Mergers, the Leading Economic Indicators, and Stock Prices:
Additional Evidence

John B. Guerard, Jr.
McKinley Capital Management, LLC

The purpose of this analysis is to present an updated and new analysis of the merger movements in the United States and the relationship between mergers, stock prices, and the leading economic indicators. We find additional statistical correlation and regression analysis to support the historical statistical evidence that stock prices lead mergers. Stock prices are a component of the leading economic indicators; however, stock prices more directly lead mergers than the leading economic indicators.

Introduction

Using quarterly data from 1895 to 1904, Nelson (1959) found a correlation coefficient of .613 between mergers and stock prices. The positive correlations between mergers and stock prices should exist because businessmen are more willing to merge their businesses when the stock prices they receive are increasing. The acquiring firms' managers are more able to pay the higher prices for the acquired firms' shares as the price-earnings multiple of the combined entity rises. Financial theory was developed by Larson and Gonedes (1969) to explain the conglomerate merger movement of the 1960s in terms of the price-earnings multiples. Larson and Gonedes hypothesized that although the price-earnings multiples of the acquiring firms exceeded those of the acquired firms, the market should drive the price-earnings multiples of the combined entity to the weighted average of the constituents' pre-combination earnings multiples. The incremental value of the combined entity would be zero if the combined entity's price-earnings multiple equaled the pre-merger weighted average multiple The lack of merger profits is evidence of the Perfectly Competitive Acquisitions

Market (PCAM) which holds that the price paid for the acquired firms is such that the acquiring firms will not profit [Mandelker (1974)]. Empirical evidence supports the larger price-earnings multiples existing for the acquiring firms than for the larger price-earnings multiples existing for the acquiring firm than for the acquired firms in the pre-merger period [(Harris, Stewart, and Carleton (1982)]. However, the acquiring firms' prices (and price-earnings multiples) in the post-merger period do not reflect merger profits and are consistent with the PCAM. A recent study by Beckenstein (1979) of larger mergers occurring during the 1948-1975 period found a positive coefficient on the stock price index variable in the merger equation; however, Beckenstein dismissed the association of stock prices and mergers because of the numerically insignificant value.

The Nelson study also found a correlation coefficient of .259 between mergers and industrial production for the same time period. Mergers should increase as economic activity increases. This study tests the existence of any statistically significant correlation among mergers, stock prices, and industrial production using quarterly data from 1895 to 1950.

A univariate Box-Jenkins model is estimated for mergers from 1895 to 1950 to test of mergers follow a random walk. Forecasts from the univariate merger model are produced for the period from 1951 to 1954 to test for the appropriateness of and industrial production. The bivariate time series models are constructed to test if the mean square forecast errors from the univariate time series models may be reduced. Causality tests are performed in the manner developed by Ashley, Granger, and Schalensee (1980) and Ashley (1981).

The post sample period from 1951 to 1954 is a selected primarily because it was the era of the rebirth of the conglomerate merger movement of the United States. A brief history of the three major merger movements is presented to trace the development of the conglomerate merge movement and show the general pattern of mergers occurring with rising stock prices. The reader is referred to Butters, Lintner, and Cary (1951) and Nelson (1959) for more complete historic analysis of the merger movements.

A Brief Merger History of the United States

The first major merger movement began in 1879, with the creation of the Standard Oil trust, and ended with the depression of 1904. During the merger movement, giant corporations were formed by the combination numerous smaller firms. The smaller companies represented nearly all the manufacturing or refining capacity of their industries. The forty largest firms in the oil-refining industry, comprising over ninety percent of the country's refining capacity and oil pipelines for its transportation, combined to form Standard Oil. In the two decades following the rise of Standard Oil, similar horizontal mergers created single dominant firms in several industries. These dominant firms included the Cottonseed Oil Trust (1884), the Linseed Oil Trust (1885), the National Lead Trust (1887), the Distillers and Cattle Feeders (1887), and the Sugar Refineries Company (1887).

The trust form of organization was outlawed by court decisions. But merger activities continued to create "near" monopolies as the single corporation or holding company organization became dominant. The Diamond Match Company (1889), the American Tobacco Company (1890), the United States Rubber Company (1892), the General Electric Company (1892), and the United States Leather Company (1893) were created by the development of the modern corporation or holding company.

The height of the merger movement was reached in 1901 when 785 plants combined to form America's first billion-dollar firm, the United States Steel Corporation. The series of mergers creating U.S Steel allowed it to control 65 percent of the domestic blast furnace and finished steel output. This growth in concentration was typical of the first merger movement. The earlier mergers saw 78 of 92 large consolidations gain control of 50 percent of their total industry output, and 25 secure 80 percent or more.

The first major merger movement occurred during a period of rapid economic growth. The economic rationale for the large merger movement was the development of the modern corporation, with its limited liability, and the modern capital markets, which facilitated the consolidations through the absorption of the large security issues necessary to purchase firms. Nelson found the mergers were highly correlated to the period's stock prices and industry production. However, mergers were more sensitive to stock prices. The expansion of security issues allowed financiers the financial power necessary to induce independent firms to enter large consolidations. The rationale for the first merger movement was not one of trying to preserve profits despite slackening demand and greater competitive pressures. Nor was the merger movement the result of the development of the national railroad system, which reduced geographic isolation and transportation costs.

The first merger movement ended in 1904 with a depression, with whose onset coincided the *Northern Securities* case. Here it was held, for the first time, that anti-trust laws could be used to attack merger leading to market dominance.

A second major merger movement stirred the country from 1916 to the depression of 1929. This merger movement was only briefly interrupted by the First World War and the recession of 1921 and 1929. The approximately 12,000 mergers of the period coincided with the stock market boom of the 1920's. Although mergers greatly affected the electric and gas utility industry, market structure was not as severely concentrated by the second movement as it was by the first merger movement. Stigler (1950) concluded that mergers during this period created oligopolies, such as Bethlehem Steel and Continental Can. Mergers, primarily vertical and conglomerate in nature as opposed to the essentially horizontal conglomerate product-line extension of the 1920's were enhanced by the high-cross Antitrust laws, though not seriously enforced, prevented mergers from creating a single dominant firm. Merger activity diminished with the depression of 1929 and continued to decline until the 1940's.

The third merger movement began in 1940; mergers reached a significant proportion of firms in 1946 and 1947. The merger action from 1940 to 1947, although involving 7.5 percent of all manufacturing and mining corporations and controlling five percent of the total assets of the firms in those industries, was quite small compared to the merger activities of the 1920's. The merger of the 1940's included only one merger between companies with assets exceeding 50 million dollars and none between firms with assets surpassing 100 million dollars. The corresponding figures for the mergers of the 1920's were 14 and eight, respectively. Eleven firms acquired larger firms during the mergers of the 1920s than the largest firm acquired during the 1940s merger.

The merger of the 1940s affected competition far less than did the two previous merger movements, with the exception of the food and textile industries. The acquisition by the large firms during 1940s rarely amounted to more than seven percent of the acquiring firm's 1939 assets or to as much as a quarter of the acquiring firm's growth rate from 1940 to 1947.

Approximately five billion dollars of assets were held by acquired or merged firms over the 1940-1947 periods. Smaller firms were generally acquired by larger firms. Companies with assets exceeding 100 million dollars acquired, on average, firms with assets of less than two million dollars. The larger firms tended to engage in a greater number of acquisitions than smaller firms. The acquisition by the larger, acquiring firms tended to involve more firms than did those acquired by smaller, acquiring firms. The relatively smaller asset growth of the larger acquiring firms is in accordance with the third merger movement's generally small effect on competition and concentration. One factor contributing to the maintenance of competition was the initiative for the mergers coming from the owners of the smaller firms. Financiers and investment bankers did not play a prominent part in the early third merger movement.

The fourth merger movement, from 1951 to 1954, the forecast period of this study, was becoming a movement of conglomerate mergers. One of the 9 mergers occurring in 1951 involving acquired firms with assets exceeding 10 million dollars, 4 of these mergers were conglomerate mergers, of which 3 were product line extension combinations. The growth of the large conglomerate mergers continued throughout the forecast period. In 1954, 21 of the 37 mergers involving acquired firms with assets exceeding 10 million dollars were conglomerate in nature; 14 of the 21 conglomerate mergers were product line extensions while only 2 of the mergers were market extension combinations.

The United States merger history was analyzed by George Stigler (1950) to have resulted from three waves. The first wave, beginning in 1879, with the creation of the Standard Oil Trust, and ending in 1903, with the <u>Northern Securities</u>, witnessed the creation of the Linseed and National Lead Trusts and the Sugar Refineries Company. The trust form of organization was outlawed in the late 19th

century, but the creation of the corporation lead to the creation of Standard Oil, the American Tobacco Company, the United States Rubber Company, the General Electric Company, and United States Steel. The horizontal mergers created “near monopolies”. The first merger movement saw 78 of 92 large consolidations gain over 50 percent of total industry output. Mergers occurred in this period of rapid economic growth. Nelson (1959) found that mergers were highly correlated with stock prices and industrial output.

The second merger movement began in 1916 and ended with the onset of the depression in 1929. The vertical and conglomerate mergers of this period, Stigler (1950) believed created oligopolies such as Bethlehem Steel and Continental Can. Competition was adversely affected by the mergers. The application of antitrust laws prevented the creation of a single dominant firm in an industry. The third merger movement began in the 1940s and continues. The conglomerate mergers tend to affect competition less than the previous merger movements, with the exception of food and textile industries [Butters, Lintner, and Cary (1951)].

Mergers: The Statistical Tests and Reported Evidence

There are several approaches to studying the history of United States mergers. The merger history of the United States was studied by Nelson (1959), who reported that mergers were highly correlated with stock prices and industrial production from 1895 to 1954. Nelson (1966) later found that stock prices lead mergers by over 5 months (5.25) over the 1919 – 1961 period. Melicher, Ledolter, and D’Antonio (1983) and Guerard (1985) used ARIMA and transfer function modeling to find that stock prices lead mergers. Guerard used the Ashley, Granger, and Schmalensee (1980) bivariate transfer function causality testing methodology and reported that stock prices led mergers over the Nelson quarterly data from 1895 to 1954. Guerard and McDonald (1995) reported that the annual merger series from 1895 to 1979 was a near-random walk and that outlier-estimated time series models did not statistically outperform the naïve random walk with drift model. Golbe and White

(1993) fit a sine wave to a "spliced" United States annual merger history and found that a sine wave, representing a forty-year merger model described the behavior of mergers.

An Analysis of the Time Series of Quarterly United States Mergers: 1992 – 2011

A history of United States quarterly data is obtained from the FactSet Mergerstat database for 1992 -2011Q2. The data is input into Oxmetrics for time series analysis. We run an analysis of the quarterly data in which the change in the logarithmic transformation (dlog) of mergers is a function of the dlog components of the Leading Economic Indicators, LEI, published by The Conference Board. The reader is referred to Zarnowitz (1992) for a complete discussion of the LEI. A time series regression of mergers as a function of the components of the LEI reveals that only stock prices and the money supply are statistically significant at the 15% level; moreover, the money supply variable has an incorrectly negative coefficient, see EQ (1). An application of the Automatic Modeling Selection procedure, see EQ(2) leads to only the negative money supply. Guerard reported a four-quarter lag in the relationship between mergers and stock prices from 1895 to 1954. We expect lags in the LEI to lead mergers. We use one and two quarter lags in the LEI data and report in EQ (3) that the one-period lagged stock price series is statistically correlated with mergers. In EQ (4), EQ (5), EQ (6), we report that the current and one-period lagged stock price data leads mergers. An analysis of EQ (7) reveals that at least four outliers are present in the quarterly merger data. The F-statistic of EQ (6) dominates the F-statistics of EQ (8) and EQ (9) in which we run regressions of mergers as a function of the LEI data. There is a statistically significant two-quarter lag with LEI and mergers; however, the effect is less statistically pronounced than the stock price data.

If one applies the Ashley, Granger, and Schmalensee (1980) transfer function causality test to the mergers and stock price series, one finds a t-value of 0.57 on the stock price series. That is, a transfer function merger model using one-period lagged stock prices as an input, reduces the root mean square root relative to a random-walk with drift model, but the forecast error reduction is not statistically significant, a result reported by Guerard and McDonald (1995).

Summary and Conclusions

The purpose of this analysis is to present an updated and new analysis of the merger movements in the United States and the relationship between mergers, stock prices, and the leading economic indicators. We find additional statistical correlation and regression analysis to support the historical statistical evidence that stock prices lead mergers. Stock prices are a component of the leading economic indicators; however, stock prices more directly lead mergers than the leading economic indicators. Stock prices do not lead mergers in an Ashley, Granger, and Schmalensee causality test.

Ox Professional version 6.00

EQ(1) Modelling dDMergers by OLS

	Coefficient	Std.Error	t-value	t-prob	Part.R^2
Constant	0.0616215	0.02423	2.54	0.0134	0.0905
dHrWeek	2.20214	1.885	1.17	0.2470	0.0206
dWkInCL	-0.406564	0.2838	-1.43	0.1568	0.0306
dMfgOrders	-1.00722	0.7157	-1.41	0.1641	0.0296
dSuppDev	0.317889	0.2910	1.09	0.2787	0.0180
dMfgNonD	0.0253327	0.2199	0.115	0.9086	0.0002
BldPerm	0.293603	0.2489	1.18	0.2425	0.0210
dSP500	0.331035	0.2130	1.55	0.1250	0.0358
dM2	-2.53324	1.605	-1.58	0.1194	0.0369
dConExp	0.00541588	0.1708	0.0317	0.9748	0.0000

sigma	0.107663	RSS	0.753438773
R^2	0.243771	F(10,65) =	2.095 [0.037]*
Adj.R^2	0.127429	log-likelihood	67.4866

---------- Autometrics: dimensions of initial GUM ----------

no. of observations	76	no. of parameters	11
no. free regressors (k1)	11	no. free components (k2)	0
no. of equations	1	no. diagnostic tests	5

Summary of Autometrics search

initial search space	2^11	final search space	2^3
no. estimated models	93	no. terminal models	2
test form	LR-F	target size	Default:0.05
outlier detection	no	presearch reduction	lags
backtesting	GUM0	tie-breaker	SC
diagnostics p-value	0.01	search effort	standard
time	0.12	Autometrics version	1.5e

EQ(2) Modelling dDMergers by OLS

	Coefficient	Std.Error	t-value	t-prob	Part.R^2
Constant	0.0595716	0.01523	3.91	0.0002	0.1713
dM2	-4.34725	1.198	-3.63	0.0005	0.1511

sigma	0.106905	RSS	0.8457254
R^2	0.151143	F(1,74) =	13.18 [0.001]**
Adj.R^2	0.139672	log-likelihood	63.0958
no. of observations	76	no. of parameters	2
mean(dDMergers)	0.0267842	se(dDMergers)	0.115257

AR 1-2 test: F(2,72) = 3.1772 [0.0476]*
ARCH 1-1 test: F(1,74) = 0.094512 [0.7594]

GUM(3) Modelling dDMergers by OLS

	Coefficient	Std.Error	t-value	t-prob	Part.R^2
Constant	0.0293535	0.02199	1.33	0.1886	0.0373
dHrWeek	0.718022	1.935	0.371	0.7123	0.0030
dHrWeek_1	-4.76930	2.260	-2.11	0.0403	0.0883
dHrWeek_2	1.46406	1.945	0.753	0.4554	0.0122
dWkInCL	-0.268383	0.2958	-0.907	0.3690	0.0176
dWkInCL_1	0.154163	0.2948	0.523	0.6036	0.0059
dWkInCL_2	-0.0874009	0.2729	-0.320	0.7502	0.0022
dMfgOrders	-0.888739	0.7525	-1.18	0.2437	0.0294
dMfgOrders_1	0.595087	0.7798	0.763	0.4493	0.0125
dMfgOrders_2	0.397199	0.7510	0.529	0.5994	0.0060
dSuppDev	0.149083	0.2632	0.566	0.5739	0.0069
dSuppDev_1	-0.291959	0.2718	-1.07	0.2883	0.0245
dSuppDev_2	0.289764	0.2669	1.09	0.2832	0.0250
dMfgNonD	0.0375464	0.2700	0.139	0.8900	0.0004
dMfgNonD_1	-0.186103	0.2740	-0.679	0.5004	0.0099
dMfgNonD_2	-0.206999	0.2516	-0.823	0.4149	0.0145
BldPerm	-0.162543	0.2562	-0.634	0.5289	0.0087
BldPerm_1	0.231607	0.2557	0.906	0.3698	0.0175
BldPerm_2	0.166691	0.2366	0.705	0.4846	0.0107
dSP500	0.181444	0.1974	0.919	0.3627	0.0180
dSP500_1	0.374018	0.2129	1.76	0.0856	0.0629
dSP500_2	0.261796	0.2092	1.25	0.2171	0.0329
dM2	-2.36158	1.649	-1.43	0.1588	0.0427
dM2_1	-1.56727	1.631	-0.961	0.3417	0.0197
dM2_2	1.89004	1.452	1.30	0.1994	0.0355
dConExp	0.0499092	0.1528	0.327	0.7454	0.0023
dConExp_1	0.0725079	0.1710	0.424	0.6735	0.0039
dConExp_2	-0.00138546	0.1626	-0.00852	0.9932	0.0000

sigma	0.0936325	RSS	0.403284062
R^2	0.531762	F(27,46) =	1.935 [0.024]*
Adj.R^2	0.256927	log-likelihood	87.8492
no. of observations	74	no. of parameters	28
mean(dDMergers)	0.0209568	se(dDMergers)	0.10862

```
       AR 1-2 test:      F(2,44)   =   5.5118 [0.0073]**
       ARCH 1-1 test:    F(1,72)   =   10.026 [0.0023]**
        Normality test:   Chi^2(2)  =   2.2175 [0.3300]
        Hetero test:      F(54,19)  =   1.4692 [0.1790]
Chow test:        F(21,25)  =  0.71075 [0.7849]   for break after 55
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---------- Autometrics: dimensions of initial GUM ----------
no. of observations        74  no. of parameters          28
no. free regressors (k1)   28  no. free components (k2)    0
no. of equations            1  no. diagnostic tests        5
```

Summary of Autometrics search

initial search space	2^28	final search space	2^8
no. estimated models	193	no. terminal models	4
test form	LR-F	target size	Default:0.05
outlier detection	no	presearch reduction	lags
backtesting	GUM0	tie-breaker	SC
diagnostics p-value	0.01	search effort	standard
time	0.25	Autometrics version	1.5e

UM(4) Modelling dDMergers by OLS

	Coefficient	Std.Error	t-value	t-prob	Part.R^2
Constant	0.00555250	0.01152	0.482	0.6315	0.0033
dSP500	0.291821	0.1458	2.00	0.0493	0.0541
dSP500_1	0.515576	0.1481	3.48	0.0009	0.1475
dSP500_2	0.204682	0.1467	1.40	0.1673	0.0271

sigma	0.0951595	RSS	0.633873118
R^2	0.264034	F(3,70) =	8.371 [0.000]**
Adj.R^2	0.232493	log-likelihood	71.1175
no. of observations	74	no. of parameters	4
mean(dDMergers)	0.0209568	se(dDMergers)	0.10862

```
        AR 1-2 test:      F(2,68)   =   9.0433 [0.0003]**
        ARCH 1-1 test:    F(1,72)   =   2.3886 [0.1266]
        Normality test:   Chi^2(2)  =   10.374 [0.0056]**
        Hetero test:      F(6,67)   =  0.52308 [0.7888]
Chow test:        F(21,49)  =  0.66163 [0.8483]   for break after 55
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EQ(5) Modelling dDMergers by OLS

	Coefficient	Std.Error	t-value	t-prob	Part.R^2
dSP500	0.320817	0.1440	2.23	0.0290	0.0645
dSP500_1	0.569148	0.1442	3.95	0.0002	0.1778

sigma	0.0954224	RSS	0.655590714
log-likelihood	69.871		
no. of observations	74	no. of parameters	2
mean(dDMergers)	0.0209568	se(dDMergers)	0.10862

```
AR 1-2 test:      F(2,70)   =   9.5500 [0.0002]**
ARCH 1-1 test:    F(1,72)   =   1.9007 [0.1723]
Normality test:   Chi^2(2)  =   10.625 [0.0049]**
Hetero test:      F(4,69)   =  0.72801 [0.5759]
Hetero-X test:    F(5,68)   =   1.1718 [0.3321]
RESET23 test:     F(2,70)   = 0.058718 [0.9430]
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                 GUM(6) Modelling dDMergers by OLS

                  Coefficient  Std.Error  t-value  t-prob Part.R^2
dSP500               0.302460     0.1434     2.11  0.0384   0.0590
dSP500_1             0.524426     0.1462     3.59  0.0006   0.1534
dSP500_2             0.214017     0.1446     1.48  0.1433   0.0299

   sigma                0.0946435  RSS                0.635975134
                 log-likelihood         70.995
   no. of observations         74  no. of parameters            3
   mean(dDMergers)      0.0209568  se(dDMergers)          0.10862

         AR 1-2 test:      F(2,69)   =   9.0747 [0.0003]**
         ARCH 1-1 test:    F(1,72)   =   1.8115 [0.1826]
         Normality test:   Chi^2(2)  =   10.242 [0.0060]**
         Hetero test:      F(6,67)   =  0.53818 [0.7773]
Chow test:         F(21,50)  =  0.63549 [0.8713]   for break after 55


                  EQ(7) Modelling dDMergers by OLS


                  Coefficient  Std.Error  t-value  t-prob Part.R^2
dSP500_1             0.603289     0.1080     5.59  0.0000   0.3115
I:12                 0.296530    0.07331     4.05  0.0001   0.1917
I:16                 0.357167    0.07352     4.86  0.0000   0.2548
I:18                 0.288096    0.07331     3.93  0.0002   0.1829
I:65                -0.179780    0.07331    -2.45  0.0167   0.0802

   sigma                0.0733045  RSS                0.370775349
                 log-likelihood        90.9588
   no. of observations         74  no. of parameters            5
   mean(dDMergers)      0.0209568  se(dDMergers)          0.10862

         AR 1-2 test:      F(2,67)   =   2.5108 [0.0888]
         ARCH 1-1 test:    F(1,72)   = 0.072879 [0.7880]
         Normality test:   Chi^2(2)  =  0.21892 [0.8963]
         Hetero test:      F(2,67)   =  0.59968 [0.5519]
         Hetero-X test:    F(2,67)   =  0.59968 [0.5519]
         RESET23 test:     F(2,67)   =   2.9589 [0.0587]
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EQ(8) Modelling dDMergers by OLS

	Coefficient	Std.Error	t-value	t-prob	Part.R^2
dDMergers_1	-0.307811	0.1105	-2.78	0.0069	0.1010
Constant	-0.0183499	0.01466	-1.25	0.2150	0.0222
dLEI	1.41159	1.122	1.26	0.2128	0.0224
dLEI_1	1.64150	1.206	1.36	0.1779	0.0261
dLEI_2	3.29982	1.159	2.85	0.0058	0.1052

sigma	0.0963794	RSS	0.640940151
R^2	0.255829	F(4,69) =	5.93 [0.000]**
Adj.R^2	0.212689	log-likelihood	70.7073
no. of observations	74	no. of parameters	5
mean(dDMergers)	0.0209568	se(dDMergers)	0.10862

EQ(9) Modelling dDMergers by OLS

	Coefficient	Std.Error	t-value	t-prob	Part.R^2
dDMergers_1	-0.266408	0.1109	-2.40	0.0189	0.0742
dLEI_2	4.16836	0.9233	4.51	0.0000	0.2206

sigma	0.0980261	RSS	0.691856946
log-likelihood	67.8789		
no. of observations	74	no. of parameters	2
mean(dDMergers)	0.0209568	se(dDMergers)	0.10862

AR 1-2 test:	F(2,70)	=	2.1666 [0.1222]
ARCH 1-1 test:	F(1,72)	=	0.19580 [0.6595]
Normality test:	Chi^2(2)	=	11.783 [0.0028]**
Hetero test:	F(4,69)	=	0.37461 [0.8260]
Hetero-X test:	F(5,68)	=	0.32981 [0.8933]
RESET23 test:	F(2,70)	=	0.13933 [0.8702]

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