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The "Hot Issue" Market of 1980

This paper analyzes the "hot issue" market of 1980, the 15-month period starting in January 1980 and extending through March 1981 during which the average initial return on unseasoned new issues of common stock was 48.4%. (This is *not* an annualized return.) This average initial return compares with an average of 16.3% during the "cold issue" market comprising the rest of the 1977–82 period. An equilibrium explanation for this difference in average initial returns is investigated but is found to be insufficient. Instead, this hot issue market is found to be associated almost exclusively with natural resource issues. For firms in other industries, a hot issue market is barely perceptible.

I. Introduction

During the 15-month period commencing in January 1980, the mean return on initial public offerings of common stock purchased at the offering price and sold at the closing bid price on the first day of public trading was 48.4%. This is in contrast to a mean return on initial public offerings of 16.3% during the remainder of the 6-year period 1977–82. This "hot issue" market for initial public offerings was not an isolated event. As first documented by Ibbotson and Jaffe (1975), there have been a number of periods over the last 2 decades in which initial public offerings of common stock have had extremely high returns.

Why do these hot issue markets occur? In this paper, I develop an implication of Rock's (1982) model of the underpricing of initial public offerings that can explain this phenomenon. In this model, some types of unseasoned new issues are underpriced more, in an expected-value sense, than others. In particular, high-risk initial public offerings are underpriced more than low-risk of-

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ferings. While this result is of interest in and of itself, it also provides a potential explanation for the existence of hot issue markets. If high-risk offerings are an unusually large fraction of initial public offerings in some periods, these periods should also have unusually high average initial returns. I test this explanation for the hot issue market of 1980 by examining the risk composition of firms going public, and find that changing risk composition cannot explain the unusually high average initial returns during this hot issue period. Instead, the high average initial returns can be attributed almost entirely to just one industry: natural resource issues. For other initial public offerings, the existence of a hot issue market is barely perceptible.

The organization of this paper is as follows. In Section II, I describe the data used in this study. In Section III, I build on the Ibbotson and Jaffe (1975) study and present a time-series analysis of the monthly volume and average initial returns on initial public offerings over the 1960–82 period. Section IV presents an equilibrium model that can explain hot issue markets and Section V tests this explanation. I find that, while there is a positive relation between risk and initial return, the changing risk composition hypothesis cannot explain the hot issue market of 1980. Instead, I find that the hot issue market of 1980 is associated with a pronounced nonstationarity in the risk–initial return relation for natural resource issues. In Section VI, I examine the behavior of natural resource issues in detail. In Section VII, the implications of the paper's findings for issuers and purchasers are discussed. The paper ends with a summary and conclusions.

II. Data and Definitions

During the 6-year period 1977–82, 1,075 companies conducted successful initial public offerings of common stock in the United States.[1] With the exception of 47 offerings possessing special characteristics, this study uses the entire population of U.S. Securities and Exchange Commission (SEC)–registered initial public offerings of common stock during the 1977–82 period, as reported in *Going Public: The IPO Reporter*.[2]

1. Since September 1978, all interstate initial public offerings of common stock raising at least $1,500,000 have been required to be registered with the SEC. Smaller offerings filed under the SEC's Regulation A are not included in this study due to data limitations. Prior to September 1978, the limit was $500,000.

2. The 47 initial public offerings not included in this paper's analysis possess one of the following four special features: the offering contained bonds (7 out of 1,075 initial public offerings), no investment banker was utilized (36 out of 1,075), a managed subscription offering was used (3 out of 1,075), or there was a tie-in deal (1 out of 1,075). Units containing bonds are essentially debt issues with equity "kickers." Issues where an investment banker was not employed have many characteristics of private place-

For each of the remaining 1,028 issues in the 1977–82 period, an initial percentage return has been calculated using the closing bid price on the first day of aftermarket trading for which a quotation could be found.[3] This initial return is a raw return that has not been adjusted for market movements. For most of the offerings, the first recorded aftermarket bid price is on the date of the offering. For some securities, however, especially best efforts offerings, the first recorded trade is several days after the offering date. Only in a few cases is the date of the first recorded closing bid more than a week after the closing date. This interval may have involved no trading, although in some cases it is likely that trading did occur. As will be seen, the findings of this paper are dramatic enough to be able to withstand some errors in the data, although I have expended considerable effort to ensure accuracy.[4]

For each month in the period January 1977–December 1982, an equally weighted average initial return has been calculated by taking the simple arithmetic average of the initial returns of all unseasoned new issues having offering dates in that calendar month. This average of (in most cases) 1-day initial returns is referred to as the month's average initial return. For the 1960–76 period, a monthly time series of the number of issues and average initial returns has also been collected, allowing an analysis of the time-series behavior of initial public offerings for the 23-year period 1960–82.

The 1960–76 data come from two sources. For the January 1960–October 1970 period, the data used are those of Ibbotson and Jaffe's (1975) " 'Hot Issue' Market" paper. For each month in the 1960s, they computed an "average first month residual." Their average first month residual is analogous to the monthly average initial return described

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ments; in particular, usually no public market develops. Managed subscription offerings are essentially rights offerings not available to the general public. A tie-in deal involves a nonfinancial commitment. (The tie-in deal was the 1977 offering of DeLorean Motor Corporation, which involved a joint purchase of a minimum of $25,000 of stock and a distributorship.) All four of these features leading to exclusion are observable ex ante.

3. The major source of aftermarket quotations is Standard and Poor's *Daily Stock Price Record for Over-the-Counter Stocks,* which records daily closing bid and ask prices for all NASDAQ-listed securities. Only 102 of the 1,028 firms conducting initial public offerings in the 1977–82 period (9.9% of the total) meeting the previously mentioned criteria were not promptly listed on NASDAQ, or, in a few cases, the American Stock Exchange. In the event that a timely quotation was not recorded in the *Daily Stock Price Record,* several other sources were utilized, listed here in order of priority: *Going Public—the IPO Reporter,* the *National Stock Summary,* and if a published quotation could not be found in one of these sources, the lead underwriter or the issuing firm's officer for stockholder relations was called.

4. In approximately one-fifth of the offerings, the first aftermarket closing bid price is the same as the offering price. For some of these issues, it is possible that the underwriters were supporting the securities, in which case one might expect to see a price decline in subsequent days. Surprisingly, however, for the securities showing no initial price change, there was no significant downward drift on average during the subsequent month of aftermarket trading.

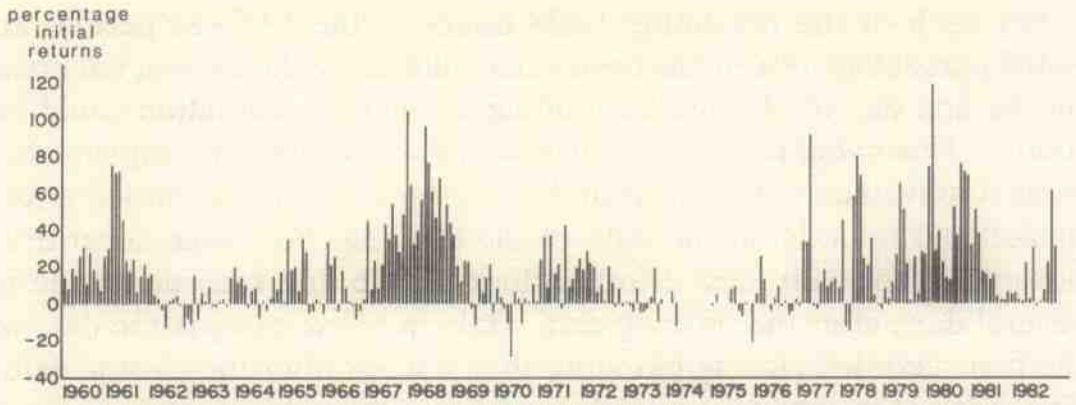

FIG. 1.—Average initial returns by month for SEC-registered initial public offerings. Returns for January 1960–October 1970 taken from Ibbotson and Jaffe (1975). Returns for November 1970–December 1982 constructed by author. See text for definitions.

above.[5] For the November 1970–December 1976 period, I have computed monthly average residuals using essentially the same methodology that Ibbotson and Jaffe adopted. The reason for using this monthly average residuals methodology instead of the average initial returns methodology that I use for 1977–82 is that, until about 1976, many of the aftermarket price quotations were not sufficiently timely to justify ignoring market movements in constructing the initial performance measures. In subsequent discussion, I will use the term "monthly average initial returns" when referring to average first month residuals.

III. The Time-Series Evidence: The Persistence of Underpricing and Cycles

Figure 1 graphs the equally weighted average initial returns (before 1977, average first month residuals) by month for the 23-year period from 1960 through 1982. Two features of this graph are problematic. As documented by numerous authors, including Ibbotson (1975, 1982), initial public offerings are underpriced, on average. For the over 5,000 firms conducting SEC-registered initial public offerings in the 1960–82 period, the *average* initial return is 18.8%.

A second feature of figure 1 that is problematic is the high degree of autocorrelation of the monthly average initial returns. Indeed, the first-order autocorrelation coefficient for the time series of monthly average

5. There are three differences between my average initial returns and their average first month residuals: (1) Ibbotson and Jaffe used the closing bid price on the last trading day of the calendar month of a given initial public offering in computing the initial return, rather than using the first available closing bid. This procedure was adopted due to data limitations at the time that they wrote their paper. (2) They subtracted the market return over the interval from the closing date to the end of the calendar month in constructing their residuals. (3) Approximately 8% of the population of initial public offerings was omitted from their sample due to missing observations.

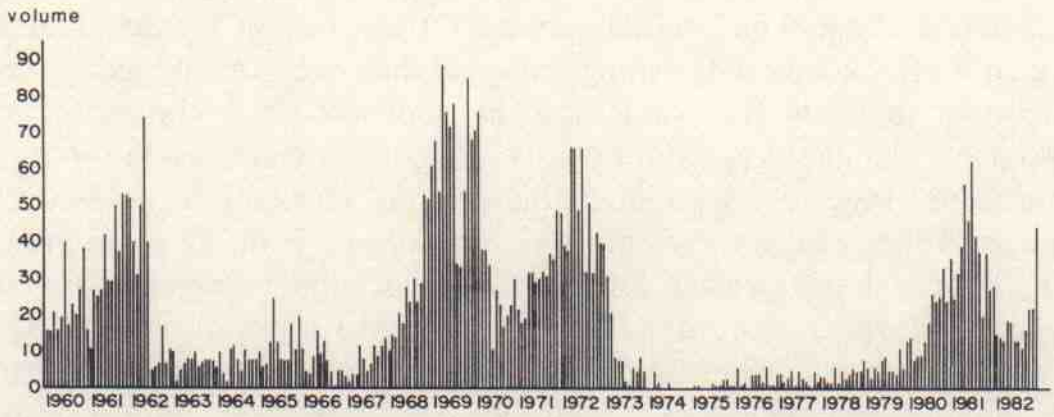

FIG. 2.—Number of offerings by month for SEC-registered initial public offerings. Volume for January 1960–October 1970 taken from Ibbotson and Jaffe (1975). Volume for November 1970–December 1974 from the "New Market Names" section of *Investment Dealer's Digest*. Volume for January 1975–December 1982 from *Going Public—the IPO Reporter*.

initial returns is 0.62.[6] This is dramatically different from zero, unlike autocorrelation coefficients for monthly returns on seasoned stocks.

Figure 2 graphs the volume of initial public offerings by month. The autocorrelation of monthly volume figures is even stronger than that of monthly average initial returns, with a first-order autocorrelation coefficient of 0.88 for the 1960–82 period. Furthermore, inspection of figures 1 and 2 together shows that the periods of high volume tend to follow periods of high average initial returns.

The strong cycles in the volume of initial public offerings evident in figure 2 are similar to the pattern that one would observe if the volume of seasoned equity offerings of New York Stock Exchange–listed corporations were graphed. While corporate finance theory does not have any good explanations for these patterns, they are not necessarily inconsistent with rational behavior by corporations, either.

The cycles in the monthly average initial returns, however, along with their nonzero mean, seem difficult to reconcile with standard notions of market efficiency. When the same phenomenon reoccurs several times in a 23-year period, there is a strong suspicion that one is observing an equilibrium phenomenon.

IV. Rock's Theory of the Underpricing of Initial Public Offerings

For a long time, the underpricing of initial public offerings has perplexed financial researchers. Recently, however, Rock (1982) pre-

6. The *t*-statistic is 12.8. For the January 1960–October 1970 period that Ibbotson and Jaffe focused on, the autocorrelation coefficient is .73. For the November 1970–December 1982 period, the autocorrelation coefficient drops slightly to .52. For the second time period, I computed the autocorrelation coefficient after deleting the 14 months in the mid-1970s for which there were no SEC-registered initial public offerings.

sented a model in which initial public offerings are, on average, underpriced. In Rock's model, issuing firms and their investment bankers are uncertain about the true value of a share, denoted by v. Investors are also uncertain about v, but for a cost, an investor can learn the share's true value. Investors who incur this cost are termed informed investors, and they will only submit purchase orders if the offering price, OP, is less than the true value, v. The decision whether or not to become informed is presumably based on some prior information, and if information is sufficiently costly, some investors may choose to participate in the market even though they do not purchase information.[7]

In Rock's model (as is true in practice), individuals face an adverse selection problem when submitting a purchase order. If the issue is overpriced ($v < OP$), only uninformed investors will submit purchase orders. Consequently, they will be allocated 100% of all the issues that trade at a discount in the aftermarket. For underpriced issues ($v > OP$), both informed and uninformed investors will submit purchase orders and uninformed investors will be allocated only some of the shares in issues that trade at a premium in the aftermarket. They face a winner's curse: if an uninformed investor is allocated shares in an initial public offering, there is a greater than usual chance that the offering will start trading at a discount. In other words, for an uninformed investor, the expected return conditional upon being allocated shares is less than the expected return conditional upon submitting a purchase order. But an uninformed investor will participate in the market only if the expected return conditional upon being allocated shares is nonnegative. This can only happen if, on average, issuers underprice their shares.

Note the source of the risk that uninformed investors face. Once the offering price is set, an issue is allocated by quantity rationing, rather than adjusting the offering price so that the market clears. It is this institutional feature of the market that results in the adverse selection problem. More fundamentally, however, underpricing is merely compensation to investors for the costs of becoming informed—doing security analysis and so on. And as might be expected, the greater is the fundamental uncertainty about an issue, the greater is the required compensation to investors for becoming informed. In particular, high-risk offerings are, in an expected value sense, underpriced more than other types.[8]

7. Since there is a fixed cost to becoming informed, the resulting economies of scale would result in only one participant in the market if there were no constraints on the amount a single individual could invest. Rock resolves this potential problem by imposing the constraint that an individual cannot invest more than his initial wealth; he also imposes a no-short-sale restriction.

8. For specific distribution functions of the aftermarket price, this can be formally demonstrated. In particular, for v uniformly distributed on $[a, b]$, the expected percentage initial return, $[E(v) - OP] \div OP$, is an increasing function of $[b - a]$, holding $E(v)$ constant. A proof of this is available on request.

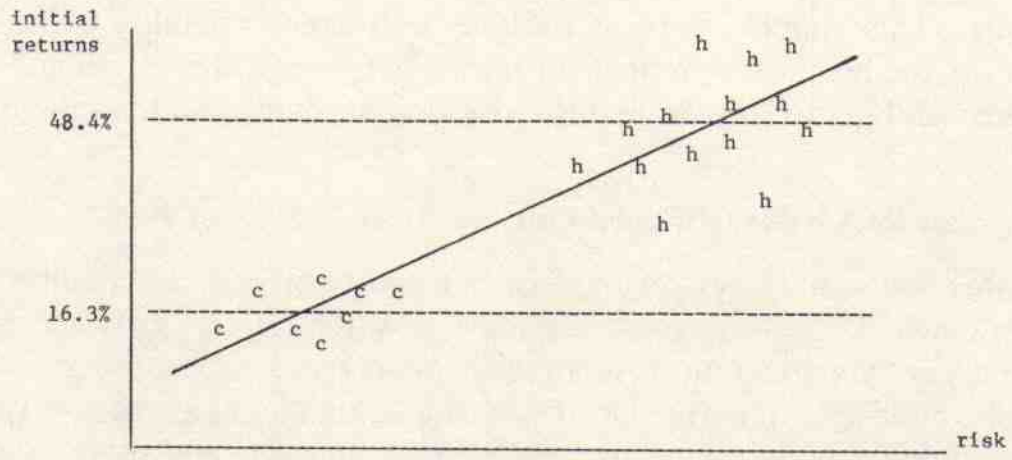

FIG. 3.—Illustration of the changing risk composition hypothesis. In some periods, a large proportion of the firms conducting initial public offerings are high-risk firms, with commensurately high initial returns. These firms are plotted with *h*'s. In other periods, a large proportion of the firms conducting initial public offerings are low-risk firms, with commensurately low initial returns. These firms are plotted with *c*'s. If one plots the mean initial returns for a high-risk period, one finds a high average initial return, such as the 48.4% average initial return during the hot issue market of 1980. In other periods, such as the cold issue market comprising the rest of the 1977–82 period, the average initial return is lower. The changing risk composition hypothesis implies that both the *c*'s and *h*'s plot along the same risk–initial return line.

The appropriate measure of risk in Rock's model of underpricing, then, is not systematic beta-type risk, but the uncertainty uninformed investors have regarding the aftermarket price. While this measure of risk is not directly observable, in the empirical tests in Section V several proxies based upon observable information will be used.

Rock's model implies that riskier firms should have higher average initial returns than firms that are easier to evaluate. This provides a possible explanation for the existence of hot issue markets. If there is autocorrelation in the risk composition of firms conducting initial public offerings, then the realized average initial returns should be autocorrelated.

In figure 3, Rock's model is illustrated by showing a positive relation between risk and initial return. A hot issue market occurs if, during a given time period, a large proportion of the firms going public have high risk. A cold issue market occurs if a large proportion of the firms have low risk. At all points in time, however, one would be observing realized initial returns that plot along the same risk–expected initial return line.

In addition to a positive relation between risk and expected initial return, there is a second cross-sectional implication of Rock's model. This second testable implication is that the risk–initial return relation should be heteroscedastic. Higher-risk issues should have higher average initial returns because there is more uncertainty about the initial

return. This should manifest itself as a greater variability of initial returns for higher-risk issues. In terms of figure 3, the c's should be more tightly clustered around the risk–initial return line than the h's.

V. Can Rock's Model Explain the Hot Issue Market of 1980?

In this section, I seek to explain hot issue markets as equilibrium phenomena caused by (i) a stationary positive relation between risk and expected initial return and (ii) a changing risk composition of initial public offerings. In particular, if some initial public offerings (low risk) are normally underpriced by only a small amount, and others (high risk) are normally underpriced by a very large amount, the average initial return on unseasoned new issues would be higher whenever an unusually large fraction of the initial public offerings were in the high-risk category. Even if it is found that this two-part hypothesis cannot explain the phenomenon of hot issue markets, part i is of independent interest as a test of Rock's model of the underpricing of initial public offerings.

One cannot directly examine the implication of Rock's model that "riskier," that is, harder to value, issues will be underpriced more than less risky issues, without also using a proxy for risk. In other words, one can only test the joint hypothesis that there is a positive relationship between risk and expected initial return and that one has an adequate measure of risk. Consequently, some attention to the issue of finding a risk proxy is called for. This risk proxy should be as highly correlated with ex ante uncertainty as possible. There is no reason, however, to restrict the risk proxy to ex ante observable characteristics, for I am not testing a trading rule. In this paper, I use two measures of risk, one based upon ex ante observable accounting information and one based upon ex post stock market returns. (I have also examined a number of other risk proxies, and the qualitative results are similar using any of them or any combination of them.)

To examine the changing risk composition hypothesis, I first classify firms into several risk categories. I then verify that the average initial returns are higher for firms in higher-risk categories. I then try to determine whether the changing risk composition of firms going public can provide a statistical explanation for the hot issue market of 1980, which I define (on the basis of ex post "eyeballing") as the period starting in January 1980 and continuing through March 1981.

On the basis of data available in the prospectuses, the 1,028 firms that went public during 1977–82 can be split into several risk-related categories. One proxy for the difficulty of valuing a firm is how "established" it is, where one could use the age of the firm, the book value of equity, its annual sales, or some combination of these to define established. For small firms with little or no operating history, it seems clear

TABLE 1 Equally Weighted Average Initial Returns by Sales of Firm

Sales Category	1977–82	Hot Issue	Cold Issue	Hot − Cold	No. of Issues All	Hot	Cold
Sales < $500,000	43.4% (84.4)	70.9% (112.2)	27.2% (57.0)	43.7%	468	173	295
$500,000 ≤ sales ≤ $4,000,000	18.3% (36.0)	35.7% (50.6)	10.3% (23.0)	25.4%	178	56	122
Sales > $4,000,000	9.6% (20.2)	15.4% (29.9)	7.7% (15.2)	7.7%	382	96	286
All issues	26.5% (62.1)	48.4% (89.4)	16.3% (40.4)	32.1%	1,028	325	703

NOTE.—Standard deviation of initial returns in parentheses. Average initial return defined as the arithmetic average percentage price change from the offering price to the closing bid price on the first day of public trading. Sales defined as 12-month sales in most recent period prior to going public, expressed in terms of 1980 dollars. Hot issue market defined as January 1980 through March 1981; the rest of 1977–82 is defined as a cold issue market.

that there would be a great deal of uncertainty regarding the appropriate price per share, subjecting an uninformed investor to the adverse selection problem that, according to theory, forces issuers to underprice their offerings substantially. More established firms presumably are easier to value, and one would expect that, on average, less money would have to be left "on the table" to compensate investors for evaluating established firms than for startups.[9]

In table 1, I test the joint hypothesis that there is a positive relationship between risk and expected initial return and that the level of a firm's annual sales is an adequate measure of risk. I have categorized firms by their annual sales in the most recent 12-month period before going public, where sales are measured in dollars of 1980 purchasing power. For the 1977–82 period, the higher-risk (lower sales) firms have substantially higher average initial returns than do the larger firms, consistent with Rock's hypothesis. Furthermore, this relation is not sensitive to the categorization adopted, and it also holds for other risk proxies, such as the age of the firms.

In table 1, the heteroscedasticity implication of Rock's model is also supported. Not only do the higher-risk categories have higher average initial returns, they also have greater variation of the initial returns, as indicated by the standard deviations. Thus, as predicted, there is also a positive relation between risk and the variability of initial returns.

As an explanation for hot issue markets, however, the evidence is less convincing. In particular, the quantitative relationship between

9. The amount of money left "on the table" is defined as the difference between the market value of the offering in the aftermarket and the gross proceeds received. On average, each initial public offering in the 1977–82 period left $1.0 million on the table, while raising $6.8 million.

sales and average initial returns is not the same in both hot and cold issue markets. For each category of sales, average initial returns are higher during the hot issue period, with the difference most pronounced among those firms with less than $500,000 in sales.

While the evidence reported in table 1 seems to indicate a distinct hot issue market effect, it is of course possible that risk is not being held constant within each of the sales categories. To examine this possibility, I have investigated exactly which firms had the highest initial returns during the hot issue market of 1980.

What is being masked in table 1 is the influence of nonstationarity in the initial returns of natural resource–related companies, and especially of startup (defined as firms with less than $500,000 in sales) natural resource–related companies. These are companies involved in oil and gas exploration and development, oil and gas field services and refining, coal, and mineral exploration.[10] During the hot issue market of 1980, such Denver-based underwriters as American Western Securities, J. Daniel Bell, OTC Net, and Securities Clearing of Colorado took public dozens of startup natural resource–related companies, frequently at an offering price of 10 cents per share. Almost all of these stocks had large initial price jumps, followed by further increases in aftermarket trading until the end of November 1980, when the oil sector's market value peaked. In the following price decline during 1981 and 1982 many of the Denver-based underwriters folded, frequently under pressure from the U.S. Securities and Exchange Commission amid charges of price manipulation and violations of net capital requirements.

The influence of this natural resources boom on the average initial returns can be seen in table 2, where the 1,028 initial public offerings in 1977–82 are categorized by both sales and whether or not the firm was in the natural resource sector. For non–natural resource issues, the existence of a hot issue market is barely perceptible, with an average initial return of 21.0% during the hot issue period and 15.8% during the cold issue period, a difference of only 5.2%. For natural resource issues, however, a hot issue market effect is clearly apparent, with an average initial return of 110.9% during the hot issue period and 18.3% during the cold issue period, a difference of 92.6%. For natural resource firms with sales under $500,000, the difference is an astounding 116.5%!

As an alternative to sales as a risk proxy, in table 3 I use the daily standard deviation of returns in the aftermarket.[11] This measure is

10. SIC codes 100, 121, 131, 138, 139, 291, and 679.

11. A better measure of ex ante information uncertainty would be unique risk rather than total volatility. These two measures are highly correlated, however, and the total volatility measure was easier to compute. For most of the firms, market movements explain less than 10% of the daily returns in the first 20 days of trading in the aftermarket.

TABLE 2 Equally Weighted Average Initial Returns by Sales and Industry Category

Type of Issue	1977–82	Hot Issue	Cold Issue	Hot − Cold	No. of Issues: All	Hot	Cold
Natural resources:							
Sales < $500,000	72.4% (110.9)	140.4% (141.4)	23.9% (59.7)	116.5%	168	70	98
$500,000 ≤ sales ≤ $4,000,000	27.4% (47.9)	48.1% (68.5)	12.3% (13.3)	35.8%	31	13	18
Sales > $4,000,000	13.5% (38.6)	32.7% (56.1)	2.1% (15.0)	30.6%	43	16	27
All natural resource issues	56.2% (103.1)	110.9% (131.5)	18.3% (50.7)	92.6%	242	99	143
Nonnatural resources:							
Sales < $500,000	27.1% (52.5)	23.6% (46.0)	28.9% (55.7)	−5.3%	300	103	197
$500,000 ≤ sales ≤ $4,000,000	16.4% (32.9)	31.9% (44.1)	9.9% (24.4)	22.0%	147	43	104
Sales > $4,000,000	9.1% (16.5)	11.8% (20.1)	8.3% (15.1)	3.5%	339	80	259
All non–natural resource issues	17.3% (37.9)	21.0% (39.0)	15.8% (37.4)	5.2%	786	226	560

NOTE.—Standard deviation of initial returns in parentheses. Natural resource issues defined as firms with SIC codes of 100, 121, 131, 138, 139, 291, or 679. Sales defined as 12-month sales in most recent period prior to going public, expressed in terms of 1980 dollars. Hot issue market defined as January 1980 through March 1981; the rest of 1977–82 is defined as a cold issue market.

TABLE 3 Average Initial Returns for Aftermarket Standard Deviation Categories, 1977–82

Category	1977–82	Hot Issue	Cold Issue	Hot − Cold	No. of Issues All	Hot	Cold
.000 ≤ S.D. < .024	6.4% (20.7)	12.4% (21.5)	5.2% (20.3)	7.2%	150	26	124
.024 ≤ S.D. < .033	9.7% (23.3)	9.8% (20.7)	9.7% (24.1)	.1%	154	35	119
.033 ≤ S.D. < .043	14.6% (26.5)	23.0% (36.3)	10.0% (17.4)	13.0%	159	57	102
.043 ≤ S.D. < .057	28.1% (58.6)	46.7% (80.0)	14.4% (29.2)	32.3%	158	67	91
.057 ≤ S.D. < .076	39.1% (65.2)	67.4% (83.5)	21.3% (42.0)	46.1%	150	58	92
.076 ≤ S.D. < ∞	59.5% (108.3)	92.6% (141.4)	33.7% (62.4)	58.9%	155	68	87
All issues	26.3% (62.0)	49.2% (90.4)	14.7% (35.5)	34.5%	926	311	615

NOTE.—Standard deviation of initial returns in parentheses. The total number of issues (926, 311, 615) differs from that in tables 1 and 2 (1,028, 325, 703) due to the lack of aftermarket standard deviations for 102 firms. The aftermarket standard deviations have been computed using the first 20 daily returns in the aftermarket. Note that the initial return is not used in the computation. The mean daily aftermarket standard deviation is .051, or 5.1% per day, with a range of .000–.317.

available for the 926 issues (out of 1,028 issues during the 1977–82 period) that promptly listed on NASDAQ, as reported in the *Daily Stock Price Record*.[12] In table 3, I have divided the 926 firms into six (approximately) equal-sized risk classes. (The number of risk classes has been chosen rather arbitrarily, with the constraint that a sufficient number of firms are in each risk class after the offerings are broken into sectors. When I used sales as a risk proxy, only three categories were used because the majority of natural resource firms had practically no sales.) As table 3 shows, the same monotonic relation between risk and average initial returns is present that was present in table 1, in which sales was used as a risk proxy. Furthermore, there appears to be a pronounced nonstationarity in the average initial returns, with it being strongest in the highest-risk classes.

In table 4, I report the average initial returns for the natural resource sector and for the non–natural resource sector for each of the same six risk classes that were used in table 3. The results are striking. For non–natural resource issues, within each risk class there is very little difference in the average initial returns between the hot and cold issue mar-

12. As noted by Gottlieb and Kalay (1983), the measured volatility is a biased estimate of the true volatility, due to the discreteness of stock price movements. This bias is more severe for low-priced stocks, which also tend to be riskier. This problem is unlikely to affect the qualitative conclusions of this paper, however.

TABLE 4 Average Initial Returns for Aftermarket Standard Deviation Categories, by Sector

Category	1977–82	Hot Issue	Cold Issue	Hot − Cold	No. of Issues		
					All	Hot	Cold
Natural resources:							
.000 ≤ S.D. < .024	3.4%	9.9%	1.9%	8.0%	26	5	21
	(15.5)	(21.1)	(14.1)				
.024 ≤ S.D. < .033	13.7%	2.2%	21.7%	−19.5%	17	7	10
	(40.2)	(7.5)	(51.6)				
.033 ≤ S.D. < .043	25.9%	45.1%	3.6%	41.5%	26	14	12
	(44.8)	(54.0)	(9.8)				
.043 ≤ S.D. < .057	62.4%	102.0%	10.4%	91.6%	37	21	16
	(101.7)	(120.3)	(20.9)				
.057 ≤ S.D. < .076	73.3%	131.0%	29.0%	102.0%	53	23	30
	(93.8)	(98.3)	(61.5)				
.076 ≤ S.D. < ∞	97.4%	175.5%	33.2%	142.3%	62	28	34
	(145.3)	(174.2)	(69.1)				
All natural resource issues	55.9%	109.9%	20.0%	89.9%	221	98	123
	(105.4)	(131.7)	(51.4)				
Nonnatural resources:							
.000 ≤ S.D. < .024	7.1%	13.0%	5.9%	7.1%	124	21	103
	(21.6)	(22.1)	(21.4)				
.024 ≤ S.D. < .033	9.2%	11.7%	8.5%	3.2%	137	28	109
	(20.5)	(22.6)	(20.0)				
.033 ≤ S.D. < .043	12.4%	15.8%	10.9%	4.9%	133	43	90
	(20.7)	(25.3)	(18.1)				
.043 ≤ S.D. < .057	17.6%	21.4%	15.2%	6.2%	121	46	75
	(30.2)	(29.4)	(30.7)				
.057 ≤ S.D. < .076	20.4%	25.6%	17.5%	8.1%	97	35	62
	(28.8)	(29.9)	(28.1)				
.076 ≤ S.D. < ∞	34.3%	34.5%	34.1%	.4%	93	40	53
	(63.5)	(70.5)	(58.4)				
All non–natural resource issues	15.7%	21.3%	13.3%	8.0%	705	213	492
	(33.4)	(39.2)	(30.2)				

NOTE.—Standard deviation of initial returns in parentheses. The total number of issues differs from that in tables 1 and 2 due to the lack of aftermarket standard deviations for 102 firms.

kets. Formal difference of mean tests verify the insignificance of the differences, with none of the six risk classes having a *t*-statistic in excess of 1.47. For natural resource issues, there is a huge difference in average initial returns. In contrast to the results for non–natural resource issues, formal difference in mean tests for the riskiest four of the six risk classes all have *t*-statistics in excess of 2.82. Furthermore, for natural resource issues, the cold issue market average initial returns are imperceptibly different from those on non–natural resource issues. The evidence is clear: except during the hot issue market of 1980, natural resource issues had the same relation between risk and expected initial return as did non–natural resource issues. For the 15-month period comprising the hot issue market of 1980, however, the natural resource issues had much higher average initial returns.[13]

The evidence presented in tables 2 and 4 does not support the changing risk composition hypothesis as an explanation for the hot issue market of 1980. Instead, the high average initial returns during the hot issue market of 1980 appear to be associated with nonstationarity in the initial returns of natural resource issues, something that is definitely not an implication of Rock's model. The cross-sectional implications of Rock's model, however, are supported: there is a positive relation between risk and average initial returns, and this relation is heteroscedastic.

The vast difference between the behavior of the non–natural resource issues and that of natural resource issues is best illustrated in figures 4 and 5. In figures 4*a* and 5*a* I have plotted the monthly average initial returns on initial public offerings of common stock during the 1977–82 period for, respectively, the non–natural resource sector and the natural resource sector. Figures 4*b* and 5*b* show the monthly volumes in these two sectors. Figures 4*c* and 5*c* show, respectively, the level (in real terms) of the S&P 500 and of an index of natural resource securities listed on the New York Stock Exchange, which I call the Natural Resource Index.[14]

As inspection of figures 4*a* and 5*a* shows, these two sectors behave very differently. The autocorrelation of monthly average initial returns is 0.27 (with a *t*-statistic of 2.3) for non–natural resource issues, while the autocorrelation of monthly average initial returns is 0.50 (with a *t*-

13. Alternative techniques, such as regression analysis, show the same pattern evident in tables 2 and 4: there was a pronounced nonstationarity in the behavior of natural resources issues that was not present for other issues, after taking changing risk composition into account.

14. The Natural Resource Index (NRI) is an equal base-period weighted index of Standard & Poor's "Oil Well Equipment and Services" and "Oil (Crude Producers)" indices, deflated by the U.S. GNP deflator, and standardized so that December 1977 = 100. The two component series are reported in Standard & Poor's *Security Price Index Record*.

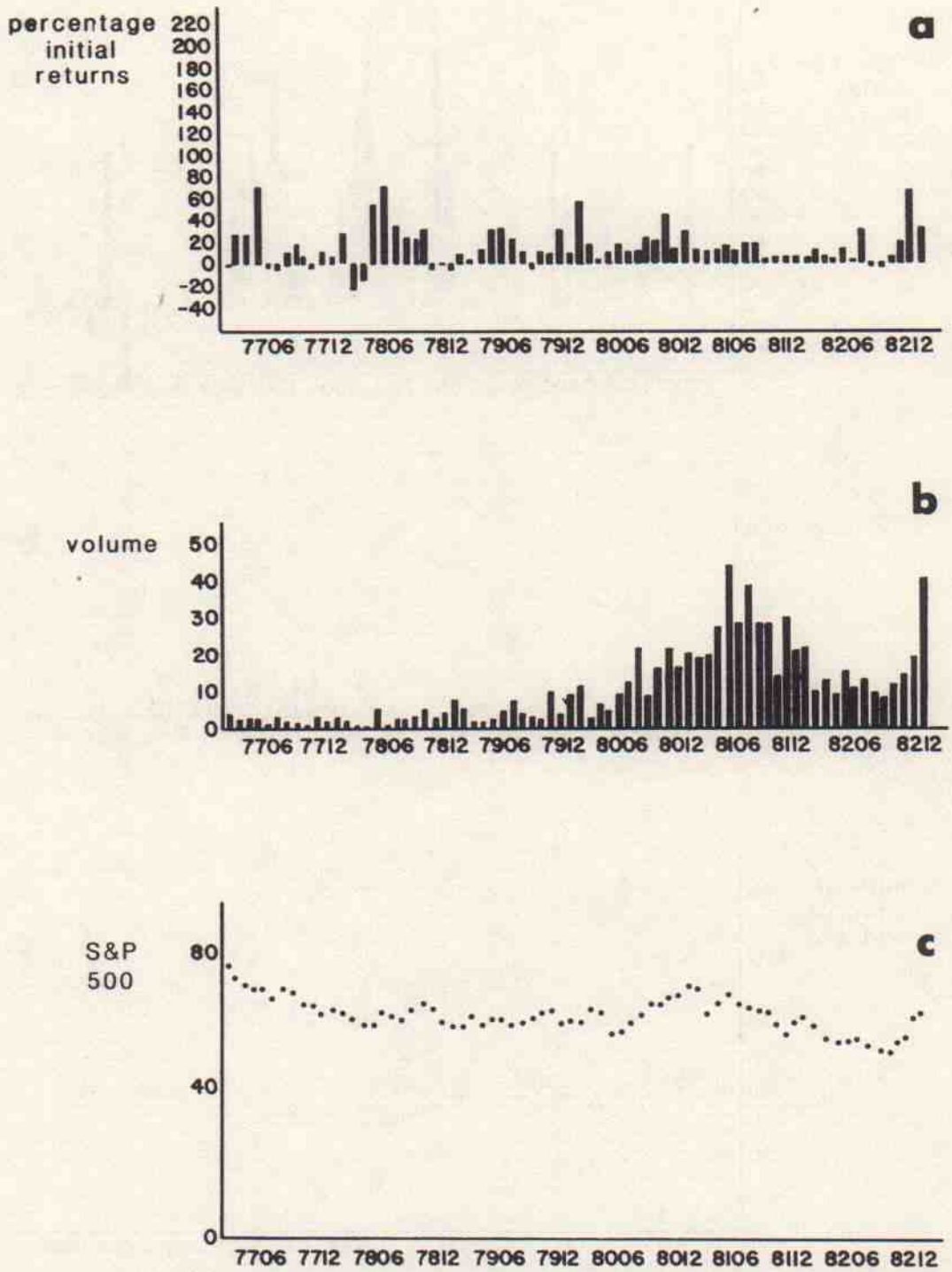

FIG. 4.—*a,* Average initial returns by month for non–natural resource issues, 1977–82. *b,* Number of offerings by month for non–natural resource issues, 1977–82. *c,* Constant-dollar Standard & Poor's 500 Stock Index, first Wednesday of every month, 1977–82. Index constructed using U.S. GNP deflator.

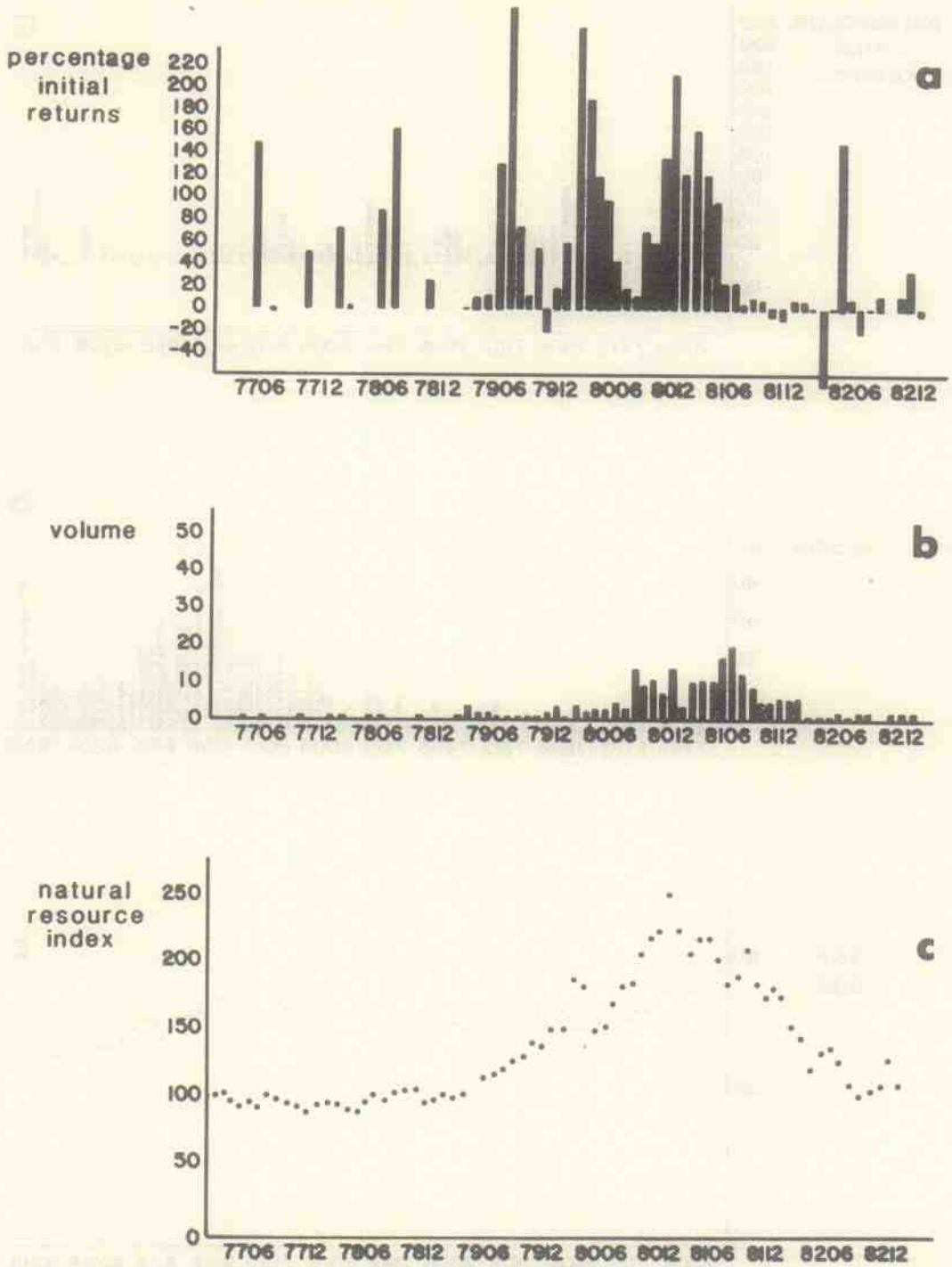

FIG. 5.—*a*, Average initial returns by month for natural resource issues, 1977–82. Months with missing return had no natural resource initial public offerings. *b*, Number of offerings by month for natural resource issues, 1977–82. *c*, Constant-dollar natural resource index, first Wednesday of every month, 1977–82. Index constructed from equal base period (December 1977) weights on Standard & Poor's "Oil Well Equipment and Services" and "Oil (Crude Producers)" indices, deflated by U.S. GNP deflator, and standardized so that January 1977 = 100.

statistic of 4.0) for natural resource issues.[15] Thus, while there is evidence that the monthly average initial returns for non–natural resource issues are autocorrelated, the amplitude and predictability of the cycles appear to be small in comparison with those of natural resource issues during the 1977–82 period.

VI. Was the Hot Issue Market for Natural Resource Issues a Speculative Bubble?

In this section I examine the behavior of natural resource issues in more detail. In tables 2 and 4 of the previous section, I found that for natural resource issues, within each risk class, average initial returns were significantly higher during the hot issue period than during the cold issue periods. Since it is hard to imagine that the incredibly high average initial returns on natural resource issues during the hot issue market of 1980 were a necessary feature of market equilibrium, I advance three alternative explanations. I label these (i) the institutional lag hypothesis, (ii) the speculative bubble hypothesis, and (iii) the monopsony power hypothesis.[16]

The institutional lag hypothesis. The underpricing of natural resource issues during the hot issue market of 1980 was due to institu-

15. There are two reasons for computing autocorrelation coefficients for monthly average initial returns, rather than of the individual initial returns. The first, and more important, reason is that if Rock's model of expected initial returns is correct, then the actual initial return on any given new issue is composed of an expected initial return plus an error term, where the error term is drawn from a distribution that has a larger variance the higher is the expected initial return. When dealing with individual initial returns, the influence of the error terms masks any autocorrelation of the expected initial returns unless a grouping procedure is employed. Even when using a grouping procedure, the measured autocorrelations of monthly average initial returns are biased estimates of the first-order autocorrelations of monthly average *expected* initial returns. Let the actual monthly average initial returns be generated by the process $r_t = \bar{r} + v_t + \epsilon_t$, where $\bar{r}$ is the average, v_t is the expected difference from the average, and ϵ_t is a zero-mean disturbance term arising from the mispricing of individual securities going public in a month. Assume that $E(\epsilon_t\epsilon_{t-i}) = 0\ \forall\ i \neq 0$ and $= \sigma_\epsilon^2$ *for* $i = 0$. Let the monthly average *expected* initial returns be generated by the process $v_t = \rho v_{t-1} + \eta_t$ where ρ is the autocorrelation coefficient of expected monthly average initial returns and η_t is a zero-mean shock term with $E(\eta_t\eta_{t-i}) = 0\ \forall\ i \neq 0$ and $= \sigma_\eta^2$ for $i = 0$. Even though the autocorrelation of expected monthly average initial returns is ρ, the noise generated by the ϵ_t's results in an attenuation bias so that the measured autocorrelation of realized monthly average initial returns is $\rho \cdot \sigma_\eta^2[\sigma_\eta^2 + (1 - \rho^2)\sigma_\epsilon^2]^{-1}$. The second reason, and the reason for using the specific grouping procedure employed here, is that this is the methodology that Ibbotson and Jaffe (1975) used, and I have used this procedure to facilitate comparison with their study.

16. These are not the only possible explanations. The existing literature, i.e., Ibbotson (1975, 1982), contains a number of hypotheses regarding the general phenomenon of underpricing, but the subset of these explanations that I am advancing here may be capable of explaining why this particular market segment experienced such incredibly high average initial returns during the hot issue market of 1980, while having the same risk–initial return relation as other issues during the cold issue periods.

tional lags in a rising market: if the offering price was determined in an early stage in the process of going public, and the market rose before an offering was consummated, underpricing resulted. (During much of the hot issue market of 1980, natural resource stocks traded on the New York Stock Exchange experienced very high rates of return.)

The speculative bubble hypothesis. Natural resource issues were priced appropriately. High average initial returns resulted from speculative excesses, possibly including price manipulation, in the aftermarket.

The monopsony power hypothesis. Underwriters intentionally underpriced the issues, and earned profits by allocating these issues only to favored customers. Natural resource issues may have been subject to this monopsony exploitation during the hot issue market of 1980 because of the concentration of these issues in a regional (Denver) market.

These three hypothesis have a number of testable implications. The institutional lag hypothesis implies that a large proportion of the initial return on natural resource issues can be explained by what happened to the market, as represented by the Natural Resource Index (NRI), between the registration date and the offering date.

The speculative bubble hypothesis has the testable implication that, when the bubble bursts, the market should crash. This implies that there should be periods of sharp price drops in the aftermarket that cannot be explained by returns on the NRI. A further implication of the speculative bubble hypothesis is that prices were "too high" in relation to the market valuations of other securities during the hot issue market of 1980.

The monopsony power hypothesis implies that there should be large initial returns that cannot be explained by the institutional lag hypothesis. The monopsony power hypothesis implies that the offering prices were set "too low" in relation to the market valuations of other securities. Also, there should be no crashes in the aftermarket, as the speculative bubble hypothesis implies. Furthermore, the issuers that are most subject to exploitation are small issuers, so I would expect to see the highest average initial returns on the small issues.[17]

Note that none of the three hypotheses is consistent with the usual paradigm of competitive equilibrium in frictionless capital markets. Therefore, there is no reason to expect stationarity in the initial returns on natural resource issues. Indeed, I would expect that all of these explanations would fail during "normal," that is, non–hot issue market, periods.

In table 5, I test the institutional lag hypothesis by regressing initial

17. See also Logue (1973).

TABLE 5 Regression Results with Initial Returns as Dependent Variable

Sample and Explanatory Variable	Average Initial Return (%)	Average Value of Explanatory Variable (%)	No. of Observations	Regression Results		
				Constant	Coefficient on NRI Return	R^2
All natural resource issues, 1977–82 (NRI return from registration date to offering date)	56.2	3.3	242	50.2 (6.5)	1.791 (.383)	.084
All best efforts natural resource issues, 1977–82 (NRI return from registration date to offering date)	72.9	3.2	146	65.8 (9.4)	2.200 (.522)	.110
All best efforts natural resource issues, 1977–82 (NRI return during selling period)	72.9	.9	146	70.2 (9.5)	2.910 (.907)	.067

NOTES.—Standard errors in parentheses. Both the average initial return and the NRI (natural resource index) return are calculated as percentage returns. The average length of the period from the registration date to the offering date is 119 days, with a range of 26–476 days, for all natural resource issues. For best efforts offerings only, the average length of this period is 143 days, with a range of 48–476 days. The average length of the selling period for best efforts offerings is 39 days, with a range of 2–175 days.

returns on changes in the NRI during the interval in which firms go public. In rows 1 and 2, I define this as the period from the registration date to the offering date.[18] In row 1, I find that of the 56.2% average initial return on natural resource issues during 1977–82, 50.2% (the value of the constant in the regression) is left unexplained by changes in the NRI. In row 2, I limit the sample to best efforts offerings only, and I find that the institutional lag hypothesis is equally ineffective at explaining the realized initial returns. In row 3, I restrict the period to that of the selling period for best efforts offerings. Once again, the institutional lag hypothesis fails to explain much of the initial returns. Further evidence that the high initial returns are not due to institutional lags in responding to market movements is contained in the coefficients of determination. None of the table 5 regressions has an R^2 of more than .110.

Note that the coefficients on the NRI return of 1.791, 2.200, and 2.910 are compatible with the view that these natural resource issues are very sensitive to movements in the market's evaluation of the energy sector. This is consistent with the results reported in table 6, where average aftermarket returns and NRI returns are listed for various holding periods.

In table 6, there is no evidence of any bubble bursting, as implied by the speculative bubble hypothesis. The price movements experienced by the natural resource issues in the aftermarket appear to coincide with movements of the NRI, and to be of plausible magnitudes. Thus, I interpret the table 6 results as rejecting the speculative bubble hypothesis.

In table 7, I address the speculative bubble and monopsony power hypotheses by looking at the price *level* of natural resource issues in relation to book values and the level of the NRI. In this table, I report several descriptive statistics for natural resource issues for three subperiods. The first subperiod, 1977–79, preceded the hot issue market of 1980. In this subperiod, the average postoffering ratio of the market value to book value of equity was 2.13, valued using the offering price, and 3.23, valued using the first aftermarket closing bid price. (These ratios can be interpreted as estimates of Tobin-Brainard Q ratios, since most of the firms had no debt.) During this pre–hot issue market period, the average value of the NRI was 122.8.

18. When a firm decides to go public, it first files registration documents with the SEC (the registration date), and, if all goes well, the offering closes and the stock is sold on the offering date. On average, this takes 4 months. For best efforts offerings, there is an intermediate date, the effective date, on which a final prospectus is issued, with a set offering price. The period between the effective date and the offering date is the selling period for best efforts offerings. For firm commitment offerings, the effective date is the offering date: the offering price is not firmly set until late in the day before the offering, but "pre-selling" activity takes place between the registration date and the effective date, during which time potential purchasers indicate their interest.

TABLE 6 Aftermarket Returns for Natural Resource Issues, Selected Time Periods

Period	Number of Natural Resource Issues in 1977–82 Having Gone Public Prior to Start of Period	Number of Securities for Which Returns Are Available	Nominal Percentage Return on Natural Resource Issues in Aftermarket during Period (%)	Nominal Percentage Return on Natural Resource Index during Period (%)
January 2, 1980–November 26, 1980	28	28	321.9	90.3
November 26, 1980–April 1, 1981	85	85	−6.4	−13.2
April 1, 1981–September 23, 1981	127	127	−45.4	−28.8
September 23, 1981–August 18, 1982	200	196	−51.2	−36.5

NOTE.—The percentage returns on natural resource issues in the aftermarket include capital gains and dividend yields, adjusted for warrant conversions. Warrant conversions were based upon zero-net new investment: a warrant conversion is financed by selling a dollar amount of shares equal to the exercise price. The resulting number of shares is then viewed as a unit-equivalent for computing aftermarket returns. The average aftermarket returns reported in this table are equally weighted averages. For the January 2, 1980 to November 26, 1980 period, the average aftermarket return for natural resource issues falls from 321.9% to 219.0% if one company, Taurus Oil, is excluded. For the September 23, 1981–August 18, 1982 return period, insufficient information to compute returns was available for Enercorp, Inc. and Lion Resources Corp. Two companies, Premier Energy and Triad Energy, had gone bankrupt before September 23, 1981.

TABLE 7 Descriptive Statistics for Natural Resource Issues, 1977–82

Descriptive Statistic	Subperiods			
	1977–79	1980–1981(I)	1981(II)–1982	1977–82
1. Number of issues	28	99	115	242
2. Average postoffering market/book ratio, valued at offering price	2.13	2.46	2.66	2.52
3. Average postoffering market/book ratio, valued at aftermarket price	3.23	4.69	2.84	3.59
4. Average value of NRI, deflated by U.S. GNP deflator	122.8	213.6	170.8	181.3
5. Average net proceeds raised	$2,853,000	$4,421,000	$4,222,000	$4,145,000
6. Average offering as a fraction of postoffering shares outstanding	.49	.45	.39	.43

NOTE.—The number of issues (242) is net of two issues that were excluded due to not using an underwriter. For rows 2, 3, and 6, the calculations have been done only for issues involving common stock; unit offerings are excluded. There were 37 unit offerings out of the 242 total natural resource issues during the 1977–82 period. The unit offerings were disproportionately concentrated during 1980, so that the averages for the 1977–82 period as a whole use different weights than the number of issues shown in row 1. Postoffering book value, the denominator of rows 2 and 3, has been calculated by adding 90% of the gross proceeds of primary offerings to the preoffering book value of equity.

During the second subperiod, the hot issue market of 1980, the average value of the NRI increased from 122.8 to 213.6, a 74% increase. Commensurate with this increase in the market valuation of established New York Stock Exchange–listed natural resource companies, the average postoffering market value/book value ratio, valued using the aftermarket price, increased 45%, from 3.23 to 4.69. This is strong evidence that there was no speculative bubble present: the increase in the market valuation of natural resource issues is consistent with market assessments of natural resource stocks in general.

What is an anomaly, however, is the fact that the average market value/book value ratio, valued at the offering price, only increased 15%, from 2.13 to 2.46. The conclusion seems inescapable: during the hot issue market of 1980, underwriters were underpricing natural resource issues far more than they had to. This is consistent with the monopsony power hypothesis.

The monopsony power hypothesis is implicitly a market-segmentation hypothesis. Since only natural resource issues were excessively underpriced during the hot issue market of 1980, other firms were not subject to this exploitation. Further evidence on this is contained in table 2. For natural resource issues going public during the hot issue

market of 1980, the underpricing was most severe for small firms, those with sales under $500,000. For these firms, the average initial return was 140.4% during the hot issue market of 1980. For more established natural resource firms, the underpricing, while still substantial, was much less severe.[19]

VII. When Should an Issuer Issue? When Should a Buyer Buy?

The results of this paper contain implications for issuers and buyers. First of all, the vast difference between the behavior of the natural resource sector and that of the non–natural resource sector provides strong evidence of market segmentation. For established firms going public, there is a small degree of underpricing—about 10% on average. While this expected underpricing does appear to have a cyclical component, the amplitude of the cycles is relatively small, so that issuing firms do not have to be overly concerned with market-timing considerations.

The degree of expected underpricing appears to be positively related to the degree of uncertainty about a security's value, consistent with the implications of Rock's model. This fact results in a strong implication for issuers: voluntary disclosure is beneficial to the extent that it reduces the heterogeneity in expectations between "informed" and "uninformed" investors. The smaller is the uncertainty about a firm's value, the smaller is the expected amount of money that must be left on the table to compensate investors for the "winner's curse" adverse selection problem.

The results of this paper concerning natural resource issues also contain strong implications for issuers and purchasers. For firms that are not well established, a characterization that certainly applies to the startup natural resource issues that went public during 1977–82, timing *does* matter. For purchasers, the implications are straightforward: if the winner's curse problem is not too severe, concentrate purchases in the market segment that is subject to exploitation by underwriters, and do this only when recent issues have been greatly underpriced. To implement this strategy, an account with a large, reputable securities firm such as Merrill Lynch will not do. Merrill Lynch is never part of

19. Five natural resource issues were taken public by "major bracket" New York underwriters during the hot issue market of 1980. The average initial return on these issues was a mere 17.5%, which is imperceptibly different from average initial returns on non–natural resource issues. This is consistent with the idea that there was a segmented market. Major bracket underwriters generally refuse to underwrite small offerings from startup firms, possibly for reputation reasons. The underpricing of natural resource issues was most severe among offerings emanating from Denver. Consistent with the market segmentation idea, the underwriting syndicates put together by Denver managing underwriters almost never included New York–based major bracket underwriters, and vice versa.

the underwriting syndicate for the types of issues that are subject to excessive underpricing during hot issue periods. The underwriters involved in the syndicates that took public the startup natural resource issues during the hot issue market of 1980 are the "fringe" underwriters.

For issuers in a market segment that is subject to severe underpricing, the timing decision is complicated by the fact that it takes anywhere from 3 months to a year to go public once the decision is made. There are two possible scenarios for what happens at the end of a hot issue market when volume surges up and average initial returns are low. One possibility is that the low returns are caused by a sudden drop in demand—not an auspicious time for taking a firm public. The other possibility is that investment bankers are pricing firms at higher multiples so that with unchanged demand, less money is being left on the table. This would be a favorable time to go public.

The bottom two rows of table 7 shed some light on what was occurring with natural resource issues during the 1977–82 period. The 1977–79 period was characterized by low volumes and moderately high underpricing. On average, an issuing firm had to give up 49% of the equity to raise $2,853,000 (net). During the hot issue market prevailing during 1980 and the first quarter of 1981, underwriters priced natural resource issues at only slightly higher multiples than had been the case in 1977–79, even though the market was willing to pay substantially more as indicated by the average postoffering market/book value ratios. In the cold issue market prevailing during the last 3 quarters of 1981 and 1982, issuers received almost as much money as during the hot issue periods, but for a smaller fraction of the equity: an average of $4,222,000 was raised while giving up only 39% of the equity.

The evidence contained in table 7 indicates that issuers in a market segment that is subject to monopsony exploitation get the best deal by going public immediately after a hot issue market period of high average initial returns: they receive large sums for comparatively little equity. Most important, they leave little money on the table. The implication is clear: for issuing firms, the best time to go public is during the high-volume period following a hot issue market.

VIII. Summary and Conclusions

In this paper, I have documented that the autocorrelation of monthly average initial returns that Ibbotson and Jaffe (1975) found has continued. There have been 3 or 4 periods during 1960–82 in which monthly average initial returns on unseasoned new issues have been extremely high for prolonged periods. Each of these hot issue market periods was followed by a large and prolonged increase in the volume of initial public offerings.

Given the continued reoccurrence of this rather puzzling phenomenon, I have taken the 6-year period 1977–82 and conducted an intensive investigation of the behavior of the initial public offerings that went public during it. This period included the hot issue market of 1980, a 15-month period during which the average initial return was 48.4%, as contrasted with an average initial return of 16.3% during the rest of the 1977–82 period. To explain this behavior, I advanced the hypothesis that the hot issue market of 1980 was an equilibrium phenomenon explainable by (i) a positive equilibrium relation between risk and expected initial return and (ii) an increase in the riskiness of the average initial public offering, the former being an implication of Rock's (1982) model of the underpricing of initial public offerings.

I found that, in the 1977–82 period, there was a tremendous disparity in the behavior of monthly average initial returns on natural resource issues and on non–natural resource issues. For non–natural resource issues, the autocorrelation of monthly average initial returns is low, and there is hardly any evidence that a hot issue market occurred. Within the non–natural resources sector, there is a positive relation between risk and average initial return, and it is stationary. Furthermore, the high-risk offerings displayed not only higher average initial returns but also a greater variability of initial returns.

For natural resource issues, there was also a positive relation between risk and average initial returns, but the relation is highly nonstationary. I have not been able to find any evidence that would indicate such shifts in average initial returns were equilibrium phenomena. Instead, they seem to be consistent with underwriters exploiting start-up natural resource firms during the oil and gas boom that occurred during 1980. This interpretation implies the existence of a segmented market, where natural resource issues, especially small natural resource issues, were at the mercy of exploitive underwriters and other issuers were not. Such a situation is inherently unstable, and so it is no surprise that it did not last.

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