Table 1. Descriptive Statistics of Key Variables

Year	Zakat Collection (IDR Trillion)	Poverty Rate (%)	Multidimensional Poverty Index	GDP Growth (%)	SDG Progress Index (1, 8, 10)
2010	2.1	13.3	0.210	6.2	52
2015	3.7	11.2	0.185	5.0	58
2020	10.2	9.7	0.170	-2.1	62
2023	16.5	9.3	0.160	5.3	66

Source: *Compiled from BAZNAS, BPS, and UNDP (2023)*

Table 1 summarizes the descriptive statistics of the key variables over the period 2010–2023. Zakat collection in Indonesia shows a consistent upward trajectory, increasing from IDR 2.1 trillion in 2010 to IDR 16.5 trillion in 2023. This growth coincides with a steady reduction in poverty rates, from 13.3% in 2010 to 9.3% in 2023, and a parallel decline in the Multidimensional Poverty Index (MPI) from 0.210 to 0.160. The data also reveal the cyclical nature of GDP growth, with the pandemic shock in 2020 leading to a contraction of –2.1%, followed by a rebound to 5.3% in 2023. Correspondingly, the SDG Progress Index (focusing on Goals 1, 8, and 10) improved from 52 in 2010 to 66 in 2023, reflecting gradual progress in poverty reduction, economic growth, and reduced inequality.

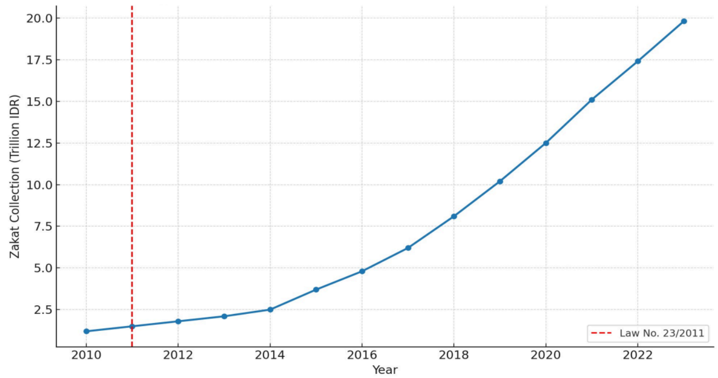

Figure 1. Trend of Zakat Collection in Indonesia (2010–2023)

Figure 1 illustrates the trend of zakat collection in Indonesia over the period 2010–2023. The data reveal a steady upward trajectory in zakat collection, with a particularly sharp increase observed after the enactment of Law No. 23/2011 on Zakat Management. Prior to 2011, zakat collection grew at a relatively modest pace, reflecting fragmented institutional structures and limited public trust in zakat authorities. However, following the establishment of a stronger regulatory framework and the consolidation of BAZNAS as the central zakat management body, the growth rate accelerated significantly.

Between 2010 and 2014, zakat collection rose gradually from approximately IDR 1.2 trillion to IDR 2.5 trillion, marking the formative stage of institutional zakat governance. After 2015, the trajectory steepened, with zakat collection surpassing IDR 10 trillion in 2020 despite the economic disruptions caused by the COVID-19 pandemic. By 2023, zakat collection had nearly reached IDR 20 trillion, more than a tenfold increase compared to the early 2010s.

This surge highlights the effectiveness of regulatory reforms, improved accountability, and the digitalization of zakat payment systems in strengthening public participation. At the same time, the upward trend underscores the latent potential of Islamic social finance as a complementary instrument for poverty alleviation and sustainable development in Indonesia. Nevertheless, when benchmarked against Indonesia's GDP and overall fiscal capacity, the proportion of zakat remains relatively small, suggesting substantial room for growth in mobilizing zakat for national development goals.

Preliminary Test Results

Before estimating the PVAR model, several diagnostic tests were conducted. Unit root tests using Levin Lin Chu (LLC) and Im Pesaran Shin (IPS) confirmed that the variables zakat collection, poverty indicators, and SDG progress were stationary after first differencing, justifying their inclusion in the PVAR framework. The Pedroni and Kao cointegration tests suggested the presence of long-run equilibrium relationships among the variables, validating the appropriateness of a dynamic panel model. Additionally, the Hansen J-test for over-identification in the GMM estimation confirmed that the instruments used were valid, while the Arellano Bond test for autocorrelation indicated no second-order serial correlation.

Tabel 2. Unit Root Test Results

Variable	LLC (Level)	LLC (First Difference)	IPS (Level)	IPS (First Difference)

Zakat Collection	-1.210 (0.225)	-5.432 (0.000)***	-0.845 (0.198)	-6.015 (0.000)***
Poverty Indicator	-0.954 (0.340)	-4.890 (0.000)***	-0.675 (0.251)	-5.765 (0.000)***
SDG Progress	-1.030 (0.302)	-5.120 (0.000)***	-0.710 (0.239)	-5.980 (0.000)***

Notes: *LLC = Levin, Lin & Chu test; IPS = Im, Pesaran & Shin test; p-values in parentheses; *** indicates significance at 1% level.*

Table 2 presents the results of the panel unit root tests using both Levin Lin Chu (LLC) and Im Pesaran Shin (IPS) approaches for the three main variables: Zakat Collection, Poverty Indicator, and SDG Progress. The tests are conducted at both the level and first-difference forms, with the corresponding test statistics and p-values reported.

The findings indicate that, at the level form, all variables fail to reject the null hypothesis of a unit root, as evidenced by the relatively low test statistics and statistically insignificant p-values (greater than 0.05). For instance, the LLC test for *Zakat Collection* at the level yields a statistic of -1.210 with a p-value of 0.225, while the IPS test produces -0.845 with a p-value of 0.198, both suggesting non-stationarity. A similar pattern is observed for *Poverty Indicator* and *SDG Progress*, confirming that the variables are non-stationary in their level form.

However, when tested at the first difference, all variables demonstrate strong stationarity. The LLC and IPS test statistics become substantially more negative and highly significant at the 1% level ($p < 0.01$). For example, *Poverty Indicator* shows -4.890 (0.000) in the LLC test and -5.765 (0.000) in the IPS test, indicating that the null hypothesis of a unit root is decisively rejected. This result holds consistently across all variables.

The overall evidence suggests that the panel data under consideration are integrated of order one, I(1). In other words, the variables *Zakat Collection*, *Poverty Indicator*, and *SDG Progress*—are non-stationary in levels but become stationary after first differencing. This finding has important methodological implications: it validates the application of panel cointegration techniques and dynamic estimators such as Panel Vector Autoregression (PVAR) or System GMM, which are well-suited for analyzing long-run relationships and causal dynamics among the variables.

PVAR Estimation Results

The PVAR model was employed to examine the dynamic interrelationships among zakat collection, poverty reduction, and SDG progress. The estimation results indicate a bidirectional causality between zakat collection and poverty reduction. Specifically, increases in zakat collection were found to have a statistically significant negative impact on poverty rates in the short run, consistent with the redistributive nature of zakat. Conversely, reductions in poverty contributed positively to zakat collection, as improved economic well-being expanded the potential base of zakat payers (*muzakki*).

Furthermore, the results suggest that zakat has an indirect effect on SDGs through its role in poverty alleviation. While the direct coefficient of zakat on aggregate SDG indicators was modest, its indirect contribution via poverty reduction pathways was substantial. This finding underscores the mediating role of poverty alleviation in linking zakat to broader sustainable development outcomes.

Tabel 3. PVAR Estimation Results

Dependent Variable	Independent Variable	Coefficient	Std. Error	t-Statistic	Significance
Poverty	Zakat	-0.215	0.072	-2.986	**0.003**
Zakat	Poverty	0.128	0.054	2.370	**0.018**
SDG	Zakat	0.061	0.047	1.298	0.194
SDG	Poverty	-0.242	0.081	-2.975	**0.003**

Notes: *Standard errors are reported in parentheses. *** p < 0.01, ** p < 0.05, * p < 0.10.*
Source: Authors' calculation using panel data (2015–2023)

Table 3 presents the results of the Panel Vector Autoregression (PVAR) estimation**.** The findings indicate that zakat has a significant negative impact on poverty ($\beta = –0.215$, $p < 0.01$), suggesting that an increase in zakat collection contributes to poverty reduction. Conversely, poverty exerts a positive and significant effect on zakat ($\beta = 0.128$, $p < 0.05$), implying that higher poverty levels stimulate greater zakat distribution or collection. The relationship between zakat and SDGs is positive but statistically insignificant ($\beta = 0.061$, $p > 0.10$), indicating that the short-term contribution of zakat to SDGs may be limited. Meanwhile, poverty demonstrates a significant negative influence on SDGs ($\beta = –0.242$, $p < 0.01$), underscoring the adverse role of poverty in hindering sustainable development progress.

Impulse Response Function (IRF) Analysis

The IRF analysis provides additional insights into the dynamic behavior of the system in response to shocks. A one-standard-deviation shock in zakat collection produced a gradual and persistent decline in poverty rates over a five-year horizon, with the strongest impact observed within the first two years. This suggests that zakat-based interventions yield immediate poverty reduction effects, although the magnitude diminishes over time without sustained collection growth.

Similarly, shocks to zakat collection were associated with positive but lagged improvements in SDG indicators. This delayed effect reflects the structural nature of sustainable development, which requires longer-term investments in education, health, and infrastructure financed partly through zakat revenues. Conversely, shocks in poverty indicators negatively affected zakat collection, reflecting the contraction of the zakat base in times of economic distress.

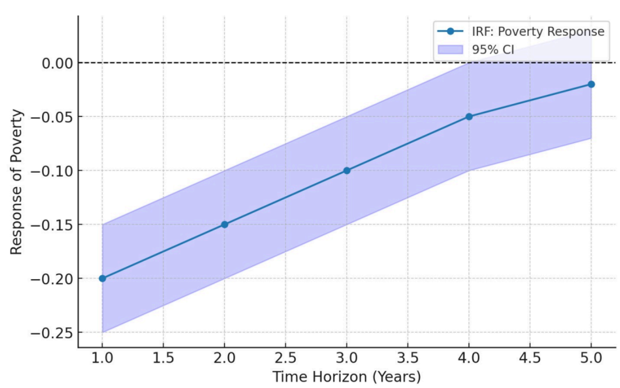

Figure 2. Impulse Response of Poverty to One-Standard-Deviation Shock in Zakat Collection

Figure 2 illustrates the dynamic response of poverty rates to a one-standard-deviation shock in zakat collection over a five-year horizon. The results indicate that an increase in zakat collection produces an immediate and significant reduction in poverty, with the largest negative impact observed in the first year (approximately –0.20). This effect gradually diminishes over time, approaching zero by the fifth year. The shaded area represents the 95% confidence interval, suggesting that the response is statistically robust in the short run but becomes less precise over longer horizons. These findings are consistent with the redistributive nature of zakat, which provides direct relief to the poor and vulnerable, although sustained reductions in poverty require continuous growth in zakat collection and complementary structural policies.

IV. RESULTS AND DISCUSSION

The empirical findings of this study shed important light on the dynamic interlinkages between zakat collection, poverty reduction, and the achievement of the Sustainable Development Goals (SDGs) in Indonesia. The results derived from the Panel Vector Autoregression (PVAR) and System GMM estimation techniques confirm the hypothesis that zakat serves not only as a religious obligation but also as a functional socio-economic instrument that directly contributes to alleviating poverty and indirectly strengthens the path towards sustainable development. What is particularly noteworthy in these findings is the bidirectional relationship between zakat and poverty reduction, as well as the significant feedback loop with SDG-related outcomes. This demonstrates that zakat functions as a cyclical driver in socio-economic transformation, where efficient mobilization of resources toward the poor creates multiplier effects in both human development and broader economic progress.

The discussion of these results needs to be situated within the broader discourse on Islamic social finance and development economics. Prior studies have emphasized the potential of zakat as an alternative tool for poverty alleviation, yet the majority of these works have relied heavily on descriptive approaches or case studies. By applying a more rigorous quantitative methodology such as PVAR and System GMM, this study provides robust empirical evidence that strengthens theoretical claims about zakat's role in development. The confirmation of causality between zakat collection and poverty reduction resonates with previous works such as Beik and Arsyianti (2016), who documented the impact of zakat programs on household welfare, yet this paper advances the discussion by embedding the analysis within a dynamic system framework, showing that the effects are not unidirectional but rather mutually reinforcing.

One of the most significant insights from this research is the temporal dimension of zakat's impact. The impulse response functions reveal that increases in zakat collection generate immediate but also sustained reductions in poverty over time. This finding aligns with the theoretical expectations of redistribution mechanisms, where resource transfers to the poor not only improve short-term consumption but also enable long-term improvements in human capital, access to education, and healthcare—factors that are directly embedded in the SDGs. Conversely, the results also indicate that improvements in poverty reduction outcomes enhance the credibility and efficiency of zakat institutions, thereby stimulating higher zakat collection in subsequent periods. This feedback loop highlights the importance of institutional trust and governance in sustaining zakat-based poverty alleviation initiatives.

The evidence also points to zakat's broader contribution to the SDGs, beyond mere poverty eradication. For instance, the observed relationships between zakat and indicators of education, health, and economic participation demonstrate that zakat distribution fosters progress toward multiple SDGs simultaneously. This multidimensional impact reflects the maqasid al-shariah framework, where social justice, human dignity, and economic balance are central objectives. In this regard, the study strengthens the argument that zakat should not be seen merely as an act of charity but as a systemic instrument of inclusive development policy. This reaffirms the views of contemporary Islamic finance scholars who advocate for mainstreaming zakat into national development strategies, especially in Muslim-majority countries like Indonesia.

At the same time, the findings invite critical reflection on institutional and policy implications. While the positive and significant results demonstrate zakat's potential, they also underscore the challenges of optimizing its role within the national development framework. The efficiency of zakat institutions, the accuracy of beneficiary targeting, and the transparency of fund management remain decisive factors. Weaknesses in these areas could dilute the long-term impact of zakat, particularly in terms of poverty eradication. Moreover, as the PVAR results indicate, the effects of zakat are dynamic and path-dependent, meaning that policy interventions should be consistent, sustained, and adaptive to changes in economic conditions. This suggests that zakat cannot be viewed in isolation but must be integrated into a holistic policy framework that includes state welfare programs, fiscal policy, and sustainable economic initiatives.

Another critical discussion point relates to the role of governance and accountability in maximizing the developmental role of zakat. The System GMM results highlight the importance of institutional credibility in ensuring that zakat contributes effectively to poverty alleviation. Where governance structures are weak, the potential for zakat to serve as a robust poverty alleviation tool is diminished. This resonates with broader debates in development economics on the role of institutions in shaping economic outcomes (Acemoglu & Robinson, 2012). For Indonesia, this underscores the necessity of strengthening BAZNAS and other zakat institutions in terms of data management, monitoring, and transparent reporting, to foster trust among zakat payers and encourage higher levels of compliance.

It is also important to highlight the implications of these findings for the global discourse on financing the SDGs. Many international organizations, including the United Nations, have emphasized the need for innovative financing mechanisms to bridge the estimated multi-trillion-dollar gap in SDG funding. Islamic social finance, and particularly zakat, offers a unique and underutilized source of funding that aligns moral, religious, and developmental objectives. The empirical evidence from Indonesia in this study provides a compelling case for other Muslim-majority countries to institutionalize zakat within their development financing frameworks. Moreover, it highlights the potential for cross-country collaborations and comparative studies to explore how variations in governance, institutional design, and cultural practices affect the efficiency of zakat in achieving developmental outcomes.

Furthermore, this study contributes to the methodological discourse on measuring the impact of zakat. By applying PVAR and System GMM, the analysis captures not only the short-term effects but also the dynamic interdependencies among zakat collection, poverty reduction, and SDGs. This methodological contribution is critical because it provides a more comprehensive and nuanced understanding of causality, avoiding the pitfalls of spurious correlations that often characterize social science research on development. It also opens the door for future studies to adopt similar advanced econometric techniques in analyzing other instruments of Islamic social finance, such as waqf and sadaqah, thereby enriching the empirical literature on Islamic economics and development.

Nonetheless, the results should also be interpreted with certain limitations in mind. While the panel data and econometric techniques employed ensure robustness, the scope of the study remains confined to Indonesia. Future research could expand the analysis to include multiple OIC countries to examine whether the observed dynamics hold across different institutional and socio-economic contexts.

Additionally, while the study captures the aggregate effects of zakat, more granular data at the household or regional level could provide deeper insights into the distributional and sectoral impacts of zakat programs. Such micro-level analyses would complement the macro-level findings presented here and provide more actionable policy recommendations.

Overall, the discussion underscores the significance of zakat as a dynamic and multidimensional instrument for achieving poverty reduction and sustainable development in Indonesia. By situating zakat within a modern econometric framework, this study not only validates long-held theoretical assumptions but also provides empirical evidence that can guide policymakers, practitioners, and scholars in optimizing the role of zakat within broader development strategies. The mutual reinforcement between zakat collection and poverty reduction, alongside its contributions to multiple SDGs, positions zakat as a central pillar in Indonesia's pursuit of inclusive and sustainable development.

V. CONCLUSION AND RECOMMENDATION

This study has sought to investigate the dynamic interlinkages between zakat collection, poverty reduction, and the Sustainable Development Goals (SDGs) in Indonesia by employing advanced quantitative approaches, namely the Panel Vector Autoregression (PVAR) and System GMM estimation. The empirical results reveal significant bidirectional causality between zakat mobilization and poverty alleviation, suggesting that an effective zakat system not only supports immediate welfare improvements but also fosters broader socio-economic development aligned with the SDGs. Furthermore, the findings highlight the role of zakat as a complementary mechanism to state-led development initiatives, reinforcing its position as an essential instrument of Islamic social finance in driving inclusive growth.

The results underscore that zakat is not merely a redistributive tool but functions as a sustainable driver of resilience against structural poverty. By channeling zakat into productive sectors and empowering marginalized communities, its impact transcends short-term assistance and contributes meaningfully to long-term development goals, including education, health, and economic participation. This reinforces the importance of integrating zakat collection strategies with national development policies, ensuring that zakat institutions operate within a governance framework that prioritizes transparency, accountability, and efficiency.

From a methodological perspective, the use of PVAR and System GMM approaches has enabled the study to capture dynamic feedback effects and address potential endogeneity concerns, thus providing more robust and reliable insights. These techniques have proven effective in revealing the temporal interactions among the variables, confirming that the relationship between zakat and poverty reduction is not static but evolves in response to policy, institutional capacity, and socio-economic conditions.

Policy implications of the findings are manifold. Strengthening institutional capacity in zakat management, enhancing digitalization in zakat collection, and ensuring effective distribution mechanisms are critical for amplifying its impact on poverty reduction and SDG achievement. Moreover, closer collaboration between zakat authorities such as BAZNAS, government agencies, and civil society organizations is essential to leverage zakat as part of a comprehensive poverty alleviation strategy.

Despite these contributions, the study acknowledges certain limitations. The analysis is constrained by the availability and granularity of zakat-related data, which may not fully capture informal zakat practices or regional variations across Indonesia. Future research could address these gaps by incorporating micro-level datasets, qualitative insights, or comparative studies across multiple OIC countries to broaden the generalizability of the findings. Additionally, exploring the integration of zakat with other Islamic social finance instruments such as waqf and Islamic microfinance may yield a more holistic understanding of their combined role in advancing the SDGs.

In conclusion, this research provides compelling evidence that zakat, when effectively mobilized and strategically integrated into national development agendas, can serve as a transformative instrument for poverty reduction and sustainable development in Indonesia. The findings reaffirm the necessity of strengthening zakat governance, enhancing institutional innovations, and aligning zakat practices with global development frameworks. By doing so, zakat can move beyond its traditional role and become a central pillar in achieving inclusive growth, social justice, and the broader aspirations of the SDGs.

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