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Market Underreaction to Large Stock Price Declines: The Case of ADRs

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This paper examines a sample of ADR stocks that experienced significant stock price declines of more than –15% during a specific month, and finds no evidence of a reversal pattern over the long run. The results are consistent with the predictions of the underreaction hypothesis and the existence of a "momentum" effect in stock prices. The underreaction hypothesis is also supported when ADRs are examined across industries, and for a sample of emerging market ADRs.

The ADR Market

Investors worldwide are looking beyond their home country markets for a way to enhance portfolio returns and reduce risk. At the same time, there has been an increase in the number and volume of American Depository Receipts (ADRs) as foreign companies seek to increase their visibility in the U.S. During the first half of 1996, ninety-eight non-U.S. companies launched new ADR programs, totaling $6.2 billion. This compares with ninety-six companies during the first half of 1997. According to Citibank reports, the ADR market has grown by 10% to 15% per year in volume over the past few years, with no indication that it will diminish anytime soon.

From an investor's point of view, ADRs offer several advantages over direct purchase of foreign shares: 1) ADRs trade easily and conveniently in U.S. dollars and settle through U.S. clearinghouses; 2) they make it easy for U.S. investors to purchase and hold non-U.S. securities, and therefore diversify their portfolios; 3) publicly traded ADRs are registered with the SEC and must disclose as much financial and corporate information as a typical U.S. firm; and 4) institutional investors who are restricted from investing outside the U.S. can easily use listed ADRs to add international exposure to their portfolios.

Market Reaction to Large Stock Price Declines and the Case of ADRs

One of the most controversial issues in finance today is the hypothesis that investors overreact to new information, thereby causing the observed anomalous movements in stock prices. DeBondt and Thaler [1985] were the first to show that stocks that experienced poor performance over the past three to five years (losers) tended to outperform prior-period winners during the subsequent three to five years. They formally stated what has now become known as the "overreaction hypothesis," and suggested that investors, in revising their beliefs, tend to overweight recent information and underweight past data. Consequently, extreme movements in stock prices are followed by price movements in the opposite direction as investors realize they have overreacted.

Whether investors do overreact has interesting implications, such as the possibility of achieving abnormal profits by purchasing or selling stocks before any subsequent reversal occurs. As a result, the subject of overreaction has inspired a large and controversial body of literature, and several competing explanations attempt to explain the effect.

Chan [1988] and Ball and Kothari [1989] attribute the reversal to errors in the measurement of risk, while Zarowin [1990] and Baytas and Cakici [1999] argue that it is partly a manifestation of the size effect. Brown, Harlow, and Tinic [1988] develop an uncertain information hypothesis, Atkins and Dyl [1990] find significant reversals for stocks that experience large one-day price declines, and Bremer and Sweeney [1991] argue that any subsequent reversal may be attributed to illiquidity.

Despite the extensive amount of research supporting the overreaction phenomenon, underreaction is also frequently discussed in the finance literature. The underreaction hypothesis predicts that stock prices will move in the direction of the initial price change as news is slowly incorporated into prices and investors revise their initial estimates. One implication of the underreaction hypothesis is that stock returns following extreme price changes should not exhibit a subsequent reversal pattern. Jegadeesh and Titman [1993], Ikenberry, Lakonishok, and Vermaelen [1995], Michaely, Womack, and Thaler [1995], and Chan, Jegadeesh, and

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Lakonishok [1996] all find evidence in favor of the underreaction hypothesis.

Studying the pattern of stock returns following extreme price changes provides rather contradictory information, with no consensus on the existence of a reversal pattern or a possible cause for it. Furthermore, the vast majority of these studies focus on U.S. stocks, but it is well-documented that foreign stocks behave differently than U.S. stocks. Therefore, research using only a U.S. sample may not be applicable to foreign stocks. Moreover, among foreign stocks, there has been even less attention paid to ADRs.

The purpose of this study is to examine a sample of ADRs that experienced significant stock price declines of more than –15% during a specific month and determine whether there is a price reversal over a long-run horizon. There are several reasons why ADRs are of interest. Because ADRs tend to represent relatively large and important foreign companies that need to register with the SEC, investors probably possess a lot of high-quality information about these firms, so initial reaction to company-specific bad news should be unbiased. Furthermore, if institutional investors (due to investment restrictions) hold a significant portion of ADRs trading in the market, we would not expect the initial reaction to be an overreaction (as hypothesized by Chopra, Lakonishok, and Ritter [1992]).

Moreover, it is possible that barriers to investing overseas may make the direct purchase of foreign stocks cumbersome. If investors value the convenience of using ADRs to diversify their portfolios and overcome investment restrictions, exchange rate restrictions, and high overseas transaction costs, we would not expect their reaction to price declines to be as severe. Wahab and Khandwala [1993], Jiang [1998], and Patro [2000] all found evidence that ADRs are effective in achieving international diversification. ADRs should, therefore, receive significant weighting in a diversification strategy.

However, if liquidity plays an important role in the reversal process—as has been argued by several studies—and since the market for ADRs is generally less liquid than that of other U.S. securities (Larson, Madura, and Akhigbe [1999]), we may expect the reversal pattern for ADRs to be more pronounced. In addition, ADRs range from the largest foreign companies to less well-known firms from emerging markets. Even though investors may have financial and other information about these companies, their degree of familiarity may vary considerably. When investors are less familiar with the company offering the ADR, a large price decline will be associated with a stock price reversal over the long run. Finally, to the extent that ADR returns retain a significant local market and exchange rate risk exposure (Jiang [1998], Patro [2000]), investor reaction to large price declines may depend on their perception of the foreign market and the degree of risk they associate with it.

The findings suggest that investors underreact to whatever caused the initial price change, so the month of the large price decline signals the beginning of a period of relatively poor performance for ADR stocks. The Underreaction hypothesis is also supported when ADRs from emerging countries and the three main industry classifications are examined.

Some work from behavioral finance may explain how investors form beliefs that lead to an underreaction. Barberis, Shleifer, and Vishny [1998] introduce the concepts of "conservatism" and the "representativeness heuristic," two concepts borrowed from psychology. These authors claim that conservative individuals tend to disregard the full information content of an announcement and appear to be overconfident about prior information. Daniel, Hirshleifer, and Subrahmanyam [1998] introduce "overconfidence" and "biased self-attribution," and argue that an overconfident investor will overreact to private information signals but downweight public signals, especially when the public signals contradict the private ones. Furthermore, they expect the effects of overconfidence to be more severe in less liquid markets.

If this theory is correct, one can argue that, because the ADR market is less liquid and tends to have more information asymmetries, more investors will be trading on private information and be less willing to fully react to public announcements. Investors may also hold ADR stocks for different reasons than the other stocks in their portfolios, and thus would be hesitant to react once negative news is out. However, as more news follows and the severity of a situation is revealed, stock prices slowly adjust to reflect the new information.

The rest of this paper is organized as follows: The second section presents the existing literature; the third and fourth sections describe the data and methodology; the fifth section presents the results; and the final section summarizes the findings.

Literature Review

Extensive empirical research on stock market overreactions has attempted to determine whether observed anomalous stock price movements, and particularly long-term reversals of extreme price changes in the past, can be explained by investor overreaction to new information

DeBondt and Thaler [1985], in one of the first studies on long-term return anomalies, advanced the hypothesis that a given stock decreases (increases) too far in price because of recent bad (good) news associated with it, but eventually returns to its fundamental value as investors realize their overreaction. They construct-

ed loser and winner portfolios and found that, over a three-year test period, loser portfolios outperformed the market by an average of 19.6%, while winner portfolios earned about 5% less than the market. They conclude that their results are consistent with the overreaction hypothesis and that the overreaction effect is asymmetric since it is much larger for losers than for winners.

DeBondt and Thaler [1987] reevaluated the original overreaction hypothesis to determine whether extreme price reversals are due to seasonal patterns, changes in risk as measured by beta, or the size effect. Their results were consistent with the overreaction hypothesis and did not support any of the other explanations.

Atkins and Dyl [1990] examined a sample of 835 losers and 836 winners, and found that the stock market overreacts in the short run, especially when considering stocks that exhibit large price declines (losers). However, because of the magnitude of the bid–ask spread, traders cannot profit from the realized price reversals. Atkins and Dyl conclude that the market is efficient when transaction costs are considered.

Lehmann [1990] found that portfolios of stocks with positive returns in one week typically had negative returns the following week, and vice versa. He concludes that the return reversals reflect imbalances in the market for short-run liquidity.

Adding to the body of contradictory and puzzling literature, Zarowin [1990] reexamined the stock market overreaction hypothesis controlling for size differences between winners and losers. He concluded that the tendency for losers to outperform winners is due to the fact that losers are usually smaller-size firms than winners.

Bremer and Sweeney [1991] examined the reversal pattern of large stock price decreases. Their results were inconsistent with the efficient market hypothesis. Their average Day 1 rebound was 1.773%, and by Day 2 the cumulative rebound was approximately 2.2%. Their results remained consistent even after trying various trigger values.

Chopra, Lakonishok, and Ritter [1992] performed a comprehensive evaluation of the overreaction hypothesis. They used the empirically determined price of beta risk and calculated abnormal returns using a comprehensive price adjustment. They found an economically significant overreaction effect, which could not be attributed to size or beta. Since the overreaction effect reported in their study was more pronounced for smaller firms, they hypothesized that individuals, who are the main holders of small-firm stocks, may overreact, while institutions, which are the main holders of larger stocks, do not.

Cox and Peterson [1994] argue that if liquidity plays an important role in the reversal process, we should observe stronger reversals in less liquid markets and for smaller firms, as well as a reduction in the degree of reversals through time. However, if the cause of the reversals is overreaction on the part of investors, one would expect that the greater the one-day decline, the greater the reversal. Consistent with results from previous studies, Cox and Peterson found significant reversals for Days 1 through 3. Furthermore, the degree of reversals declined over time, a finding consistent with increasing liquidity in the market. Over the longer term, they examined cumulative abnormal returns for Days 4 through 20 and 21 through 120, and observed that securities with large one-day declines enter a period of relatively poor performance. Their results agreed with the existence of an underreaction effect.

Jegadeesh and Titman [1993] found that buying past winners and selling past losers can result in significant abnormal returns. They found that stocks with high returns over the past year tend to have high returns over the following three to six months, and attribute to this to the existence of a "momentum" effect. Dissanaike [1997] investigated the evidence on the stock market overreaction by restricting his sample to larger and better-known U.K. companies to control for a possible size effect, bid–ask biases, and infrequent trading. The results of his study were consistent with the overreaction hypothesis, and suggested that time-varying risk does not seem to explain the reversal effect.

Baytas and Cakici [1999] evaluated the performance of arbitrage portfolios based on past performance, price, and size in seven industrialized countries. They found evidence supporting long-term overreaction in all countries except the U.S. Their results also indicated that long-term investment strategies based on price and size produce higher returns than those based on past performance. Since losers tend to be low in price and low in market value (and vice versa for winners), they argue that much of the observed long-term price reversals may be due to price and size effects.

Da Costa [1994] investigated the overreaction hypothesis using data for the Brazilian stock market and concluded that the magnitude of the overreaction effect was more pronounced in Brazil than in the U.S. Ajayi and Mehdian [1994] examined investor reaction to surprises across the major financial markets using world market indices, and found that the majority of evidence supports the uncertain information hypothesis (UIH).

Overall, there is extensive research on overreaction, but not much on the reversal pattern that the ADR market may exhibit. The only study that looks at ADRs is Larson, Madura, and Akhigbe [1999]. Using daily data, they found that ADR stock prices underreact to unfavorable news and overreact to favorable news. They conclude that the efficient market hypothesis is rejected, and that "ADR investors seem to be optimistic in the wake of news pertinent to share price." However, they do not examine potential differences across coun-

tries and industries. This study addresses these issues by using monthly return data on a sample of ADR stocks, and looking as far ahead as three years from the event month.

Sample and Data Description

The sample analyzed here contains ADR stocks traded in U.S. markets identified from J.P. Morgan's database. Monthly returns for every ADR stock were obtained for the period from May 1989 to May 2000. Monthly returns were then compared to a specific trigger value, here set at –15%. As Table 1 shows, the month of August 1998 accounts for approximately 20% of the events examined here. Since there was a market decline in that month of about 14%, we set the trigger value at –15% to account for firms that had a poorer performance than the market.

If in any given month the return was equal to or less than the trigger value, that return was defined as an event observation. If a certain ADR stock had consecutive declines, then only the first one was included in the sample. The next decline allowed in the sample had to occur at least three years later. Monthly stock returns following the event date were then analyzed over one-, two-, and three-year periods. This procedure identified 234 event observations involving 164 different companies from 30 different countries.

Table 1 provides a summary description of the distribution of events across years and months. Note that the years 1997, 1998, and 1999 account for almost 63% of the total number of events. This is not surprising, since data was available well after 1990 for most ADR stocks.

Table 2 shows a breakdown of the sample by three main industry classifications. Manufacturing and Technology stocks account for 39.6% and 39%, respectively, of the total sample, an almost equal representation. Services stocks represent 21.4% of the sample.

Table 3 displays a breakdown by country of origin and a classification between developed and emerging markets based on the scheme employed by Morgan Stanley Capital International Perspectives.

Methodology

To determine abnormal returns following the events, the market-adjusted returns model suggested by Brown and Warner [1985] is used. The same model was used by DeBondt and Thaler [1985], who point out that "the use of market-adjusted excess returns has the further advantage that it is likely to bias the research design against the overreaction hypothesis" [p. 797]. Fama [1998] explains how studies of long-term returns are sensitive to the way the tests are done, and suggests that CARs should be used instead of buy-and-hold abnormal returns (BHARs). He argues that "BHARs can give false impressions of the speed of price-adjustment to an event" [p. 294], and are likely to grow with the return horizon even when there is no abnormal return after the first period. CARs correct for this long-term drift and pose fewer statistical problems than long-term BHARs. The abnormal return for firm j on month t is computed as:

$$AR_{j,t} = R_{j,t} - R_{m,t}$$

where $R_{m,t}$ is the market rate of return on that month using the S&P 500 index.

For N events, a monthly average abnormal return (AR) for each month t is obtained:

$$AR_t = \frac{1}{N}\sum_{j=1}^{N} AR_{j,t}$$

The analysis of changes in the value of a portfolio of firms requires computation of the average abnormal

Table 1. *Distribution of Events Across Time*

	Jan	Feb	Mar	Apr	May	June	July	Aug	Sept	Oct	Nov	Dec	Total
1989						1		1		2			4
1990			1	2				3	8		1		15
1991					1						2		3
1992				1		4			1	2			8
1993		1				2			1		6		10
1994		2		8			3				1	6	20
1995	5	1						2		2	1		11
1996	1				1	2	1	1		1	1	3	11
1997	4	2	3	4	2	1	1	10	1	21	5	1	55
1998	7		2	1	4	8	2	48	4				76
1999		1	1	1	5			2	1	1	2	2	16
2000	2	3											5
Total	19	10	7	17	13	18	7	67	16	29	19	12	234

Table 2. *Industry Classifications for the Sample of 164 ADR Stocks*

Industry Classification	Number of ADRs	Percentage
Technology	64	39.0
Services	35	21.4
Manufacturing	65	39.6

Table 3. *ADR Distribution by Country*

Developed Markets	Number of ADRs	Emerging Markets	Number of ADRs
Netherlands	15	**Chile**	15
Ireland	5	**Argentina**	9
Japan	12	**Peru**	2
France	9	**Brazil**	5
Australia	6	**Mexico**	12
Hong Kong	5	**Indonesia**	2
U.K.	24	**Korea**	3
Germany	6	**China**	3
Spain	5	**Israel**	2
Sweden	4	**Russia**	3
Other	14	**Other**	3
Total	105	**Total**	59

returns over time. The cumulative abnormal return (CAR) for the time period [b, e] is defined as:

$$CAR = \sum_{t=b}^{e} AR_{j,t}$$

This paper uses five main testing period windows: 1) month t = +1 to t = +6, a relatively short-term window; 2) month t = +1 to t = +12; 3) month t = +12 to t = +24; 4) month t = +12 to t = +36; and 5) t = +24 to t = +36.

To investigate the role of the industry and the existence of a country of origin effect, a cross sectional model is used. More specifically, cumulative abnormal returns for different time periods are regressed on the abnormal returns for event month t = 0 and three dummy variables indicating the stock's industry sector and whether it comes from a developed or an emerging market.

The specified model is:

$$CAR_i = \gamma_0 + \gamma_1 ARO_i + \gamma_2 D_{1,i} + \gamma_3 D_{2,i} + \gamma_4 D_{3,i} + \varepsilon_i$$

where:

CAR_i = cumulative abnormal returns for Months 1 through 6, 1 through 12, 12 through 24, 12 through 36, and 24 through 36.

ARO_i = the abnormal return for the month of the large price decline, t = 0.

$D_{1,i}$ = a dummy variable equal to 1 if the event under consideration corresponds to a services company, and 0 otherwise.

$D_{2,i}$ = a dummy variable equal to 1 if the event corresponds to a technology company, and 0 otherwise.

$D_{3,i}$ = a dummy variable equal to 1 if the event corresponds to a company from a developed country, and 0 otherwise.

γ = the OLS regression coefficient.

Empirical Analysis

Analysis of the Overall Sample

Table 4 shows the monthly average abnormal returns (ARs), and the associated t-statistic for the complete sample of N = 234 events during a thirteen-month period surrounding the month of the large price decline.

The large negative AR of –17.55% at t = 0 is, of course, due to the large decline in price that caused these ADR stocks to be included in the sample. It has an associated t-statistic of –33.81 and is statistically significant at the 0.5% level. Note that this sample earned positive returns, and in two of the three cases statistically significant abnormal returns, during the three months preceding the month of the price decline. Thus, there was no indication of the major drop in price that was about to occur.

Nevertheless, the most interesting finding is that ARs following the event month are negative, which indicates the lack of a reversal pattern and suggests that the initial price change was not due to overreaction. In fact, these results seem to imply that the month of the large price decline signals the beginning of a period of relatively poor performance for the ADR stocks.

These results are in contrast with the findings of numerous studies that report a reversal associated with large price declines, but are somewhat consistent with the findings of Cox and Peterson [1994]. Their

Table 4. *Monthly Average AR for a Sample of ADR Stocks that Exhibited Large One-Month Price Declines*

Event Month	AR (%)	t-Statistic
–3	1.332	1.850*
–2	0.471	0.657
–1	2.638	3.572***
0	–17.545	–33.806***
+1	–0.888	–0.935
+2	–0.219	–0.228
+3	–1.734	–2.419**
+4	–1.321	–1.389
+5	0.169	0.186
+6	–0.529	–0.682
+7	–3.126	–3.624***
+8	–1.318	–1.458
+9	–0.252	–0.320
+10	–2.059	–1.982*

Note: *, **, and *** denote significance at the 5%, 1%, and 0.5% levels, respectively.

study, however, used daily data and a sample of U.S. stocks.

Figure 1 shows the pattern of CARs over the entire three-year period following the large price decline.

The results are striking. Following the event month there is a dramatic decline in performance that lasts approximately one year. Afterward, there is a slight recovery, but the positive abnormal returns do not reverse the negative performance of the first twelve months.

Finally, Table 5 reports information on CARs for different selected intervals after the event month that may be of interest from an investor viewpoint. According to Table 5, investors who enter the market one month after the large price drop hoping to take advantage of a possible reversal earn approximately 4.5% less than the market during the next six months, and at least 10% and 2% less over one and two years, respectively. It takes one year after the initial price decline for investors to enter the market and start realizing positive returns. The CARs for months t = +12 to t = +24 and t = +12 to t = +36 are 11.65% and 21%, respectively, statistically significant at the 0.5% level.

In conclusion, the results from the overall sample of ADR stocks are inconsistent with overreaction but consistent with the underreaction hypothesis, which states that stock prices incorporate information slowly. Following Jegadeesh and Titman [1993], these results can be attributed to a "momentum" effect in stock prices. These findings verify the results of Larson, Madura, and Akhigbe [1999], who examined a sample of fifty-three ADR stocks that experienced a one-day price change of –10%, and found negative abnormal returns following that decline for up to twenty days. They concluded that ADR investors are too optimistic in the wake of news pertinent to share price.

Since August 1998 accounts for approximately 20% of the events in the overall sample, there is a chance that the results are biased, however. In order to control for that bias, the analysis was repeated by excluding the observations of that month, reducing the sample size to 186. As shown in Table 6, the results remain essentially the same; therefore, the observed performance of ADRs is not driven by the August 1998 decline. The same conclusion is supported by Figure 2,

FIGURE 1
CARs for the Overall Sample of 234 Events Over a Three-Year Period

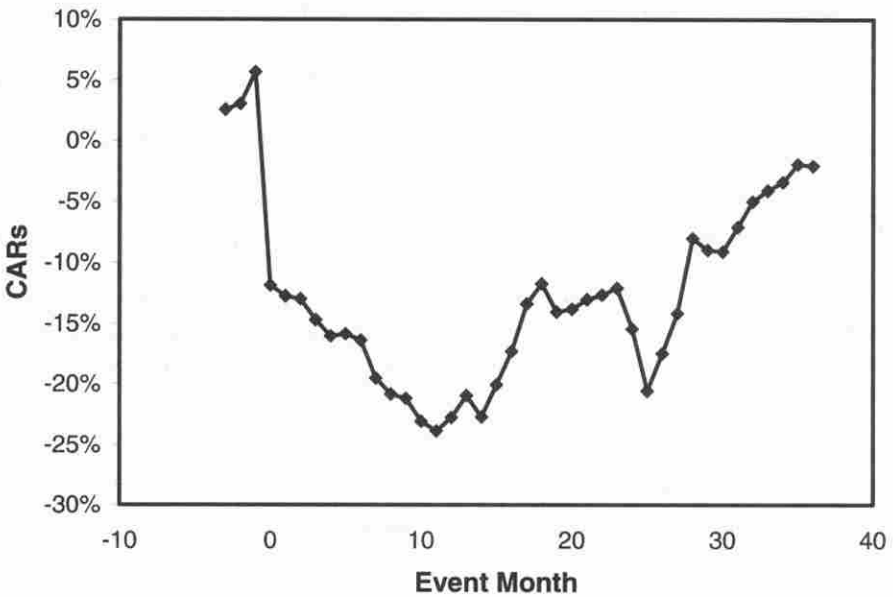


Table 5. *CARs for the Overall Sample of 234 Events and 164 ADRs over Different Selected Intervals*

Interval	CAR (%)	t-Statistic
[1, 6]	–4.523	–2.021*
[1, 12]	–10.531	–3.185***
[1, 24]	–2.193	–0.450
[12, 24]	11.655	3.230***
[12, 36]	21.082	2.978***
[24, 36]	15.466	2.935***

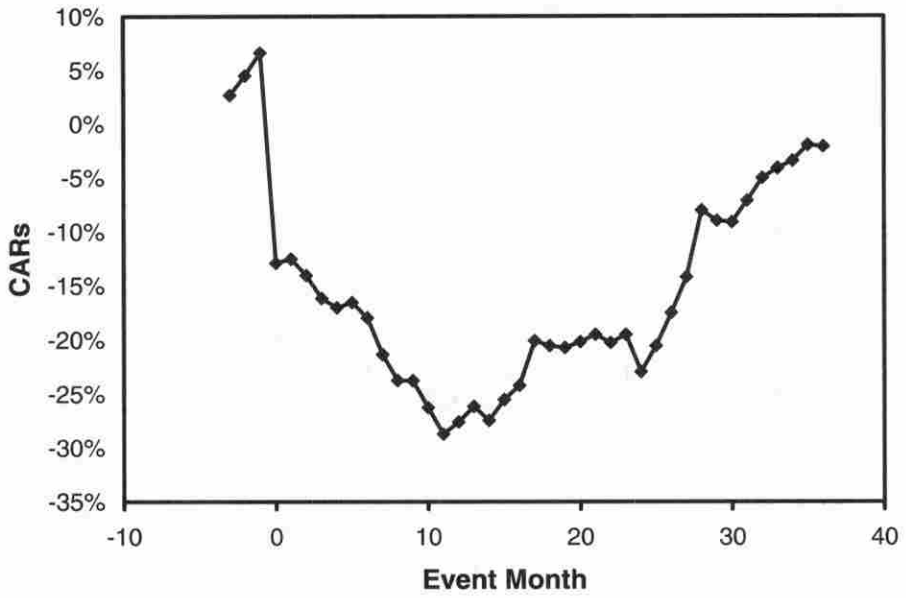
Note: *, **, and *** denote significance at the 5%, 1%, and 0.5% levels, respectively.

Table 6. *CARs for the Sample of N = 186 Events, Excluding August 1998*

Interval	CAR (%)	t-Statistic
[1, 6]	–5.035	–2.002*
[1, 12]	–14.134	–3.664***
[1, 24]	–8.060	–1.503
[12, 24]	10.433	2.464**
[12, 36]	21.082	2.978***
[24, 36]	15.466	2.935***

Note: *, **, and *** denote significance at the 5%, 1%, and 0.5% levels, respectively.

FIGURE 2
CARs for the Sample of 186 Events, Excluding August 1998



which graphs the CARs of that sample over a three-year period. The pattern is essentially identical to that of Figure 1.

Analysis Across Countries

To examine how the market reaction differs across countries, this study compares the performance of ADR stocks from developed countries with those from emerging markets.

ADRs from Developed Markets

Table 7 reports the average monthly abnormal returns and their corresponding t-statistics for the sample of 105 ADR stocks from developed markets over a thirteen-month period surrounding the event month. This sample accounts for a total of N = 144 events.

As Table 7 shows, at t = 0 the AR is –16% for "developed" ADRs, which is statistically significant at the 0.5% level. Furthermore, the ARs for months after the event date appear to be random, indicating that the market is efficient with respect to the large price drop. Figure 3 provides a graphical representation of the CARs calculated from month t = –4 to t = +36 that clearly reinforces these results.

The pattern of CARs appears to be random up to one year after the month of the initial price decline. Following that period, the performance of ADR stocks exhibits an increase in volatility. The graph also seems to suggest that a consistent recovery in the performance of these stocks does not take place until month t = +24.

Table 8 shows that investors who bought these stocks one month after their initial decline and held them for twelve and twenty-four months earned approximately 0.9% and 8% more than the market, respectively. However, none of these results are statistically significant. Only when investors hold these stocks for a total of three years do they earn 23% more than the market, statistically significant at the 5% level. As mentioned previously, this seems to be due to the observed recovery after the second year.

Investors who enter the market as late as one year after the original decline appear to earn positive and statistically significant ARs, which agrees with the results from the overall sample. The market response to the large one-month price decline is consistent with the efficient market hypothesis, and suggests that investors are appropriately pricing ADR stocks from developed

Table 7. *Monthly Average Abnormal Returns for a Sample of ADR Stocks Originating from Developed Countries*

Event Month	AR (%)	t-Statistic
–3	2.362	2.378**
–2	–0.884	–1.118
–1	2.739	2.723**
0	–16.026	–25.505***
+1	–1.468	–1.141
+2	2.229	1.715*
+3	–1.241	–1.453
+4	–1.288	–1.100
+5	1.155	1.037
+6	–0.497	–0.526
+7	–1.664	–1.764*
+8	–0.634	–0.679
+9	0.832	0.967
+10	0.698	0.599

Note: *, **, and *** denote significance at the 10%, 1%, and 0.5% levels, respectively.

FIGURE 3
CARs for the Sample of Developed ADRs

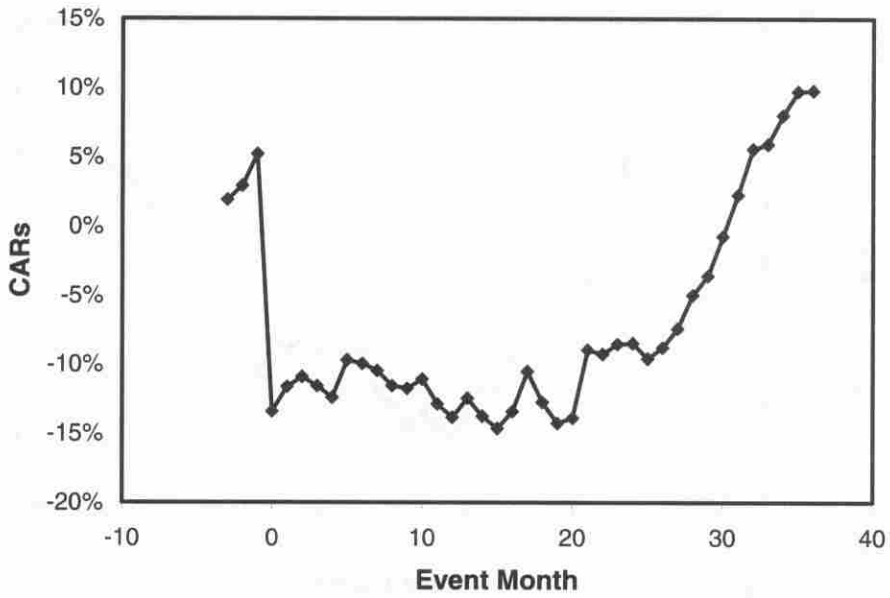


Table 8. *CARs for a Sample of ADR Stocks from Developed Countries over Selected Intervals*

Interval	CAR (%)	t-Statistic
[1, 6]	–1.110	–0.382
[1, 12]	0.900	0.231
[1, 24]	8.765	1.259
[1, 36]	23.203	2.064*
[12, 24]	11.058	2.375**
[12, 36]	22.662	2.612**
[24, 36]	18.319	2.710**

Note: *, **, and *** denote significance at the 5%, 1%, and 0.5% levels, respectively.

markets. This may reflect the greater degree of economic stability, information efficiency, and certainty with which these markets are associated.

Table 9. *ARs for the Sample of Emerging Market ADRs*

Event Month	AR (%)	t-Statistic
–3	–0.316	–0.325
–2	2.641	1.960*
–1	2.478	2.349*
0	–19.975	–23.697***
+1	0.038	0.028
+2	–4.136	–3.202***
+3	–2.523	–1.987*
+4	–1.375	–0.846
+5	–1.407	–0.899
+6	–0.580	–0.432
+7	–5.458	–3.340***
+8	–2.396	–1.326
+9	–1.934	–1.297
+10	–6.274	–3.386***

Note: *, **, and *** denote significance at the 5%, 1%, and 0.5% levels, respectively

ADRs from Emerging Markets

Table 9 presents monthly average ARs and their corresponding t-statistics for the fifty-nine ADRs from emerging markets, a total of N = 90 events.

When compared to Table 8, the results are striking in two respects. First, month t = 0 is associated with an AR of approximately –20%, compared to –16% for the sample of "developed" ADRs, revealing a larger price decline for these stocks. More importantly, the ARs following the event month are successively negative, suggesting that investors underreacted to whatever news caused the initial price decline.

Figure 4 graphs the CARs from month t = –4 to t = +36. It clearly shows the underreaction pattern that takes place up until the end of the first year.

Following the end of the first year, there is a slow but steady recovery in the performance of these stocks.

Finally, Table 10 shows that investors who enter the market one month after the large price drop earn approximately 10% less than the market over six months, and at least 27% and 17% less than the market over one and two years, respectively. All results are statistically significant at the 0.5% level. In contrast with the results from the sample of developed ADRs, investors who buy these stocks after one year appear to earn positive but statistically insignificant ARs.

Overall, the results from the sample of emerging market ADR stocks are consistent with the underreaction hypothesis. Investors seem to remain optimistic at the release of unfavorable information about

FIGURE 4
CARs for the Sample of Emerging Market ADR Stocks

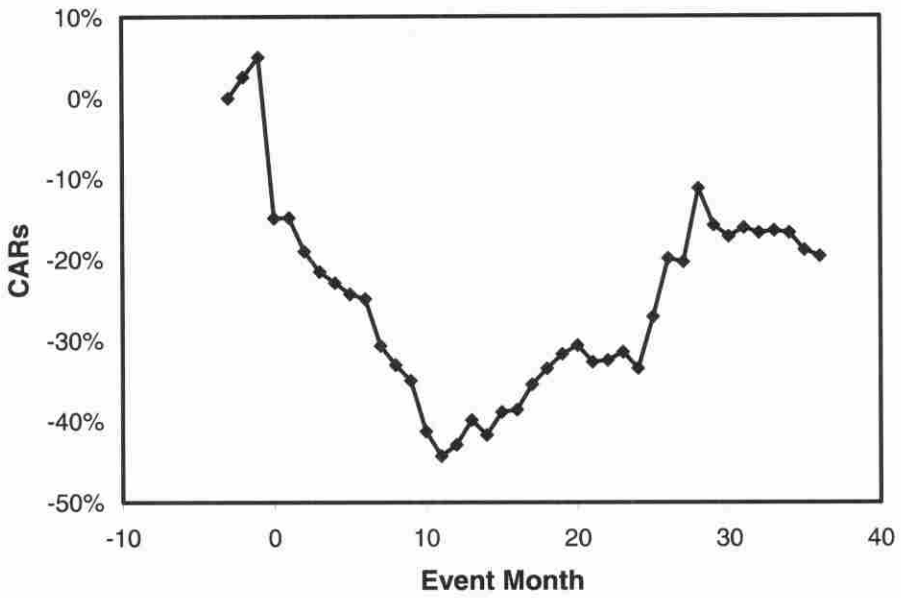


Table 10. *CARs for a Sample of Emerging Market ADRs over Different Selected Intervals*

Interval	CAR (%)	t-Statistic
[1, 6]	–9.983	–2.901***
[1, 12]	–27.743	–5.149***
[1, 24]	–17.560	–2.874***
[12, 24]	12.491	2.178*
[12, 36]	18.749	1.551
[24, 36]	11.252	1.329

***Note:* *, **, and *** denote significance at the 5%, 1%, and 0.5% levels, respectively.**

these ADRs, which leads to a slow downward adjustment of prices over time. Given that many emerging stock markets legally prohibit foreign investors from directly purchasing equity securities, ADRs can provide U.S. investors with international diversification without incurring excessive costs. It may be that investors are not reacting very strongly to the initial large price decline because they view ADRs from emerging markets as a way to achieve superior long-term performance and effectively diversify risk.

Analysis Across Industries

The third part of the analysis examines the three main industry classifications of the sample to determine whether the observed underreaction pattern is present and significant at the industry level.

Table 11 presents average monthly ARs and the corresponding t-statistics for the various events in the sample based on their industry classification during the thirteen-month period surrounding the event date.

At t = 0 the AR is –15% for Services stocks, –17% for Technology stocks, and –18% for Manufacturing stocks. All three industries have predominantly negative ARs following the month of the large price decline, indicating that the stocks enter a period of relatively poor performance. The results are inconsistent with the overreaction hypothesis in all three cases.

Table 12 reports information on CARs for the different industries. CARs calculated from t = +1 to t = +6 and t = +1 to t = +12 are negative for all three industries and in some cases statistically significant. Only Technology investors who hold the stocks for three years earn 25% more than the market, statistically significant at the 5% level.

Furthermore, the only time investors earn statistically significant positive ARs after one year is by buying Technology stocks. CAR [12, 24] and CAR [12, 36] are approximately 23% and 34%, respectively, for the Technology sample, statistically significant at the 0.5% level. In contrast, investors in Services and Manufacturing stocks earn modest and insignificant returns.

Figure 5 shows a graphical representation of CARs calculated from month t = –4 to t = +36 that illustrates the differences in the patterns among industries. Clearly, the evidence from all industries is consistent with the underreaction hypothesis. Note, also, that both the Manufacturing and the Services samples exhibit a somewhat similar pattern. However, Technology stocks experienced a less pronounced decline in performance after the large price drop during the event month. Investors seem far more optimistic when the decline is associated with a Technology stock, and react less to whatever caused the initial price change.

Table 11. *ARs for Different Industry Classifications*

	Technology N = 95		Services N = 45		Manufacturing N = 94	
Event Month	AR (%)	t-Statistic	AR (%)	t-Statistic	AR (%)	t-Statistic
–3	3.609	2.628**	–0.988	–1.049	0.142	0.142
–2	0.560	0.544	–1.744	–1.339	1.444	1.103
–1	3.358	3.409***	2.166	1.553	2.138	1.526
0	–17.793	–20.1***	–15.791	–15.2***	–18.134	–23.0***
+1	0.322	0.197	–2.298	–1.131	–1.436	–1.030
+2	–0.918	–0.673	0.953	0.583	–0.075	–0.041
+3	–2.818	–2.763**	3.417	2.315**	–3.106	–2.552**
+4	–1.372	–0.795	–1.147	–0.648	–1.354	–0.983
+5	0.145	0.096	–1.973	–1.080	1.221	0.840
+6	0.134	0.101	–0.812	–0.506	–1.064	–0.907
+7	–3.168	–2.86***	–3.480	–1.677*	–2.910	–1.867*
+8	–1.219	–0.998	–2.112	–1.524	–1.040	–0.587
+9	1.771	1.566	–2.872	–1.650*	–1.062	–0.792
+10	–1.170	–0.741	–4.682	–2.153***	–1.689	–0.959

Note: *, **, and *** denote significance at the 10%, 5%, and 0.5% levels, respectively.

Table 12. *CARs over Different Selected Intervals Across Industries*

	Technology	Services	Manufacturing
CAR [1, 6]	–4.506%	–1.860%	–5.813%
t–Statistic	–1.163	–0.503	–1.628*
CAR [1, 12]	–4.284%	13.357%	–15.707%
t-Statistic	–0.844	–2.804**	–2.583**
CAR [1, 24]	14.741%	–16.684%	–11.370%
t-Statistic	1.828*	–3.038***	–1.350
CAR [1, 36]	25.484%	–4.799%	1.237%
t-Statistic	2.353**	–0.348	0.078
CAR [12, 24]	23.588%	0.313%	5.747%
t-Statistic	4.078***	0.082	0.888
CAR [12, 36]	34.885%	9.918%	9.186%
t-Statistic	4.412***	0.555	0.667

Note: *, **, and *** denote significance at the 10%, 5%, and 0.5% levels, respectively.

Regression Analysis Results

Results from the estimation of the cross-sectional equation are presented in Table 13. According to the model, cumulative abnormal returns are regressed against the abnormal return of t = 0, and three dummy variables for the industry classification of each stock and its country of origin. The regression model is estimated for five different specifications of the dependent variable depending on the period under consideration.

If investors overreacted to whatever caused the initial price decline, we would expect that the greater the decline during t = 0, the greater the subsequent reversal. In that case, γ_1 would be negative. If, in contrast, investors underreacted, γ_1 would be positive. Furthermore, if industry classification and/or country of origin were related to the subsequent performance, then γ_2, γ_3, and γ_4 would be different from zero.

Table 13 reveals no evidence of an overreaction effect immediately following the large price decline because the coefficient of the event month abnormal return in the first regression is positive. However, in all specifications of the model, the γ_1 coefficients are statistically insignificant. When cumulative abnormal returns are calculated for Months 24 through 36 the γ_1 coefficient is negative and statistically significant at the 5% level, evidence of a delayed improvement in stock performance.

In each case, the coefficient of the second dummy variable has the correct sign, which indicates that the expected improvement in performance is larger for Technology stocks than for Manufacturing stocks. However, it is only statistically significant at the third specification of the model. Finally, the coefficient of the country of origin dummy is positive and statistically significant in the first two regression equations, which indicates that, immediately following the large price drop, developed country ADRs exhibit much better performance than those from emerging markets.

Conclusions

This paper examines a sample of ADR stocks that experienced significant stock price declines of more than –15% during a specific month, and tries to determine if there is a reversal pattern over the long run. The results reveal no evidence of a reversal pattern. Instead, the results are consistent with the predictions of the underreaction hypothesis and the existence of a "momentum" effect in stock prices, as described by Jegadeesh and Titman [1993]. For at least two years after the initial price decline, investors continue to earn negative and in most cases statistically significant ARs.

FIGURE 5
CARs for the Different Industry Samples

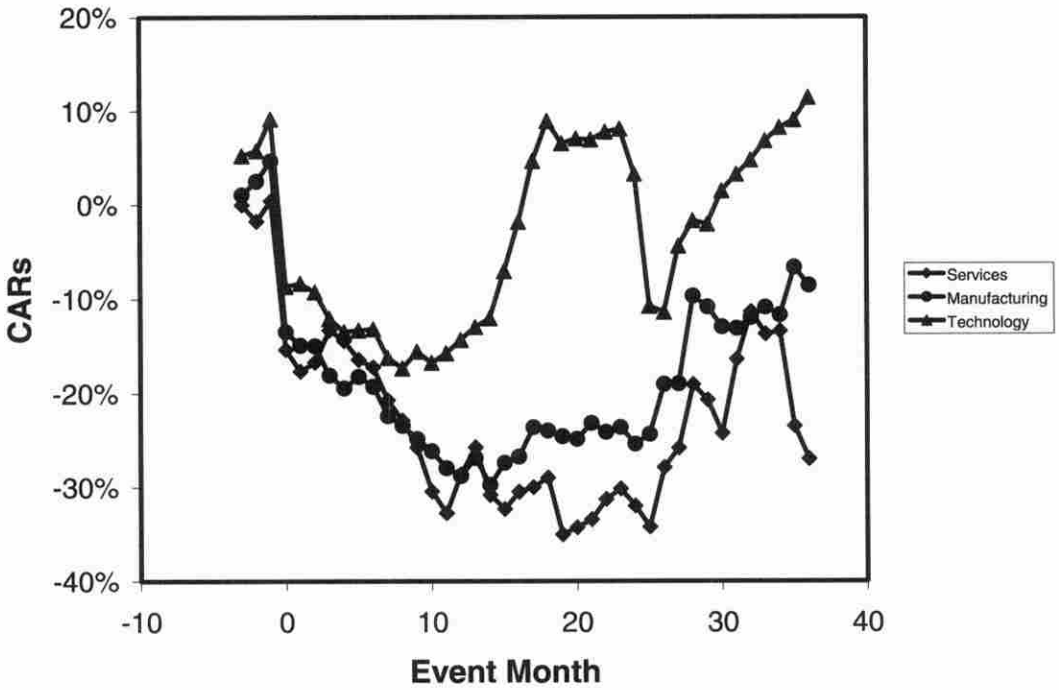


Table 13. *Regression Results of* $CAR_i = \gamma_0 + \gamma_1 ARO_i + \gamma_2 D_{1,i} + \gamma_3 D_{2,i} + \gamma_4 D_{3,i} + \varepsilon_i$

		Parameter Estimates				
Intercept	**ARO_i**	**$D_{1,i}$**	**$D_{2,i}$**	**$D_{3,i}$**	**F-Value**	**Adj-R^2**
CARs Measured over Months t = +1 to t = +6						
–0.1045	0.0078	0.0323	0.0005	0.0881	0.402	0.00019
(–1.421)	(0.026)	(0.517)	(0.010)	(1.843)*		
CARs Measured over Months t = +1 to t = +12						
–0.3371	–0.1810	7.96E–05	0.0698	0.2852	5.192***	0.0702
(–3.26)***	(–0.439)	(0.0008)	(0.970)	(4.192)***		
CARs Measured over Months t = +12 to t = +24						
0.1911	0.5731	–0.0626	0.1826	–0.0586	2.332**	0.0249
(1.662)*	(1.255)	(–0.6413)	(2.275)**	(–0.774)		
CARs Measured over Months t = +12 to t = +36						
0.0082	–0.3774	0.0108	0.2539	0.0176	0.8443	–0.0057
(0.034)	(–0.409)	(0.049)	(1.635)*	(0.119)		
CARs Measured over Months t = +24 to t = +36						
–0.2729	–1.4356	0.1078	0.1718	0.0867	1.8774	0.0314
(–1.576)	(–2.133)**	(0.679)	(1.514)	(0.804)		

Note: *, **, and *** denote significance at the 10%, 5%, and 1% levels, respectively.

Furthermore, the nature of the market reaction is found to be different when comparing the developed country ADR sample with the emerging market ADR sample. The results from the developed country sample suggest that investors are appropriately pricing these stocks, thus offering support for the efficient market hypothesis. The results from the emerging market sample are consistent with the underreaction hypothesis, which shows a slow and statistically significant downward adjustment of prices over time.

Finally, the results from the analysis of reversal patterns across industries further support the underreaction hypothesis. The exception is Technology stocks, which experience a less pronounced decline in performance after the large price drop, suggesting that investors react less to whatever caused the initial price change for these stocks.

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