Russian and East European Finance and Trade, vol. 36, no. 5,
September–October 2000, pp. 6–26.

ISSN 1061–2009/2001 $9.50 + 0.00.

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A Cross-Section of Expected Stock Returns on the Istanbul Stock Exchange

The capital asset pricing model developed by Sharpe (1964), Lintner (1964), and Black (1972) stipulates that the expected return on a stock is determined by a risk-free interest rate and a risk premium, which is a function of the stock's responsiveness to the overall movements in the market (i.e., its beta coefficient). Early empirical tests of the model generally supported its main prediction that beta would be the only explanatory factor in explaining the cross-sectional variation across stock portfolios (see, for example, Black, et al. 1972; and Fama and MacBeth 1973). However, more recent empirical work on asset pricing has identified a number of variables that help explain cross-sectional variation in stock returns, in addition to the market risk variable. Notably, firm size (Banz 1981; Keim 1983), leverage (Bhandari 1988), P/E ratio (Basu 1983; Ball 1988), ratio of cash flow to stock price (Rosenberg et al. 1985), book-to-market equity (Fama and French 1992), and past sales growth (Lakonishok et al. 1994) are among those variables found to have significant explanatory power in asset pricing tests.

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In their seminal work on the American market, Fama and French (1992) found that book-to-market equity stands out as the most significant factor in explaining the cross-section of returns. Market risk measured by beta, on the other hand, has no explanatory power even in models where it is the only explanatory variable. Chan et al. (1991) reached the same conclusion on book-to-market in the Japanese market. As an alternative to the capital asset pricing model, Fama and French (1993) suggested a three-factor empirical model that can explain most of the empirical anomalies cited in the literature. Yet, Daniel and Titman (1997), by looking at the covariance structure of returns, together with certain firm characteristics, argued that the three factors in Fama and French (1993; 1996) are not priced; hence, they cannot be considered as risk factors.

Research on stock returns in emerging markets indicate that these markets are characterized by high volatility and high returns. It has been shown that they are not integrated into the developed markets of the world, as evidenced by very low correlation with the rest of the world and among themselves (Bekaert and Harvey 1997). Investor interest in emerging markets exploded during the last decade, as a result of the quest for higher returns and further international diversification. Yet little is known about the nature of stock returns in those markets. At the aggregate level, variables like average P/E ratios, book-to-market ratios, and dividend yields are reported to have some explanatory power for average market returns (Bekaert et. al. 1997). There is, however, much more to be understood at the individual stock level in emerging markets.

The objective of this study was to investigate the cross-section of stock returns in the Istanbul Stock Exchange (ISE) for the period 1992–98. The ISE is highly representative of an emerging market with rapid growth in terms of market capitalization, trade volume, and number of listed companies. A detailed analysis of stock returns in this market will undoubtedly shed light on other emerging markets with similar characteristics. Moreover, our small sample, both in time and number of stocks, coupled with high inflation experienced during the period of study, posed additional challenges to employing the traditional methodology adopted in

similar studies for developed markets. To this end, a methodology similar to that of Fama and French (1992) was employed, by taking into account the constraints imposed by a smaller sample, both in time and in terms of the number of stocks. Our findings indicate that book-to-market and firm size explain stock returns, whereas no significant earnings/price ratio effect is encountered. Market beta has no explanatory power, even in models where it is the only variable in the model.

The organization of the paper is as follows. The data are described in the next section. The findings on size, beta, book-to-market, and E/P are presented in the third, fourth, and fifth sections. Results are discussed in the sixth section, followed by a summary and conclusions.

The Data

The study covered all non-financial companies during the period between January 1992 and December 1998. We chose to exclude banks, insurance companies, holding companies, and other finance companies in order to have consistent interpretations on certain firm characteristics such as earnings and size. Sample size concerns imposed the limitation of the time period to post-1992. Hence, our sample size ranged between 80 companies for 1992, and 150 for 1998. Monthly return data were downloaded from *Datastream*. All returns were adjusted for cash and stock dividends. Financial statement data were obtained from various ISE publications. Companies listed on the ISE are required to file financial statements quarterly; however, interim statements are not audited, with the exception of semiannual statements. Moreover, it has been observed that some companies have serious delays in reporting their interim statements. We also know the presence of significant seasonal factors for some industries and companies. Therefore, we chose to employ end-of-year financial statements in our analysis.

In order to make sure that financial statement information was available to the public at the time they were included in our analysis, we used end-of-year t-1 figures, starting with June of the following year, t. Market price data, on the other hand, is the end

month closing price in the same month. Hence E/P ratio and book-to-market ratio measures between July of year t-1 and June of year t employ financial statement data for end-of-December of year t-2 and market data for the same month. For example, the E/P ratio for a company for April 1995 was computed by dividing the EPS based on the December 1993 income statement by the end-of-April 1995 closing price. Values of accounting variables and beta, as of the end of a month, were later matched with stock returns in the following month throughout the analysis.

Estimation of Betas

We estimated the beta coefficient for each stock using a two-stage process. First, a time-series beta was estimated via OLS for each month and stock using monthly data for the previous 24 months. For that purpose, we regressed monthly returns on a stock on the contemporaneous and one-month-lagged return on the ISE Composite Index, which is a value-weighted index of 100 stocks. The beta estimate for that month was found as the sum of the regression coefficients of the ISE index return and its lagged value. According to Dimson (1979), the sum-beta, calculated this way, is regarded as an adjustment for nonsynchronous trading in the absence of autocorrelation in market returns. The Ljong-Box test statistic for the presence of autocorrelation in monthly returns on the ISE index fails to reject the null hypothesis of no autocorrelation.

For a given month in the sample period, once a beta coefficient was estimated for each stock using data for the previous 24 months, stocks were ranked on estimated betas. The ranked stock sample was divided into five equal groups, and the average beta coefficient for each quintile was calculated. The average portfolio beta was then assigned to individual stocks in that beta quintile for that month. The beta estimation process was repeated for each month in the period 1992–98. Hence, we allowed for stock beta changes over time, yet assigned each stock to a beta-group in each month, restricting fluctuation in individual stock betas to one of five portfolio beta categories in that month. We repeated our analyses by

arbitrarily dividing our sample period into two sub-samples of equal length. This way it was possible to check whether the overall results based on the full sample were determined by a dominant sub-sample. We report our findings for both sub-samples as well as the full sample.

Size and Beta

We first explore the impact of size and beta on average monthly returns. As explained above, stocks were ranked with respect to their time series betas, and assigned into one of five beta portfolios each month. Then average values of E/P, book-to-market, and size in each beta portfolio in that month, as well as average rate of return for the following month, were computed. After repeating the same process for each month in the sample between January 1992 and December 1998, we took the weighted average of monthly averages under each beta portfolio. Panel A in Table 1 reports the overall average values of monthly returns, E/P, book-to-market, and size for each beta portfolio. The value of average beta ranges between 0.38 and 1.63 in five groups. Average monthly returns, which hover around 7 percent per month, do not vary with beta at all, a finding consistent with Fama and French (1992). Firm size, book-to-market, and E/P do not display much difference between beta portfolios either. Similar results hold for the two sub-samples. Market beta does not distinguish any stock characteristic at all.

To investigate the size effect, we ranked companies with respect to size in a given month, and assigned them to one of five size quintiles. Average returns, beta, E/P, and book-to-market for each size portfolio, computed in a similar way to that described for beta portfolios, are presented in Table 2. In all three panels, market beta does not display any pattern across size portfolios. Average returns over the full sample, on the other hand, generally decrease with size. Portfolios of smaller firms earn higher returns on the average. This result is totally in agreement with findings in developed capital markets. However, size effect almost disappears during the second sub-period, despite a strong manifestation in the earlier period. Book-to-market is negatively related with size.

Table 1

Properties of Portfolios Formed on Betas

(A) Full sample: January 1992–December 1998

	β_1	β_2	β_3	β_4	β_5
Return	0.0653	0.0795	0.0803	0.0658	0.0732
b	0.3797	0.8429	1.0869	1.3028	1.6324
ME	184.541	118.642	128.487	143.835	143.792
B/M	0.3105	0.3543	0.3415	0.3264	0.3270
E/P	0.0210	0.0440	0.0482	0.0479	0.0421

(B) Sub-sample: January 1992–June 1995

	β_1	β_2	β_3	β_4	β_5
Return	0.0834	0.1287	0.1211	0.0912	0.1061
b	0.4164	0.9058	1.1566	1.3719	1.6992
ME	126.076	106.166	120.275	110.055	141.936
B/M	0.3793	0.3854	0.4070	0.3656	0.3360
E/P	0.0026	0.0264	0.0177	0.0193	0.0131

(C) Sub-sample: July 1995–December 1998

	β_1	β_2	β_3	β_4	β_5
Return	0.0526	0.0452	0.0521	0.0480	0.0501
b	0.3538	0.7991	1.0384	1.2547	1.5857
ME	225.720	127.316	134.190	167.323	145.092
B/M	0.2622	0.3327	0.2960	0.2992	0.3206
E/P	0.0339	0.0562	0.0693	0.0678	0.0624

Note: Each month's beta coefficient is estimated for each stock using monthly data for the previous 24 months; then, stocks are ranked on estimated betas for each month. The ranked stock sample is divided into five equal groups, and the average beta coefficient for each quintile is calculated. The average portfolio beta is then assigned to individual stocks in that quintile. Then average values of E/P, book-to-market, and size in each beta portfolio in that month, as well as the average rate of return for the following month, are computed. This process is repeated for each month, and the weighted average of monthly averages under each beta portfolio is reported in the body of the table. Panel A reports the values for the full sample, January 1992–December 1998. Panel B reports the values for the period, January 1992–June 1995. Panel C reports the values for the period, July 1995–December 1998. Market size (ME) is in millions of U.S. dollars.

Table 2

Properties of Portfolios Formed on Size

(A) Full sample: January 1992–December 1998

	ME_1	ME_2	ME_3	ME_4	ME_5
Return	0.0972	0.0719	0.0675	0.0597	0.0591
β	0.9311	0.8321	0.8694	0.9188	0.8332
ME	7.689	20.801	44.044	93.310	499.003
B/M	0.5232	0.3760	0.3134	0.2415	0.2004
E/P	0.0099	0.0513	0.0653	0.0542	0.0447

(B) Sub-sample: January 1992–June 1995

	ME_1	ME_2	ME_3	ME_4	ME_5
Return	0.1344	0.1096	0.1044	0.0802	0.0755
β	1.0184	0.8541	0.8948	0.9543	0.8059
ME	5.329	17.777	44.772	93.175	417.153
B/M	0.5991	0.4085	0.3331	0.2479	0.2621
E/P	–0.0428	0.0210	0.0618	0.0464	0.0347

(C) Sub-sample: July 1995–December 1998

	ME_1	ME_2	ME_3	ME_4	ME_5
Return	0.0699	0.0445	0.0408	0.0449	0.0472
β	0.8666	0.8162	0.8509	0.8929	0.8532
ME	9.434	23.009	43.514	93.409	559.047
B/M	0.4672	0.3524	0.2991	0.2369	0.1552
E/P	0.0488	0.0735	0.0680	0.0600	0.0521

Note: Stocks are ranked with respect to size (i.e., stock price times shares outstanding) in a given month and assigned to one of five size quintiles. Then, average values of E/P, book-to-market, and beta in each size portfolio in that month, as well as the average rate of return for the following month, are computed. This process is repeated for each month and the weighted average of monthly averages under each size portfolio is reported in the body of the table. Panel A reports the values for the full sample, January 1992–December 1998. Panel B reports the values for the period, January 1992–June 1995. Panel C reports the values for the period, July 1995–December 1998. Market size (ME) is in millions of U.S. dollars.

This is clearly seen in Table 2 where average book-to-market of size portfolios get smaller with larger firm size. E/P values of size portfolios display a weaker trend within the size portfolios, although we observe a reverse U-shape.

In order to explore the interaction between size and beta, we first tabulated the percentage of beta portfolios that fell under a size group in every month. In the top panel of Table 3, the percentages in the body of the table represent the proportion of stocks in a beta portfolio that are within a particular size group. For example, 30 percent of stocks that were classified in the lowest beta quintile were among the largest group of companies. Similarly, 22.5 percent of smallest firms were high-beta companies. A careful analysis of the table suggests that with the exception of a low beta/large size combination, the distribution of stocks among the cells of the table is almost even (i.e., around 20 percent in most of the cells). This was to be expected, considering the equality of average beta values across size portfolios. Second, we tabulated average monthly returns corresponding to size and beta portfolio combinations in the bottom panel of Table 3. Each cell in the table represents average monthly returns of stocks in a size group that fall within a particular beta portfolio. In each beta group, we generally observe higher returns for smaller size portfolios; but, this relationship is weak. Highest average returns are found for the smallest-size portfolios in each beta classification. No pattern can be detected when the returns are examined row by row. This is another indication of the lack of beta effect in average stock returns. In short, Table 3 demonstrates a weak size effect in returns, and almost total independence of average returns and firm size from market beta.

Book-to-Market and E/P Ratios

We next turned our attention to two variables that emerge as significant factors in explaining stock market returns. These are the ratio of book value of equity to its market value (book-to-market); and the ratio of earnings per share to the market price of stock (E/P), the reciprocal of the well known price/earnings ratio. Initially, in each month stocks are ranked according to their book-to-market values and grouped into five book-to-market portfolios. Average values of E/P, beta, and size in each book-to-market portfolio in that month, as well as average rates of return for the fol-

Table 3

Proportion of Stocks in Beta and Size Portfolios, and Average Returns for These Portfolios for the Full Sample, January 1992 to December 1998

	β_1	β_2	β_3	β_4	β_5
ME_1	0.1885	0.1806	0.2026	0.2139	0.2275
ME_2	0.1916	0.2147	0.1718	0.1707	0.1912
ME_3	0.1493	0.1979	0.2244	0.1830	0.2049
ME_4	0.1671	0.2049	0.2265	0.2171	0.2086
ME_5	0.3033	0.2017	0.1745	0.2150	0.1676
	β_1	β_2	β_3	β_4	β_5
ME_1	0.0887	0.1109	0.1035	0.0909	0.1052
ME_2	0.0622	0.0759	0.1032	0.0577	0.0612
ME_3	0.0787	0.0627	0.0653	0.0880	0.0704
ME_4	0.0380	0.0902	0.0764	0.0395	0.0599
ME_5	0.0586	0.0636	0.0561	0.0548	0.0629

Note: In the top panel, the percentages in the body of the table represent the proportion of stocks in a beta portfolio that are within a particular size group. In the bottom panel, values represent average monthly returns of stocks in a size group that fall within a particular beta portfolio.

lowing month, are computed and reported in Table 4. For the full sample, the lowest average book-to-market value is 8.2 percent, and the highest average is 79 percent (the ratio of market-to-book values of 12 times and 1.27 times, respectively). Market beta slightly increases with higher book-to-market portfolios, a result obtained in both sub-periods. However, the differences are rather small. Other factors, namely, average monthly returns, E/P, and size have very clear patterns as book-to-market varies. Most important of all, average returns vary directly with book-to-market. The lowest book-to-market portfolio earns 5.4 percent per month; the highest portfolio has a return of 9 percent, with returns getting larger steadily with increasing book-to-market. This is in agreement with the findings of well known studies in developed markets, such as Fama and French (1992) and Chan et al. (1991). On the other hand, similar to the size effect, the trend in average return disappears in the second period. We will elaborate on this anomaly together with other findings below, in the fourth section. In Table 4, we also observe that average firm size and E/P values

Table 4

Properties of Portfolios Formed on Book-to-Market

(A)	Full sample: January 1992–December 1998				
	$(B/M)_1$	$(B/M)_2$	$(B/M)_3$	$(B/M)_4$	$(B/M)_5$
Return	0.0540	0.0604	0.0682	0.0831	0.0895
β	0.7470	0.8397	0.9120	0.9488	0.9416
ME	302.042	138.790	101.552	78.086	53.924
B/M	0.0821	0.1728	0.2583	0.3756	0.7889
E/P	0.0218	0.0409	0.0518	0.0675	0.0617
(B)	Sub-sample: January 1992–June 1995				
	$(B/M)_1$	$(B/M)_2$	$(B/M)_3$	$(B/M)_4$	$(B/M)_5$
Return	0.0648	0.0850	0.0908	0.1287	0.1398
β	0.7496	0.8648	0.9541	0.9809	1.0159
ME	231.183	130.424	94.405	73.101	63.812
B/M	0.0878	0.1828	0.2881	0.4364	0.9117
E/P	0.0281	0.0322	0.0317	0.0519	0.0134
(C)	Sub-sample: July 1995–December 1998				
	$(B/M)_1$	$(B/M)_2$	$(B/M)_3$	$(B/M)_4$	$(B/M)_5$
Return	0.0465	0.0430	0.0522	0.0506	0.0538
β	0.7452	0.8219	0.8820	0.9259	0.8889
ME	352.525	144.768	106.643	81.648	46.890
B/M	0.0782	0.1658	0.2371	0.3323	0.7017
E/P	0.0175	0.0471	0.0663	0.0787	0.0961

Note: Stocks are ranked with respect to book-to-market values in a given month and assigned to one of five book-to-market portfolios. Then average values of E/P, size, and beta in each book-to-market portfolio in that month, as well as the average rate of return for the following month, are computed. This process is repeated for each month, and the weighted average of monthly averages under each book-to-market portfolio is reported in the body of the table. Panel A reports the values for the full sample, January 1992–December 1998. Panel B reports the values for the period, January 1992–June 1995. Panel C reports the values for the period, July 1995–December 1998. Market size (ME) is in millions of U.S. dollars.

for book-to-market portfolios have patterns. Average firm size gets smaller with higher book-to-market. Average E/P ratio, however, becomes larger as book-to-market increases. Results from the two sub-sample periods display the same properties.

We repeated the same exercise used in developing Table 4 to

obtain a similar table for E/P values. Hence, for each month, stocks are sorted with respect to E/P values and grouped into five E/P portfolios, such that stocks with the smallest E/P values make up the first portfolio, while the fifth portfolio contains those with highest E/P values. After repeating the process every month for the sample, average values of monthly size, book-to-market, beta and one month ahead returns were computed. The results are presented in Table 5. The average value of E/P for the first portfolio is negative. For the full sample, reported in Panel A, the fifth portfolio has an E/P of 0.138, which corresponds to a price-earnings ratio of 7.25. As we found before, market beta slightly declines with E/P values. Yet we cannot see the decline in beta in the second subperiod. Average book-to-market does not display any regularity across different E/P portfolios. We suspect that allowing for negative E/P stocks in the sample may hinder a relationship. Sample size concerns forced us to keep stocks with negative earnings in the analysis. Nevertheless, average returns and market size display a consistent trend across E/P portfolios. Larger the average E/P value the smaller is the average monthly return. Monthly returns display a U-shape, with larger returns in both high and low E/P portfolios, but smaller average return in portfolios with medium E/P values. As with size and book-to-market, E/P effect is not observable during the second sub-period, either

As both book-to-market and E/P emerge as potential determinants of average returns, it is natural to ask which factor dominates in explanatory power. We set up a cross-tabulation similar to what we did with beta and size in Table 2. This time, we first sorted cross-sectional returns in a month according E/P, and computed the percentage of stocks within each book-to-market portfolio. The first number in the body of the top panel of Table 6 indicates that 34 percent of stocks classified in the lowest E/P portfolios have book-to-market values that are in the lowest quintile. In contrast, only 1.3 percent of the lowest book-to-market stocks are in the largest E/P quintile. To gain a better insight into the relative power of E/P and book to market, one has to look at the bottom panel of Table 6. In this panel, average monthly returns are cross tabulated with respect to both variables, E/P and book-to-

Table 5

Properties of Portfolios Formed on E/P

(A)	Full sample: January 1992–December 1998				
	$(E/P)_1$	$(E/P)_2$	$(E/P)_3$	$(E/P)_4$	$(E/P)_5$
Return	0.0871	0.0614	0.0574	0.0759	0.0738
β	0.9366	0.9002	0.8687	0.8597	0.8414
ME	181.878	171.745	133.595	96.634	88.311
B/M	0.3191	0.2711	0.2834	0.3166	0.4652
E/P	–0.0646	0.0291	0.0506	0.0740	0.1380
(B)	Sub-sample: January 1992–June 1995				
	$(E/P)_1$	$(E/P)_2$	$(E/P)_3$	$(E/P)_4$	$(E/P)_5$
Return	0.1183	0.0805	0.0737	0.1256	0.1090
β	1.0149	0.9130	0.8756	0.9361	0.8083
ME	96.846	160.929	126.492	110.490	89.964
B/M	0.4404	0.3097	0.2863	0.3261	0.4939
E/P	–0.1231	0.0228	0.0415	0.0609	0.1193
(C)	Sub-sample: July 1995–December 1998				
	$(E/P)_1$	$(E/P)_2$	$(E/P)_3$	$(E/P)_4$	$(E/P)_5$
Return	0.0643	0.0476	0.0457	0.0398	0.0481
β	0.8793	0.8910	0.8638	0.8041	0.8658
ME	244.102	179.637	138.742	86.524	87.101
B/M	0.2304	0.2430	0.2813	0.3097	0.4442
E/P	–0.0219	0.0337	0.0573	0.0837	0.1518

Note: Stocks are ranked with respect to their E/P values in a given month and assigned to one of five E/P portfolios. Then, average values of size, book-to-market, and beta in each E/P portfolio in that month, as well as the average rate of return for the following month, are computed. This process is repeated for each month and the weighted average of monthly averages under each E/P portfolio is reported in the body of the table. Panel A reports the values for the full sample, January 1992–December 1998. Panel B reports the values for the period, January 1992–June 1995. Panel C reports the values for the period, July 1995–December 1998. Market size (ME) is in millions of U.S. dollars.

market. When we examine the returns by glancing at the numbers by column-by-column, we do not observe any clear trend: After control -market, returns are no longer related with E/P.

Next we examine the bottom panel of Table 6 row-by-row, to see the impact of book-to-market after controlling for E/P.

Table 6

Proportion of Stocks in Book-to-Market and E/P Portfolios, and Average Returns for These Portfolios

	$(B/M)_1$	$(B/M)_2$	$(B/M)_3$	$(B/M)_4$	$(B/M)_5$
$(E/P)_1$	0.3397	0.1691	0.1400	0.1283	0.1905
$(E/P)_2$	0.3798	0.2067	0.1518	0.1306	0.1324
$(E/P)_3$	0.2064	0.2960	0.2084	0.1714	0.1257
$(E/P)_4$	0.0606	0.2421	0.2827	0.2584	0.1619
$(E/P)_5$	0.0134	0.0861	0.2170	0.3114	0.3895
	$(B/M)_1$	$(B/M)_2$	$(B/M)_3$	$(B/M)_4$	$(B/M)_5$
$(E/P)_1$	0.0576	0.0642	0.0985	0.1092	0.1306
$(E/P)_2$	0.0508	0.0570	0.0652	0.0824	0.0759
$(E/P)_3$	0.0606	0.0393	0.0674	0.0771	0.0531
$(E/P)_4$	0.0514	0.0825	0.0766	0.0747	0.0754
$(E/P)_5$	0.0427	0.0535	0.0379	0.0845	0.0912

Note: In the top panel, the percentages in the body of the table represent the proportion of stocks in a book-to-market portfolio that are within a particular E/P group. In the bottom panel, values represent average monthly returns of stocks in a E/P group that fall within a particular book-to-market portfolio.

We can observe a weak trend here. For lowest and highest E/P portfolios, average returns increase with book-to-market. Yet in medium E/P portfolios, no book-to-market effect is visible. We have to remember that the sample size in each cell of the cross-tabulation becomes too small for certain effects to present themselves. Nevertheless when book-to-market and E/P effects are taken together, it is not wrong to argue that book-to-market dominates E/P in explaining the cross-section of returns in the Turkish market.

For completeness, a similar cross-tabulation of returns, with respect to size and book-to-market, was also undertaken. Both of these factors, when taken alone, generated significant explanatory power. Cross-tabulation, on the other hand, seemed to remove the individual effects. In the bottom panel of Table 7, we cannot observe a trend row-by-row or column-by-column. Reduction in sample size, as a consequence of cross-tabulation, has to be responsible for the removal of trends observed individually.

Table 7

Proportion of Stocks in Book-to-Market and Size Portfolios, and Average Returns for These Portfolios

	$(B/M)_1$	$(B/M)_2$	$(B/M)_3$	$(B/M)_4$	$(B/M)_5$
ME_1	0.0705	0.1203	0.1728	0.2222	0.4130
ME_2	0.1172	0.1535	0.1958	0.2730	0.2443
ME_3	0.1308	0.1818	0.2678	0.2312	0.1845
ME_4	0.2309	0.2784	0.2111	0.1818	0.1018
ME_5	0.4504	0.2658	0.1521	0.0916	0.0562
	$(B/M)_1$	$(B/M)_2$	$(B/M)_3$	$(B/M)_4$	$(B/M)_5$
ME_1	0.0429	0.0646	0.1118	0.0945	0.1065
ME_2	0.0704	0.0421	0.0718	0.0936	0.0712
ME_3	0.0588	0.0635	0.0642	0.0872	0.0641
ME_4	0.0445	0.0760	0.0436	0.0614	0.0816
ME_5	0.0551	0.0508	0.0555	0.0575	0.1424

Note: In the top panel, the percentages in the body of the table represent the proportion of stocks in a book-to-market portfolio that are within a particular size group. In the bottom panel, values represent average monthly returns of stocks in a size group that fall within a particular book-to-market portfolio.

Fama-MacBeth Regressions

The discussion above has been confined to tabular analysis of a cross-section of stock returns. Although simple, the preceding analysis has uncovered significant clues to explain the nature of stock returns in the Turkish market. In this section, we adopt a more formal approach to test the factors that came up in previous analysis. We employed the well known time series–cross section regression method of Fama and MacBeth (1973). Their methodology first requires the estimation of stock betas using time series data. Stocks are ranked on estimated betas; then, each ranked stock sample is divided into five portfolios. The average portfolio beta is then assigned to individual stocks. In the second phase, cross sectional regressions are run for each month in the sample. The dependent variable of cross-sectional regressions is the stock returns, which are regressed against a set of explanatory variables, including the beta estimated during the first stage. Cross-sectional regressions are repeated for every month in the sample period.

Finally, time series averages of estimated regression coefficients are computed and tested for significance via a simple *t*-test. Most direct and indirect tests of the Capital Asset Pricing Model of Sharpe, Lintner and Black employ a variant of Fama-MacBeth algorithm. The model predicts that only the coefficient of market beta will be positive and significant, and that other explanatory variables will not be priced in the market (i.e., their regression coefficients are not expected to be significantly different from zero.

$$R_{i,t+1} = \lambda_0 + \lambda_1 \beta_{it} + \varepsilon_{it}$$

We have already obtained the time series estimates of market betas (please refer to the Data, above). Hence, we ran the following cross-sectional regression models for every month *t*:

$$R_{i,t+1} = \lambda_0 + \lambda_1 \beta_{it} + \lambda_2 \ln(ME)_{it} + \varepsilon_{it},$$

$$R_{i,t+1} = \lambda_0 + \lambda_1 \beta_{it} + \lambda_2 \ln(ME)_{it} + \lambda_3 \ln(BM)_{it} + \lambda_4 (E/P)^{+}_{it} + \lambda_5 (DEP^{-})_{it} + \varepsilon_{it}$$

where $R_{i,t+1}$ is the rate of return month *t+1*; ME_{it} is the market value of equity; BM_{it} is the ratio of book value of equity to its market value; E/P^{+}_{it} is the earnings to price ratio for company *i* with positive earnings; DEP^{-}_{it} is a dummy variable that takes a value of 1 for firms with negative earnings, zero otherwise, in month *t*. λ_0, λ_1, λ_2, λ_3, λ_4 and λ_5 are regression coefficients and e_{it} is the error term; *ln* denotes the natural logarithm operator. The regression models above were estimated 84 times for every month *t* between January 1992 and December 1998. Hence, we had 84 estimates for each l in every model. The average value of each l, over 84 estimates were found and tested for significance via *t*-test. We report our results for the full sample, as well as the two sub-periods.

Results of Fama-MacBeth regressions are given in Table 8. In the table, rows represent models, while figures in the body of the table are time series averages of regression estimates; *t*-statistics are in parentheses. In the model where beta is the only explanatory variable, the coefficient cannot be distinguished from zero, rejecting the central prediction of the capital asset pricing model.

Table 8

Average Slopes from Month-by-Month Cross-Sectional Regressions of Stock Returns on Beta, Size, Book-to-Market, and E/P

(A) Full sample: January 1992–December 1998

Intercept	β	ln ME	ln (B/M)	E/P+	DEP-
0.0725	0.0006				
(10.1082)	(0.1033)				
0.1137	–0.0011	–0.0100			
(10.1606)	(–0.1810)	(–5.1009)			
0.1238	–0.0070	–0.0063	0.0130	0.0397	0.0283
(10.16)	(–1.07)	(–2.94)	(2.87)	(0.50)	(2.65)

(B) Sub-sample: January 1992–June 1995

Intercept	β	ln ME	ln (B/M)	E/P+	DEP-
0.0912	0.0026				
(7.19)	(0.25)				
0.1478	0.0018	–0.0149			
(7.63)	(0.17)	(–4.40)			
0.0796	–0.0122	–0.0092	0.0232	0.1914	0.0351
(6.12)	(–1.05)	(–2.44)	(2.79)	(1.31)	(1.88)

(C) Sub-sample: July 1995–December 1998

Intercept	β	ln ME	ln (B/M)	E/P+	DEP-
0.0543	–0.0013				
(7.84)	(–0.21)				
0.0804	–0.0040	–0.0052			
(7.01)	(–0.64)	(2.57)			
0.0796	–0.0020	–0.0036	0.0031	–0.1085	0.0216
(6.12)	(–0.31)	(–1.64)	(0.82)	(–1.71)	(2.05)

Note: Cross-sectional regressions of stock returns on beta, size, book-to-market, and E/P are run for each month in the period from 1992 to 1998. Time series averages of estimated regression coefficients are computed and reported in the body of the table; *t*-statistics are in parentheses.

In the next model, where firm size is added as an explanatory variable along with beta, beta still remains insignificant, whereas the size variable has explanatory power with a negative sign. This finding is a manifestation of the well known "size effect" in

the literature. The negative sign of the size variable is consistent with the results of the tabular analysis above (see Table 2). The coefficient remains significant, albeit with a lower *t*-statistic, even in the second sub-period. When all variables are entered into the model, book-to-market, size, and negative E/P dummy have significant coefficients with positive values for book-to-market and dummy, and negative value for the size variable. While beta keeps lacking significance as before, the explanatory power of the E/P ratio vanishes when other variables (e.g., book-to-market, size, and negative E/P dummy) are added into the regressions. Fama-MacBeth regressions confirm our earlier findings. Expected returns can best be explained with book-to-market and size of stocks. E/P ratio has an explanatory power when only beta and itself are in the regression (not reported), whereas market beta plays no role at all in determining the cross-section of expected returns. Stocks with negative earnings command a higher return. The results of the earlier sub-period are in line with the full sample. Yet, as we have demonstrated in the tabular analysis above, the second period that covers 1995–98, the relationship between stock returns and explanatory variables totally disappears. Negative E/P dummy remains to be an exception, while book-to-market and size cease to be significant, although they keep their signs as before.

Discussion

The major findings of this study are consistent with the results of similar studies carried out in major developed markets (e.g., Fama and French 1992; and Chan et al. 1991). Research on emerging markets—which are characterized by high average returns, high volatility, and low correlations with other markets—report findings similar to developed markets. However, unlike this study, emerging market results are obtained on aggregate national data, as opposed to individual stocks. For example, Bekaert et al. (1997) reported that average market returns in emerging markets vary inversely with market capitalization, P/E, and book-to-market.

It is now a well established fact that book-to-market and firm

size are two characteristics that best explain stock returns in the United States and Japan. However, the former (i.e., book-to-market) varies directly with returns, while the latter is inversely related to stock returns. E/P, though not as powerful as these two, also has a strong positive relationship with returns in developed markets. Although we obtained similar findings over the full sample, our results departed from those in the literature in one significant way. The relationship between stock returns and explanatory variables disappeared during the second sub-period. This segment of data covered the period between July 1995 and December 1998. Firm size, book-to-market, and E/P ceased to be significant in this period, after displaying a strong explanatory power during the earlier sub-period. It is clear that overall results were dominated by the relationships found in this segment of data. At this point, we do not have any readily available explanation for the disappearance of the relationship. However we can offer some clues that may help us understand our findings.

The first line of explanation can attack data and sample problems. One can argue that our findings in general are sample-specific, due to the short period and smaller number of companies. Yet one must also remember that we included all non financial firms and went back as far as possible in time, to 1990. The time period we excluded belongs to the initial development stage of the Istanbul Stock Exchange, which started its operations only in 1986. Therefore any meaningful replication of our study, to see if the results reported here were sample-specific, should wait a few more years for new data to become available.

Our explanation is based upon the changing trading strategies in the market. Since opening up to foreign investors following financial liberalization in 1980s, the Turkish market has gone a long way toward integration with the global capital markets. This is hardly surprising when we consider the investor profile in the Turkish stock market. It has been reported that almost one-half of the stocks being traded in the market are held by foreign investors. Domestic investors in the stock market are mostly individuals who are known to speculate in the short term. Hence, although they own less than half of the shares outstanding, they account for 90 per-

cent of the trading. Most of the foreign investors, on the other hand, are institutions that try to diversify internationally. These investors follow similar indicators across different markets, contributing to the integration process. However, with the publication of consistent empirical regularities in the academic literature, investors increasingly are following the same indicators, such as P/E and book-to-market. The natural outcome of similar investment behavior based on empirical regularities is the self destruction of such anomalies. Already there are indications of the disappearance of certain calendar anomalies. The so-called January effect, for example, has not appeared in recent years. Similarly, small firms earning higher returns have not been observed consistently during the recent time period. We believe that our findings in the more recent 1995–98 period are the initial signs of the self-destruction process. Yet, similar empirical regularities must be confirmed in other markets.

Summary and Conclusions

This paper investigates the cross-section of stock returns in the Turkish stock market. The methodology adopted in the study is similar to Fama and French (1992). We have included all nonfinancial companies during the period January 1992–December 1998. We have examined the impact of market risk measured by beta, firm size, book-to-market, and earnings-to-price (E/P) ratios on monthly stock returns. Cross-tabulation of monthly returns indicate that stock returns vary directly with book-to-market, and inversely with firm size; market beta has no effect at all. These findings were confirmed with the Fama-MacBeth algorithm, which employs time-series and cross-sectional regression. Significant explanatory factors, namely book-to-market, size, and E/P cease to have an explanatory power during the second period, covering 1995 and 1998. Although our study does not offer any clues to the underlying reasons for this anomaly, we nevertheless suggest some insights. Specifically, we point out changing trading strategies based on well-publicized empirical regularities as potential reasons for our findings.

It is evident that much has yet to be done to understand the nature of stock returns in an emerging market. As a first step, additional variables such as leverage and the cash flow-to-price ratio can be included in a similar analysis. Then, proposed reasons for anomalous findings can be further elaborated. Depending on the availability of data, investigation of investor profiles for different time periods and stocks may yield interesting clues.

Notes

1. We would like to express our thanks to Alternatifbank for providing the ISE financial statement data on electronic media.

2. On the average, 10.7 percent of the firms had negative E/P values.

3. In order to investigate the effect of a high-inflation environment on our findings, we repeated Fama-MacBeth regressions with inflation-adjusted accounting data. We adjusted monthly values of EPS and book values according to changes in the CPI. The results that we obtained from inflation adjustment on accounting variables were in line with our earlier findings; hence, they are not reported.

4. For a brief exposure to the development of Istanbul Stock Exchange and its main indicators, readers can refer to Aydogan and Muradoglu (1998).

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