

**ENTRANCE, EXIT AND MERGER ACTIVITY IN TENNESSEE'S BANKS:  
A MULTIVARIATE ANALYSIS OF MARKET BEHAVIOR AND THE BUSINESS CYCLE**

by

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Abstract

*This paper evaluates the joint contribution of market behavior and macroeconomic fluctuations on merger, entrance and exit in Tennessee's banking industry from 1966 through 1997. The results suggest minimal business cycle influence on firm entrance, merger or exit through five business cycles. Instead rival behavior, in the form of low cost facility expansion, appears to be correlated with entrance. This suggests that banks respond more in aggregate to rival behavior than to macroeconomic fluctuations in this market. Econometric methods of note include a Vectorautoregression Exogenous, with error correction specification.*

I. Introduction

The spate of banking mergers in the 1990's is of considerable interest to economists studying industrial markets as well as those investigating the aggregate economy. The former are concerned with market power issues arising from concentration in markets, while the latter are concerned with cyclical business activity. At the confluence of these two areas of interest is the nature and cause of mergers, entrance and exit in the banking industry. This industry is important both for its size and the role banking plays in the transmission of monetary policy.

The interest concerning this market may be distilled into two concerns: a) the more concentrated an industry becomes, the higher the price and b) the less frequent will be price adjustments, simply prices may be sticky. A full accounting of these concerns is outside the scope of this research; but, the first possesses clear antecedents in the work of industrial economists over the past fifty years, while the second assertion is a critical element of the body of research known variously as *New Keynesian* or *New Monetarist* macroeconomics (Hicks, 1998). Sticky prices represent a major causative element in cyclical fluctuations in this interpretation of the macroeconomy.

Without enumerating the problems associated with market power and sticky prices I will simply suggest the cyclicity of mergers and the concentration of firms is important to both sets of researchers. So, the questions of central interest concern market power and the cyclical nature of entrance, mergers and exit. This paper will examine the entrance, merger activity and exit of banks in Tennessee from 1966 through 1997, assessing both market power contribution and the cyclicity of these business decisions.

II. Background

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Two stylized descriptions of merger/entrance/exit activity emerge as potential candidates in empirical tests. The first is based in firm behavioral response to cyclical fluctuations. The procyclicality of pricing theory (Bils, 1989) suggests that firms are more likely to adjust prices asymmetrically in response to business cycle fluctuations. Hence price adjustment and profits will follow from upturns in the business cycle. This informally suggests that merger and entrance activity are likely to follow expansions with exits occurring during contractions. This is one macroeconomic explanation for the potential cyclicity of business mergers and entrance and exits. The *economic base theory* (see Mayo and Flynn, 1988) also suggests cyclicity to merger, entrance and exits. This theory suggests regional economic activity (with some emphasis on exports) tends to promote entrance. Both macro explanations predict some procyclicality of entrance, exit and mergers.

The microeconomic description of merger activity rests in the framework of oligopoly behavior espoused by industrial economists. These theories have in common the inference that mergers occur to effect market power or reduce costs. Simply, mergers and expansion are the result of rival behavior or technological change. They will not necessarily follow a business cycle, but should occur either due to rival behavior or cost changes.

Existing micro research into mergers, entrance and exit began with Bain (1949, 1956) extending through the period of static theoretical analysis of the 1950's and 1960's. Orr (1974) presented a dynamic model of entrance with empirical evidence from Canadian manufacturing firms. This work provided the basis for more extensive analysis of entrance that included Gorecki [1975], Kessides [1986] and Audretsch and Acs [1989]. Each of these authors attempted to focus on verifiable micro elements such as innovation and profits. The explosion of studies in this period examined barriers to entry, economies of scale and price-cost margin effects on entry, exit and merger activity. The result being research primarily into market structure/performance and cost analysis of entry decisions. Contemporary studies of advertising and entrance (Jaumandreu and Mato, 1987), fixed costs (Baumol and Willig, 1981) and dynamic entry deterrence (Dixit, 1980) and others offered a multitude of explanatory theories and evidence of firm behavior that delved more deeply into firm profit motivation and barriers to entry. This later development also had roots in game theoretic interpretations which was beyond the grasp of empirical economics. In the mid 1980's this research was extended by perhaps the most important economic book of the decade *Contestable Markets and the Theory of Industry Structure* (Baumol, Panzar and Willig, 1982, 1988) which dealt extensively with industry structure, investment and entrance, outlining micro conditions for entrance and implications for oligopoly pricing behavior.

Thus, the underlying causes of entrance, exit and merger differ between the micro and macro theories and may be examined empirically. The macro explanation suggests that indications of cyclical fluctuations will generate mergers, entrance and exits, while the microeconomic theory relies on behavioral responses by firms to rival action or cost changes. Simultaneous testing of these alternative explanations may potentially answer the question whether it is primarily the macroeconomy, rival behavior, or some combination of the two that spawns merger activity in banks.

At the confluence of industrial economics and macroeconomics have been competition policy analysts.

Anti-trust officials have long associated mergers and entrance with the business cycle; however, there has not emerged a detailed analysis of dynamic entrance, merger and exit of firms coupled with more advanced statistical methods available in the past decade. This study seeks to analyze the cyclical and behavioral responses of firms in a dynamic test of entry, exit, and mergers. The hope is that evidence of cyclical and behavioral components of entry, exit and mergers will spawn additional research into dynamic market behavior.

From this expansive coverage of entrance, merger and exit came a number of repeated empirical observations concerning firm entrance. These were detailed by Geroski (1991, pp 282) as: a) entrance is short-lived and rarely successful, b) entrance is difficult to measure clearly, c) the types of entry vary remarkably and d) entrance may not often be worthwhile to the firm. These “reflections on the entry process” provide industrial economists the necessary groundwork for continued study of entry, with a few guidelines. These heuristics may be summarized as a suggestion to: employ easily defined markets, use clearly defined methods of measuring entrance and employ richer time series data to capture dynamic effects. This has implication for market selection, data frequency and econometric modeling. This study will attempt to meet these rules of thumb.

### III. Method and Data

Causality in time series econometrics depends upon the exogeneity of independent variables in a multivariate test. This exogeneity may be tested in part by the cointegrative behavior of variables employed in the test. The absence of cointegration and Granger causality suggests weak exogeneity between variables (Campos, Erickson and Hendry, 1996). This condition is necessary for a structural equation to meet the assumptions of the classical linear model. Unfortunately, with variables of interest such as mergers, exits and entrances this will seldom be the case. This suggests a restrictive structural models may present a real analytical problem—it simply cannot distinguish well between endogeneity and exogeneity in variables, so causation cannot be inferred. An attractive method for including exogenous variables and *potentially* endogenous variables in a multivariate framework is the vectorautoregression exogenous (VARX). This time series econometric technique employs both potentially endogenous variables and structural components, or exogenous variables.

Exogeneity of variables may be suggested either through theoretical or statistical analysis, following which restrictions on directional causation is placed. Likewise, the nature of endogeneity may be inferred from a theoretical or statistical basis. This differs from the traditional structural model that typically does not employ statistical exogeneity tests. This model assumes and tests the exogeneity of economic variables. Specifically, the assumption that mergers and related business strategy do not cause business cycles. Further, the endogeneity of business response is assumed. That is, mergers, exits, entrances, changes in the quantity of branches or offices potentially are the result of endogenous behavioral response by firms.

The data employed in this study were collected from the *Bureau of Labor Statistics, Department of the Census* and the *Center for Business and Economic Research, the University of Tennessee*. All data are public and

consists of annual data on Tennessee's total state banks, entry, mergers, branches and offices in Tennessee from 1966 through 1997. From these exits are calculated. Additional variables of *Gross State Product* (TNGSP) and *Gross Private Domestic Investment* (GPDI) will be employed, both in real terms. A business cycle dummy variable RECCDUMMY was constructed. Of note here is the use of annual data. A previous study of firm exit and entrance in Tennessee (Mayo and Flynn, 1988) employed quarterly data in a multi-sectoral empirical evaluation of entrance. The choice of annual data is used here to meet Goreski's [1991] standards of precisely measuring entry, exit and merger activity.<sup>1</sup>

#### IV. The Model and Results

Firm decisions to enter or exit a market, to vary the number of branches and offices, or to merge are all viewed as endogenous. Exogeneity restrictions were placed on the business cycle variables and confirmed statistically through the absence of Granger causality and cointegration in a Johansen cointegration test. The endogenous variables were cointegrated with an order 1 (Johansen test) so the VARX was transformed to an error correction model (ECM), through *first differencing* of the data. The resulting differenced variables were not cointegrated.<sup>2</sup> The total number of cointegrating equations suggested was four (Johansen cointegrating test), assuming a trend and intercept in the data. The latter assumptions were based on a simple observation of the variables. See Figure 1.

This presents the interesting observation that the ratio of branches to banks and offices to banks, as well as the endogenous variables themselves all displayed an obvious time trend. The trend and intercept assumptions may be interpreted as suggesting a long run, but trending relationship is occurring. This type of assumption seems appropriate given the cointegration tests, and will not be analyzed further.

The resulting error correction model takes the form (in first differences):

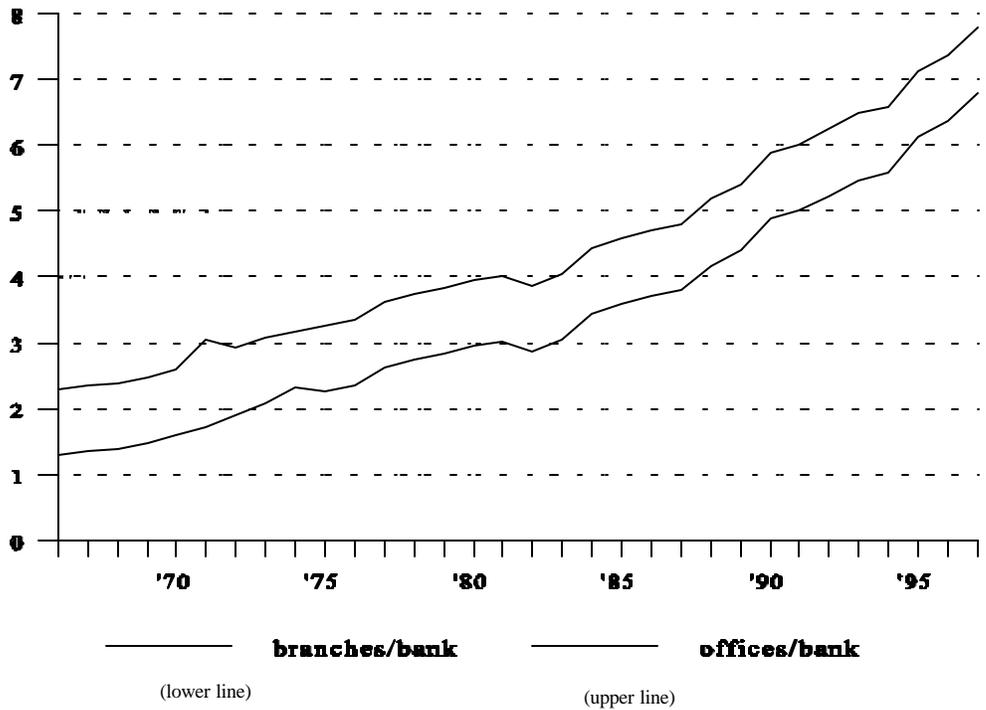
$$Y_{ij} = a_i + \tilde{a}_i \hat{O}_i + B_{ij,t-n} Y_{ij,t-n} + \check{O}_{ij} X_{ij} + e_{i,t} \quad (1)$$

where  $Y_{ij}$  are the endogenous variables,  $a_i$  the intercept,  $\hat{O}_i$  the time trend with parameter  $\tilde{a}_i$ ,  $B_{ij,t-n}$  the vector of parameters of endogenous and lagged endogenous variables  $Y_{ij,t-n}$  and  $\check{O}_{ij}$  the parameter estimates of the exogenous,

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<sup>1</sup>This is not a critique of the use of shorter data frequency, simply an effort to include a more precise measurement of these variables. Any shorter period may not reveal the actual period in which effective entrance (not just a business license or merger agreement) occurred. For example, while mergers may occur in one period, where does the effect occur? Also, where does the exit/entrance effect occur within a given month or quarter. Annual data at least keeps us honest in dealing with Geroski's comments on the existing research.

<sup>2</sup>The existence of a unit root in the first differences was strongly rejected four out of five variables (reject at greater than 1% confidence) while this hypothesis could be rejected at the 10% level for the merger variable in the ADF test and at the 1% for the Phillips-Perron test. (Augmented Dickey-Fuller and Phillips-Perron tests, all failed to reject an absence of the unit root at the 10% level).



contemporaneous business cycle variables  $X_{i,t}$  and  $e_{i,t}$  the error term.<sup>3</sup>

Interpretation of the intercept and trend are not important in this study, nor is interpretation of the cointegration equations or their normalizations. One problem associated with the error correction model is the obvious concerns with estimation of first differences (in this case). That is the loss of explanatory power associated with estimation of differenced, not level variables.

This is of course necessary given the non-stationarity determined in the cointegration tests. Non-stationarity implies a non-stable relationship between variables, the source of which is more than the trending nature of the variables.

This question is important for industrial economists because it suggests a dynamic adjustment to market structure as the number of branches, offices, and total banks changed during the sample period. However, further analysis of this is beyond the scope of this study.<sup>4</sup> The results appear in Table 1.

<sup>3</sup>The ECM model removed some of the distributional concerns of the data. These were, in essence, a numeric count (potentially a Poisson or negative bi-nomial distribution.) Separate regression tests suggest parameter stability under these alternate distributional assumptions. This linked with the observation that Poisson and normal distributions both generate asymptotically efficient estimates points to robustness in the estimation.

<sup>4</sup>This is part of a larger study of the regional banking structure, that is currently ongoing

Table 1, Error Correction Model Results

	Entrance	Mergers	Offices	Branches	Exit
Entrance $t-1$	-0.244 (-0.77)	-.32 (-0.48)	-3.01 (-0.75)	-5.12 (-1.43)	-0.09 (-0.13)
Entrance $t-2$	-0.07 (-0.24)	-0.60 (-0.99)	-4.93 (-1.36)	-1.03 (-0.32)	-0.58 (-0.91)
Mergers $t-1$	0.31 (0.57)	0.11 (0.09)	-6.05 (-0.87)	-10.43 (-1.69)	-0.03 (-0.02)
Mergers $t-2$	-0.12 (-0.24)	0.65 (0.61)	-4.02 (-0.62)	-5.66 (-0.99)	0.39 (0.33)
Offices $t-1$	-0.88*** (-2.49)	-0.007 (-0.09)	-0.48 (-1.08)	-0.67* (-1.67)	-0.06 (-0.69)
Offices $t-2$	-0.08*** (-3.38)	-0.004 (-0.09)	-0.43 (-1.32)	-0.79*** (-2.73)	-0.03 (-0.05)
Branches $t-1$	0.08 (1.51)	0.06 (0.60)	-0.12 (-0.20)	-0.11 (-0.19)	0.06 (0.53)
Branches $t-2$	0.08** (2.09)	0.05 (0.59)	0.19 (0.37)	-0.03 (-0.08)	0.07 (1.07)
Exit $t-1$	-0.13 (-0.45)	0.48 (0.74)	4.40 (1.13)	6.30* (1.83)	0.73 (1.06)
Exit $t-2$	0.11 (0.26)	-0.35 (-0.39)	-0.35 (-0.39)	4.14 (0.87)	-0.02 (-0.02)
Intercept	-15.95 (-1.59)	9.52 (0.45)	-79.85 (-0.63)	-357.66*** (-3.17)	17.63 (0.78)
TNGSP	-0.0003 (-0.39)	-0.0002 (-1.41)	0.0006 (0.66)	0.001 (1.28)	-0.0002 (-1.20)
RECCDUMMY	0.67 (0.47)	2.55 (0.84)	-36.2* (-1.99)	-0.13 (-0.008)	1.41 (0.43)
GPGDI	1.13 (1.38)	-1.18 (-0.68)	13.26 (1.27)	32.20*** (3.50)	-1.45 (-0.79)
Adj R <sup>2</sup>	0.45	0.59	0.45	0.35	0.61
Akaike IC	-46.519	-67.350	-117.540	-114.221	-69.100

\*\*\* Significant at the 1% level, \*\* Significant at the 5% level, \* Significant at the 10% level, asymptotic t-statistics in parentheses

These results present very intriguing issues regarding entrance and exit. Firstly, neither economic or market behavioral variables appear to affect exit in this market. This may be explained by simply noting that firm exit may

occur at intermittent lags that do not permit clear statistical analysis. Likewise, changes in merger activity could not be explained either through rival behavior or cyclical economic variables. This result may be explained in the same manner as exits, simply, firms merge acyclically due to variable lags in economic response, or through variable lags in rival behavior. Third, the number of offices was reduced during a recession. This may be viewed as a cost savings measure or as reductions during a period of low demand for banking services. These results should be interpreted as marginal, with limited informational value in this study other than a statistical rejection of rival behavior and cyclical contribution to these variables.

Of strong explanatory interest is the behavioral response of the number of new branches caused by changes in lagged number of offices, and the lagged number of exits and the change in gross private domestic investment. A reduction of one hundred total offices in a previous year led to an increase of sixty seven branches in the current year, while a similar reduction two years previously leads to an increase of seventy nine branches. This may be interpreted as a behavioral response of banks to changes in the number of rival retail locations. The cost differences associated with branches and offices would lead the firm to increase its branches during periods of increased demand. This result is supported by the large increase in the number of branches as a result of increases in gross private domestic investment. Increased demand, and reduced offices in previous periods lead to a larger number of bank branches, a more costly full service retail outlet. Of greatest interest is the entrance variable. Entrance in the market by a new firm occurs in this model, primarily as a negative response a change in the number of offices. There is a positive response to the number of branches, suggesting in part the endogeneity of branches with entrance. These results suggests entrance is based not on cyclical fluctuations but in structural changes in the market. This is a very interesting result that implies macroeconomic variables are not of significant effect in determining the number of exits and entrances in the banking market in Tennessee.

## V. Conclusions

The particular causes of firm entrance, exit and merger activity are the subject of ongoing and fertile research. Studies performed primarily by industrial organization researchers point to both firm level variables (primarily profits) as well as cyclical fluctuations. The majority of these studies find some weak cyclicity to mergers, exits and entrances. This study, using a somewhat more advanced statistical technique than is commonly employed in microeconomic analysis fails to uncover compelling evidence of cyclicity to mergers, exits and entrance. These results point instead to a series of behavioral responses by rivals to the number of bank offices existing in the market.

This suggests that reductions in the low cost retail banking outlets tend to increase the number of higher cost outlets as well as entrance by firms, in later periods. This particularly interesting result suggests a substitutability between the high cost branches and low cost offices. That branches respond to the cyclical demand

variable of gross private domestic investment suggest that these variables respond to demand variations as well.

As with any study of a sub macroeconomic (regional) economic variable the lack of general applicability is a potential problem, due to structural variations in banking regulation across states. Also, since this is annual data some response power is lost—that is the tradeoff made in this study. Both these unavoidable problems, once noted present few additional problems with a study of this type. Another potential problem is the behavioral response of aggregate markets should be viewed in closer detail. While I have found behavioral responses greater than responses to aggregate economic variations, I would hesitate to draw micro market inferences from these results (primarily anti-trust analysis). Further study, of local and regional markets as well as national level statistics are warranted, and should provide useful understanding of these issues.

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