Chapter XIII

Using Neural Networks to Discover Patterns in International Equity Markets: A Case Study

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BACKGROUND

In the current economic environment, international stock markets have become increasingly linked, due to financial deregulation, the globalization of markets, and information technology. Financial deregulation and globalization of markets have contributed to the stronger relationships between stock markets, with the U.S. causing other market movements by influencing key underlying macroeconomic variables that cause stock index movements (Nasseh & Strauss, 2000). Information technology accelerates responsiveness to world events as information travels around the world in nanoseconds. Traders can now react instantly to corporate announcements, rumors, and the activities of other markets. In fact, in addition to extending trading hours to create linkages between international markets, exchange links have been developed that allow traders to trade at another exchange through specific agreements during any time of the day or night (Cavaletti, 1996).

An understanding of the international market equity structure has become important for investment decision-making, since international diversification is a strategy often used in portfolio management to reduce risk (Malliaris, 1996; Theodossiou, 1994). International portfolio diversification has gained popularity as

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an investment strategy in industrial countries as individual and corporate investors have been encouraged to increase their holdings in foreign securities. *Barron’s* reported that U.S. investors had tripled their ownership of foreign equities from $63 billion in 1988 to $200 billion in 1993, and this number has more than tripled again since then. There is a widespread belief that profit can be increased and risk can be reduced with a portfolio consisting of domestic and foreign investments. The reason that international diversification was originally recommended as an investment strategy is that, if domestic and foreign markets are highly uncorrelated, portfolio risk is reduced. If, on the other hand, domestic market movement follows movement in foreign markets, the trader has some advance warning of profitable positions to take daily.

Recent events in the stock market have dramatically demonstrated the degree of integration among international equity market price indices in times of great financial upheaval. For example, the U.S. equity markets responded to the October 1997 collapse of the Southeast Asian markets with its own downward plunge, followed by the current period of volatility, demonstrating global linkages between these two markets (Lee & Kim, 1994). While it is interesting to study the periods immediately before and after such catastrophic events, the more general question is whether or not international equity markets demonstrate co-movement on a daily basis. The degree to which markets are integrated or segmented internationally and move together on a daily basis is one that impacts investment decisions for investors and traders and yet largely remains an unanswered question. Studies have suggested (Dickinson, 2000; Masih & Masih, 1997) that the U.S. has a greater impact on the other international equity markets. But the amount of day-to-day impact of the other markets on the U.S. has yet to be demonstrated. This is the problem we want to address.

The use of neural networks represents a new approach to how this type of problem can be investigated. The economics and finance literature is full of studies that require the researcher to prespecify the exact nature of the relationship and select specific variables to test. In this study, we use a multistage approach that requires no prespecification of the model and allows us to look for associations and relationships that may not have been considered. Previous studies have been limited by the nature of statistical tools, which require the researcher to determine the variables, time frame, and markets to test. An intelligent guess may lead to the desired outcome, but neural networks are used to produce a more thorough analysis of the data, thus improving the researcher’s ability to uncover unanticipated relationships and associations.
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