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Industry Effects in the Stock Returns of Banks and Nonfinancial Firms

The volatility of an individual company's stock price is indicative of the risk of holding that stock. This volatility depends on a number of factors. Some of the factors that influence stock risk are quite general, like the extent to which the firm's stock price varies with changes in the overall market. This kind of risk is often referred to as market or systematic risk.

Other sources of risk are less general. Some may be specific to the firm, such as its degree of leverage or the willingness of its management to pursue risky projects. Another may be specific to an industry. That is, firms engaged in similar businesses or activities may share a common element of risk. This so-called "industry effect" may be quite strong in the banking industry, since banks are subject to an extensive system of regulations that restricts what they can do and, often, how they can do it. Moreover, many banks interact regularly with one another, maintaining significant correspondent relationships in deposit-taking or lending activities. These relationships make it more likely that bank stocks are subject to significant industry risk effects. Close interactions between banking companies also raise concerns about possible contagion effects in the banking industry. Contagion occurs when solvency problems at one bank can spill over to affect the financial condition of other institutions, even though those other banks might not be directly involved in the original problem. Concerns about contagion might be heightened if evidence of a strong industry effect exists in bank stocks.

In this *Weekly Letter*, I investigate the role of industry effects in stock return behavior for banks as well as for companies in nine nonfinancial sectors. I then consider whether the stock risk associated with different-sized companies exerts any identifiable influence on the risks of other-sized firms in the same industry. The analysis shows that significant industry effects exist in most of the ten sectors. However, the industry effects among the banking firms in the sample appear stronger and more consistent than those of the nonfinancial companies. One interpretation of these industry effects is that "the market" views certain companies as being particularly informative about the risks of doing business in that industry. In assessing the future prospects for firms in the industry, investors and other market participants may look especially to these influential firms. Shocks to the stock returns of these important companies may presage more widespread shocks to the industry as a whole.

Measuring risk

Volatility of stock prices is a widely used measure of risk. This is because the stock market processes information about companies in a way that is considered to be independent and efficient. In this analysis, I look at monthly stock returns for companies in 10 different industries over the 10-year period from 1982 to 1991. The sectors include banking, oil and gas exploration, food, chemicals, fabricated metals, machinery, electrical equipment, transportation, instruments, and utilities.

The companies in each industry are divided into three portfolios (sets of firms) based on size: the large portfolios contain the stock returns of the largest one-third of the companies in the sample in each industry, the medium portfolios contain the next largest one-third, and the small portfolios contain the rest. The nonfinancial companies range in size from multinational conglomerates with several hundred billion dollars in assets to relatively small companies with a market value of only a few million dollars. The banking firms in the sample are all fairly large; the smallest bank had over $3 billion in assets as of the end of 1991.

The portfolios are divided by size in part because companies of different sizes often display different stock price behavior. For example, in many empirical estimates, large nonfinancial companies often exhibit lower market-related risk than smaller companies. Notably, the opposite is true in estimates of banking firms; larger banks

tend to have higher market risk than smaller publicly traded banks. Another reason for using size-based portfolios is that they may capture the market's use of information to assess industry risk. The idea is that market participants use information on certain firms in order to evaluate industry risk effects. In general, more information should be available about the largest firms in each industry. Moreover, market analysts may concentrate their information-gathering efforts on these larger firms in the belief that they are most representative of industry-specific risks. If this is the case, then the risks of these larger firms would be expected to exert a positive impact on the risks of smaller firms in the same industry.

The analysis requires estimating an asset-pricing model that explains the stock return on each portfolio as a function of its own "risk," a feature that is common to many models of asset-pricing. In this particular instance, the risk measure is the *conditional* variance of the portfolio's stock return. The intuition behind this measure of risk is that investors must assess the expected return and risk of an asset before they decide to hold it. They make this assessment *conditional* on some set of relevant information. When the information changes, investors will alter their perceptions of the asset's risk. In this model, changes in conditional risk affect future values of each portfolio's stock return, which in turn, may influence future conditional risk. This framework is based on a class of models called GARCH, which stands for Generalized Auto-Regressive Conditional Heteroskedasticity. The framework differs from most empirical applications of traditional asset pricing models which use unconditional measures of risk that are not permitted to change over time.

Industry effects

To get evidence on possible industry effects, I look at how the risk of the three portfolios in each industry are related. Evidence of significant cross-portfolio risk effects are indicative of so-called "causality in variance" (Engle, Ng, and Rothschild 1990) whereby the conditional risk of one portfolio affects the risk and return of another. Accordingly, I look at all possible pairwise combinations between the different-sized portfolios in order to determine the pattern of such causality (for more extensive discussion, see Neuberger 1994).

The estimates of these cross-portfolio effects produce a number of significant coefficients, some positive and some negative. Positive cross-portfolio estimates are consistent with an industry effect between companies of different sizes. The interpretation of negative estimates is somewhat more problematic, but they are not indicative of the kind of industry effects considered here. If industry risk effects exist, it seems plausible that such effects would be constrained to be positive. The negative estimates suggest that a more complicated interaction may be occurring between the different portfolios but I do not interpret this as evidence of an industry effect.

Six of the ten industries included in the study show positive significant estimates between portfolios of different sizes. The sectors in which these significant industry effects appear are banking, oil and gas exploration, machinery, electrical equipment, instruments, and utilities. In all but one instance, the significant coefficients occur when the conditional risk of a portfolio of larger firms is included in the estimates of a portfolio of smaller ones. The one exception occurs in the utilities sector, where the conditional risk of the small firms has a positive effect on the stock risk of the medium firms. Thus, there is substantial evidence that industry effects exist in a broad array of industries and that these effects generally run from larger to smaller companies. This suggests that stock market participants may look to larger firms as being a more cost-effective source of information about the risks facing firms operating in these industries.

In most instances, the positive industry effects occur in only one or two cases. That is, the largest companies affect the risk of the medium-sized companies but not the small ones, or both large and medium-sized companies affect the risk of the small companies but the large firms have no effect on the medium ones. Of the industries that show significant industry effects, however, the most consistent results occur in the banking industry. The conditional risk of a portfolio of larger banks is always significant with a positive sign when included in the estimates of a portfolio of smaller banks. Thus, the large-bank portfolio significantly affects the estimates of both the medium and small-bank portfolios, and the medium-bank conditional variance is significant in the small-bank equation. The positive estimated coefficients mean that increases in the conditional risk of the largest banks raise the conditional risk of the smaller banks and, working through the return equations, raise the return from holding these portfolios of assets. This find-

ing confirms the importance of the largest banks in the industry in influencing the market's view of bank stock risk and return.

Concluding comments

The results presented here provide evidence that, in a broad array of industries, the stock risk of larger firms has a positive influence on the stock risk of smaller firms. The strongest and most consistent evidence of these industry effects occurs among banking firms. It probably comes as no surprise that the largest banks play an important role in this industry. A failure of one of these large institutions could have serious repercussions for public confidence in the banking system as well as for other financial intermediaries that have significant business dealings with the large bank. This concern has led to careful scrutiny by regulators of the activities of the largest banks, and may have given rise to such notions as "too big to fail." The work described here suggests that it is especially important to understand what drives the risk of the largest banks and to recognize that these companies may have significant and wide-ranging effects on the rest of the banking industry.

Jonathan A. Neuberger
Economist

References

Engle, Robert, Victor Ng, and Michael Rothschild. 1990. "Asset Pricing with a Factor-ARCH Covariance Structure: Empirical Estimates for Treasury Bills." *Journal of Econometrics* 45, pp. 213–237.

Neuberger, Jonathan A. 1994. "Conditional Risk and Return in Bank Holding Company Stocks: A Factor-GARCH Approach." Unpublished manuscript.

MONETARY POLICY OBJECTIVES FOR 1994

On February 22 Federal Reserve Board Chairman Alan Greenspan presented a report to the Congress on the Federal Reserve's monetary policy objectives for 1994. The report includes a summary of the Federal Reserve's monetary policy plans along with a review of economic and financial developments in 1993 and the economic outlook in 1994. Single or multiple copies of the report can be obtained upon request from the Public Information Department, Federal Reserve Bank of San Francisco, P.O. Box 7702, San Francisco, CA 94120; phone (415) 974-2246 or fax (415) 974-3341.

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