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The Price Effect of Option Introduction

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ABSTRACT

This paper examines the price effect of option introduction from 1974 to 1980. The introduction of individual options causes a permanent price increase in the underlying security, beginning approximately three days before introduction. The price effect appears to be associated with introduction, and not announcement, throughout the sample period. Excess returns volatility declines with option introduction. Systematic risk is unchanged. There is a positive relation between the price increase and a measure of activity in the options market.

THIS PAPER EXAMINES THE effect of option introduction on the returns of the underlying security. Black and Scholes [1] originally priced options by assuming that they are redundant assets and can therefore be valued with a no-arbitrage relation; in their model, option introduction can have no price effect on the underlying security. There are several reasons to test this assumption. First, the use of the option may allow the investor to take positions in the underlying security which were not possible prior to option introduction.[1] Second, Ross [13] and Hakansson [7] also discuss some conditions under which options may affect the opportunity sets of investors. Generally, in these two cases, the introduction of the option may improve the welfare of previously restricted traders and be associated with a price effect. In contrast, there has been recent popular support for the notion that options (and derivative securities in general) may instead be detrimental to investors. This argument states that trading in these instruments may be "driving down the value of stocks and other securities,"[2] presumably by increasing volatility in the underlying markets. Given these conflicting views as to the effect of derivative securities on primary markets, it is an interesting empirical question whether the introduction of an option in fact has a price effect in the underlying security and, if so, what this price effect may be.

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[1] For example, institutional features such as trading restrictions could have made a position costly or even prohibited it altogether; one example of such features is a short sale restriction.

By making some investment positions less costly, it can be argued that the option may also allow new information about the security to enter the price directly for the first time. (As an illustration, the option may be used to more easily obtain a short position in the security. Some "pessimistic" traders, restricted from shorting in the securities market, may be able to trade directly on their negative information in the options market.) However, any "new" (previously untraded on) information entering the options market would have been estimated (correctly, on average) by rational traders and influenced their price expectations. (See, for example, Diamond and Verrecchia [4].) The new information itself should not cause a systematic price effect, although the decrease in information estimation costs may affect the security price at initiation of trading.

[2] New York Times News Service, September 1986.

The results in this paper indicate that the introduction of an options market is associated with a positive price effect on the underlying security beginning slightly before the introduction date. This price effect appears to be associated with introduction and not the announcement date. Its magnitude remains roughly constant throughout the sample period. The variance of individual underlying security returns declines following option introduction. The systematic risk of a security is not affected by option introduction. This evidence suggests that options are not completely redundant securities.

The price effect's occurrence slightly before introduction but not at the announcement is puzzling; if the price effect is large and anticipated, an efficient market would imply that this effect should occur at the announcement of option introduction. However, the price increase may be sufficiently small (~2%) that transactions costs make it unprofitable for any but those traders who anticipate acting as a dealer in the new option and using the security to hedge. For example, a trader/dealer who anticipates writing calls may purchase the security immediately before option introduction to satisfy his or her anticipated hedging demand and facilitate trading. (Note that, since early option introductions involved only call options, the hedging argument in these cases must imply that the dealers supply calls to investors and simultaneously purchase the stock.) If these dealers have positive inventory carrying costs (see, e.g., Ho and Stoll [9] or Stoll [16] for a discussion of dealer's carrying costs), then even they may have little incentive to purchase well before introduction in the face of a "small" price increase.

Some support is found for this argument. If dealers correctly estimate their hedging demand for options, there should be a positive correlation between the price increase caused by the hedging demand and the volume of trading in the option. In fact, the price increase in the primary market is positively associated with initial trading volume in the security, although much of the variation in the price increase remains unexplained.

For the dealers' hedging demand to cause a net increase in demand in the underlying security, it must also be the case that the existence of the option causes more investors to invest indirectly in the security through the option market, perhaps by making some positions less costly. In addition, for the increase in demand to be associated with the observed price effects, the excess demand in the optioned security cannot be infinitely elastic. This seems plausible; to create the hedge, the dealer would presumably not accept a "substitute" nonoptioned security. The lack of a good substitute would cause a price increase when demand shifted up. In this context, note that the magnitude of the price increase found in this paper is approximately equal to the magnitude of the listing effect found by Harris and Gurel [8] while testing the price-pressure hypotheses. The major difference in these results, which supports the imperfect-substitute hypothesis, is that the price effect associated with option introduction appears to be permanent.

The paper is organized as follows: Section I examines the characteristics of the data set used in the study; Section II discusses the methodology; Section III reports the results; Section IV discusses security parameters; and Section V contains conclusions.

I. Data

Data were gathered from the *Wall Street Journal* on the introduction of stock options between 1973 and 1980 on both the Chicago Board of Options Exchange and the American Option Exchange. To remove any "learning effect" in options trading (for example, see Chiras and Manaster [2]), we only use options introduced after December 1974 on the Chicago Board of Options Exchange and June 1975 on the American Options Exchange.[3] In addition, the underlying security must have returns data listed for 130 days before and after option introduction since this is the largest "window" over which parameters are estimated. Ninety-six stock options satisfy these criteria.

II. Methodology

To determine whether the introduction of an option has a price effect, an event study is performed. The market model is estimated over a period of two hundred days outside the event window, one hundred days before and one hundred days after the window. The event window extends from day −30 to day +30 relative to the event; the event is defined alternatively as the day of option introduction (the day when some trading constraints may be removed) and the announcement of option introduction. Scholes-Williams [15] betas are estimated throughout the paper.

Since many options are sometimes introduced on a single calendar date, cross-sectional correlation in excess returns could bias the results. We therefore form equally weighted portfolios of the securities which have identical option introduction dates and treat these portfolios as one individual security.[4] To draw inferences, a z-score is computed from the standardized excess returns of individual firms for each day in the event window using the methodology employed by Patell [12].

III. Results

The results using introduction as the event date are presented in Table I. Beginning immediately before the option introduction, there are several large positive excess returns. The t-statistics for day −3 to day +1 are 4.29, 2.02, 2.32, 1.69, and 3.09, respectively. There is also a tendency toward positive values in individual forecast errors; testing the hypothesis that the numbers of positive and negative excess returns are equal around the event, we obtain p-values on days −4 to 0 of 0.07, 0.03, 0.14, 0.36, and 0.14, respectively.

Option introduction on individual securities appears to be associated with a price increase in the security. If an investor had purchased the underlying security

[3] These cutoff dates were chosen somewhat arbitrarily to balance the increase in trading volume on the exchange market against the loss of option introduction dates from the sample.

[4] Event studies were also performed using individual securities (rather than portfolios), OLS betas, and different event and parameter estimation windows. The results shown here are robust to all these changes in methodology.

Table I

Average and Cumulative Residuals, *t*-Statistics, and *p*-Values around Option Introduction

A market model with Scholes-Williams betas is used to estimate excess returns during the event window. The event window consists of thirty days before plus thirty days after the event date (option introduction). The market model is estimated over one hundred days before plus one hundred days after the event window. Excess returns in the event window are standardized by the standard deviation of market model residuals. Securities with identical event dates are formed into portfolios. The number of different event dates is thirty.

Day	Average Excess Return	*t*-Statistic	Cumulative Excess Return	*t*-Statistic	% Positive[a]	*p*-Value[b]
−30	0.115773	0.630904	0.115773	0.630904	56.67%	0.23
−29	0.537221	2.927582	0.652994	2.516230	70.00%	0.01
−28	−0.264892	−1.443524	0.388103	1.221074	36.67%	0.07
−27	−0.138796	−0.756369	0.249306	0.679296	50.00%	0.50
−26	0.187883	1.023870	0.437190	1.065470	53.33%	0.36
−25	0.019111	0.104146	0.456301	1.015154	60.00%	0.14
−24	−0.104951	−0.571928	0.351350	0.723681	36.67%	0.07
−23	−0.017631	−0.096079	0.333719	0.642973	50.00%	0.50
−22	−0.079570	−0.433615	0.254149	0.461662	56.67%	0.23
−21	0.317655	1.731059	0.571804	0.985380	63.33%	0.07
−20	−0.001708	−0.009310	0.570096	0.936716	53.33%	0.36
−19	−0.220671	−1.202544	0.349425	0.549692	53.33%	0.36
−18	0.111390	0.607019	0.460815	0.696484	50.00%	0.50
−17	−0.040496	−0.220684	0.420319	0.612169	43.33%	0.36
−16	0.019355	0.105477	0.439675	0.618645	50.00%	0.50
−15	0.213204	1.161854	0.652879	0.889464	56.67%	0.23
−14	−0.121698	−0.663192	0.531181	0.702059	46.67%	0.36
−13	0.090869	0.495190	0.622050	0.798997	53.33%	0.36
−12	−0.129876	−0.707759	0.492174	0.615315	40.00%	0.14
−11	0.129446	0.705416	0.621620	0.757471	56.67%	0.23
−10	0.198123	1.079668	0.819743	0.974819	56.67%	0.23
−9	−0.182913	−0.996785	0.636829	0.739891	40.00%	0.14
−8	0.057921	0.315642	0.694750	0.789443	50.00%	0.50
−7	0.190314	1.037112	0.885064	0.984521	46.67%	0.36
−6	−0.114945	−0.626390	0.770119	0.839352	50.00%	0.50
−5	0.068727	0.374527	0.838846	0.896503	46.67%	0.36
−4	0.181557	0.989393	1.020403	1.070153	63.33%	0.07
−3	0.787817	4.293205	1.808220	1.862209	66.67%	0.03
−2	0.370561	2.019370	2.178781	2.204808	60.00%	0.14
−1	0.425243	2.317361	2.604025	2.590840	53.33%	0.36
0	0.310491	1.692021	2.914516	2.852605	60.00%	0.14
1	0.567828	3.094376	3.482345	3.354693	56.67%	0.23
2	0.034189	0.186310	3.516533	3.335906	50.00%	0.50
3	−0.211260	−1.151259	3.305273	3.089043	40.00%	0.14
4	0.165958	0.904388	3.471232	3.197464	60.00%	0.14
5	0.051695	0.281710	3.522926	3.199694	46.67%	0.36
6	0.039354	0.214458	3.562280	3.191415	53.33%	0.36
7	0.044512	0.242570	3.606792	3.188493	53.33%	0.36
8	0.320146	1.744634	3.926939	3.426714	63.33%	0.07
9	0.012958	0.070616	3.939897	3.394775	50.00%	0.50
10	−0.174538	−0.951142	3.765359	3.204576	50.00%	0.50
11	0.054750	0.298360	3.820109	3.212234	50.00%	0.50
12	0.036154	0.197019	3.856263	3.204708	53.33%	0.36
13	−0.295280	-1.609124	3.560983	2.925497	40.00%	0.14

Table I—*Continued*

Day	Average Excess Return	*t*-Statistic	Cumulative Excess Return	*t*-Statistic	% Positive[a]	*p*-Value[b]
14	−0.035102	−0.191289	3.525881	2.864293	43.33%	0.23
15	0.003990	0.021742	3.529871	2.836194	46.67%	0.36
16	−0.045138	−0.245979	3.484733	2.769980	56.67%	0.23
17	−0.269653	−1.469473	3.215080	2.528874	36.67%	0.07
18	−0.048600	−0.264848	3.166479	2.465101	50.00%	0.50
19	0.276823	1.508545	3.443302	2.653666	56.67%	0.23
20	0.255884	1.394435	3.699186	2.822781	60.00%	0.14
21	−0.013794	−0.075169	3.685392	2.785083	53.33%	0.36
22	−0.107569	−0.586198	3.577823	2.678163	36.67%	0.07
23	−0.206715	−1.126492	3.371108	2.499953	36.67%	0.07
24	−0.190526	−1.038268	3.180582	2.337122	56.67%	0.23
25	−0.232489	−1.266948	2.948093	2.146858	53.33%	0.36
26	−0.136415	−0.743392	2.811678	2.029478	40.00%	0.14
27	−0.354911	−1.934083	2.456768	1.757949	46.67%	0.36
28	0.265380	1.446185	2.722147	1.931264	53.33%	0.36
29	0.202420	1.103086	2.924567	2.057510	63.33%	0.07
30	0.165169	0.90087	3.089736	2.155820	50.00%	0.50

[a] Percentage of firms with positive excess returns.

[b] The *p*-value is the result of testing the hypothesis that the number of positive excess returns equals the number of negative excess returns.

at announcement of option introduction (weighting all securities equally), excess returns of approximately two percent would have been earned in the five days (day −3 to day +1) around introduction. The price effect also appears to be permanent; cumulative returns remain abnormally high at least thirty trading days after introduction.

Since the price effect begins slightly before introduction, the obvious question to be answered is whether the timing of this price effect is more closely associated with announcement of option introduction. To test for the announcement effect, announcement dates for seventy-eight options in our sample were collected from the *Wall Street Journal.* We again form portfolios of securities which have identical event dates. When returns around the announcement dates are examined, there is no evidence of price increase immediately associated with the announcement. (See Table II.) There is a small increase on day −9 (*t*-statistic = 1.85) and an increase on day +5 (*t*-statistic = 2.16). The large excess return on day +5 is more closely associated with the introduction date since the median number of days between announcement and introduction of the option is eight. The excess returns immediately around announcement are not significant, with *t*-statistics on days −3 to +1 of −0.42, 0.99, 1.13, 0.05, and 0.67, respectively. These results imply that either the price effect occurs *after* the announcement (which is contrary to rational behavior) or slightly before the introduction of an option.[5]

[5] There is little evidence that the options exchanges' announcements are not believable or accurate, which might explain the effect occurring closer to introduction. Only one case was found where an option introduction was announced but did not occur. Only two cases were found where introduction occurred more than 125 trading days after the initial announcement.

Table II

Average and Cumulative Residuals, *t*-Statistics, and *p*-Values around Option Introduction Announcement

A market model with Scholes-Williams betas is used to estimate excess returns during the event window. The event window consists of thirty days before plus thirty days after the event date (option introduction announcement). The market model is estimated over one hundred days before plus one hundred days after the event window. Excess returns in the event window are standardized by the standard deviation of market model residuals. Securities with identical event dates are formed into portfolios. The number of different event dates is fifteen.

Day	Average Excess Return	*t*-Statistic	Cumulative Excess Return	*t*-Statistic	% Positive[a]	*p*-Value[b]
−30	−0.053310	−0.205422	−0.053310	−0.205422	46.67%	0.40
−29	0.102386	0.394533	0.049077	0.133722	53.33%	0.40
−28	−0.028599	−0.110203	0.020478	0.045558	46.67%	0.40
−27	−0.105694	−0.407280	−0.085217	−0.164186	40.00%	0.22
−26	−0.258105	−0.994576	−0.343322	−0.591640	40.00%	0.22
−25	0.734148	2.828945	0.390826	0.614821	73.33%	0.04
−24	−0.140773	−0.542450	0.250053	0.364186	53.33%	0.40
−23	−0.086931	−0.334979	0.163121	0.222232	46.67%	0.40
−22	0.726562	2.799713	0.889683	1.142760	66.67%	0.10
−21	−0.576392	−2.221055	0.313291	0.381758	40.00%	0.22
−20	0.135554	0.522340	0.448845	0.521484	53.33%	0.40
−19	−0.081362	−0.313520	0.367482	0.408777	53.33%	0.40
−18	0.134838	0.519583	0.502321	0.536847	53.33%	0.40
−17	0.042090	0.162190	0.544411	0.560666	60.00%	0.22
−16	0.231511	0.892099	0.775922	0.771993	46.67%	0.40
−15	0.313336	1.207401	1.089258	1.049330	86.67%	0.00
−14	−0.309751	−1.193585	0.779508	0.728512	33.33%	0.10
−13	−0.029613	−0.114112	0.749894	0.681090	66.67%	0.10
−12	0.203144	0.782791	0.953038	0.842509	66.67%	0.10
−11	0.421288	1.623379	1.374326	1.184175	53.33%	0.40
−10	0.168115	0.647811	1.542441	1.297000	46.67%	0.40
−9	0.481201	1.854248	2.023643	1.662507	60.00%	0.22
−8	−0.240557	−0.926955	1.783086	1.432681	40.00%	0.22
−7	0.280371	1.080376	2.063457	1.623046	53.33%	0.40
−6	0.039362	0.151675	2.102819	1.620589	40.00%	0.22
−5	−0.463758	−1.787032	1.639061	1.238653	26.67%	0.04
−4	−0.259103	−0.998421	1.379958	1.023352	33.33%	0.10
−3	−0.107826	−0.415495	1.272132	0.926390	53.33%	0.40
−2	0.256081	0.986776	1.528213	1.093518	60.00%	0.22
−1	0.294078	1.133193	1.822291	1.282030	66.67%	0.10
0	0.012578	0.048469	1.834869	1.269888	33.33%	0.10
1	0.174568	0.672674	2.009437	1.368801	60.00%	0.22
2	0.140202	0.540249	2.149639	1.441948	40.00%	0.22
3	0.036002	0.138727	2.185640	1.444376	40.00%	0.22
4	0.183340	0.706479	2.368980	1.543009	53.33%	0.40
5	0.560730	2.160701	2.929710	1.881544	60.00%	0.22
6	0.216582	0.834570	3.146292	1.993146	46.67%	0.40
7	0.054481	0.209934	3.200772	2.000802	46.67%	0.40
8	−0.132874	−0.512012	3.067899	1.892996	46.67%	0.40
9	0.089623	0.345352	3.157522	1.923789	40.00%	0.22
10	0.017072	0.065785	3.174594	1.910457	46.67%	0.40
11	−0.003477	−0.013399	3.171117	1.885509	53.33%	0.40
12	−0.146306	−0.563773	3.024810	1.777481	40.00%	0.22
13	−0.258784	−0.997191	2.766026	1.606834	40.00%	0.22

Table II—*Continued*

Day	Average Excess Return	*t*-Statistic	Cumulative Excess Return	*t*-Statistic	% Positive[a]	*p*-Value[b]
14	0.004184	0.016122	2.770210	1.591284	53.33%	0.40
15	0.078151	0.301145	2.848361	1.618293	60.00%	0.22
16	−0.249858	−0.962797	2.598503	1.460546	26.67%	0.04
17	−0.090746	−0.349678	2.507757	1.394781	33.33%	0.10
18	−0.110979	−0.427642	2.396779	1.319383	33.33%	0.10
19	0.221872	0.854957	2.618651	1.427032	53.33%	0.40
20	0.088076	0.339390	2.706727	1.460496	33.33%	0.10
21	−0.554661	−2.137317	2.152066	1.149992	26.67%	0.04
22	−0.365448	−1.408208	1.786618	0.945660	40.00%	0.22
23	−0.009048	−0.034865	1.777570	0.932118	46.67%	0.40
24	−0.029501	−0.113679	1.748069	0.908277	46.67%	0.40
25	−0.075501	−0.290935	1.672567	0.861253	40.00%	0.22
26	−0.054016	−0.208145	1.618551	0.826095	46.67%	0.40
27	−0.155495	−0.599182	1.463056	0.740266	40.00%	0.22
28	0.066336	0.255619	1.529392	0.767245	66.67%	0.10
29	0.185922	0.716428	1.715314	0.853315	53.33%	0.40
30	0.499460	1.924605	2.214774	1.092712	73.33%	0.04

[a] Percentage of firms with positive excess returns.

[b] The *p*-value is the result of testing the hypothesis that the number of positive excess returns equals the number of negative excess returns.

The price effect, therefore, seems to be more closely associated with the option introduction than with the announcement of the introduction. The price effect beginning approximately three days before actual trading in the option can occur may be evidence of market inefficiency. It may also be consistent with the net increase in demand occurring only at introduction due to an inventory buildup on the part of (hedging) dealers and floor traders. Nonhedging traders may find the price increase small compared to round-trip transactions costs; Stoll and Whaley [17], for example, report that average turnaround transactions costs are 2.7 percent for the largest firms in their sample.[6]

If the price effect does represent an inefficient market, then the movement in the price may occur closer to announcement as traders learn of this price effect. To test this possibility, the sample was split into 1980 vs. pre-1980 introductions. The differences in mean excess returns across these two subsamples are

[6] We also explored the possibility that the price effect observed at option introduction could be due to confounding events or announcements by firms. The number and content of *Wall Street Journal* articles were collected from the *Wall Street Journal Index* around both option introduction and announcement for the seventy-eight securities for which both dates are available. The announcement period is used as a control since no abnormal price effect is observed immediately around this date. Announcements in the *Journal* were collected for five trading days before and two trading days after each date. This window was chosen so as to encompass the entire price-effect period around introduction and minimize overlap in the two periods. When overlap did occur, the news release was associated with introduction.

No immediately discernible pattern in announcements was observed in the timing or content of the news releases. In fact, the average difference between the number of news items at introduction and announcement per security is exactly zero. It does not appear that firms systematically release other information around the time of option introduction.

Table III

Mean Differences and *t*-Statistics for Differences between Average Excess Returns for Options Introduced in 1974–1979 and 1980

A market model with Scholes-Williams betas is used to estimate excess returns during the event window. The event window consists of thirty days before plus thirty days after the event date (option introduction). The market model is estimated over one hundred days before plus one hundred days after the event window. Excess returns in the event window are standardized by the standard deviation of market model residuals. Securities with identical event dates are formed into portfolios. The number of different event dates from 1974–1979 is twenty-three; in 1980 there are seven separate event dates.

Day	1974–1979 Average Excess Return	1980 Average Excess Return	Average Difference[a]	*t*-Statistic[b]
−30	0.086304	0.212600	0.1263	0.293
−29	0.661701	0.128215	−0.5335	−1.236
−28	−0.286017	−0.195480	0.0905	0.210
−27	−0.109844	−0.233927	−0.1241	−0.287
−26	0.393431	−0.487486	−0.8809	−2.041
−25	0.030582	−0.018578	−0.0492	−0.114
−24	−0.184601	0.156757	0.3414	0.791
−23	0.016729	−0.130529	−0.1473	−0.341
−22	0.027622	−0.431771	−0.4594	−1.064
−21	0.263165	0.496695	0.2335	0.541
−20	0.039437	−0.136900	−0.1763	−0.408
−19	−0.305227	0.057158	0.3624	0.840
−18	0.113242	0.105307	−0.0079	−0.018
−17	−0.045856	−0.022886	0.023	0.053
−16	0.177381	−0.499872	−0.6773	−1.569
−15	0.121232	0.515398	0.3942	0.913
−14	−0.278677	0.394089	0.6728	1.559
−13	0.081437	0.121860	0.0404	0.094
−12	−0.175007	0.018412	0.1934	0.448
−11	0.215279	−0.152576	−0.3679	−0.852
−10	0.197401	0.200495	0.0031	0.007
−9	−0.424080	0.609490	1.0336	2.394
−8	0.059673	0.052167	−0.0075	−0.017
−7	0.245333	0.009536	−0.2358	−0.546
−6	−0.030135	−0.393606	−0.3635	−0.842
−5	0.229838	−0.460637	−0.6905	−1.600
−4	0.177008	0.196504	0.0195	0.045
−3	0.625651	1.320648	0.695	1.610
−2	0.388421	0.311878	−0.0765	−0.177
−1	0.198465	1.170372	0.9719	2.252
0	0.556252	−0.497006	−1.0533	−2.440
1	0.599489	0.463801	−0.1357	−0.314
2	−0.045762	0.296885	0.3426	0.794
3	−0.033581	−0.795060	−0.7615	−1.764
4	0.211749	0.015501	−0.1962	−0.455
5	0.085890	−0.060663	−0.1466	−0.340

Table III—*Continued*

Day	1974–1979 Average Excess Return	1980 Average Excess Return	Average Difference[a]	t-Statistic[b]
6	0.064400	−0.042940	−0.1073	−0.249
7	0.124455	−0.218155	−0.3426	−0.794
8	0.176830	0.791043	0.6142	1.423
9	−0.083199	0.328903	0.4121	0.955
10	−0.163261	−0.211590	−0.0483	−0.112
11	0.361633	−0.953580	−1.3152	−3.047
12	−0.013691	0.199929	0.2136	0.495
13	0.227104	−0.519284	−0.2922	−0.677
14	−0.219889	0.572053	0.7919	1.835
15	−0.093518	0.324371	0.4179	0.968
16	−0.268407	0.688460	0.9569	2.217
17	−0.290305	−0.201797	0.0885	0.205
18	−0.025222	−0.125416	−0.1002	−0.232
19	0.260859	0.329278	0.0684	0.158
20	0.237444	0.316469	0.079	0.183
21	−0.087299	0.227723	0.315	0.730
22	−0.264714	0.408764	0.6735	1.560
23	−0.237772	−0.104671	0.1331	0.308
24	−0.126282	−0.401610	−0.2753	−0.638
25	−0.241436	−0.203092	0.0383	0.089
26	−0.075918	−0.335192	−0.2593	−0.601
27	−0.416109	−0.153831	0.2623	0.608
28	0.218123	0.420651	0.2025	0.469
29	0.217321	0.153461	−0.0639	−0.148
30	0.295637	−0.263511	−0.5591	−1.295

[a] Difference in average excess returns across the two samples.

[b] The t-statistic is calculated using the standard deviation of $(\bar{X}_1 - \bar{X}_2)$, where $\bar{X}_1$ is the 1980 average excess return and $\bar{X}_2$ is the 1974–1979 average excess return.

presented in Table III. The differences are computed as the 1980 average excess return less the pre-1980 average excess return. There appears to be a similar positive price effect in both subsamples. The total price increase in 1980 is as large as the pre-1980 effect. In addition, the evidence in Table III shows that the price effect in 1980 is not any closer to the announcement date than in the pre-1980 subsample; the price effect begins three to four trading days before option introduction throughout the entire time period. In fact, the announcement date actually moves farther away from the introduction date in 1980 (the minimum number of trading days between announcement and introduction is thirteen), while the price effect continues to start at day −3 relative to introduction. This again suggests that the price effect throughout the sample is more closely associated with introduction than with announcement.

If the market makers or floor traders are causing the price increase by purchasing securities in anticipation of their level of activity in the option, this implies that the price run-up before introduction will be positively correlated with some measure of activity in the options market. To test this, volume was

collected for each option on the introduction date. The abnormal price increase was cumulated from day −5 to day +5, and this abnormal return was regressed against volume for each individual option.[7]

The results suggest that opening day volume is positively related to the price increase around introduction. The coefficient on volume is positive, with a p-value of 0.0537.[8] The adjusted R^2 is fairly small at 2.88 percent. There appears to be some correlation between volume and the price increase although there is still a great deal of variation in the price increase left unexplained.

IV. Security Parameters

An examination of parameter estimates measured in the estimation windows shows that the variance of the average excess returns declines; the variance of the average market model excess return (computed across individual securities) measured for two hundred days before introduction is 2.29 percent, while the variance measured two hundred days after the event is 1.79 percent. (The eleven days immediately around the event are excluded.) The F-statistic of 1.65 (with 200 degrees of freedom in both measurements) rejects the null hypothesis of equal variances across the introduction period. At the individual firm level, eighty-three of the ninety-six firms experienced a decline in variance. This cross-sectional decrease in volatility is not significantly related to the cross-sectional cumulative price increase (measured from days −5 to +5); it is, however, consistent with previous work on option introduction and its effect on volatility. (See Klemkosky and Maness [10] and Whiteside, Dukes, and Dunne [18].)

The decline in volatility could be due to a selection bias in the sample; that is, the options exchanges may be choosing securities which are currently "in the limelight." If this is true, then the decline in volatility for these securities may not be associated with option introduction, but rather it may be a natural consequence of the stock returning to its "normal" level of public interest and trading.

To test this hypothesis, the number of announcements of any type concerning the individual securities with option introductions was collected from the *Wall Street Journal Index* for periods both before and after option announcement and introduction. If the exchanges are deliberately selecting securities which have a higher "awareness" level, the number of *Wall Street Journal* announcements may be higher for those particular securities before announcement of the decision to introduce an option.

In fact, the number of times that information about a security appears in the *Wall Street Journal* seems to remain relatively constant in the months before announcement and after introduction. The mean number of *Journal* articles per security in the month prior to announcement is 2.77, while the mean number of articles in the month after introduction is 3.01. With respective standard deviations of 2.81 and 3.39 and a sample size of seventy-eight, this difference is not significant and the direction of the difference is of the wrong sign. The mean

[7] I am indebted to Stephen Figlewski for suggesting this test.

[8] The results using standardized abnormal returns are similar, with a positive coefficient on volume and a p-value of 0.0486.

monthly number of announcements per security in the six months after option introduction is 3.1, indicating that the number of appearances in the *Journal* is relatively stable long after introduction. If this measure is a reasonable proxy for the public interest in a security, the options exchanges do not appear to be selecting securities on this basis over this sample period. Put another way, the decline in volatility does not appear to be associated with a return to a more "normal" level of public awareness.

While the variance of average excess returns declines, the systematic risk does not appear to change with option introduction. When the betas of the firms before and after the introduction date were examined (both OLS and Scholes-Williams), a simple paired t-test on the sample means could not reject the hypothesis that the betas were the same before and after the introduction. The average Scholes-Williams beta before introduction is 1.317, with a sample standard deviation of 0.40, while after introduction it is 1.316, with a sample standard deviation of 0.44. Thus, the introduction of an option on a security does not appear to be associated with a change in that security's systematic risk.

V. Conclusion

This paper examines the effect of an introduction of options on individual securities during the period 1974–1980. Using an event study methodology around the date of option introduction and announcement of introduction on the American Option Exchange and the Chicago Board of Options Exchange, it appears that introduction (and not announcement) causes a permanent price increase. Both the size and timing of the price effect are constant through the six years in the sample.[9] The price effect is accompanied by a decline in volatility; however, this cross-sectional decrease in the variance of excess returns did not appear to explain a significant portion of the cross-sectional variability in the price increase. The systematic risk of securities does not appear to be affected by option introduction. The price increase is positively related to opening day trading volume in the option. This fact and the timing of the price effect (beginning approximately three days before introduction) may suggest that the dealers or other traders are building inventory for hedging purposes in anticipation of the trading volume in the option.

[9] Another difference between the 1980 vs. pre-1980 option introductions is that prior to 1980 the initial introduction of options consisted only of calls. Puts on these securities were introduced only at later dates. Since the price effect for these two subsamples is not significantly different, we might conclude that put introduction has no separate price effect. To further test this, subsequent put introduction dates were collected for the firms in our sample which had only call options introduced prior to 1980. Thirty-six such put introductions were found. An event study was performed using the identical event study methodology with the put introduction date as the event date. No price effect is found to be immediately associated with this put introduction date.

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