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Determinants of Financial vs. Non Financial Stock Returns: Evidence from Istanbul Stock Exchange

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Abstract

We estimate a four-factor model for a sample of financial and nonfinancial firms traded on the Istanbul Stock Exchange (ISE). The factors relate to market return, interest, inflation and exchange rates. By investigating the effects of these factors simultaneously for different exchange rate regimes, we show that market return, interest, inflation, and exchange rates play a separate role in financial and nonfinancial firms' stock returns. We also show that all factors are priced during the period of free float. These results are important for determining financial institutions' cost of capital and for identifying the risks that should be hedged.

Keywords Interest rate risk; Inflation risk; Foreign exchange risk;

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1. Introduction

The empirical literature on the determinants of financial institution stock returns has identified market return, interest, inflation, and exchange rates as important factors. Choi et al. (1992) examine the joint impact of the market return, interest rates and exchange rates on U.S. bank returns. Chamberlain et al. (1997) compare the impact of the market return, interest rates, and exchange rates on U.S. and Japanese banks. Lajeri and Dermine (1999) focus on the joint sensitivity of market return, interest rates, and inflation rates on French banks. Yet, we know of no study that has investigated the simultaneous effect of all these factors on financial and nonfinancial firms' asset returns.

In this paper we estimate a four-factor Arbitrage Pricing Theory (APT) model in which the factors relate to the unexpected shocks on market return, interest rates, inflation rates and exchange rates. We use a sample of firms traded in the Istanbul Stock Exchange (ISE). Our choice is dictated by the fact that the ISE is one of Europe's largest and fastest growing emerging equity markets. Further, the Turkish economy has been characterized by high interest and inflation rates for over two decades. To scrutinize the role of each of these factors for different periods of exchange rate regimes, we perform separate regressions over four different periods, the full sample, the managed-float, crawling-peg, and free-float periods.

Our results provide evidence that the percentage of financial stocks that are affected by interest, inflation, and exchange rates is generally higher than that of nonfinancial firms. Our cross-sectional regressions show that each of these factors has a separate effect on stock returns, and that this effect is different for financial institutions and nonfinancial institutions. Our results also show that all of the factors that we consider are priced during the period of free float. These results are important for the determination of the cost of capital of financial institutions and for identifying the risks that should be hedged.

The paper is organized as follows: In Section 2 we review the literature. In Section 3 we describe the Turkish economy, and in Section 4 we present our methodology. Section 5 describes our data, and in Section 6 we discuss our results. Section 7 concludes.

2. Literature Survey

The interest-rate variable has major importance in the valuation of common stocks of financial institutions, because the revenues and costs of these institutions directly depend on interest rates. Not surprisingly, many studies have investigated the impact of interest rates on financial stock returns (Flannery 1981; Flannery and James 1984; Flannery et al. 1997; Saunders and Yourougou 1990; Lajeri and Dermine 1999; Elyasiani and Mansur 1998; Elyasiani, Mansur and Pagano 2007; and others). A few studies, such as Bartram (2002), have focused on the impact of interest-rate exposure on nonfinancial firms.

Interest-rate exposure for financial firms mainly stems from the maturity mismatch between assets and liabilities. A short-funded bank's stock return will be negatively affected by an increase in interest rates and vice versa. However, empirically, we cannot always expect a negative sign on the sensitivity coefficient, since the sign will eventually depend on how well the financial institutions are hedged (Flannery 1981). Banks hedge against interest-rate exposure by reducing their duration gap, securitizing their loans, switching to off-balance sheet activities, and using derivative products (Elyasiani and Mansur 1998).

Saunders and Yourougou (1990) show that the interest-rate sensitivity of firms' assets and liabilities partially explains the differences in common stock returns. They also show that nonfinancial firm stocks are less sensitive to unexpected changes in interest rates than are financial firm stocks. Using a two-factor APT model, Yourougou (1990) provides further evidence that interest-rate risk has a significant (negative) impact on the stock prices of financial intermediaries, but not on nonfinancial intermediaries.

Bartram (2002) focuses on the interest-rate exposure of nonfinancial corporations. Interest-rate exposure affects nonfinancial firms either directly, through changes in the cash flows and the value of financial assets and liabilities, or indirectly, through changes in the competitive position of the firm. He reports significant linear and nonlinear exposures that are determined by measures of firms' liquidity rather than financial leverage.

The impact of the inflation factor on the market value of banks has been studied theoretically by Kessel and Alchian (1960), Fisher and Modigliani (1978), and Dermine (1985; 1987). The main idea that emerges from these studies is that financial stocks should be negatively affected by inflation. At the same time, nonfinancial stocks should provide a natural hedge against inflation because they represent claims to real assets. Studies by Lintner (1975), Fama and Schwert (1977), Modigliani and Cohn (1979), Fama (1981), Cohn and Lessard (1981), Geske and Roll (1983), and Boudoukh and Richardson (1993) indicate that the empirical testing of the impact of inflation on common stock returns provides conflicting evidence. However, the only empirical study we know of on the relation of inflation and financial stock returns is that of Lajeri and Dermine (1999) on the French market. Their findings show that in periods of high and volatile inflation, there is an inflation risk factor that is independent of the well-documented interest-rate factor, and that these factors affect bank stock returns and nonfinancial stock returns differently.

In addition to the interest and inflation factors, it is important to consider the exchange rate factor. Firms typically face two types of foreign-exchange exposure, transaction and economic exposure. Transaction exposure is a short-term exposure relative to transactions that are made in foreign currency. It results from the movement in exchange rates between the dates the transactions are entered to and the dates they are settled. Firms usually hedge transaction exposure by netting, using derivative products, or using money market hedges. Economic exposure is a long-term exposure. It is the degree to which the value of the company is sensitive to unexpected movements in the exchange rate. It is relative to the input/output markets and to the overall competitiveness of the firm. So, even if a firm does not have any transaction exposure, it may well be exposed to economic risk. Firms usually hedge economic exposure by matching cash flows and spreading activities.

Jorion (1991) finds that foreign-exchange exposure is different across industries, but he does not identify a significant effect on financial stocks. Overall, he does not find evidence that the exchange risk is priced in the US market. His paper confirms the results of Amihud (1993) and Bodnar and Gentry (1993). Giovannini and Jorion (1989) show that the foreign-exchange market is characterized by nonzero conditional premia. Dumas and Solnik (1995), and De Santis and Gerard (1998) show that the time-varying exchange risk receives a statistically significant price in international capital markets. Doukas et al. (1999) and Choi et al. (1998) provide evidence that currency risk is priced in Japan.

We know of only two studies that look specifically at the impact of exchange rates on financial stocks, Choi et al. (1992) and Chamberlain et al. (1997), although Grammatikos et al. (1986) suggest that exchange-rate risk could be an important factor in determining bank returns. The Choi et al. (1992) and Chamberlain et al. (1997) studies examine the joint impact of interest rates and exchange rates on bank stock returns. Their focus stems from the growing international attention given to banks' risks, including currency risk. Choi et al. (1992) show that exchange rates have an effect that is independent from that of interest rates, and that this effect changes over time. Chamberlain et al. (1997) note that the 1993 Basel Accord suggested that foreign-exchange risk could be measured by tallying up net open positions across currencies, including positions arising from both assets and liabilities, and from off-balance sheet instruments. They provide evidence that the percentage of banking firms affected by exchange rates is much higher in the U.S. than it is in Japan.

Although several researchers have used Istanbul Stock Exchange data, see for instance Bildik and Gulay (2007), Dogan and Yalcin (2007), Erdem et al. (2005), Odabasi et al. (2004), Muradoglu et al. (1999), none of them explore whether market return, interest, inflation, and exchange rates play a separate role in explaining financial and nonfinancial firms' stock returns. In that regard our study fills a unique gap in the literature.

3. The Turkish Economy

For over two decades the Turkish economy has been characterized by persistently high inflation. The public deficit, high level of government debt, and repeated devaluations of the Turkish lira contributed to the high inflationary environment. The ever-increasing government debt also kept interest rates very high. A large part of the debt was financed with foreign borrowing. Turkey signed many stabilization agreements with the International Monetary Fund (IMF) but none of them were successful. Then in 1998, the availability of external financing was limited by the Russian crisis. In 1999, Turkey signed another IMF stand-by accord, the major aim of which was to cut inflation. However, the program had other objectives, such as banking sector reform and privatization. But although inflation started going down the other components of the program lagged behind.

Our study of the Turkish stock market spans three exchange-rate regimes. From 1986 until 1998, it used a system of managed float. Initially, the Central Bank announced daily quotations of a nominal exchange rate. In this system, the Turkish lira depreciated continuously along with inflation expectations. Later, the Central Bank launched the interbank spot exchange market. From 1998 to 2001, the Central Bank introduced a system of crawling peg, initially around the deutschmark and later against the euro. The new system, which was part of the IMF stabilization program, limited the pace of depreciation of the currency to the programmed inflation rate. The system helped bring inflation and interest rates down. However, the fragility of the financial sector led to the banking and currency crises of 2001. In February 2001, the Central Bank abandoned the crawling peg regime in favor of a free float regime. This new regime was part of a new IMF package that also included acceleration of the restructuring of the banking sector.

The banking sector in Turkey faced several problems. Banks were dependent on the high interest earnings from government bonds. State banks were weakened even further by the role they had to play in financing government policy. The government introduced a 100% deposit insurance following the financial crisis of 1994 which led to an increase in moral hazard and erosion of market discipline.

Under the 1999-2000 IMF program, the Turkish government tried to solve some of the issues by seizing troubled banks, establishing a banking sector watchdog, recapitalizing public and state banks, and tightening banking regulations. The government required banks to set up internal risk management systems and to provide more thoroughly for bad loans. However, the situation worsened as banks avoided regulations and increased their short term hard currency borrowing to benefit from the crawling-peg policy. When the Turkish lira devalued in February 2001, banks with net foreign-currency liability suffered an instant loss. More troubled banks were seized by the government. In the first half of 2002, the Banking Regulations and Supervision Agency, which began operating in 2000, subjected all banks to a special audit to ensure that they matched up to a new 8% capital adequacy requirement. At the end of 2003, the government further tightened banking regulation and supervision. In May 2005, the Turkish government signed a three-year IMF stand-by credit agreement that called for additional legislation to improve the regulation and supervision of the financial sector. The following three years after the IMF stand-by agreement was signed, efforts to restructure the banking sector were accelerated.

4. Methodology

We use a four-factor APT model to test the joint sensitivity of stock returns to market, interest-rate, inflation-rate, and exchange-rate factors. Earlier studies such as Saunders and Yourougou (1990), Yourougou (1990), Choi et al. (1992), Chamberlain et al. (1997), and Lajeri and Dermine (1999), use either two or three of these factors to analyze the returns of bank equity stocks. However, to accurately determine the cost of capital and to identify the risks that should be hedged, we believe it is essential that all factors are considered simultaneously. This reasoning is intuitive, as each factor affects stock returns both significantly and differently. Furthermore, these effects may differ over periods of different exchange-rate regimes. Hence, we assume that the four-factor model can apply to both financial and nonfinancial firms traded in the ISE. We then implement this model for different periods.

4.1. The Model

The model in Equation (1) describes the *ex-post* return generating process for the stock of firm *i*:

$$r_{it} = E(r_{it}) + \sum_{j=1}^{j=4} \beta_{ij}(F_{jt} - E(F_j)) + \varepsilon_{it} \quad \forall i \in [1,N],\ \forall j \in [1,4],\ \forall t \in [1,T] \qquad (1)$$

where r_{it} denotes the actual return on stock of firm i (i=1,...N) at time t (t=1,...T), E(). denotes the expectation operator, F_{jt} is the level of factor j (j=1,…, 4) at time t, $(F_{jt} - E(F_j))$ measures the unexpected shock in factor j at time t, β_{ij} indicates the sensitivity coefficient of the return of firm i to the unexpected shock in factor j, and ε_{it} is an idiosyncratic term. The macroeconomic factors F_j are the unexpected changes in the market returns, interest rates, inflation rates, and exchange rates.

We estimate the model for individual firms as well as for financial and nonfinancial institutions traded in the ISE. We perform a time-series-cross sectional estimation on data in each group to see whether the market distinguishes between the two types.

4.2. Estimating the Factors

In our empirical investigation, we use unexpected shocks to the macroeconomic variables as potential factors that affect firms' returns. The use of unexpected components removes a potential multicollinearity problem that might arise if we were to use the actual values. This approach is an alternative to a more standard orthogonalization procedure to generate the factors.[3] We define an unexpected shock to variable Y_j as the difference between the realized and the expected level of that factor:

$$Y_{jt} = E_{t-1}(Y_{jt}) + U_{jt} \quad \forall j \in [1,4], \forall t \in [1,T] \tag{2}$$

where Y_{jt} is the actual level of variable Y_j at time *t*, $E_{t-1}(Y_{jt})$ is the expected value at time *t-1*, and U_{jt} is the unexpected shock on Y_{jt}. If financial markets are efficient, then the expected levels of the variables should already be reflected in the expected return of the stocks.

Following previous work by Sweeney and Warga (1986), Yourougou (1990), Choi et al. (1992), and Lajeri and Dermine (1999), we use ARIMA models to generate forecasts, which are used to estimate the unexpected shocks.

The general ARIMA(p,d,q) model takes the form,

$$\Phi(L)(1-L)X_t = \mu + \Gamma(L)\varepsilon_t \tag{3}$$

where L is the back shift operator. Φ and Γ are polynomials of degrees p and q, respectively, and represent the autoregressive and moving average components. This specification allows

[3]See, e.g., Flannery and James (1984) and Jorion (1991). However, Giliberto (1985) points out the danger of biases introduced by the orthogonalization of factors.

us to generate the unexpected shocks series by taking the difference between the forecasted values and the realized values.

4.3. Estimating the Risk Premia

If we assume no arbitrage profit opportunities in an APT framework, then the *ex ante* expected return on individual stock i is given by:

$$E(r_i) = \alpha_0 + \sum_{j=1}^{j=4} \beta_{ij}\alpha_j \quad \forall i \in [1,N],\ \forall j \in [1,4] \tag{4}$$

where α_0 is the risk-free rate, β_{ij} *(i=1..N; j*=1..4*)* represents the sensitivity coefficient of firm *i* with respect to factor *j*, and α_j is the risk premium of factor *j*.

Substituting (4) into (1) yields

$$r_{it} = \alpha_0 + \sum_{j=1}^{j=4} \beta_{ij}(\alpha_j - E(F_j)) + \sum_{j=1}^{j=4} \beta_{ij}F_{jt} + \varepsilon_{it} \tag{5}$$

$\forall i \in [1,N]$, $\forall j \in [1,4]$, $\forall t \in [1,T]$

Letting $\delta_j = \alpha_j - E(F_j)\quad \forall j \in [1,4]$ and $U_{jt} = F_{jt}$ and replacing in the above equation yields:

$$r_{it} = \alpha_0 + \sum_{j=1}^{j=4} \beta_{ij}\delta_j + \sum_{j=1}^{j=4} \beta_{ij}U_{jt} + \varepsilon_{it} \quad \forall i \in [1,N],\ \forall j \in [1,4],\ \forall t \in [1,T] \tag{6}$$

where U_{jt} is the unexpected shock of factor *j*.

We can estimate Equation (6) by using a one-step Gauss-Newton procedure in which we linearize the system using Taylor series expansions around consistent estimators of the sensitivity coefficients and the risk premia (Gibbons 1982).

We use two steps to perform the Gauss-Newton procedure. First, we obtain estimates of the sensitivity coefficients β_j through an OLS estimation of equation (1). We then obtain estimates of the risk primia α_j through a regression of returns on estimated sensitivity coefficients β_j. In the second step, we use these estimates as inputs in a one-step Gauss-Newton procedure. Fama and McBeth (1973) and Black et al. (1972) use a grouping technique to alleviate the error-in-variable problem. The one-step Gauss-Newton procedure increases the precision of the estimated risk premia (Gibbons 1982) by as much as 76% compared to the Black et al. (1972) procedure. Further, Shanken (1992) notes that the one-step Gauss-Newton procedure alleviates the error-in-variable problem. He shows that when an estimator of the covariance matrix of returns is incorporated, the one-step Gauss-Newton procedure and MLE methods are asymptotically equivalent.

Taylor series expansions of $\beta_{ij}\delta_j$ for j =1..4 around the consistent estimators yield:

$$\beta_{ij}\delta_{ij} \approx \hat{\beta}_{ij}\delta_j + \beta_{ij}\hat{\delta}_j - \hat{\beta}_{ij}\hat{\delta}_j \tag{7}$$

Combining (7) with (6) yields:

$$r_{it} + \sum_{j=1}^{j=4} \hat{\beta}_{ij}\hat{\delta}_j = \alpha_0 + \sum_{j=1}^{j=4} \hat{\beta}_{ij}\delta_j + \sum_{j=1}^{j=4} \beta_{ij}(U_{j,t} + \hat{\delta}_j) + \varepsilon_{it} \tag{8}$$

$\forall i \in [1, N]$, $\forall j \in [1,4]$, $\forall t \in [1,T]$

A one step Gauss-Newton estimation of (8) gives the estimates of the sensitivity coefficient β_j and of δ_j. We recover the premia α_j by adding the expected value of factor j.

5. Data

We obtain adjusted monthly stock prices and market index data from January 1986 to September 2005 from the ISE. The sample includes 51 financial firms (10 banks, 7 leasing/factoring firms, 29 investment firms and 5 insurance firms) and 225 nonfinancial firms. (We note that when we perform the analysis for banks alone, we obtain similar results.) The sample includes all firms for which data are available.

The International Financial Statistics (IFS), which are produced by the IMF, provides monthly inflation rates and T-bill rates. We obtain exchange rates for the Turkish lira with respect to the U.S. dollar, the Japanese yen, the UK pound and the euro from the IFS.[4] We use these data to construct an equally weighted basket of the four currencies. We use the unexpected change in the value of this basket as our proxy for the foreign-exchange variable.

We perform estimations for the whole period 1986-2005, as well as subperiods. We choose the cut-off dates to correspond to changes in foreign-exchange regimes. The first period, 1986-1998, corresponds to a period of managed float. The period from February 1998 until February 2001 corresponds to a period of crawling peg, initially around the deutschmark then around the UK pound. The last period, from February 2001 to 2005, corresponds to a period of free float. During the 1986-2001 period, interest and inflation rates were very high, reaching a double-digit level. But they both began to decline following the restructuring of the economy and the banking system in 2001 that is supported by the IMF mandated package.

5.1. Multicollinearity

Two important questions are why does the market return not capture the interest-rate effect and why does the interest-rate factor not capture the inflationary effect? For the interest-rate factor, Flannery (1981) and Flannery and James (1984) find that if firms (banks) are not well hedged, then they will be sensitive to (unanticipated) interest-rate changes and to changes in

[4] The Turkish Central Bank implemented daily exchange rate adjustments in 1980. In 1984, the government introduced a substantial financial and trade liberalization package. This package was modified in 1989 and 1990, widening the scope of the capital account regime. At the same time, the Turkish Lira became fully convertible. In the early 1980s, free market rates were different from official rates, but by 1986-1987, these rates were at least similar, if not identical.

the market return. This argument is also valid for the inflation and exchange-rate factors. If firms are not well hedged, then theoretically, we could expect simultaneous effects on firms' returns for at least some periods.

Since our main concern in this paper is to dissociate the separate impact of each factor, it is important that we check the correlation between the factors and test for multicolinearity. The correlation coefficient between the exchange rate factor and the inflation factor is the highest at 40%, followed by the correlation coefficient between the market factor and the interest-rate factor at –23%, and then by the correlation coefficient between the exchange rate factor and the interest rate factor at 15%. The variance of the inflation factor (VIF) has values that range from 1.02 to 1.74. These results indicate that there is no multicollinearity pattern.

We note that the absence of multicollinearity is due to the fact that our factors are the unexpected shocks in the market, interest, inflation, and exchange-rate factors. If we were to look at the expected shocks, then we would expect higher correlation coefficients between the factors that are due to the international parity relations (purchasing power parity and interest rate parity) for at least some of the periods. However, it is reasonable to assume that the expected shocks are already embedded in returns. Therefore, our factors are the unexpected rather than expected shocks.

5.2. Portfolio Grouping

First, we divide the sample of firms into two groups, financial and nonfinancial firms. We do so to estimate and compare the sensitivity (β_{gi}, g =1,2) of their returns to the unexpected shocks on the factors. Second, we estimate the risk premia (α_i) using the method described in Section 3. Following Yourougou (1990) and Lajeri and Dermine (1999), we use a modified version of the Fama and McBeth (1974) grouping. We then divide the returns into two subsamples, the odd months and the even months. We use the odd month subsample to estimate the sensitivity coefficient of each stock to the different shocks. We rank the subsample according to the size of the interest-rate sensitivity coefficient and divide it into two subgroups. We rank each subgroup according to the inflation-rate sensitivity coefficient and then divide each subgroup into three subgroups. Finally, we rank each new subgroup by exchange-rate sensitivity and divide it into portfolios comprising three securities. We use this grouping technique to create the maximum dispersion in the distribution of sensitivity coefficients.

For each group, we form an equally weighted portfolio. We use the even-month subsample in a two-step estimation of the sensitivity coefficients and the risk premia. We then use these estimates in a second stage as inputs in the one step Newton-Gauss estimation as suggested by Gibbons (1982).

6. Empirical Results

We select the ARIMA models for predicting the expected market return, interest rate, inflation rate and exchange rate variables on the basis of the Akaike and Schwarz information criteria. Both methods aim at finding the model that best explains the data with the minimum of free parameters, except that the Akaike criterion penalizes free parameters less strongly than does the Schwarz criterion. Here, both criteria lead us to similar specifications.

6.1 Factor Analysis for Financial vs. Nonfinancial Firms

We initially estimate Equation (1) for each firm. Table (1) presents the number/percentage of firms in each group for which the hypothesis that the sensitivity coefficient is zero is rejected at the 5% or 10% levels. Table (1) shows that the market factor is the most important factor in explaining the returns of both financial and nonfinancial firms. The percentage of firms for which the market beta is significant is higher than 90% for both groups. The table also shows that the interest, inflation, and exchange rate factors play a role in explaining stock returns.

Our results show that in general, the percentage of financial firms with significant interest-rate sensitivity is higher than that of nonfinancial firms. In both groups, more firms are affected negatively. The period 2001-2005 is an exception, since more firms are affected positively in both groups.

The inflation factor seems to affect both groups in similar ways. The impact is mainly positive for both financial and nonfinancial firms. However, over the 2001-2005 period, more financial firms are affected by inflation in a negative way while more nonfinancial firms are affected in a positive way. As mentioned earlier, beginning in 2001, following the restructuring of the economy inflation began to decline steadily. During this period, the government introduced new banking regulations to strengthen the financial system in Turkey. Hence, it seems that these changes in the economy and in the way financial companies operated affected how inflation impacted financial and nonfinancial stock returns.

Table (1) also shows that more financial firms are affected by the exchange rate factor than are nonfinancial firms, and the impact is mostly negative. The managed-float period, 1986-1998, is an exception, as not many firms of either group have significant exchange-rate sensitivity. During this period, more nonfinancial firms are affected negatively. The 1998-2001 crawling-peg period is another exception, as the impact of exchange rates is mainly positive for both groups. We also note that more nonfinancial firms are affected by exchange rates than are financial firms. It is plausible that during this period, firms are better able to hedge their exposures because they have more time to adjust.

We note that the percentage of firms affected by the interest and inflation factors is small compared to the percentage of firms affected by the market and exchange rate factors, and that in some cases the range of coefficient values is wide. Although we believe that regressions at the firm level may be informative, different firms have different exposures and different abilities to hedge these exposures, so group regressions are certainly more relevant from a diversified investor's prospective.

Table (2) provides the summary statistics for the distribution of the sensitivity coefficients for each group. The results indicate that over the whole period, on average, the interest-rate sensitivity is negative for both groups of firms. Nonfinancial firms seem to be more affected by interest rates. Over the 1986-1998 period, interest-rate sensitivity is positive for financial firms and negative for non financials. In the context of the Turkish market this result is not surprising. To finance its deficit, the Turkish government was issuing high-yield bonds. In many cases, nonfinancial firms were generating more profit from these bonds than from their operations. Their exposure to interest-rate movement was high and they were not necessarily well-hedged against interest-rate risk.

Over the 1998-2001 period, on average, the interest-rate sensitivity is again negative for both groups. During this period we see that financial firms are affected more by interest rates than are nonfinancial firms. This result could be due to excessive risk-taking by financial institutions. As we noted earlier, the Turkish government introduced 100% deposit insurance following the financial crisis of 1994. This new regulation led to an increase in moral hazard and erosion of market discipline.

Over the 2001-2005 period, interest-rate sensitivity is positive for both groups of firms. In this period, interest rates started to fall because the rate of inflation declined due to the implementation of an IMF-mandated program. Furthermore, the government put into place new regulations aimed at accelerating the reform of banking practices.

When we look at the impact of inflation, we observe that over the 1986-1998 and 1998-2001 periods, on average, financial firms are negatively affected by inflation while nonfinancial firms are affected positively. Yet, nonfinancial firms do not seem to represent a good hedge against inflation in these periods. Over the 2001-2005 period, inflation affects both groups of firms in a positive way. During this period, nonfinancial firms seem to represent a good hedge against inflation, but financial firms do not.

We also detect that the exchange-rate factor seems to affect both groups negatively in almost all periods. This observation may be due to the fact that both financial and nonfinancial firms use hard currency as an instrument against the effects of high inflation. In such an environment, unexpected shifts in the value of foreign currency could have adverse effects on the balance sheets of the firms, rendering an overall negative effect. However, financial firms seem to be affected more than are nonfinancial firms.

Table (3) reports the time-series cross-sectional estimation of equation (1) on the groups of financial and nonfinancial stocks separately. Over the whole period, 1986-2005, financial firms are negatively affected by interest rates only at the 10% level. They are positively affected by inflation, also at the 10% level. Finally, they are negatively affected by exchange rates at the 1% level. Nonfinancial firms are affected by all factors at the 1% level. Furthermore, the impact of interest rates on nonfinancial firms seems to be higher than that on financial firms. A comparison shows that the market beta is higher for financial firms at the 10% level, the inflation beta is similar for both groups at the 5% level, and the exchange-rate beta is more negative for nonfinancial firms at the 1% level.

The negative interest-rate beta for nonfinancial firms is explained by their investment in government bonds, and also by the fact that nonfinancial firms are not necessarily well-hedged against interest rates. The negative foreign-exchange beta for financial firms is explained by the fact that the government deficit was largely financed through banks that borrowed heavily abroad. Either a large short position in foreign currency or a position that is not fully hedged could show a negative foreign-exchange beta.

During the managed-float period, 1986-1998, interest rates affect both groups negatively, but nonfinancial firms are affected more. This period corresponds to the period of higher-yield government bonds. The market beta is higher for nonfinancial firms at the 5% level. Neither group is affected by inflation, even though this period corresponds to the double-digit inflation period. This result could be explained by the fact that firms learned to live in an inflationary environment, using government bonds and hard currency as a protection against inflation. Therefore, both groups are negatively affected by exchange rates, but financial firms are affected more at the 5% level. In all subperiods the impact on nonfinancial firms is the lowest and that on financial firms is the highest.

During the crawling-peg period 1998-2001, the market beta is not significantly different between the two groups. Interest rates affect both groups in a negative and similar way. As we noted earlier, the significant negative interest-rate exposure for financial firms can be explained by the excessive risk-taking that resulted from the imposition of the 100% deposit insurance requirement. Both groups are affected similarly by inflation, and in a positive way. Neither group is affected by exchange rates, as it is easier to hedge currency exposure during a crawling-peg regime.

During the free-float period, 2001-2005, the market beta is higher for nonfinancial firms at the 1% level. Only nonfinancial firms are affected by interest rates, and the impact is positive. As interest rates go down, interest-rate exposure shrinks and may become easier to hedge. Both groups are similarly and positively affected by inflation. Both groups are negatively affected by exchange rates, but financial firms are still affected more at the 1% level.

Table (4) shows the change in return in response to a one-standard-deviation shock on the factors. The market factor is the most important cause affecting stock returns. A one-standard-deviation shock in market returns leads to between 10% and 17% change in stock returns; the size of the effect depends on the period under scrutiny.

The impact of a one-standard-deviation shock on the interest-rate factor causes a change in stock returns between -1.72% and 0.75%. The results confirm the findings in Table (3). Over the whole period, nonfinancial firms are more negatively affected than are financial firms. Over the managed-float period, only nonfinancial firms are affected; the impact is -0.9%. Over the crawling-peg period, the impact on financial firms is -1.72%, and -1.46% for nonfinancial firms. Over the free-float period, the impact on nonfinancial firms is 0.75%, but it is not significant for financial firms.

The impact of an inflationary shock is similar for both groups over the whole period (around 0.7%), but it is significant at only the 10% level for financial firms. It is not significant for either group during the managed-float period. It is positive for both groups during the crawling-peg period, at 1.22% for financial firms and 0.88% for nonfinancial firms. Over the free-float period, the impact on financial stocks is 0.92% and 1.45% for nonfinancial stocks.

Over the whole period, the impact of a currency shock is –2.02% for financial firms and -0.9% for nonfinancial firms. Over the managed- and free-float periods, the impact is negative for both types of firms, and higher for the financial firms compared to the nonfinancial firms. Over the crawling-peg period, the impact is not significant for either type.

Table (5) summarizes the estimation results of equation (8) on the full sample of firms. The results indicate that the market factor is priced over the entire period as well as all subperiods. During the managed-float period, only the inflation factor is priced along with the market factor, and the premium is negative. During the crawling-peg period, the market actually carries a negative premium and it is the only factor priced. Over the free-float period, all factors are priced and the interest-rate premium is negative: the positive sign of the interest-rate beta indicates that the market attaches a negative value to unexpected increases in interest rates.

Our analysis shows that the impact of the market, interest, inflation, and foreign-exchange rate factors changes over different time periods for both groups of firms. These periods correspond to different monetary policy and foreign-exchange regimes. These findings support results from Kane and Unal (1988), Saunders and Yourougou (1990), Yourougou (1990) and Choi et al. (1992), all of whom find that interest-rate sensitivity changes over time.

6.2 ARCH Modeling

A stream of studies model bank returns using ARCH/GARCH method (Song 1994; Flannery et al. 1997; Elyasiani and Mansur 1998; Elyasiani et al. 2007). We implement GARCH models in the spirit of Elyasiani and Mansur (1998) and Elyasiani et al. (2007), using equally weighted indexes constructed from the financial and nonfinancial firm data. We construct some ARCH models to see if the data can be characterized by such effects.

We find that within the context of ARCH models, the data do not provide support for any specification in which the conditional variance of interest, inflation, exchange rates or market return have an impact on the conditional variance of financial or non financial firm returns, as discussed by Elyasiani et al. (1998). However, our regression results show that the data support the presence of ARCH effects for both financial and nonfinancial excess returns. (See Table 6 which presents results for the full data, and Table 7, which depicts results in which we allow the slope coefficients to differ following the 2001 restructuring of the economy).

In general, ARCH models show that the exchange rate has a larger negative impact on financial firms, while interest rates have a larger negative impact on nonfinancial firms. However, inflation does not seem to be relevant. The lack of significance of inflation can be explained by two observations. First, that the ARCH models we implement here are different from those that generate the results presented in Tables 1-5. Unlike the empirical models we implemented to generate our results in these tables, ARCH methodology is specifically used to model the error term while allowing the lagged dependent variable as a regressor. Second, and possibly more important, we estimate the presence of ARCH effects by using aggregate data, not firm-specific data. We compute ARCH effects by using an excess-return index, but construct the earlier tables using firm-specific information. Thus, any results based on aggregate data would not necessarily reflect the fine differences across firms that we might expect. Furthermore, some effects may also be veiled due to aggregation. Hence, slight differences between the two approaches are inevitable. Yet, the only discrepancy seems to be related to the effect of inflation rate. Overall, both approaches are useful, since they provide similar messages.

7. Conclusion

Empirical studies on the determinants of financial-institution stock returns identify market return, interest rates, inflation rates, and exchange rates as important factors. However, we know of no empirical study that examines the interaction of all these variables to see whether they have a simultaneous effect on financial asset returns. We do so in this paper, filling this gap by estimating a multifactor model in which the assumed factors include the unexpected shocks on the market return, interest, inflation, and exchange rates. We test the model on data from the Turkish market, which has been characterized by rapid growth, as well as high inflation and interest rates, over the study period of 1986-2005.

We run regressions on individual firms and on cross-sections of financial and nonfinancial firms. Our results show that the percentage of firms that are significantly affected by interest, inflation, and exchange-rate factors is higher for the financial firms group than for the nonfinancial firms group. We perform the cross-sectional regression on three periods of exchange-rate regimes: managed float, crawling peg, and free float. Our results confirm previous findings that interest, inflation, and exchange rates affect financial stock returns differently from nonfinancial stock returns. Our results also confirm previous findings that risk factor effects may be time dependant and related to changes in regulation. Our results show that in Turkey, during the 2001-2005 period of free float, all risk factors are priced. These findings are important for the determination of the cost of capital of financial and nonfinancial firms, and for identifying the risks that should be hedged.

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Table 1. Number and percentage of firms for which the risk exposures are significant

We estimate Equation (1): $r_{it} = \alpha_{it} + \beta_{iM} U_{Mt} + \beta_{iI} U_{It} + \beta_{i\pi} U_{\pi t} + \beta_{ifx} U_{fxt} + \varepsilon_{it}$ (1)

for each individual firm. We regress firm returns on the unexpected shocks in the market, interest rates, inflation rates, and foreign exchange factors (U_{m}, U_{I}, U_{π} and U_{fx}). This table reports the number and percentage of firms for which the market and interest rate exposures, β_M and β_I, are significant at 5% and 10%, respectively. Results are reported for the full sample (1986-2005) and for the 1986-1998, 1998-2001 and 2001-2005 subperiods.

	Total Period 86-05				**Subperiod 86-98**				**Subperiod 98-01**				**Subperiod 01-05**			
	Fin.		**Nonfin.**		**Fin.**		**Nonfin**		**Fin.**		**Nonfin.**		**Fin.**		**Nonfin.**	
	(-)	**(+)**	**(-)**	**(+)**	**(-)**	**(+)**	**(-)**	**(+)**	**(-)**	**(+)**	**(-)**	**(+)**	**(-)**	**(+)**	**(-)**	**(+)**
β_M																
5%	0	49	0	218	0	40	0	201	0	42	0	193	0	44	0	205
	(0%)	(96.1%)	(0%)	(97%)	(0%)	(78.43%)	(0%)	(89.33%)	(0%)	(82.35%)	(0%)	(85.78%)	(0%)	(86.3%)	(0%)	(91.11%)
10%	0	49	0	218	0	42	0	205	0	2	0	4	0	45	0	209
	(0%)	(96.1%)	(0%)	(97%)	(0%)	(82.35%)	(0%)	(91.11%)	(0%)	(3.92%)	(0%)	(1.78%)	(0%)	(88.2%)	(0%)	(92.9%)
β_I																
5%	4	5	18	8	3	1	12	2	7	3	22	5	1	3	2	7
	(7.84%)	(9.8%)	(8%)	(3.56%)	(5.88%)	(1.96%)	(5.33%)	(0.89%)	(13.73%)	(5.88%)	(9.78%)	(2.22%)	(1.96%)	(5.88%)	(0.89%)	(3.11%)
10%	9	5	34	11	4	2	17	4	2	1	12	1	2	4	5	11
	(17.65%)	(9.8%)	(15.11%)	(4.89%)	(7.84%)	(3.92%)	(7.56%)	(1.78%)	(3.92%)	(1.96%)	(5.33%)	(0.44%)	(3.92%)	(7.84%)	(2.22%)	(4.89%)

Table 1 (Continued). Number and percentage of firms for which the risk exposures are significant

We estimate Equation (1): $r_{it} = \alpha_{it} + \beta_{iM} U_{Mt} + \beta_{iI} U_{It} + \beta_{i\pi} U_{\pi t} + \beta_{ifx} U_{fxt} + \varepsilon_{it}$ (1)

for each individual firm. We regress firm returns on the unexpected shocks in the market, interest rates, inflation rates, and foreign exchange factors (U_{m}, U_{I}, U_{π} and U_{fx}). This table reports the number and percentage of firms for which the inflation market and foreign-exchange exposures, β_{π} and β_{fx}, are significant at 5% and 10%, respectively. Results are reported for the full sample (1986-2005) and for the 1986-1998, 1998-2001, and 2001-2005 subperiods.

	Total Period 86-05				**Subperiod 86-98**				**Subperiod 98-01**				**Subperiod 01-05**			
	Fin.		**Nonfin.**		**Fin.**		**Nonfin**		**Fin.**		**Nonfin.**		**Fin.**		**Nonfin**	
	(-)	**(+)**	**(-)**	**(+)**	**(-)**	**(+)**	**(-)**	**(+)**	**(-)**	**(+)**	**(-)**	**(+)**	**(-)**	**(+)**	**(-)**	**(+)**
β_{π}																
5%	1	4	1	11	1	0	3	3	2	2	3	10	0	4	0	25
	(1.96%)	(7.84%)	(0.44%)	(4.89%)	(1.96%)	(0%)	(1.33%)	(1.33%)	(3.92%)	(3.92%)	(1.33%)	(4.44%)	(0%)	(7.84%)	(0%)	(11.11%)
10%	1	4	3	17	1	0	4	3	0	2	1	5	2	5	3	40
	(1.96%)	(7.84%)	(1.33%)	(7.56%)	(1.96%)	(0%)	(1.78%)	(1.33%)	(0%)	(3.92%)	(0.44%)	(2.22%)	(3.92%)	(9.8%)	(1.33%)	(17.78%)
β_{fx}																
5%	9	0	15	5	0	0	5	2	0	2	1	4	13	0	30	7
	(17.65%)	(0%)	(6.67%)	(2.22%)	(0%)	(0%)	(2.22%)	(0.89%)	(0%)	(3.92%)	(0.44%)	(1.78%)	(25.49%)	(0%)	(13.33%)	(3.11%)
10%	13	0	33	7	1	0	11	5	0	0	3	7	16	0	40	10
	(25.49%)	(0%)	(14.67%)	(3.11%)	(1.96%)	(0%)	(4.89%)	(2.22%)	(0%)	(0%)	(1.33%)	(3.11%)	(31.37%)	(0%)	(17.78%)	(4.44%)

Table 2. Distributional properties of the betas

We estimate Equation (1): $r_{it} = \alpha_{it} + \beta_{iM} U_{Mt} + \beta_{iI} U_{It} + \beta_{i\pi} U_{\pi t} + \beta_{ifx} U_{fxt} + \varepsilon_{it}$ (1)

for each individual firm. We regress firm returns on the unexpected shocks in the market, interest rate, inflation rate and foreign exchange factors (U_m, U_I, U_π and U_{fx}). This table reports the distributional properties of the market and interest rate betas, β_M, β_I. We report results for the full sample period 1986-2005 and for the 1986-1998, 1998-2001 and 2001-2005 subperiods.

	Period 86-05		Subperiod 86-98		Subperiod 98-01		Subperiod 01-05	
	Fin.	**Nonfin.**	**Fin.**	**Nonfin.**	**Fin.**	**Nonfin.**	**Fin.**	**Nonfin.**
β_M								
Mean	0.8428946	0.8014749	0.6750570	0.7727929	0.8205057	0.8020744	0.8834738	0.7754082
Std	0.2323829	0.2334495	0.5701193	0.3864683	0.2629898	0.2852981	0.2867602	0.3086388
Minimum	0.2338275	0.0501519	-1.889661	-1.7305707	0.1089752	-0.027360	0.2333375	-0.068982
Maximum	1.3027377	1.9275593	1.3839149	1.9685176	1.3466611	2.7842220	1.4321037	1.9275593
β_I								
Mean	-0.545615	-1.1852854	0.5868950	-0.9038102	-2.3957468	-1.8549563	1.4372429	1.7684997
Std	3.4395141	5.8554997	6.2659876	3.4868878	6.6291589	6.4623789	5.7622798	7.7015436
Minimum	-7.088094	-50.455227	-17.505550	-11.487777	-30.367328	-59.297873	-16.241027	-50.45522
Maximum	9.9958903	30.5534411	18.6241779	11.5513002	10.1453210	15.2515857	18.5332142	30.5534411

Table 2 (Continued). Distributional properties of the betas

We estimate Equation (1): $r_{it} = \alpha_{it} + \beta_{iM} U_{Mt} + \beta_{iI} U_{It} + \beta_{i\pi} U_{\pi t} + \beta_{ifx} U_{fxt} + \varepsilon_{it}$ (1)

for each individual firm. We regress firm returns on the unexpected shocks in the market, interest rate, inflation rate and foreign exchange factors (U_{m}, U_{I}, U_{π} and U_{fx}). This table reports the distributional properties of inflation and foreign-exchange betas, β_{π}, β_{fx}. We report results for the full sample period 1986-2005 and for the 1986-1998, 1998-2001 and 2001-2005 subperiods.

	Period 86-05		**Subperiod 86-98**		**Subperiod 98-01**		**Subperiod 01-05**	
	Fin.	**Nonfin.**	**Fin.**	**Nonfin.**	**Fin.**	**Nonfin.**	**Fin.**	**Nonfin.**
β_{π}								
Mean	0.3556204	0.3027155	-0.3339112	0.0267889	-0.488662	0.3507371	0.6076520	0.9391725
Std	1.3078077	1.9924147	3.9673220	2.3205746	6.2491457	4.4492433	1.7911426	2.3978697
Minimum	-3.496335	-24.06190	-20.26953	-13.0118862	-40.78144	-29.131460	-3.497138	-24.06190
Maximum	4.8606621	6.4356004	5.1282050	12.6616308	6.8198179	37.4772725	6.4065184	6.1158188
β_{fx}								
Mean	-0.375870	-0.178103	0.6339249	-0.0488683	-0.363718	-0.0227884	-0.441521	-0.195533
Std	0.4407334	0.4187030	2.8885586	2.3835357	8.9758451	4.7358988	0.5338504	0.5795285
Minimum	-1.672168	-1.217712	-3.8673639	-24.1660968	-61.35258	-30.631157	-2.227833	-1.99128
Maximum	0.3806587	1.6276098	10.2689942	7.6764715	6.1330787	24.3554816	0.5423999	2.1279688

Table 3. Cross sectional estimation of the sensitivity coefficients

We estimate Equation (1): $r_t = \alpha + \beta_M U_{Mt} + \beta_I U_{It} + \beta_\pi U_{\pi t} + \beta_{fx} U_{fxt} + \varepsilon_t$ (1) for the cross-section. This table reports the sensitivity coefficients to the unexpected shocks in the market, interest rate, inflation rate and foreign-exchange factors (U_m, U_I, U_π and U_{fx}). We report results for the financial and nonfinancial groups for the full sample period 1986-2005 and for the 1986-1998, 1998-2001 and 2001-2005 subperiods.

	Period 86-05		**Subperiod 86-98**		**Subperiod 98-01**		**Subperiod 01-05**	
	Fin. Stocks	**Nonfin.**	**Fin. Stocks**	**Nonfin.**	**Fin. Stocks**	**Nonfin.**	**Fin. Stocks**	**Nonfin.**
Intercept	0.073024	0.067136	0.083419	0.079056	0.071590	0.057900	0.079031	0.074834
	(24.91)***	(54.41)***	(12.39)***	(33.64)***	(11.33)***	(20.18)***	(14.01)***	(30.07)***
U_m	0.859774	0.829790	0.786867	0.873792	0.823303	0.783528	0.889711	0.775036
	(47.87)***	(112.04)***	(20.32)***	(67.91)***	(24.25)***	(50.86)***	(30.34)***	(59.87)***
U_I	-0.57683	-0.82212	-0.33582	-1.21370	-1.72251	-1.46382	1.382883	1.986838
	(-1.72)*	(-5.81)***	(-0.53)	(-5.16)***	(-2.88)**	(-5.36)***	(1.31)	(4.27)***
$U\pi$	0.272854	0.287768	-0.09497	-0.11127	0.584868	0.420639	0.645616	1.015808
	(1.93)*	(4.96)***	(-0.29)	(-0.99)	(2.09)**	(3.35)***	(2.33)**	(8.30)***
U_{fx}	-0.38465	-0.17267	-0.47720	-0.14775	0.548720	-0.18080	-0.42844	-0.19535
	(-6.99)***	(-7.2)***	(-3.04)***	(-2.71)**	(1.31)	(-0.95)	(-5.57)***	(-5.74)***
R^2	0.32272	0.32290	0.22514	0.30031	0.39934	0.37851	0.31632	0.27981
F	722.38	3717.63	118.04	1254.88	265.60	1071.91	321.79	1186.92

t-values are parenthesized. *, ** and *** indicate significance at the 10%, 5% and 1% levels, respectively.

Table 4. Change in return in response to a one-standard deviation shock in the factors

This table reports the change in return in response to an equal probability shock equal to a one-standard-deviation. We multiply standard deviations for each factor by the corresponding sensitivity coefficient from Table 3. We report results for the financial and nonfinancial group for the full sample period 1986-2005 and for the 1986-1998, 1998-2001 and 2001-2005 subperiods.

Factor	Change in Return							
	Period 86-05		Subperiod 86-98		Subperiod 98-01		Subperiod 01-05	
	Fin. St.	Nonfin.	Fin. St.	Nonfin.	Fin. St.	Nonfin.	Fin. St.	Nonfin.
U_m	16.45%***	15.8%***	15.74%***	17.48%***	17.22%***	16.38%***	12.36%***	10.77%***
U_I	-0.51%*	-0.7%***	-0.27%	-0.9%***	-1.72%**	-1.46%***	0.52%	0.75%***
U_π	0.65%*	0.7%***	-0.23%	-0.28%	1.22%**	0.88%***	0.92%**	1.45%***
U_{fx}	-2.02%***	-0.9%***	-2.34%***	-0.69%**	0.81%	-0.27%	-2.25%***	-1.03%***

Entries are sensitivity coefficients multiplied by the standard deviation of the factor during the period. *, ** and *** indicate significance at the 10%, 5% and 1% levels, respectively. Significance corresponds to the significance of the sensitivity coefficient.

Table 5. Estimation of the risk premia

We obtain estimates of the sensitivity coefficients β_j by using an OLS estimation of equation (1): $r_t = \alpha + \beta_M U_{Mt} + \beta_I U_{It} + \beta_\pi U_{\pi t} + \beta_{fx} U_{fxt} + \varepsilon_t$ (1). We let $\delta_j = \alpha_j - E(U_j)$ where α_j is the risk premium on factor j. We obtain an estimate of δ_j by regressing returns on the estimated sensitivity coefficients β_j and estimating Equation 6: $r_{it} = \alpha_0 + \sum_{j=1}^{j=4} \beta_{ij}\delta_j + \sum_{j=1}^{j=4} \beta_{ij} U_{jt} + \varepsilon_{it}$ (6). We use these estimates as inputs in a one-step Gauss-Newton procedure and estimate Equation (8): $r_{it} + \sum_{j=1}^{j=4} \hat{\beta}_{ij}\hat{\delta}_j = \alpha_0 + \sum_{j=1}^{j=4} \hat{\beta}_{ij}\delta_j + \sum_{j=1}^{j=4} \beta_{ij}(U_{j,t} + \hat{\delta}_j) + \varepsilon_{it}$ (8). We recover the risk premia α_j and report the results for both groups for the full sample period 1986-2005 and for the 1986-1998, 1998-2001 and 2001-2005 subperiods.

	Period 86-05	**Subperiod 86-98**	**Subperiod 98-01**	**Subperiod 01-05**
Market (U_m)	0.0174 (5.47)***	0.032600 (3.62)***	-0.03965 (-5.13)***	0.041250 (12.93)***
Int. Rate (U_I)	0.001021 (0.96)	0.00178 (-1.14)	-0.00016 (-0.17)	-0.006426 (2.35)**
Inf. Rate ($U\pi$)	0.002470 (1.10)	-0.00755 (-1.82)*	-0.00014 (-0.58)	0.010509 (4.26)***
Ex. Rate (U_{fx})	0.006954 (0.91)	-0.01056 (-1.16)	-0.0169 (-0.87)	0.032764 (4.14)***

t-values are parenthesized. *, ** and *** indicate significance at the 10%, 5% and 1% levels, respectively.

Table 6. ARCH models of excess returns: Maximum likelihood estimates.

We estimate the following model: $R_t = \beta X_t + \varepsilon_t$ where $\varepsilon_t = p\varepsilon_{t-1} + \eta_t + q\eta_{t-1}$ and $\sigma^2_{t,\varepsilon} = \delta + A_1\sigma^2_{t-1,\varepsilon} + A_2\sigma^2_{t-2,\varepsilon} + A_3\sigma^2_{t-3,\varepsilon}$. R_t is the excess return on an equally weighted index. X_t, the factor matrix, includes a vector of ones to allow for the constant, the lagged excess return, and the market, interest rate, inflation rate and foreign-exchange factors (U_m, U_I, U_π and U_{fx}).

	Financial Index	**Nonfinancial Index**
Excess Retn		
*Lag***Excess Return**	0.273	0.221
	(10.07)***	(13.76)***
$\mathbf{U_m}$	0.871	0.841
	(38.13)***	(39.80)***
$\mathbf{U_I}$	-0.596	-1.699
	(-0.70)	(-3.23)***
$\mathbf{U_\pi}$	0.0114	-0.0212
	(0.04)	-(0.11)
$\mathbf{U_{fx}}$	-0.537	-0.179
	(-3.36)***	(-1.88)*
Constant	0.0166	0.0141
	(2.70)**	(3.81)***
Error Term		
AR(1)	-0.778	-0.118
	(-6.08)***	(-1.65)*
MA(1)	0.661	
	(3.84)***	
ARCH		
Arch(1)	0.0946	0.028
	(1.94)*	(0.42)
Arch(2)	0.223	0.120
	(4.21)***	(1.37)
Arch(3)	0.467	
	(4.44)***	
Constant	0.004	0.0032
	(5.27)***	(6.76)***
Log likelihood	210.4416	326.451

z-statistics are given in parenthesis. *, ** and *** indicate significance at the 10%, 5% and 1% levels, respectively.

Table 7. ARCH models of excess returns: Maximum likelihood estimates with dummy for 2001. We estimate the following model: $R_t = \beta X_t + \varepsilon_t$ where $\varepsilon_t = p\varepsilon_{t-1} + \eta_t + q\eta_{t-1}$ and $\sigma^2_{t,\varepsilon} = \delta + A_1\sigma^2_{t-1,\varepsilon} + A_2\sigma^2_{t-2,\varepsilon} + A_3\sigma^2_{t-3,\varepsilon}$. R_t is the excess return on an equally weighted index. X_t, the factor matrix, includes a vector of ones to allow for the constant, the lagged excess return, and the market, interest rate, inflation rate, and foreign-exchange factors (U_m, U_I, U_π and U_{fx}).

	Financial Index	Nonfinancial Index
Excess Return		
*Lag***Excess Return**	0.340 (10.79)***	0.233 (11.61)***
$\mathbf{U_m}$	0.860 (39.01)***	0.847 (40.17)***
$\mathbf{U_I}$	0.0451 (0.06)	-1.531 (-2.86)***
$\mathbf{U\pi}$	0.519 (1.75)*	0.131 (0.70)
$\mathbf{U_{fx}}$	-0.671 (-3.47)***	-0.318 (-3.05)***
D	0.0233 (1.44)	0.012 (0.73)
$\mathbf{DU_m}$	0.0522 (0.42)	-0.096 (-0.80)
$\mathbf{DU_I}$	-1.096 (-0.29)	0.245 (0.14)
$\mathbf{D\ U\pi}$	-0.503 (-0.50)	-0.036 (-0.50)
$\mathbf{DU_{fx}}$	0.276 (0.71)	0.023 (0.08)
D*Lag***Excess Retn L1**	-0.166 (-2.02)**	-0.216 (-2.18)**
Constant	0.0034 (0.60)	0.09 (2.16)**
Error Term		
AR(1)	-0.754 (-6.22)***	-.862 (-5.45)***
MA (1)	0.614 (3.93)***	.800 (4.23)***
ARCH		
Arch(1)	0.111 (1.53)	.0537 (0.75)
Arch(2)	0.260 (3.66)***	.247 (1.98)**
Arch(3)	0.539 (4.65)***	
Constant	0.0032 (3.78)***	0.0025 (6.03)***
Log likelihood	216.81	334.58

D = 1 if year is greater than or equal to 2001, and D = 0 otherwise. z-statistics are given in parenthesis. *, ** and *** indicate significance at the 10%, 5% and 1% levels, respectively.