CHAPTER V CONCLUSION

This chapter presents the conclusions of the research as an answer to the formulation of the problems and research objectives that have been presented in Chapter I, as well as suggestions for the development of research and subsequent systems based on the findings and limitations identified during the research process.

5.1 Conclusion

Based on the results of the design, implementation, and testing of the Bitcoin and Ethereum investment risk classification system based on multi-scale volatility and the quantile approach outlined in Chapter III and IV, the following conclusions can be drawn:

1. The volatility characteristics of Bitcoin and Ethereum over various time horizons were successfully measured using a multi-scale volatility approach. The test results showed that the volatility of the two assets was time-varying and not stationary, with Ethereum consistently showing higher and more volatile volatility levels than Bitcoin, as shown in the comparative analysis of average risk scores and high risk frequencies (Subchapter 4.6). This indicates that Bitcoin tends to act as a relatively more stable asset (store of value), while Ethereum reflects the characteristics of assets with more dynamic network activity.
2. The application of the multi-scale volatility approach, which combines short, medium, and long scale volatility into a single aggregate volatility value, has been proven to be able to describe investment risks more comprehensively than the single-scale approach. This approach succeeds in capturing market noise on the short horizon as well as more stable risk trends on the long horizon, so that the resulting risk profile is more robust against short-term changes in market conditions that are temporary.
3. The quantile method has proven to be effective in classifying and differentiating the risk levels of Bitcoin and Ethereum investments objectively and adaptively to historical distributions, without relying on subjective fixed thresholds. The division of volatility into ten deciles (Q1–Q10) mapped to six qualitative risk categories (Very Low to Extreme) results in an empirically consistent classification, where volatility above

Q75 is consistently in the high-risk category and volatility above Q90 is almost always classified as extreme risk (Subchapter 4.3). The integration of technical indicators (RSI, MA200, and ATR) as risk score adjusters per point in time also strengthens the interpretation of risk without replacing the primary role of volatility as the basis for risk measurement.

4. The risk classification system developed in the form of a Streamlit-based interactive dashboard successfully implements the entire methodological framework in an integrated manner, starting from the extraction of OHLC historical data through Binance API and local CSV, multi-scale log-return and volatility calculations, quantitary-based risk classification, to the presentation of technical indicators along with automatic interpretive explanations. The system is transparent and not black-box, as each stage of the calculation can be traced back to the underlying statistical and technical principles, as shown through manual calculations in Subchapter 3.9.

Overall, the study successfully answered the entire formulation of the problem and achieved the stated research objective, which is to develop a transparent, easily replicable, and easily interpretable cryptocurrency investment risk classification framework, especially for beginner investors who need an understanding of risk without having to rely on complex and black-box price forecasting models.

5.2 Suggestions

Based on the results of the research, the limitations of the research described in Subchapter 1.5, as well as the findings during the process of developing and testing the system, several suggestions are proposed for the development of the research and the system further:

1. Further research is suggested to expand the object of research by adding other cryptocurrencies outside of Bitcoin and Ethereum, such as altcoins with medium to small market capitalization, in order to test the generalization of risk classification methods based on multi-scale volatility and quantitancy on more diverse market characteristics.
2. Given that this study is deliberately limited to price volatility-based risk measurement (Subchapter 1.5), further research can integrate fundamental factors and market sentiment, such as trading volume, on-chain activity, and

social media sentiment, as additional variables to enrich the risk classification context.

3. The validation in this study is descriptive and interpretive in accordance with the research objectives that focus on risk classification, not price forecasting (Subchapter 3.10.3). Further research is suggested to develop more formal quantitative validation methods, for example through historical backtesting or comparison with other standard financial risk measures (such as Value at Risk), to strengthen the statistical validity of the proposed classification framework.
4. In terms of system technical development, it is recommended to add a caching mechanism at all stages of computing (volatility, technical indicators, and risk classification) to improve efficiency when the dashboard is reloaded, as well as provide a feature to export analysis results and risk profiles into report formats (e.g. PDF or Excel) to make it easier for users to document.
5. For novice investors who use this system, it is recommended to use the results of the risk classification as a tool to understand market conditions (decision-support system) and not as the only reference in investment decision-making, considering that this system is not designed to make price predictions or direct transaction recommendations as emphasized in Subchapter 3.11.

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