



## Annex II

# Dynamics of Asset Prices Around Large Price Changes

The surges of capital into emerging markets, the sharp declines in equity prices in times of crises, and—in some cases<sup>1</sup>—the subsequent robust recoveries of these markets raise questions about the rationality of asset market dynamics. Insights into these dynamics can perhaps best be gleaned from the extensive body of research into the U.S. equity market, where high-quality data for thousands of stocks are available over a 70-year period. Using these data, financial economists have studied the dynamics of equity prices by examining the behavior of (notional) portfolios of stocks that are formed based on their prior return performance. In many studies, stocks are sorted into deciles, with those stocks previously showing the largest gains referred to as the “winner” portfolio and those showing the largest falls referred to as the “loser” portfolio. The performance of these portfolios is then simulated in the subsequent “test period,” to see if there are any consistent differences in the subsequent returns on the different portfolios.

A standard finding (for example, Jegadeesh and Titman, 1993) is that U.S. stocks that have been winners and losers over prior periods of one month to one year show “momentum” (or positive autocorrelation) in their relative performance over the corresponding subsequent test period: that is, winners continue to yield above-average returns and losers continue to yield below-average returns at these horizons.<sup>2</sup> Other studies have shown similar momentum effects in the performance of stocks in European countries (Rouwenhorst, 1998) and of national markets within the global market (Asness, Liew, and Stevens, 1997). The magnitude of these effects is often quite large and persistent, with return differentials between winners and losers often around 1 percent a month over periods of 6 to 12 months.

At longer horizons, however, U.S. stocks appear to demonstrate reversals (or negative autocorrelation) in

their relative performance. A number of researchers, beginning with DeBondt and Thaler (1985), have demonstrated that stocks that have been losers over a period of two to five years go on to subsequently yield higher rates of return than the corresponding prior winner stocks, with return differentials of up to around 9 percent a year. Other researchers (for example, Lakonishok, Shleifer, and Vishny, 1994) have found similar return differentials between “glamor” and “value” stocks, that is, stocks with respectively high or low prices relative to their fundamentals (earnings, cash flows, and so on) and that are likely to have been winners or losers in the recent past. Furthermore, winner-loser reversals of up to about 6 percent a year have also been found in the performance of the national market indices of various mature stock markets (Richards, 1997), and there is also some evidence for reversals in emerging markets (Richards, 1996).

Since predictable patterns in asset prices are suggestive of market inefficiency, the phenomena of short-term momentum and longer-term reversals have generated substantial debate. Researchers investigating the momentum phenomenon (for example, Jegadeesh and Titman, 1993) have, however, found it difficult to explain using conventional asset pricing models. Accordingly, some financial economists (such as Fama, 1998) consider momentum to be evidence of temporary underreaction to news, just as the phenomenon of price drift after earnings announcements is generally considered evidence of slow reaction in stock prices. However, other economists (for example, Lakonishok, Shleifer, and Vishny, 1994) argue that momentum is the result of investors’ overreaction to current trends.

The voluminous literature on price reversals has noted that reversals could be due to risk factors, since changes in required rates of return have immediate effects on asset prices in one direction and an offsetting influence in subsequent periods: for example, losers could be stocks that have fallen sharply in price because they have become riskier, with their subsequent higher returns simply reflecting their now-higher risk. Indeed, some researchers have suggested that reversals can be fully explained by risk differentials and by the disproportionate effect of small or low-priced stocks (for example, Ball, Kothari, and Shanken, 1995). However, other researchers of the related

<sup>1</sup>In the Mexican crisis, for example, stock prices in the five hardest-hit emerging markets (Argentina, Brazil, Mexico, the Czech Republic, and Poland) fell by an average (capitalization-weighted) of around 51 percent between October 1994 and March 1995, but then recovered by around 79 percent over the following two years. By contrast, the average initial fall in 25 other emerging markets was around 9 percent, with a subsequent two-year increase of 14 percent.

<sup>2</sup>At shorter horizons, however, the evidence for momentum is less clear, with some studies showing negative autocorrelation around large daily or weekly price movements.

glamor-versus-value effect have demonstrated that value stocks, which go on to outperform glamor stocks, are not riskier based on conventional notions of risk (Lakonishok, Shleifer, and Vishny, 1994). Instead, they suggest that reversals are related to momentum effects, with the pattern of autocorrelations due to irrational fads or investor misperceptions that systematically take prices away from fundamental values, requiring an eventual correction that is reflected in negative autocorrelation at longer horizons. As evidence for this, Lakonishok, Shleifer, and Vishny (1994) have shown that *ex post* differences in the growth rates of fundamentals of glamor and value stocks turn out to be far smaller than the differences that must have been (irrationally) expected based on the initial difference in valuations.

While proponents of market efficiency may disagree, many financial economists would now argue that the phenomenon of short-term momentum and long-term reversals is both pervasive<sup>3</sup> and the result of behavior by market participants that is not fully compatible with full market efficiency. There is now a long tradition of arguments (for instance, Graham (1959), Shiller (1981), Arrow (1982), DeBondt and Thaler (1985), and Lakonishok, Shleifer, and Vishny (1994)) that stock prices do not merely reflect rationally discounted expected cash flows but often also reflect irrational investor sentiment or systematic errors in expectations formation. In addition, there are a number of possible explanations or rationalizations for such behavior by investors. First, the literature on individual decision making (Kahneman and Tversky, 1982) suggests that individuals may systematically give weight to recent information in forming judgments, which could lead investors to amplify price movements resulting from recent news. Second, the behavioral literature also suggests the possibility of judgment errors of the type that investors might equate good companies—or those that have recently performed well—with good investments, regardless of price (Shefrin and Statman, 1995). Third, there may exist a class of traders—“noise traders”—who are able to move prices away from fundamental values without necessarily inviting arbitrage activity that would cause them to lose money (DeLong and others, 1990). Indeed, theoreticians are currently working to build some of these ideas into formal models that can yield the observed pattern of autocorrelations in returns with as few deviations as possible from the standard assumptions about rational agents in fully efficient markets.<sup>4</sup>

<sup>3</sup>Cutler, Poterba, and Summers (1991) document this common pattern of “speculative dynamics” in a range of markets including equities, currencies, land, and collectibles.

<sup>4</sup>See, for example, Daniel, Hirshleifer, and Subrahmanyam (forthcoming).

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