# LITECOIN – A DIVERSIFIER, SAFE HAVEN, OR HEDGING ASSET?

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## ABSTRACT

*The growth of cryptocurrencies has transformed global finance, with Litecoin emerging as a prominent alternative to Bitcoin. Despite growing adoption in South Africa, empirical evidence on Litecoin's role as a portfolio diversifier or hedging asset remains limited. This study examines the nonlinear and asymmetric relationship between Litecoin and two major South African equity indices—the All Share Index (ALSI) and JSE Industrial 25, using monthly data from January 2013 to May 2024. The Nonlinear Autoregressive Distributed Lag (NARDL) model, alongside Random Matrix Theory (RMT), was used to capture short and long-run asymmetries while filtering spurious correlations. Results reveal that Litecoin exhibits significant asymmetric impacts on both indices, with positive shocks exerting stronger effects than negative shocks, highlighting its potential as a diversification tool. In contrast, Bitcoin, Ethereum, and Ethereum Classic show limited or insignificant influence. The findings provide novel insights for investors, portfolio managers, and policymakers on leveraging Litecoin to enhance risk management and portfolio resilience in emerging markets.*

**Keywords:** Litecoin, Diversifier, Safe Haven Asset, Hedging Asset, South African Stock Market, Nonlinear Autoregressive Distributed Lag, Random Matrix Theory.

## 1. INTRODUCTION

Digital technologies have revolutionized global finance, with cryptocurrencies emerging as one of the most significant innovations of recent decades. Cryptocurrencies are decentralized, cryptographically secured digital assets based on blockchain technology. While Bitcoin has dominated global attention, alternative coins such as Litecoin have gained traction as investment instruments and potential hedging tools (Suriya, Beryl-Andrina & Shilpa, 2021; Böhme et al., 2020; Shaturaev, 2023). Launched in 2011 as a "lighter" version of Bitcoin, Litecoin offers faster transactions and lower costs, making it attractive for investors and traders. By 2021, the cryptocurrency market exceeded $783 billion, with South Africa emerging as a leading adopter through platforms such as Luno and VALR (ElBahrawy et al., 2017; Jankeeparsad & Tewari, 2018; Budree & Nyathi, 2023). Projections indicate that the South African cryptocurrency market will reach US$246 million in 2024 and US$332.9 million by 2028 (Statista, 2023).

Despite its growing adoption, Litecoin, like other cryptocurrencies, is highly volatile, influenced by speculative trading, market sentiment, and external shocks. These nonlinear and asymmetric fluctuations often mirror traditional equity markets during crises, raising questions about Litecoin's potential as a diversifier, hedge, or safe-haven asset (Katsiampa, 2017, 2018; French, Schwert & Stambaugh, 1987; Ghorbel et al., 2022). Events such as the COVID-19 pandemic intensified correlations between cryptocurrencies and stock markets, potentially weakening their diversification benefits (Wang et al., 2020; IMF, 2022).

Although empirical literature suggests that cryptocurrencies may serve as diversification instruments, hedging tools, or safe havens, their effectiveness is inconsistent across assets, timeframes, and market conditions (Demir et al., 2018; Gil-Alana et al., 2020; Huynh et al., 2020; Charfeddine et al., 2020; Conlon et al., 2020; Ji et al., 2020). Volatility clustering, structural breaks, and market shocks further complicate their role in portfolios (Stock & Watson, 1996; Pesaran & Timmermann, 2004; Aharon et al., 2023). Advanced econometric models, such as the Nonlinear Autoregressive Distributed Lag (NARDL) and Random Matrix Theory (RMT), have been

increasingly applied to capture these nonlinear, asymmetric, and noisy relationships (Hsu et al., 2021; Khalfaoui et al., 2023; Ibrahim et al., 2024).

Despite global research advances, South African studies remain limited. Most investigations focus on Bitcoin, while Litecoin's role in domestic markets has been largely ignored (Sanusi et al., 2022; Udom & Nnamani, 2023). Moreover, domestic factors such as policy uncertainty, cybercrime, and macroeconomic instability may uniquely influence Litecoin's interactions with major stock indices like the ALSI and JSE Industrial 25.

This study addresses a clear gap in the literature by systematically examining Litecoin's role as a diversifier or hedging asset in South Africa. Unlike prior studies that rely on linear models and focus primarily on Bitcoin, this research employs the NARDL framework, supported by RMT, to capture both short- and long-run asymmetries while filtering out spurious correlations. The findings provide novel insights for South African investors, portfolio managers, and policymakers, while contributing to the broader understanding of alternative cryptocurrencies in emerging financial markets.

## 2. METHODS

### *Research Methodology*

This study adopts a positivist and quantitative design, relying on objective secondary data and econometric analysis (Creswell, 2014; Saunders, Lewis & Thornhill, 2019). Using monthly data from January 2013 to May 2024, the analysis explores Litecoin's relationship with two South African stock indices, the All Share Index (ALSI) and the JSE Industrial 25. The NARDL bounds testing approach is employed to evaluate both short- and long-run asymmetries, distinguishing between the effects of positive and negative shocks. Wald tests are applied to confirm the presence of nonlinear asymmetries.

Data were sourced from the Johannesburg Stock Exchange (JSE) and the South African Reserve Bank (SARB), while econometric estimations are performed using Stata 17. Conceptually, the analysis is underpinned by Random Matrix Theory, which validates the need for nonlinear econometric modeling by highlighting the limits of conventional correlation analysis in noisy financial systems (Laloux et al., 1999; Plerou et al., 2002; Bouchaud & Potters, 2009). Together, NARDL and RMT provide a robust framework for assessing whether Litecoin acts as a diversifier, hedge, or neither in the South African context.

### *Theoretical Framework*

The theoretical foundation of this study is grounded in portfolio theory, hedging and safe-haven concepts, market efficiency, and behavioral finance, which collectively explain the potential role of Litecoin (LTC) in South African equity portfolios.

Portfolio Theory: Modern Portfolio Theory (Markowitz, 1952) posits that diversification reduces portfolio risk without necessarily sacrificing returns. Cryptocurrencies, including Litecoin, may serve as diversifying assets if their returns are weakly correlated or negatively correlated with traditional equities, thereby improving the risk-return profile of investment portfolios.

Hedging and Safe-Haven Concepts: A hedge protects portfolios against adverse market movements, while a safe-haven protects against extreme market turmoil (Baur & Lucey, 2010). Litecoin's unique characteristics, including faster transaction speeds and lower costs, may enable it to act as a hedge or safe-haven against shocks in South African stock indices such as the ALSI and JSE Industrial 25.

Market Efficiency Theory: According to the Efficient Market Hypothesis (Fama, 1970), asset prices fully reflect all available information. However, the high volatility and speculative nature of cryptocurrencies suggest potential deviations from efficiency, which could create opportunities for asymmetric and nonlinear interactions between Litecoin and equity markets.

Behavioral Finance: Investor sentiment, herding behavior, and overreaction can drive nonlinear market dynamics (Shiller, 2003). These behavioral factors may amplify asymmetric responses of South African stock indices to Litecoin price movements, particularly during periods of market stress or external shocks.

***Conceptual Link to the Study (Conceptual Framework)***

Integrating these theories, Litecoin's role as a diversifier, hedge, or safe-haven can be examined empirically using advanced econometric techniques that account for asymmetries and nonlinearities. This framework provides a rationale for investigating how Litecoin interacts with major South African equity indices and informs the selection of the Nonlinear Autoregressive Distributed Lag (NARDL) model and Random Matrix Theory (RMT) in subsequent analyses.

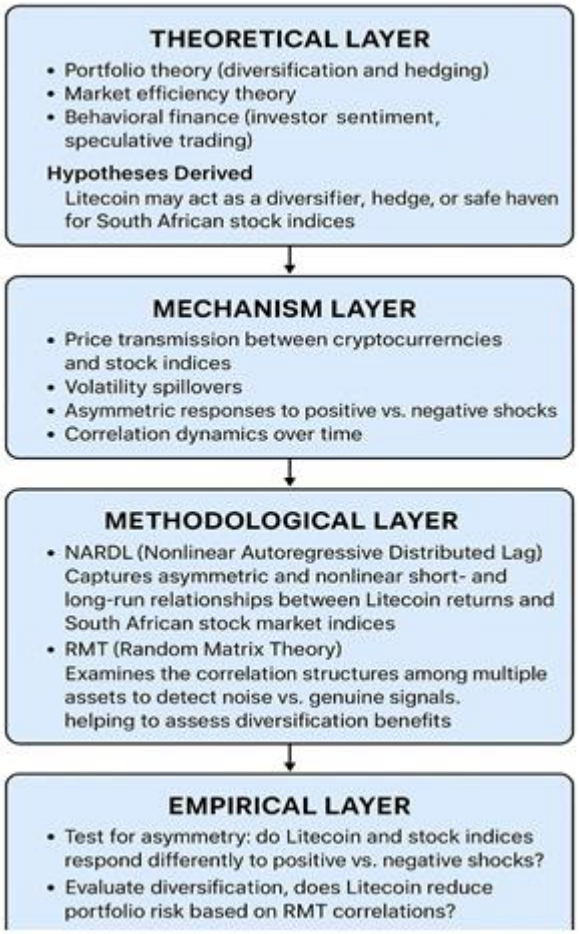


**FIGURE 1**
**CONCEPTUAL FRAMEWORK LINKING THEORY → MECHANISM → METHODOLOGY → EMPIRICAL ANALYSIS → CONTRIBUTION**

The conceptual framework for this study is structured across four interconnected layers, providing a coherent link from theory to empirical analysis and practical contribution. At the theoretical layer, the framework draws on foundational economic and financial theories, including portfolio theory, which underpins concepts of diversification and hedging; market efficiency theory, which informs expectations about asset pricing and information flow; and behavioral finance, which considers the role of investor sentiment and speculative trading.

The following hypothesis is derived from these theories: Litecoin may serve as a diversifier, hedge, or safe haven for South African stock indices.

The mechanism layer explains how these theoretical effects occur in practice. This involves price transmission between cryptocurrencies and stock indices, volatility spillovers, asymmetric responses to positive versus negative shocks, and the evolution of correlation dynamics over time. These mechanisms explain how Litecoin may shape the risk-return characteristics of South African investment portfolios.

At the methodological layer, the framework links theory to empirical investigation using advanced econometric techniques. the nonlinear autoregressive distributed lag (NARDL) model is used to analyse asymmetric and nonlinear short and long-run connections between Litecoin returns and South African stock market indices. Random Matrix Theory (RMT) is used as a complement to examine the correlation structure among multiple assets, distinguishing genuine signals from noise and thereby assessing potential diversification benefits.

The empirical layer focuses on analysis and interpretation. The study tests for asymmetry by examining whether Litecoin and stock indices respond differently to positive versus negative shocks, evaluates diversification benefits based on RMT correlations, and derives policy and investor implications regarding the effectiveness of Litecoin as a hedging instrument within South Africa.

Finally, the result and contribution layer highlight the study's value. The framework facilitates empirical validation of the theoretical hypotheses, provides evidence-based guidance for investors and policymakers, and establishes originality by being the first study to examine Litecoin's hedging and diversification role in South Africa using the integrated NARDL and RMT approach.

## 3. RESULTS

### *NARDL Model*

Two models were conducted, namely, the All-Share Index and the Industrial 25 JSE model

**Model 1: (All Share Index as the dependent variable)**

**a. NARDL – Short Run Results**

**Table 1. NARDL Short-Run Results**

| Variable | Coefficient | Std. Error | t-statistic | Prob |
|---|---|---|---|---|
| ASI (-1) | -.033732 | .0066017 | -5.11 | 0.000 |
| BC_Pos | -.0003775 | .0003061 | -1.23 | 0.218 |
| BC_Neg | .0003437 | .0005472 | -0.63 | 0.530 |
| LC_Pos | .2087714 | .0569931 | 3.66 | 0.000 |
| LC_Neg | -.2006602 | .0606503 | - 3.31 | 0.001 |
| EC_Pos | -.3839798 | .2338894 | -1.64 | 0.101 |
| EC_Neg | -.3661146 | .2750726 | -1.33 | 0.183 |
| EM_Pos | .0068113 | .0053963 | 1.26 | 0.207 |
| EM_Pos | .0052495 | .0072496 | 0.72 | 0.469 |

**Note: POS implies a positive or direct relationship between independent and dependent variables, while NEG implies a negative or indirect relationship.**

The error correction term (ECT) of -0.0337 (p = 0.000) confirms a slow but statistically significant adjustment of the All-Share Index (ASI) toward its long-run equilibrium following a shock. As noted by Kripfganz and Schneider (2023), such a negative and significant coefficient indicates gradual correction of disequilibrium over time, suggesting a stable long-term relationship between ASI and the selected cryptocurrencies.

In the short run, the impacts of cryptocurrency shocks on ASI are asymmetric and vary in significance. Bitcoin and Ethereum exhibit minimal and statistically insignificant effects, while Ethereum Classic shows weak significance. Litecoin stands out with both positive and negative shocks significantly increasing ASI, indicating a strong nonlinear and asymmetric relationship. These findings suggest that while most cryptocurrencies have limited short-run influence, Litecoin plays a distinct and statistically significant role in shaping South Africa's equity market performance.

The long-run asymmetrical results are shown in Table 2 below:

**b. NARDL Long-run results**

**Table 2. NARDL Long-run results**

| Variable | Coefficient | Std. Error | t-statistic |
|---|---|---|---|
| BC_Pos | -0.011 | . 1.537 | 0.215 |
| BC_Neg | 0.010 | .3864 | 0.534 |
| LC_Pos | 6.189 | 19.24 | 0.000 |
| LC_Neg | -5.949 | 13.2 | 0.000 |
| EC_Pos | -11.383 | 2.639 | 0.104 |
| EC_Neg | 10.854 | 1.658 | 0.198 |
| EM_Pos | 0.202 | 1.624 | 0.203 |
| EM_Pos | -0.156 | .5081 | 0.476 |

The NARDL results reveal asymmetric and nonlinear long-run relationships between selected cryptocurrencies and South Africa's All-Share Index (ASI). Bitcoin and Ethereum Classic display inconsistent or negative impacts on ASI under both positive and negative shocks, while Ethereum shows a weak but positive association. Litecoin stands out, with both positive and negative shocks significantly increasing ASI, indicating a strong and consistent influence. These findings confirm a unique, nonlinear, and asymmetric link between Litecoin and ASI, highlighting its notable role in shaping South Africa's equity market dynamics.

**c. Wald Test Results**

**Table 3. The Wald test results**

| | |
|---|---|
| F (9, 1542) | 3.34 |
| Prob | 0.0005 |

The Wald test results, shown in Table 3, reveal an F-statistic of 3.47. Given the test's significance level of 0.005, the null hypothesis of symmetry is rejected at the 5% level. This indicates a statistically significant asymmetric relationship in the model. Specifically, the Wald test evaluates whether positive and negative changes in the independent variables have different effects on the dependent variable—in this case, the All-Share Index (ASI).

The rejection of the null hypothesis confirms the presence of a long-run asymmetric nonlinear relationship between ASI and the selected cryptocurrencies: Bitcoin (BC), Litecoin (LC), Ethereum Classic (EC), and Ethereum (EM). This implies that positive and negative fluctuations in these variables affect ASI differently over time. However, when assessed individually, only Litecoin exhibits significant short- and long-run correlations with ASI. This suggests that while there may be a collective asymmetric effect from all the cryptocurrencies, Litecoin alone consistently influences ASI dynamics both in the short and long term.

**Model 2: Industrial 25 JSE as the Dependent Variable**

**a. NARDL Model**

i. NARDL – Short Run

**Table 4. NARDL – Short Run**

| Variable | Coefficient | Std. Error | t-statistic | Prob |
|---|---|---|---|---|
| IJSE (-1) | -.0323874 | .005612 | -5.77 | 0.000 |
| BC_Pos | -.0003092 | .0004407 | -0.70 | 0.483 |
| BC_Neg | -.001419 | .0008005 | -1.77 | 0.076 |
| LC_Pos | .3156122 | .0816492 | 3.87 | 0.000 |
| LC_Neg | .4021837 | .0946584 | 4.25 | 0.000 |
| EC_Pos | -.7157955 | .3508701 | -2.04 | 0.042 |
| EC_Neg | -1.326029 | .4292876 | -3.09 | 0.002 |
| EM_Pos | .0017378 | .0077574 | 0.22 | 0.823 |
| EM_Neg | .0183624 | .0106627 | 1.72 | 0.085 |

**Note: POS implies a positive or direct relationship between independent and dependent variables, while NEG implies a negative or indirect relationship.**

Table 4 above portrays the short-run nonlinear asymmetric results. The speed-of-adjustment coefficient, also referred to as the error correction term (ECT) tells us how fast the process for the dependent variable reverts to its long-run relationship when this equilibrium is distorted If it is closer to 1, this would imply that—in the absence of any other short-run fluctuations—any deviation from the equilibrium is corrected within a short period after the distortion occurs. In contrast, if it is closer to 0, this would imply that the process returns to its equilibrium path after a long period (Kripfganz & Schneider, 2023). The error correction term ( ) has a coefficient (-0.0323874), with a correct negative sign which is less than 1 and is perfectly significant with a p-value of 0.000.

The ECT coefficient (-0.0323874) implies that if there is any disturbance in this system it takes an average speed of about 3% on this non-linear ARDL model to adjust back from the short run to the long run on daily basis.

In the case of asymmetry, if the response of the dependent variable to the positive changes in the independent variable is larger than that of a negative change, we say there is an asymmetric relationship between the two variables. However, if it is the same, we conclude that the relationship is symmetric.

The positive sign of BC Pos (-.0003092) suggests that, if the Bitcoin appreciates by 1 unit, IJSE will also decrease by 0.0003092 (0.0003) units. On the other hand, the negative sign of BC Neg (-.001419) implies that if the Bitcoin appreciates by 1 unit, IJSE will appreciate by 0.001419 units (about 0.001) units. Regarding Litecoin (LC), the positive sign of LC Pos (0.3156122) denotes that, if the Litecoin appreciates by 1 unit, IJSE will also appreciate by 0.3156122 (0.316) units. Alternatively, the positive sign of LC Neg (0.4021837) implies that if Litecoin appreciates by 1 unit, IJSE will depreciate by 0.4021837 (about 0.402) units.

The positive sign of EC Pos (-.715955) suggests that, if the Ethereum Classic appreciates by 1 unit, IJSE will also decrease by 0.715955 (0.716) units. On the other hand, the negative sign of EC Neg (-1.326029) implies that if the Ethereum Classic appreciates by 1 unit, IJSE will appreciate by 1.326029 units (about 1.326) units.

Regarding Ethereum (EM), the positive sign of EM Pos (0.0017378) denotes that, if Ethereum appreciates by 1 unit, IJSE will also appreciate by 0.0017378 (0.0017) units. Alternatively, the positive sign of EM Neg (0.0183624) implies that if the Ethereum appreciates by 1 unit, IJSE will depreciate by 0.0183624 (about 0.018) units.

The results reveal a short-run asymmetric nonlinear relationship between the dependent variable (IJSE) and each independent variable. The absolute value of the coefficient of the positive change of each explanatory variable under review is greater than that of the negative change.

The short-run nexus results indicate that the IJSE is affected by positive changes in Bitcoin, Litecoin, Ethereum Classic, and Ethereum in the long run. However, the relationship between IJSE and the 3 variables, namely, Bitcoin, Ethereum, and Ethereum Classic for positive change, is insignificant, as their p-values are greater than 0.05 at the 5% significance level. Only Litecoin has a significant effect as denoted by the p-value of 0.000 and 0.001 for the positive and negative changes, followed by Ethereum Classic with a significant effect, as denoted by the p-value of 0.002 for the negative change.

**b. Asymmetric Effect**

Table 5, below, portrays the long-run nonlinear asymmetric results. According to Table 9 above, the null hypothesis is that there is an asymmetric nonlinear long-run relationship between the dependent variable and the explanatory variable, against the alternative that there is a symmetric nonlinear long-run relationship between the dependent variable and the explanatory variable.

The negative sign of the coefficient of BC Pos (-0.010) implies that, if there is an increase in the value of Bitcoin by 1 unit, the value of IJSE will decrease by about 0.01 units. On the contrary, the positive sign of BC Neg (0.044) implies that if Bitcoin increases by 1 unit, IJSE will decrease by 0.04.

Concerning Litecoin, the positive sign of LC Pos (9.745) implies that, if there is an increase in Litecoin by 1 unit, IJSE will also increase by 9.7 units. Conversely, the negative sign of LC Neg (-12.418) implies that if Litecoin increases by 1 unit, IJSE will increase by 12.4 (or about 12) units.

The negative sign of EC Pos (-22.101) suggests that, if the Ethereum Classic appreciates by 1 unit, IJSE will also decrease by 22.101 (22.1) units. Conversely, the positive sign of EC Neg (40.943) implies that if the Ethereum Classic appreciates by 1 unit, IJSE will depreciate by 40.943 units (about 40.9) units.

In the case of Ethereum (EM), the positive sign of EM Pos (0.054) denotes that, if Ethereum appreciates by 1 unit, IJSE will also appreciate by 0.054 (0.05) units. Instead, the negative sign of EM Neg (-0.567) implies that if the Ethereum appreciates by 1 unit, IJSE will appreciate by 0.567 (about 0.56) units.

The short-run nexus results indicate that the relationship between IJSE and the 2 variables, namely, Bitcoin for positive change and Ethereum Classic (for both positive and negative change) is insignificant, as their p-values are greater than 0.05 at the 5% significance level.

Litecoin has a significant long-run effect as denoted by the p-value of 0.000, respectively, for the positive and negative changes, followed by Ethereum Classic (0.035 and 0.001) and Bitcoin (0.000) for negative changes.

Thus, a short and long-run nonlinear asymmetric link between Litecoin and Industrial 25 JSE exists.

**Table 5. NARDL Long Run Results**

| Variable | Coefficient | Std. Error | t-statistic |
|---|---|---|---|
| BC_Pos | -0.010 | .4815 | 0.485 |
| BC_Neg | 0.044 | 3.064 | 0.000 |
| LC_Pos | 9.745 | 21.05 | 0.000 |
| LC_Neg | -12.418 | 25.08 | 0.000 |
| EC_Pos | -22.101 | 4.475 | 0.035 |
| EC_Neg | 40.943 | 10.63 | 0.001 |
| EM_Pos | 0.054 | 0.05036 | 0.822 |
| EM_Pos | -0.567 | 2.979 | 0.085 |

**c. Wald Test**

**Table 6. The Wald Test Results**

| | |
|---|---|
| F( 9, 1542) | 4.94 |
| Prob | 0.0000 |

The Wald test of asymmetry for both long-run and short-run is presented in Table 6. The F statistic with 1 numerator and 44 denominator degrees of freedom is 3.47. The significance level of the test is 0.005%, so we can reject the hypothesis at the 5% level.

Since the p-value of 0.0000 is less than 0.05, we can reject the null hypothesis at the 5% significance level and conclude there is long-run asymmetric nonlinear correlation between IJSE and the regressors (BC, LC, EC, and EM). The implication is that, when tested as a group, the explanatory variables portray the absence of a long-run connection with the dependent variable. However, when tested individually, only Litecoin denotes the existence of both short and long-run correlation.

## 4. DISCUSSION

This study provides robust evidence of asymmetric and nonlinear interactions between select cryptocurrencies and South African equity indices, as revealed by the NARDL model and Wald tests. Litecoin (LTC) exhibits significant short- and long-run asymmetric relationships with the JSE All Share Index (ALSI) and JSE Industrial 25 (IJSE), whereas Bitcoin (BC), Ethereum (EM), and Ethereum Classic (EC) show no statistically significant links. This suggests LC's potential as a portfolio diversifier, while the other cryptocurrencies may function better as hedging or safe-haven assets due to their limited correlation with these indices.

Further analysis indicates that positive LC shocks have a stronger impact on equity indices than negative shocks, reinforcing the asset's diversification role. These results underscore the heterogeneity among cryptocurrencies, shaped by their unique characteristics and prevailing market conditions. The observed nonlinear asymmetry aligns with prior research on complex crypto-equity dynamics, contrasting studies that report symmetric or insignificant relationships.

The findings emphasize the importance of employing econometric models that capture asymmetries and nonlinearities, particularly in emerging markets like South Africa, where linear approaches may overlook critical dynamics. Practically, LC emerges as a valuable tool for investors and portfolio managers seeking to enhance risk management and portfolio resilience during periods of heightened market volatility.

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