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Can statistics-based early warning systems detect problem banks before markets?

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ABSTRACT

Statistical early warning systems (EWS) to identify problematic banks have grown in sophistication, complexity, and accuracy, but can they inform markets? We utilize five "archetypical" EWS using a unique dataset which accumulates data from 1986 through 2009. An arbitrage portfolio is formed by shorting problematic banks and going long the remaining banks. We find accumulating data allows the models to function during long periods with few or no bank failures and that the factors used are stable. While all models studied do a good job predicting bank failure, we find that EWS are unable to inform markets.

1. Introduction

Almost as long as there have been banks, market participants have been trying to predict their failures. Bank regulators want to prevent failures from occurring and investors want to keep from losing their money. Researchers and regulators have typically turned to early-warning systems (EWS)

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or other statistical models to help predict bank failure. Over the decades, EWS have grown in sophistication, complexity, and, at least according to their proponents, accuracy. This begs the question: have bank EWS become efficient enough to inform markets, that is, can they be used to form riskless arbitrage portfolios of bank stocks that can earn abnormal returns after adjusting for risk? It stands to reason that as banks become troubled, their performance will suffer and their market valuations will decline (Eisdorfer, 2008). If this decline can be predicted by EWS before it occurs, i.e., before the market becomes aware, then the EWS can be used to form successful costless arbitrage portfolios and markets are proven to be less than perfectly semi-strong form efficient. On the other hand, if EWS are not able to be used to form successful arbitrage portfolios, then either they have no special predictive power or the information generated by EWS is quickly incorporated into market prices, perhaps by the action of market analysts.

In this paper we utilize five "established" or "archetypical" EWS[1] to find problematic publicly traded commercial banks using data from 1986 through 2009. A zero cost arbitrage portfolio is formed each year by shorting all of the banks identified by the models as potential problems and going long the remaining non-problematic banks in the sample. The returns on the arbitrage portfolio and its long and short components are compared to returns on a long portfolio of all banks in the sample, which represents a "naïve" strategy. If the returns on any of these portfolios are statistically greater than the "naïve all bank strategy" long portfolio, we can infer that the early warning system is able to provide information not available to investors and can conclude that the market is not semi-strong form efficient.

To prove (or disprove) that EWS can be used to form successful costless arbitrage portfolios, we must first prove that they are able to detect problematic banks over long periods of time without modification. This means that the factors used by the models to detect problematic banks must be stable over long periods of time. In addition, since four of the five models studied require the a priori identification of failed banks for their classification phase, we must devise a way for them to work during periods when there are few bank failures. We do this by accumulating data over the entire prior period (see Section 3.5 for more on the method used).

The traditional method of judging the effectiveness of EWS is to look at the number of type 1 errors (predicting a bank will fail when it does not) and type 2 errors (failing to predict a bank will fail when it does). This can be difficult for researchers without access to confidential bank regulator information as many banks may become troubled, but only the most severely troubled will be allowed by regulators to actually fail. Since only regulators know which banks were troubled but turned around with assistance or forbearance by the regulator, these banks would be counted as non-failed by researchers. Banks may also become troubled without being identified as such by regulators. These problematic banks may eventually be detected by regulators or might self-correct due to management action or exogenous circumstances. This issue is not a concern in this study as actual failure is not required for the stock price to be affected. When the EWS detects a problem, the stock will be shorted. If this occurs before the market realizes the bank is troubled, the portfolio formed by use of the EWS will profit. If the EWS determines that a bank is no longer troubled it will be removed from the portfolio of shorted banks and added to the long portfolio. Again, if the market belatedly perceives this, the EWS portfolio will profit.

We find that our method of accumulating data over time allows the four models that require the a priori identification of failed banks to continue functioning during decade long periods when there are few or no bank failures and that the factors used by the models to detect problematic banks are stable over this period of time. All of the models studied do a good job of predicting banks that will fail within 1 and 2 years. However, we also find that bank EWS are unable to inform markets, that is, they cannot be used to form successful riskless arbitrage portfolios.

We conclude that the factors used by EWS to predict bank failure are stable over long periods of time and so can be used to predict bank failures even when there are few or no failures in the years immediately preceding the failure of a bank. EWS systems are effective in predicting failure,

[1] Detailed descriptions of the five models (logit, MDA, Cox PHM, trait recognition, and LOESS) are provided in Appendix A.