Doctoral Dissertation

Essays on the Financial Market Pattern

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(Summary of Dissertation)

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The financial market plays a pivotal role in all aspects of human life. However, it is well known for its non-linearity and complexity. Many experts have applied various methods to understand how the financial market works. Getting such an understanding will provide critical benefits for related authorities and investors. It will support the related authorities in maintaining economic stability and the development process. On the other side, investors will have a bigger opportunity to get a higher return on their investments. This study aims to analyse how financial patterns change over time through machine learning and the wavelet method.

The application of the machine learning approach in finance and economics fields flourished in recent decades. The ability to capture the nonlinearity and complexity of the financial market is one of the machine learning method's attractiveness. Nevertheless, most of the existing machine learning applications focus on developing a better forecasting ability. Amid the huge potency of the machine learning approach, the application of machine learning beyond prediction purposes is still limited. This study proposes a machine learning approach to get an insightful understanding of the financial market pattern. This study constructs an "Error Monitoring Index" to identify the possibility of structural market pattern change (called the change-candidate). Then, this study applies the "Error Profile Analysis" to determine whether these change candidates come from temporary or persistent changes and the exact timing of these changes. If the changes come from

persistent changes, we argue that structural changes occur in the change candidates.

In chapter two, this study focuses on the stock market in the US and some other advanced countries (UK, German, and Japan). Utilizing the “Error Monitoring Index” and “the Error Profile Analysis”, this study identifies five significant change candidates in the US stock market from 2000 to 2021. These change candidates are persistent and coincide with some critical events such as the Global Financial Crisis in 2008 and the Covid-19 spread in 2020. But not all significant events are associated with these changes. This study also shows similar results for other advanced countries. These markets show some significant changes that are persistent and coincide with some US/Global and significant domestic events.

In chapter three, this study applies the "Error Monitoring Index" to analyze Indonesia's financial market pattern change. This is one of the most attractive emerging countries compared to its peers. Different from the previous chapter, the analysis of Indonesia's financial market will focus on the two main markets, i.e., the stock and bond markets. The examination of the "Error Monitoring Index" for Indonesia's financial market shows some change candidates that coincide with some US/Global and major domestic events. Both the stock and bond markets share some similar changes in terms of the timings. It shows the association between the stock and bond market in Indonesia. Furthermore, this chapter also discusses the variables that significantly influence the forecasting process. It

provides a clear picture of the differences between before and after a structural change occurs. This study focuses on the differences between pre-and post-Great Financial Crisis (GFC) in 2008. Utilizing Permuted Feature Importance (PFI), this study shows clear differences in variables' importance between pre-and post-GFC 2008.

In the third chapter, this study implements the wavelet analysis to provide the co-movements between foreign investment flows and the perception of credit risk (proxied by the Credit Default Swap (CDS) rate) in the Indonesian government bond (IGB) market. More specifically, this study utilizes the partial wavelet coherence (PWC) method. This method allows us to obtain the relationship information among two variables after excluding the effect from other variables (control variables). The wavelet examination results find that foreign investment flow and perception of sovereign credit risk co-move differently across frequencies and times. Strong co-movements are present in the medium run from 2010 to 2016. The beginning and the end of this co-movements period correspond to the second round of the Fed's quantitative easing program and the introduction of a new central bank instrument, respectively. Moreover, the analysis also exhibits that foreign investment flow generally leads perception of sovereign credit risk with their negative relationship.