Part III

IN PARTS I AND II WE HAVE DOCUMENTED the presence of statistically significant sources of predictability in recent US stock and bond returns. The natural question that follows is whether such predictability is also economically significant, i.e., is it something that investors should consider in formulating their portfolio strategies, or are the effects too small, too short-lived, or too concentrated in illiquid securities to be of any practical value? In other words, is there value left after trading costs have been deducted? This depends, of course, on the magnitude of trading costs, the frequency of trades, and the impact of market conditions on both. These implementation issues naturally revolve around higher-frequency investment horizons—intradaily trading, in contrast to the weekly and monthly horizons of the studies in Parts I and II—and the microstructure of securities markets. This is the focus of Part III.

In Chapter 10 we develop a nonlinear econometric model of transaction price changes—also known as "tick" data—that relates trade-by-trade price changes to trade size, past order flow, bid/offer spreads, elapsed time between trades, and other aspects of market conditions. Using a statistical technique known as *ordered probit*, we are able to accommodate price discreteness (until recently, stock prices moved in minimum increments of 1/8 of a dollar, and currently move in minimum increments of 1/16), an important feature of the data that cannot be ignored, especially for purposes of measuring price impact and trading costs. The ordered probit model allows us to estimate the conditional distribution of price changes, conditional on the regressors, and from this conditional distribution we can develop estimators of market liquidity and price impact while controlling for the effects of order flow, volatility, bid/offer spreads, and general market conditions.

Transaction prices also provide valuable insights into the linkages *between* markets. In particular, in Chapters 11 and 12 we explore the link between the futures market and the cash market for the Standard and Poor's 500 Index. In an efficient market, we would expect the link between the cash and futures

markets to be a strong one. Chapter 11 investigates the properties of the link by considering both the cash index price and the futures contract price. We hypothesize that the tightness of the link is maintained by arbitrage activities, and test this and related hypotheses using transactions data. We find evidence that futures-price changes are more volatile than spot-price changes, and this finding is not completely explained by nonsynchronous trading (see Chapter 4), but is consistent with information being reflected more quickly in the futures market. Using the cost-of-carry relation, we examine the time series behavior of the basis, i.e., the difference between the futures price and the spot price adjusted for the cost of carry. We find that the basis exhibits greater volatility the longer the time to maturity of the futures contract and also displays some path dependence. Both of the findings are consistent with arbitrageurs playing a key role in linking the spot and futures markets together.

In Chapter 12, we turn to "Black Monday," October 19, 1987. This was one of the most dramatic trading days in recent stock market history, with a decline in US stock market prices of more than 20%. During this precipitous decline, demand for trading outstripped the financial system's capacity, market linkages suffered a breakdown, and pandemonium ensued. This unusual event provides a unique opportunity to study the behavior of prices in the absence of a tight link between the spot and futures markets, which can shed considerable light on the importance of such links in general.

In particular, we examine the behavior of individual stocks on October 19 and 20, 1987, and find that on these two days not only was there a breakdown of the link between the cash index and futures price, but there was also a breakdown of the link among stocks. Stocks with larger order imbalances declined more on Monday and rebounded more on Tuesday. These results suggest that at least part of the decline was not due to economic factors, but due to the inability of the system to handle the trading volume and that, with substantially more capacity in place today, the likelihood of a repeat of October 19, 1987 is reduced.

The studies in Part III underscore the importance of implementation issues in exploiting the research findings of Parts I and II. While predictability in US stock and bond markets are both statistically and economically significant, an entirely different set of technologies may be required to take advantage of such predictability, some of which we develop in this last part.