CHAPTER I
INTRODUCTION

1.1. Background

The development of the crypto asset market in recent years has shown a significant increase in terms of the number of investors, the complexity of instruments, and the dynamics of price movements. Bitcoin as the first and largest crypto asset by market capitalization remains the main reference for the overall behavior of the crypto market. Nevertheless, Bitcoin's characteristics are very different from traditional financial assets. Its volatility is high, price movements are fast, and its sensitivity to various market factors is much more extreme. This is emphasized by Zhang and Hua who explain that high-frequency financial data such as open-high-low-close-volume (OHLCV) shows price dynamics that fluctuate in short time intervals, so microstructure-based analysis becomes relevant to understand the behavior of the crypto market [1]. Other research also shows that Bitcoin price changes can occur in minutes to hours, indicating that intraday volatility is a key characteristic of cryptocurrency markets. [2].

Amidst such complexity, an analytical approach that focuses on only one indicator has proven insufficient to comprehensively capture the behavior of the Bitcoin market. Several studies suggest that the crypto market is driven by various dimensions, ranging from price patterns (Price Action), market structural factors such as Bitcoin's dominance, to the psychological condition of investors reflected through sentiment indices [3]. Therefore, the integration of several indicators is an important need in the decision-making process. This kind of multi-dimensional approach is recognized to be able to provide a more complete picture than the use of a single indicator.

In terms of price pattern analysis, Parlika's research shows that patterned dataset based on the calculation of technical variables such as Range (R), Top Range (TR), and Lower Range (LR), as well as the ratio PTR and PLR, being able to identify extreme patterns related to price reversal momentum [4]. The Diamond Crash and Diamond Moon patterns introduced in the study empirically showed a

correlation with significant changes in Bitcoin's price movements [4], [5]. In addition, the rule-based pattern recognition method has also proven to be effective in the analysis of cryptocurrency time series [6], supporting the use of objective pattern-based approaches such as patterned dataset in this study.

From the perspective of market structure, Bitcoin Dominance (BTC. D) is an important indicator that reflects the proportion of Bitcoin's market cap to the total crypto market. The literature notes that Bitcoin's dominance can describe the phase of capital rotation between Bitcoin and altcoins as well as provide an indication of overall market conditions [7]. Studies on Market regimes shows that the division of market conditions is based on quantile-based regime classification is a common and accurate practice in analyzing structural changes in financial markets [8]. This is the basis for the grouping of BTC. D into several classes (low, medium, high) can help understand the market context surrounding Bitcoin's price movements.

In addition to technical and structural factors, the psychological dimension of investors also has a big influence on changes in crypto prices. Fear and Greed Index (FGI), developed by Alternative.me, is one of the widely used indicators to measure the level of fear and greed in the crypto market. A number of studies have shown a significant relationship between fear-greed sentiment and the price of Bitcoin, including its effect on volatility, price synchronization, and the formation of new trends [9], [10]. Thus, FGI acts as a sentiment indicator that is able to complement technical and structural analysis.

Although many studies use Machine Learning or Deep Learning to predict the price of Bitcoin, most of those studies still focus on a predictive approach based on complex models [11], [12]. This condition shows that there is a research gap, namely the lack of an approach non-ML which integrates price patterns, market structures, and sentiments, which not only integrates various indicators, but also implements them in the form of a decision support system that can be used directly by users. Taking into account Bitcoin's volatility, the significance of technical and sentiment indicators, and the need for a decision-making system that does not rely on complex prediction models, research is needed that designs a decision model based on a combination of three key indicators: patterned dataset, Bitcoin Dominance, and Fear–Greed Index.

Based on the research gap, this study developed a Decision Support System (DSS) that combines a patterned dataset, Bitcoin Dominance (BTC. D), and the Fear and Greed Index (FGI) to generate bullish, bearish, or neutral market direction signals. The system is designed web-based using Streamlit so that users can access information interactively. The output produced by the system includes the value of the BTC indicator. D and FGI, the results of pattern classification from patterned datasets, combination indicators, and rule-based market direction signals. In addition, the system also provides short-term price estimates as additional information to support the interpretation of market conditions, without making it the primary basis for decision-making. Thus, the developed system not only serves as an analysis tool, but also as a means of interpreting market conditions that is structured, transparent, and easy to understand by users.

1.2. Problem Statement

Bitcoin's price movements are influenced by various factors that interact with each other, including intraday price patterns, market structure through Bitcoin Dominance, and investor sentiment represented through the Fear and Greed Index. Although each indicator has been extensively studied, the integration of all three in an integrated analysis framework is still rare. Based on this, the formulation of this research problem is as follows:

1. How to form a patterned dataset model, Bitcoin Dominance (BTC. D), and the Fear and Greed Index (FGI) to represent the technical, structural, and sentiment conditions of the Bitcoin market?
2. How to combine the patterned dataset indicator, BTC. D, and FGI to generate rule-based market direction signals that can be evaluated using returns?
3. How to design and build a web-based decision support system that is able to present information on market conditions, combinations of indicators, and market direction signals in a structured and interactive manner?

1.3. Research Objectives

This research aims to design and build a web-based Decision Support System that is able to integrate the patterned dataset indicator, Bitcoin Dominance (BTC.

D), and the Fear and Greed Index (FGI) in generating rules-based Bitcoin market direction signals in a structured and interactive manner.

1.4.Research Benefits

The benefits that can be obtained from this research are as follows.

1. Academic Benefits

   This research contributes to the development of literature related to crypto market analysis by integrating three main indicators, namely intraday price patterns through patterned dataset, market structure through Bitcoin Dominance, and investor sentiment through Fear and Greed Index. The integration of these three indicators can enrich scientific understanding of how technical, structural, and psychological aspects interact with each other in influencing Bitcoin's price movements. In addition, this research also contributes to the development of the concept of a multi-aspect indicator-based decision support system that emphasizes interpretability and transparency, particularly in the Non-machine learning.

2. Methodological Benefits

   This research provides a systematic and replicable methodological approach in intraday data processing, market indicator formation, as well as the development of multi-faceted combinations to generate price direction signals. The developed method includes the formation process patterned dataset, classification of indicators BTC Dominance and Fear and Greed Index, as well as the integration of indicator-based Rule-based. This approach can serve as a reference for other studies that want to develop historical data-driven analysis in a structured manner without relying on complex models.

3. Practical Benefits

   The web-based decision support system developed in this study can help users understand the state of the crypto market in a more structured and informative way. The system presents information in the form of indicator values BTC Dominance and Fear and Greed Index, classification results patterned dataset, a combination of indicators, as well as market-based directional signals Rule-based. This information allows users, both novice

investors, analysts, and market observers, to gain additional insights into the decision-making process. In addition, the system also provides short-term price estimates as supporting information to aid in the interpretation of market conditions, without making it the primary basis for decisions. Thus, the system provides a more transparent, easy-to-understand approach and does not rely on complex prediction models.

1.5. Research Limitations

This study has the following limitations:

1. The data used is limited to the 1-hour Bitcoin OHLCV, as per the standards of intraday and microstructure analysis.
2. The market structure indicator is limited to Bitcoin Dominance (BTC. D) which is classified using a quantile distribution based approach of historical data, without involving other structural indicators.
3. The sentiment indicator used is only the Fear and Greed Index (FGI) of Alternative.me, which is grouped into representative classes for the needs of sentiment analysis in the context of this study.
4. The patterned dataset was constructed using core variables (R, TR, LR, PTR, PLR) and pattern analysis focused on extreme patterns, specifically Diamond Crash and Diamond Moon, as per the underlying literature.
5. This study does not use machine learning, deep learning, or complex prediction models, but focuses on descriptive-exploratory analysis and the development of rule-based approaches in decision-making.
6. The Decision Support System developed functions as a provider of data-driven information, including market direction signals, indicator visualizations, and simple estimation results, and does not include investment recommendation or trading automation features.
7. The short-term price estimation in this study uses the simple ARIMAX forecasting method, which serves as supporting information and not as the main model in decision-making.