

***DO RECENT CHANGES IN THE DOW JONES
INDUSTRIAL AVERAGE SUPPORT THE
PRICE-PRESSURE HYPOTHESIS?***

Patricia A. Freeman, Jackson State University

Geungu Yu, Jackson State University

Phillip Fuller, Jackson State University

ABSTRACT

The price-pressure hypothesis (PPH) assumes that a temporary increase (decrease) in returns and volume results as firms are added to (deleted from) an index around the announcement date. This event study analyzed recent unexamined changes in the Dow Jones Industrial Average (DJIA) since 1996. Examination of returns of firms added to and firms deleted from DJIA did not support the PPH. Only deleted stocks' volume exhibited a slight increase following the announcement dates. Otherwise, the volume analyses for stocks either added to or deleted from the DJIA tended not to support the PPH.

INTRODUCTION

The Dow Jones Industrial Average (DJIA) was first compiled in 1884 by Charles H. Dow, editor of The Wall Street Journal. The DJIA was initially based on the closing prices of eleven actively traded stocks. Since the DJIA is a price-weighted index, higher (lower) priced stocks have greater (lesser) effect on the index. In 1928, the number of stocks in the DJIA was expanded to its current number of thirty stocks. Historically, only the most "respectable stocks" comprised the DJIA. The DJIA's composition may change if a firm listed in the index is merged with or acquired by another firm. The decline of relative importance of a firm or an industry in the economy can cause a firm to be replaced. For example, in 1997, Woolworth and Bethlehem Steel were replaced by Wal-Mart Stores Inc. and Hewlett-Packard Co. Table 1 presents the changes in the DJIA since 1996.

**TABLE 1
ADDITIONS AND DELETIONS OF DJIA CONSTITUENTS SINCE 1996**

Date	Additions	Deletions
March 17, 1997	Travelers Group, Hewlett-Packard Co., Johnson & Johnson, and Wal-Mart Stores Inc.	Westinghouse Electric, Texaco Inc., Bethlehem Steel, and Woolworth
November 1, 1999	Microsoft Corp., Intel Corp., SBC Communications, and Home Depot	Chevron Corp., Goodyear Tire and Rubber Co., Union Carbide Corp., and Sears Roebuck
April 8, 2004	American International Group Inc., Pfizer Inc. and Verizon	AT&T Corp., Eastman Kodak Co., and International Paper Co.

Source: <http://djindexes.com>, 1997, 1999, 2004.

During the 1990's, the stock markets changed. Individual investors used the internet to buy and sell stocks more quickly and cheaply than if they used a traditional "brick and mortar" stockbroker. Concurrently, investing in stock indexed mutual funds became more popular. In 1998 investors were provided a new investment vehicle called Diamonds Trust (Diamonds). Diamonds Trust is the Exchange Traded Fund (ETF) that tracks the DJIA. Diamonds are periodically adjusted to mirror changes in the composition and relative weights of securities in the DJIA. Consequently, Diamonds' returns are highly correlated with the DJIA's returns. Furthermore, Diamonds provided individual and institutional investors with an easy and affordable way to invest in companies comprising the DJIA. According to the American Stock Exchange (2006), ETFs such as Diamonds offer investors numerous benefits over mutual funds because: (1) they are designed to generally replicate the holdings and yield of their underlying index; (2) they are tax efficient due to low turnover; (3) they have lower costs since they are not actively managed; and (4) they can be bought and sold at intraday market prices, purchased on margin, sold short, and traded using stop orders and limit orders.

This study examines the changes to the DJIA that have occurred since 1996 that had not previously been examined. In light of the recent advances and new investment opportunities that now exist, the purpose of this study is to determine if recent changes in the DJIA caused any significant impact on the price and volume of stocks that were either added to or deleted from the DJIA. The efficient market theory (EMT) suggests that including a stock in or removing a stock from the DJIA should not affect either a stock's price or volume if the change does not convey any new information. However, the price-pressure hypothesis (PPH) assumes that a temporary increase (decrease) in returns and volume results as firms are added to (deleted from) an index around the announcement date. Several studies have been conducted to examine these important issues. Prior studies focused on changes in the composition of the S&P 500, FTSE 100, Australian All Ordinaries and DJIA.

In the late 1990's, several changes occurred. The DJIA replaced NYSE listed stocks with NASDAQ listed stocks for the first time to reflect the importance of technology. Individual investors can quickly alter their portfolios for tactical and/or strategic reasons by engaging in online trading. In addition, investors can easily invest in Diamonds. Consequently, due to these recent changes, altering the composition of the DJIA may now cause detectable pricing pressures.

LITERATURE REVIEW

Harris and Gurel (1986) confirmed the PPH in examining prices and volume surrounding changes in the composition of the S&P 500. The PPH assumes that investors who accommodate demand shifts must be compensated for the transaction costs and portfolio risks that they bear when they agree to immediately buy or sell securities, which they otherwise would not trade. The PPH and EMH are similar in that both suggest that long-run demand is elastic at the full-information price, but they differ in that the PPH hypothesizes that short-term demand curves may be less than perfectly elastic. They found that immediately after an addition is announced, prices increased by more than 3 percent, but the increase was nearly fully reversed after two weeks.

Lamoureux and Wansley (1987) supported the PPH. By examining market responses to changes in the S&P 500, they found that stocks added to (deleted from) the index experienced a significant positive (negative) announcement day excess return. The average announcement day trading volume for firms added to the S&P 500 was substantially larger than the average pre-period trading volume of traded stocks. Pruitt and Wei (1989) also supported the PPH by showing that institutional holdings increased when listing occurred.

Sahin (2005) analyzed the valuation and volume effects of 219 additions of Real Estate Investment Trusts (REITs) to various S&P indices since 2001. Salin's analysis supported the PPH. The study found that the inclusions of REITs in various S&P indices experienced approximately a 5 percent market-adjusted abnormal return on average at the time of the announcement.

Chan and Howard (2002) examined additions to and deletions from the Australian All Ordinaries Share Price Index (AOI). They found significant changes in daily returns and volume around the change date, which supported the PPH. They believed their findings, which were contrary to some findings based on the S&P500, were due to institutional differences in how changes in the composition of the AOI and S&P 500 are determined.

Gregoriou and Ioannidis (2003) examined changes in the FTSE 100. They found no evidence that suggested that changes of the FTSE 100 supported the PPH. However, their findings were consistent with the information cost and liquidity explanation in that inclusion in (deletion from) the FTSE 100 list increased (decreased) the likelihood that they would be widely followed. Their study supported Merton's attention hypothesis in that the changes in the FTSE 100 affected the likelihood of the market's attention.

Beneish and Gardner (1995), examining changes in the composition of the DJIA, found that the price and the trading volume of newly added DJIA firms were unaffected. However, firms removed from the index experienced significant price declines, which was consistent with the PPH. They believed that the market demanded an extra-return premium for higher trading costs due to relatively less information available to those stocks removed from the index. This suggested that the short-term demand curves of firms removed from the index would not be perfectly elastic, supporting the downward-sloping demand curve hypothesis.

Poloncheck and Krehbiel (1994) compared the price and volume responses associated with changes in the DJIA and Dow Jones Transportation Averages. They found that firms added to the roster of the DJIA experienced significantly positive abnormal returns and significantly greater trading volume on the event date; however, firms added to the Transportation Average experienced neither event period abnormal returns nor increased trading volume. They attributed the lack of significant effects on the Transportation Average to much less media attention, supporting Merton's (1987) attention hypothesis.

METHODOLOGY

Since 1996 the composition of the DJIA has changed three times. Ten firms were deleted and ten firms were added. The New York Times Index was used to identify firms that were involved in major lawsuits, labor disputes, bankruptcy or reported financial distress, mergers and/or acquisitions and stock buyback programs 60 days before to 60 days after the announcement dates. As a result, Sears and Union Carbide were eliminated from this study. Two equally weighted portfolios were

constructed and examined. One portfolio consisted of the firms that were added to the DJIA and the other consisted of firms that were deleted from the index. All companies either added to or deleted from the DJIA that are examined in this study were identified by using the Dow Jones Indexes website (<http://djindexes.com>). Daily stock price and trading volume data were collected from historical data provided by Commodity Systems, Inc.

An event study was conducted to evaluate the impact on returns and volume on the two portfolios. The market model was used to calculate excess returns or the prediction error as follows:

$$PE_t = R_t - [a + (b \cdot RM_t)] \quad (1)$$

where PE_t = the prediction error for market period or day t ,
 R_t = the return of the portfolio for period t or day t ,
 RM_t = the market return for period t or day t , and
 a and b are ordinary least squares estimates of the coefficients of the market model.

A positive (negative) prediction error means that the underlying stock price increased (decreased) more than was predicted. As in Beneish and Gardner (1995) and Gregoriou and Ioannidis (2003), prediction errors are examined over the 121-day period that extends from 60 days before to 60 days after the changes were announced. Average prediction errors, APE , are computed by dividing the prediction errors by the number of firms in the sample on each day t .

To assess the presence of abnormal returns, the average prediction errors are cumulated over intervals of k days from t through $t+k$ to obtain cumulative average prediction errors, CAE . That is,

$$CAE_{t,t+k} = \sum APE_i \quad i = t, t + 1, t + 2, t + 3, \dots, t + k. \quad (2)$$

Following the procedure used by Beneish and Gardner (1995) and Gregoriou and Ioannidis (2003) to test the null hypothesis that CAE equals zero, the following t -statistic with 79 degrees of freedom was computed:

$$t = CAE_{t,t+k} / [k s_{APE}^2]^{1/2} \quad (3)$$

$$s_{APE}^2 = \frac{1}{79} \sum_{t=1}^{80} (APE_t - \overline{APE})^2 \quad (4)$$

where s_{APE}^2 is an equally weighted portfolio variance estimate and \overline{APE} is the mean average prediction error for the 80-trading-day estimation period, -61, -21 and +21, +61.

The behavior of trading volume is analyzed based on the procedures used by Beneish and Gardner (1995) and Polonchek and Krehbiel (1994). Three announcement periods are examined: 1) the day of the announcement; 2) the day of the announcement and the day before the announcement; and 3) the day before the announcement, the day of the announcement, and the day after the announcement.

First, trading volume is evaluated around the announcement with the mean volume in the prior eight weeks adjusted for changes in the market volume. Then, the mean trading volume for the eight weeks prior to and after the announcement period of DJIA changes (excluding days -1 to +1) are compared.

Following the procedure of Beneish and Gardner (1995), Polonchek and Krehbiel (1994) and Gregoriou and Ioannidis (2003), trading volume is examined using the market-volume adjustment approach. The null hypothesis is that this ratio is 1. The relative trading volume, VR, is measured for firm *i* by the following equation:

$$VR_{it} = (VOL_{it}/VOL_{mt}) \quad (5)$$

where VOL_{it} is the natural logarithm of trading volume of security *i* traded in period *t* of added (deleted) firms and VOL_{mt} is the natural logarithm of trading volume for the S&P 500 index in period *t*.

The natural logarithm is used to compensate for the fact that daily volume distributions have been found to be skewed to the right and leptokurtotic (Polonchek and Krehbiel, 1994). Ajinkya and Jain (1989) found that natural log transformations of the volume measures are approximately normally distributed. Following the procedure of Beneish and Gardner (1995) and Gregoriou and Ioannidis(2003), the *t*-test is used to test the hypothesis of no significant statistical difference.

FINDINGS

The results of the tests to determine if stock prices are affected when the DJIA changes its composition are summarized in Table 2. As can be seen from Table 2, the stock returns of firms added to the DJIA are not affected by their inclusion. The CAE for the three day-period surrounding the announcement (day -1 to day +1) is 0.0051 percent and is not statistically different from zero (*t* = 0.63). These results are consistent with Beneish and Gardner (1995). Only one CAE is statistically significant: -0.0134 on day -4 (*t* = 2.85).

The stock returns of firms deleted from the DJIA are not affected by their deletion. The CAE for the three day-period surrounding the announcement is -0.0792 percent and is not statistically different from zero (*t* = -0.30). These results are not consistent with those of Beneish and Gardner. None of the CAEs for firms deleted from the DJIA are statistically significant. Beneish and Gardner found only CAE on the day of the announcement to be statistically significant. Our findings suggest that changing the composition of the DJIA does not provide any significant new information or pricing pressure as proposed by the PPH.

Results of the tests on market-adjusted trading volume effects are presented in Table 3. For the three announcement periods in Panel A, there are no significant changes in trading volume on the day of the announcement and the prior eight weeks for firms either added to or deleted from the DJIA. These results are consistent with those of Beneish and Gardner (1995), but not consistent with those of Polonchek and Krehbiel (1994).

The comparisons of trading volume in the eight-week periods before and after the announcement, that are presented in Panel B, indicate that the mean volumes before and after the announcement are not statistically significant for added firms. However, they are statistically significant for deleted firms. Intensified dumping by some portfolio managers may explain this result. The volume ratio results indicate

that trading volume change is not statistically significant for added firms but significant for deleted firms. In contrast, Beneish and Gardner (1995) found that trading volume did not change significantly for added firms but decreased for deleted firms with some statistical significance. Polonchek and Krehbiel (1994) found that trading volume increased for added firms on the event date and that the trading volume change was not statistically significant for deleted firms. Therefore, the volume effects for deleted firms seem inconclusive at best. Overall, the volume analyses do not support the PPH.

TABLE 2
STOCK PRICE EFFECTS

Days Relative to Event	Days in Cumulation	Portfolios (Additions)		Portfolios (Deletions)	
		CAE %	t- Statistic	CAE %	t- Statistic
-60, -2	59	0.01754	0.48	-0.53928	-0.47
-60, -41	20	-0.00057	-0.03	-0.12722	-0.19
-40, -21	20	0.01985	0.94	-0.25356	-0.38
-20, -11	10	0.00739	0.50	-0.10950	-0.23
-10	1	-0.00205	-0.43	-0.01419	-0.09
-9	1	-0.00072	-0.15	-0.02122	-0.14
-8	1	0.00691	1.47	-0.01442	-0.10
-6	1	0.00153	0.32	-0.00300	-0.02
-5	1	-0.00581	-1.23	-0.00236	-0.02
-4	1	-0.01342	-2.85*	0.00677	0.05
-3	1	0.00538	1.14	0.02081	0.14
-2	1	-0.00010	-0.02	-0.00979	-0.07
-1	1	-0.00003	-0.01	-0.03195	-0.21
0	1	0.00381	0.81	-0.03494	-0.23
1	1	0.00134	0.28	-0.01231	-0.08
2	1	-0.00812	-1.72**	-0.00318	-0.02
3	1	0.00525	1.11	-0.02523	-0.17
4	1	0.00754	1.60	-0.01554	-0.10
5	1	0.00111	0.23	-0.03295	-0.22
6	1	-0.00014	-0.03	-0.00114	-0.01
7	1	0.00240	0.51	-0.02053	-0.14
8	1	0.00242	0.51	-0.02070	-0.14
9	1	0.00709	1.50	-0.01474	-0.10
10	1	-0.00449	-0.95	-0.02475	-0.16
+11, +20	10	-0.01608	-1.08	-0.20806	-0.44
+21, +40	20	0.01143	0.54	-0.11593	-0.17
+41, +60	20	-0.03107	-1.47	1.10123	1.64
+2, +60	59	-0.02267	-0.63	0.61849	0.54
-1, +1	3	0.00513	0.63	-0.07921	-0.30

Note:
CAE = cumulative average prediction error.
*Indicates significant at the 1 percent level.
**Indicates significant at the 10 percent level.

*Do Recent Changes In the Dow Jones Industrial Average
Support the Price-Pressure Hypothesis?*

**TABLE 3
TRADING VOLUME EFFECTS**

Panel A				
Market-Adjusted Volume Effects - An Evaluation of Trading Volume of Days around the Announcement with Mean Volume in the Prior Eight Weeks Adjusting for Changes in Market Volume				
Period	Additions		Deletions	
	Mean VR	t-Statistic	Mean VR	t-Statistic
Day 0	.998	-0.184	.995	-0.286
Days -1, 0	1.003	-0.046	.995	-0.286
Days -1, +1	1.005	-0.000	1.017	-0.494

Panel B				
Comparison of Trading Volume Before and After the DJIA Change				
N	Mean Volume		Ratio of Post-Volume to Pre-Volume Adjusted for Market Volume	
	Before	After		
Additions 10	.86%	.87%	0.998	
t-statistics	-0.791	-1.638		
Deletions 8	.75%	.76%	1.008	
t-statistics	-2.233**	-3.325*		

Note:
 VR = relative trading volume.
 *Indicates significant at the 1 percent level.
 **Indicates significant at the 5 percent level.

SUMMARY AND CONCLUSIONS

This study examined the changes to the DJIA that occurred since 1996 that had not previously been examined. In recent years several changes have occurred. For example, individual investors are now able to quickly alter their portfolios for tactical and/or strategic reasons by engaging in online trading; individuals and institutions can easily invest in DJIA by purchasing Diamonds. Although financial markets have changed in recent years, this study indicates that investors believe no significant additional information is provided when stocks are chosen to be either excluded from or included in the DJIA. Trading volume did not change for added firms but increased for deleted firms after the announcement date. The findings of this study are more consistent with prior research, which tended to reject the PPH. In essence, changing the composition of the DJIA does not provide the market with any significant pricing pressure as suggested by the PPH.

REFERENCES

- Ajinkya, Bipin B and Jain, Prem C. "The behavior of daily stock market trading volume." *Journal of Accounting and Economics*, Volume 11, Issue 4 , November 1989, 331-359.
- Beneish, Messod D. and Gardner, John C. "Information Costs and Liquidity Effects from Changes in the Dow Jones Industrial Average List." *Journal of Financial and Quantitative Analysis*, March 1995, 135-156.
- Chan, Howard W.H. and Howard, Peter F. "Additions to and Deletions from an Open-Ended Market Index: Evidence from the Australian All Ordinaries." *Australian Journal of Management*, June 2002, 45-74.
- Gregoriou, A. and Ioannidis, C, "Liquidity Effects due to Information Costs from Changes in the FTSE 100 List." *Economics and Finance Working paper*, Brunel University, West London, January 2003.
- Harris, Lawrence and Gurel, Eitan. "Price and Volume Effects Associated with Changes in the S&P 500 List: New Evidence for the Existence of Price Pressures." *Journal of Finance*, September 1986, 815-829.
<http://djindexes.com>, 1997, 1999, 2004.
<http://www.amex.com>, 2006.
- Lamoureux, Christopher G. and Wansley, James W. "Market Effects of Changes in the Standard & Poor's 500 Index." *The Financial Review*, February 1987, 53-69.
- Merton, Robert. "A Simple Model of Capital Market Equilibrium with Incomplete Information." *Journal of Finance*, 1987, 42 (3), 483-510.
- Poloncheck, John and Krehbiel, Tim. "Price and Volume Effects Associated with Changes in the Dow Jones Averages." *The Quarterly Review of Economics and Finance*, Vol. 34, No. 4, Winter, 1994, 305-316.
- Poterba, J., and J. Shoven. "Exchange Traded Funds: A New Investment Option for Taxable Investors," *American Economic Review*, 92, 2002, 422-427.
- Pruitt, S. and Wei, K. "Institutional Ownership and Changes in the S&P 500." *Journal of Finance*, 1989, 509-513.
- Sahin, Olgun Fuat. "The Impact of Standard & Poor's Index Inclusions on Real Estate Investment Trusts." *The Southern Business & Economic Journal*, Volume 28, 2005, 74-84.