Towards an International Cost of Capital

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SUMMARY: *The purpose of this paper is* (1) *to provide a theoretical analysis of the cost and availability of capital to firms located in segmented capital markets*; (2) *to analyze a case study of a Danish firm, Novo Industri A/S (Novo), which successfully internationalized its cost of capital despite the constraints imposed by an illiquid and segmented home capital market*; *and* (3) *to identify barriers to internationalization. We start by defining the theoretical concepts of market "efficiency," "liquidity," and "segmentation" and analyze how they apply to the Danish securities market. Next we analyze how these concepts might impact a firm's cost and availability of capital. Then we analyze the Novo case. We conclude by identifying barriers to internationalization.*

Introduction

Market efficiency

According to finance theory, a market is 'efficient" if security prices in that market reflect all available or obtainable information and adjust quickly to any new relevant information. If these conditions are met, the price of an individual security reflects its correct market value and any price fluctuations will be variations around that value. The efficient market hypothesis assumes that transaction costs are low; there are many participants in the market; and those participating have sufficient financial clout to move security prices.[1]

Empirical tests of market efficiency have been conducted on most of the major European securities markets, Japan, Canada, and, of course, the U.S. The results show that some of these markets are reasonably efficient, especially the U.S. and U.K. markets.[2] Efficiency of the Danish securities market has been tested by Nielsen and Svarrer.[3] Using the semi-strong form test on new information about stock emissions

This article was originally presented at the Financial Management Association Annual Meeting, Cincinatti, Ohio, October 23, 1981.

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(stock dividends, splits, and new issues), they concluded that the Danish market is reasonably efficient with respect to the types of information tested. They did not attempt a strong-form test because the limited number of managed funds in Denmark would probably preclude arriving at statistically significant results.[4]

Market liquidity

A securities market might be efficient but "illiquid." Although no concensus exists about the definition of market liquidity, one frequently used measure is trading volume. A second measure is the ability of firms to sell new securities at existing market prices.

Considerable evidence exists to infer that the Danish capital market is illiquid, particularly with respect to equity issues.

Annual trading volume in 1980 on the Copenhagen Stock Exchange was Dkr. 301,772,000, or about $50 million at the year-end exchange rate of Dkr. 6 equals $1.[5] This compares to $375 billion on the New York Stock Exchange and $73 billion on the Stock Exchange in London.[6]

The total market value of all stocks listed on the Copenhagen Stock Exchange (Main Exchange and After Exchange) at the end of 1980 was equivalent to $5.5 billion.[7] This represented 1.5% of 1980 GNP in Denmark or $1,074 per capita of population. In contrast, the total market value of stocks listed on the New York Stock Exchange alone was $1,215 billion, representing $5,337 per capita of population.[8]

All firms listed on the Copenhagen Stock Exchange issued total new equity in Denmark in 1980 equivalent to $100 million, or $19 per capita and at prices considerably below market price. During 1980, U.S. corporations issued $16.9 billion in new equity, or $90 per capita.[9] Indeed, Novo alone issued $64.8 million of new equity in the U.S. in July 1981, equal to about two-thirds of all equity raised in Denmark in the previous year!

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4. *Ibid.* Based on a conversation with Niels Christian Nielsen.
5. Copenhagen Stock Exchange, *Annual Report* 1980, Copenhagen, 1981. This is based on the nominal value (100 Kr) of shares. Market value might be slightly higher, but the Copenhagen Stock Index of all shares, as well as the index of industrials alone, hovered around 100 during 1979 and 1980 (p. 17). This means that nominal and market values were close.
6. New York Stock Exchange, 1981 *Fact Book*, June 1981. The Stock Exchange in London, *The Stock Exchange Fact Book*, December 1980.
7. Copenhagen Stock Exchange, *Annual Report* 1980, Copenhagen, 1981.
8. New York Stock Exchange, 1981 *Fact Book*, June 1981.
9. *Federal Reserve Bulletin*, August 1981, p. A34. Copenhagen Stock Exchange, *Annual Report* 1980, Copenhagen, 1981.

Market segmentation

A national capital market is "segmented" if the required rate of return on securities in that market differs from the required rate of return on securities of comparable expected return and risk traded on other national or international securities markets (New York and London, for example). Conversely, if all capital markets are fully integrated, securities of comparable expected return and risk should have the same required rate of return in each market after adjusting for tax and foreign exchange risk. Although each individual investor will not experience the same rate of return on a particular security because of differences in national taxation and foreign exchange gains or losses, as long as arbitrage is permitted between markets a single price for a security should exist. This price is usually a compromise between the valuation standards of each market and the relative level of trading volume in each market.

What causes a national capital market to be segmented? Market segmentation may be caused by governmental constraints and/or investor perceptions. Governmental constraints include tax policies, controls on foreign exchange usage, restrictions on the free transfer of capital, and interference in the functioning of domestic securities markets. Market segmentation due to investor perception is caused by informational barriers, such as the quality of corporate disclosure, and familiarity with securities markets and institutions. Investors are also influenced by transaction costs, alternative portfolio possibilities, financial risk, foreign exhcange risk, and political risk.

Note that a market can be efficient and liquid and still segmented. An efficient and liquid national securities market might "correctly price" all securities traded in that market, based on information available to the investors who participate in that market. However, if that market is segmented, foreign investors would not be participants. Thus securities in the segmented market would be priced on the basis of domestic rather than international standards.

Empirical studies of market segmentation

Substantial research has been undertaken to address the following questions:

(1) To what extent are national capital markets segmented or integrated?

(2) Can investors improve their portfolio's performance by diversifying internationally?

(3) If markets are segmented, can investors satisfy their international diversification motive by holding the securities of multinational firms?

We will investigate a fourth question. What is the impact of market segmentation

on the cost of capital of a firm located in that market, and how can such a firm overcome the limitations of a segmented home market?

Early research studies concentrated on establishing that investors benefit by diversifying their portfolios internationally because economic activities are not perfectly correlated between countries. Important verifications of this thesis, under varying economic and exchange rate conditions, were made by Grubel (1968), Levy and Sarnat (1970), Grubel and Fadner (1971), Agmon (1972), Cohn and Pringle (1973), McDonald (1973), and Lessard (1974).[10]

If investors can benefit by diversifying internationally, then it follows that securities which are traded internationally should be priced to reflect their contribution to lowering the systematic risk of an internationally diversified portfolio. This is the international version of the capital asset pricing model which we will refer to as ICAPM. Early versions of this model appeared in Black (1974), Solnik (1974), Adler and Dumas (1975), and Grauer, Litzenberger, and Stehle (1976).

Tests of the ICAPM have been undertaken to determine the extent to which securities are priced according to national or international factors. Among the more notable tests were those by Lessard (1974, 1975, 1976), Solnik (1974, 1977), Stehle (1977), and Biier (1979). The tests, as a whole, show some degree of both international and national factors in security prices, leading to a conclusion that capital markets are partly integrated and partly segmented. This inconclusive result stems from the difficulty of correctly specifying a testable version of the ICAPM. Roll (1977) and Ross (1978) have questioned whether it is theoretically possible to find a correct test for the domestic version of the capital asset pricing model. Solnik (1977) and Dumas (1977) have raised the same kind of question about the ICAPM.

The argument that multinational firms may serve as proxies for international diversification when capital markets are segmented, has been developed and tested by Hughes, Logue, and Sweeney (1975), Agmon and Lessard (1977), Lee and Sachdeva (1977), and Rugman (1977, 1979). Mehra (1978) extended this line of research to include the effect of foreign exchange risk on a multinational firm's Beta. The most recent test, which includes tax imperfections, is by Errunza and Senbet (1980). On the other hand, Jacquillat and Solnik (1978) and Adler (1981) disagree that these studies have proven that multinational firms benefit from the proxy effect, claiming that all such studies are plagued by statistical problems. Indeed, all have agreed that multinational firms could have a lower cost of capital due only to the perceived

10. See bibliography for full references.

benefits of imperfections in the product and factor markets. It seems to be impossible to segregate, for testing purposes, these real benefits from the financial benefits.[11]

The corporate financial policy implications for firms residing in segmented capital markets were investigated by Stapleton and Subrahmanyam (1977). They concluded:

> In most cases, the effect of segmented capital markets is to depress security prices, and also, to produce an incentive for corporations to increase diversification opportunities available to investors. Three corporate financial policies that effectively reduce the effects of segmented markets are:
>
> a. Foreign portfolio/direct investment by firms.
> b. Mergers with foreign firms.
> c. Dual listing of the securities of the firm on foreign capital markets.[12]

Most of the tests of market segmentation and the proxy effect of multinational firms suffer from the usual problem of model builders, namely, the need to abstract from reality in order to have a testable model. This results in a loss of credibility with financial practitioners, who find it unrealistic to attempt "single issue" comparisons when they are convinced that security prices incorporate differing degrees of perceived foreign exchange risk, political risk, income tax consequences, business cycle considerations, and numerous other accounting and institutional variables.

In our opinion, a reasonable test of market segmentation would be to observe what happens to a single firm's cost of capital when its securities have been traded only in a domestic market but then begin to be traded in other national markets. Arbitrage should keep the market price of its securities equal in all markets. However, if during the transition one observes a significant change in the price of its securities, uncorrelated with price movements in any of the underlying securities markets, this may be evidence, by inference, that the domestic market is segmented. Novo provides such a test!

One word of caution is appropriate. In academic circles, tests based on case studies are often considered to be "casual empiricism", since no theory or model exists to explain what is being observed. Nevertheless, something may be learned from such cases, just as scientists learn from observing nature in an uncontrolled environment. Furthermore, case studies which retain real world complications may identify actual barriers to market integration and policies to overcome them.

The impact of market segmentation and liquididity on a firm's cost of capital

The degree to which capital markets are segmented or illiquid may have an important influence on a firm's cost of capital. At one extreme, if a firm is sourcing its

11. See Stanley (1981) for a summary of empirical work on the multinational firm as a proxy for internationally diversified portfolios.
12. Stapleton and Subrahmanyam (1977, p. 317).

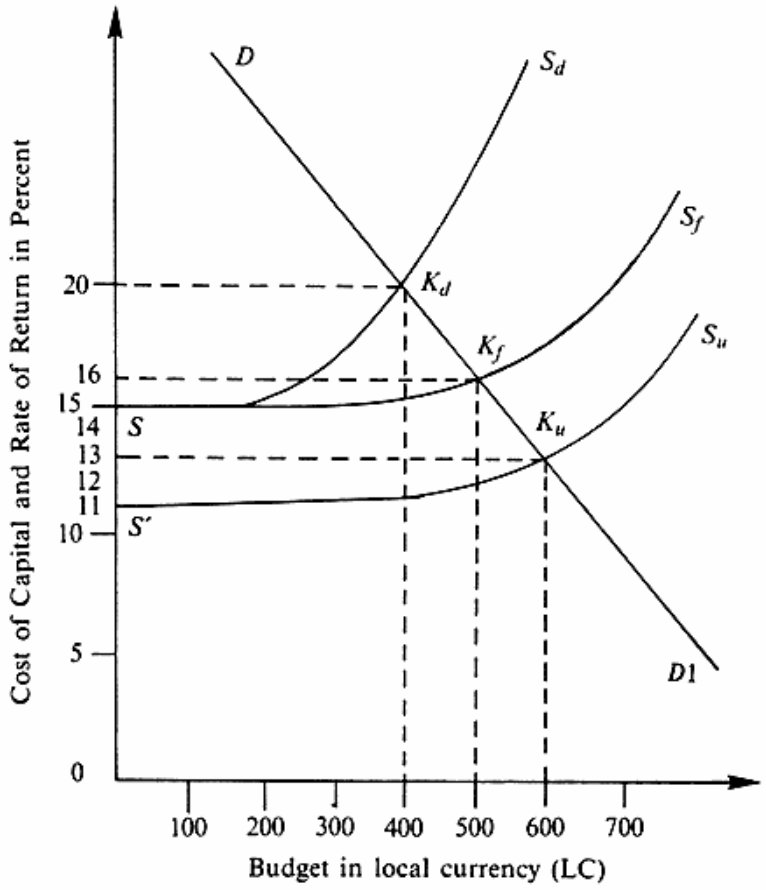

Exhibit 1. *Market Segmentation. Availability of Funds and the Cost of Capital*

capital in a fully segmented and illiquid market, it is likely to have a higher cost of capital than if it had access to international capital markets. However, as will be shown later, a firm may be able to overcome this disadvantage by adopting financial policies which gain it access to international capital markets.

At the other extreme, if a firm has access to fully integrated capital markets, its cost of capital may be lower because it may reflect the international price of risk. As summarized earlier, empirical studies have shown that if one assumes that economic

activities are less than perfectly correlated among countries, investors can improve their portfolio performance by diversifying internationally. Adding foreign securities to a domestic portfolio should reduce that portfolio's systematic risk (Beta). Therefore, the required rate of return on internationally traded securities should reflect their higher value to internationally diversified portfolios, rather than just their value to investors in the country in which the reside.

From a managerial perspective, the differences between sourcing capital in a segmented and illiquid capital market versus an integrated capital market, can be shown diagramatically in Exhibit 1. The model shows how escaping from dependence on a segmented and illiquid capital market can lower a firm's cost of capital.

In Exhibit 1 the line SSd represents the marginal cost of capital of a firm in a segmented and illiquid capital market. The line SSf represents its decreased marginal cost of capital if it gains access to a more liquid capital market. The line S'Su shows the effect of moving from a segmented to an integrated capital market. As a result of the combined effects of greater availability of capital and international pricing of the firm's securities, the marginal cost of capital declines from 20% (at Kd) to 13% (at Ku), and the optimal capital budget climbs from LC 400 to LC 600. The fact that the marginal cost of capital schedule S'Su is lower than SSd at all levels of the capital budget reflects the advantage of market integration. The fact that it is also "flatter" reflects the advantage of greater market liquidity.

Exhibit 1 is a good representation of the problem faced by Novo in 1977. They believed that the cost of capital was represented by a schedule similar to SSd but hoped to move to schedule S'Su. Therefore, we now turn to the Novo case.

Novo Industri A/S (Novo): A case illustration

Novo is a Danish multinational firm which produces industrial enzymes and pharmaceuticals (mostly insulin). In 1977, Novo's management decided to "internationalize" its capital structure and sources of funds. This decision was based on the observation that the Danish securities market was both illiquid and segmented from other capital markets. In particular, the lack of availability and high cost of equity capital in Denmark resulted in Novo having a higher cost of capital than its main multinational competitors, such as Eli Lilly (U.S.), Miles Laboratories (U.S.—a subsidiary of Bayer, Germany), and Gist Brocades (The Netherlands).

Apart from the cost of capital, Novo's projected growth opportunities signalled the eventual need to raise new long-term capital beyond what could be raised in the illiquid Danish market. Since Novo is a technology leader in its specialties, planned capital investments in plant, equipment and research could not be postponed until

internal financing from cash flow became available. Novo's competitors would preempt any markets not served by Novo.

Even if an equity issue of the size required could have been raised in Denmark, the required rate of return would have been unacceptably high. For example, Novo's price/earnings ratio was typically around five, while that of its foreign competitors was well over ten. Yet, Novo's business and financial risk appeared to be about equal to that of its competitors. A price/earnings ratio of five was considered appropriate for Novo in a Danish context, when Novo was being compared with other domestic firms.

If Denmark's securities market were integrated with other capital markets, one would expect foreign investors to rush in an and buy "undervalued" Danish securities. In that case, firms like Novo would enjoy an international cost of capital comparable to their foreign competitors. Strangely enough, no Danish governmental restrictions exist which would prevent foreign investors from holding Danish securities. Therefore, one must look for investor perception as the main cause of market segmentation in Denmark.

At least six characteristics of the Danish equity market may be responsible for market segmentation:

1. Disparity in the information base of Danish and foreign investors.
2. Taxation
3. Alternative sets of feasible portfolios.
4. Financial risk.
5. Foreign exchange risk.
6. Political risk.

Disparity in the information base

Certain institutional characteristics of Denmark cause Danish and foreign investors to be uninformed about each other's equity securities. The most important information barrier is the Danish regulation which prohibits Danish investors from holding foreign private sector securities. As a result of this rule, Danish investors have no incentive to follow developments in foreign securities markets, nor to factor such information into their evaluation of Danish securities. Another detrimental effect of this regulation is that foreign securities firms do not locate offices or personnel in Denmark since they have no product to sell. Lack of physical presence in Denmark reduces the ability of foreign security analysts to follow Danish securities. Therefore, Danish securities might be priced correctly in the efficient market sense, relative to each other considering the Danish information base, but priced incorrectly considering the combined foreign and Danish information base.

A second information barrier is lack of enough Danish security analysts following Danish securities. Only one professional security analysis service is published (Børsinformation), and that is in Danish. A few Danish institutional investors employ in-house analysts, but their findings are not available to the public. Thus both domestic and foreign investors are deprived of the broad analytical coverage of securities available in many other markets.

Other information barriers include language and accounting principles. Naturally, financial information is normally published in Danish using Danish accounting principles. Most major firms, such as Novo, publish English versions, but almost none use U.S. or British accounting principles or attempt to show any reconciliation with such principles. Lack of comparability might discourage some foreign investors who do not find it worthwhile to invest the time and money to derive comparable data.

Taxation

Until very recently, Danish taxation policy had all but eliminated investment in common stock by individuals. Until a tax law change in July 1981, capital gains on shares held for over two years were taxed at a 50% rate. Shares held for less than two years, or for "speculative" purposes, were taxed at personal income tax rates, with the top marginal rate being 75%. In contrast, capital gains on bonds are tax free. This results in bonds being issued at deep discounts because the redemption at par at maturity is considered a capital gain. As a result, most individual investors hold bonds rather than stocks. This reduces the liquidity of the stock market and increases the required rate of return on stocks if they are to complete with bonds.

The feasible set of portfolios

Because of the prohibition on foreign securities ownership, Danish investors have a very limited set of securities from which to choose a portfolio. In practice, Danish institutional portfolios are composed of Danish stocks, government bonds, and mortgage bonds. Since Danish stock price movements are closely correlated with each other, Danish portfolios can be expected to possess a rather high level of systematic risk. In addition, government policy has been to provide a relatively high real rate of return on government bonds after adjusting for inflation. The net result of taxation policies on individuals, and attractive real yields on government bonds, is that ex ante required rates of return on stocks need to be relatively high by international standards, although ex post realized rates of return were unexpectedly low during the relevant 1975-81 period.

From a portfolio perspective, Danish stocks are an opportunity for foreign investors to disversify internationally. If Danish stock price movements are not

closely correlated with world stock price movements, inclusion of Danish stocks in foreign portfolios should reduce these portfolio's systematic risk. Furthermore, foreign investors are not subject to the high Danish income tax rates since they are normally protected by tax treaties, which typically limit their taxes to 15% on dividends and capital gains. As a result of the international diversification potential, foreign investors might require a lower rate of return on Danish stocks than Danish investors, other things being equal. However, other things may not be equal, because foreign investors may perceive Danish stocks to carry more financial, foreign exchange and political risk than their own domestic securities.

Financial, foreign exchange and political risks

Financial leverage utilized by Danish firms is relatively high by U.S. and U.K. standards but not abnormal for Scandinavia, Germany, Italy, or Japan. In addition, most of the debt is short term with variable interest rates. Just how foreign investors would view financial risk in Danish firms depends on what norms they follow in their home countries. We know from Novo's experience in tapping the Eurobond market in 1978 that Morgan Grenfell, its British investment banker, advised Novo to maintain a debt ratio (debt/total capitalization) closer to 50% rather than the traditional Danish 65-70%.

Foreign investors in Danish securities are subject to foreign exchange risk. Whether this is a plus or minus factor depends on the investor's home currency, perception about the future strength of the krone, and its impact on a firm's economic exposure. Through personal contacts with Novo's foreign investors and bankers, the authors do not believe foreign exchange risk was a factor in Novo's stock price, because Novo's operations were perceived as being well-diversified internationally. In fact, 97% of sales are outside of Denmark. Based on the same interviews, with respect to political risk, Denmark is perceived as a stable western democracy but with the potential to cause periodic problems for foreign investors. In particular, Denmark's national debt is regarded as too high for comfort, although this has only begun to show up in the form of risk premiums on Denmark's Eurocurrency syndicated loans. The other threat perceived by foreign investors is that Denmark will move toward implementing "economic democracy" in a more substantial manner. Economic democracy implies that mandatory profit sharing plans are implemented in industry. Employees' share of the profit would be exchanged for stock in the firms. This stock would be held and voted by centralized, labor union-controlled funds. This differs from present practice whereby pension funds are encouraged to purchase equity in private sector firms. Ultimately, of course, this could lead to employee control of these firms and a weak bargaining

position for foreign portfolio investors, Despite these general concerns about Denmark's political situation, investors in Novo, in particular, indicated that their evaluation of Novo's prospects were not influenced by political risk.

Barriers to Internationalization

Although Novo's management in 1977 wished to escape from the shackles of Denmark's segmented and illiquid capital market, many barriers needed to be overcome. It is worthwhile to describe some of these, since they would also be typical of the barriers faced by other firms from segmented markets.

The Information Gap

Novo had been a family-owned firm from its founding in the 1920's by the two Pedersen brothers until 1974, when it went public and listed on the Copenhagen Exchange. However, prior to the decision to internationalize its financial sources of funds, Novo was essentially unknown in investment circles outside of Denmark. In order to overcome this disparity in the information base, Novo adopted a policy of increasing the breadth and depth of its financial and technical disclosure in both Danish and English versions. This was aided in late 1977 by Grieveson, Grant and Company, a British stock brokerage firm, which had started to follow Novo's stock. They issued the first professional security analysis report about Novo in English.

The information gap was further closed when Morgan Guaranty Trust Company of New York, Novo's main foreign commercial banker, was consulted about alternative strategies to tap international capital markets. Its advice was to try a Eurobond issue. It then introduced Novo to Morgan Grenfell & Co., a leading U.K. investment bank, which confirmed the recommended strategy. In 1978, Morgan Grenfell sucessfully organized a syndicate to underwrite and sell a $20 million convertible Eurobond issue for Novo. In connection with this offering, Novo listed its shares on the Stock Exchange in London to facilitate conversion and to gain visibility. These twin actions were the key to dissolving the information barrier as far as foreign investors were concerned and, of course, also raised a large amount of long-term capital on favorable terms, which would have been unavailable in Denmark.

Despite the favorable impact of the Eurobond issue on availability of capital, Novo's cost of capital actually increased when Danish investors reacted negatively to the potential dilution effect of the conversion right. During 1979, Novo's stock price declined from around Dkr. 300 per share to around Dkr. 200-225 per share.

Biotechnology

During 1979, a fortuitous event occurred. Biotechnology began to attract the interest of the U.S. investment community, with several sensationally oversubscribed stock issues by such start-up firms as Genentech and Cetus. Thanks to the aforementioned domestic information gap, Danish investors were unaware of these events and continued to value Novo at a low price/earnings ratio of 5, compared to over 10 for its established competitors and 30 or more for these new potential competitors.

At this point Novo felt it had to position itself with its customers in the U.S. market as a firm which had a proven track record in biotechnology, compared to the "blue sky" promises of the recent start-up firms. A failure to do so could lead to the faulty conclusion that Novo was not at the forefront in technology. Therefore, in order to protect its customer base, Novo organized a seminar in New York City on April 30, 1980. About 40 journalists and financial analysts attended the seminar. Soon after the seminar a few sophisticated individual U.S. investors began buying Novo's stock and convertibles through the Stock Exchange in London. Danish investors were only too happy to supply this foreign demand. Therefore, despite relatively strong demand from U.S. and British investors, Novo's share price increased only gradually, climbing back to the Dkr. 300 level by mid-summer. However, during the following months foreign interest began to snowball. By the end of 1980 Novo's stock price had reached the Dkr. 600 level. Moreover, foreign investors had increased their proportion of share ownership from virtually nothing to around 50%. Novo's price/earnings ratio had risen to around 16, which was now in line with that of its international competitors but not with the Danish market. At this point one must conclude that Novo had succeeded in internationalizing its cost of capital.

Other Danish securities remained locked in a segmented capital market. Indeed, movement in the Danish stock market in general was not correlated with the rise in Novo's stock price in 1980, nor could Novo's stock price be explained by movement in the U.S. or U.K. stock markets as a whole. Exhibit 2 compares an index of Novo's stock price to Stock Exchange Indices in Copenhagen, London, and New York during the period 1977-1982. Note the extreme divergence after the seminar in New York in April 1980.

In order to improve the liquidity of its shares held by U.S. investors and to increase the availability of capital by tapping the U.S. new issues market, Novo's management decided to sponsor an "American Depositary Receipts" (ADR) system in the U.S., quite its shares on the over-the-counter market (NASDAQ), and retain a U.S. investment banker to advice it about a U.S. stock issue. Goldman, Sachs and Company was selected for this purpose.

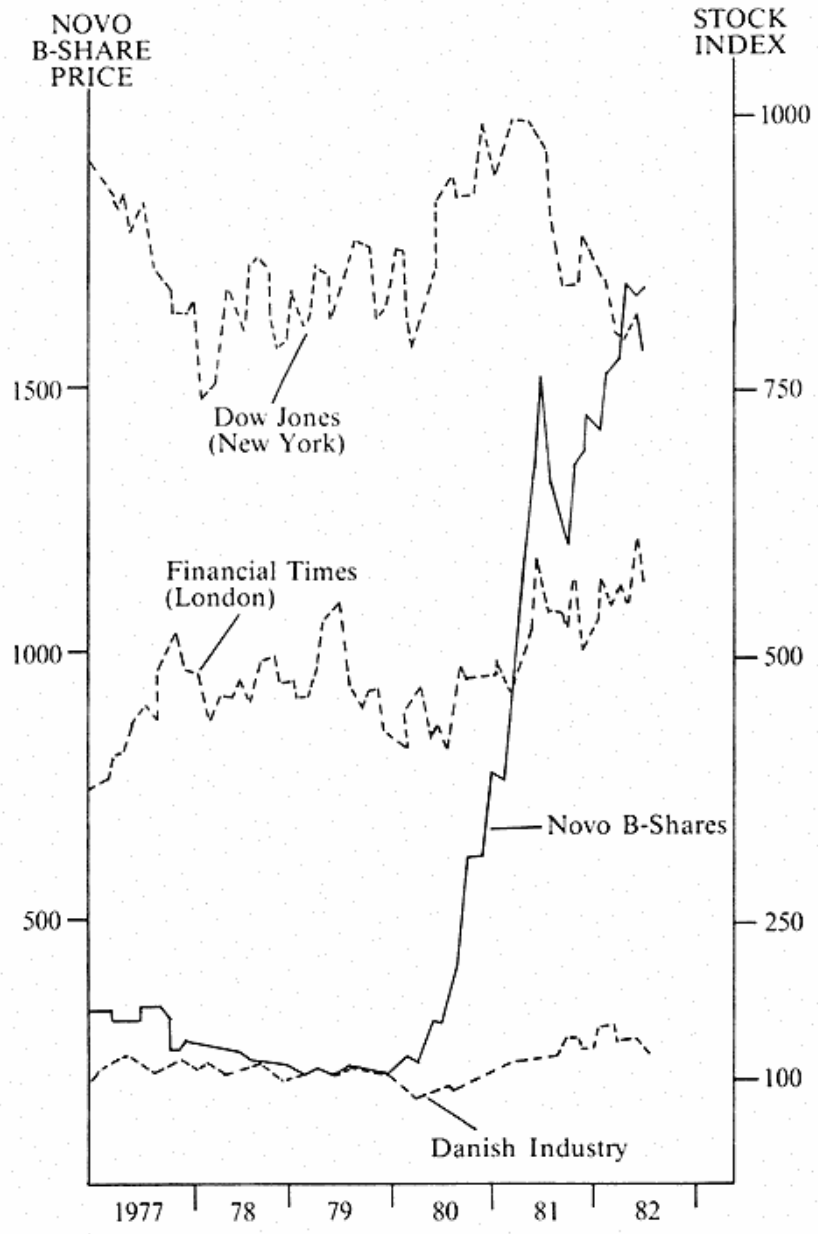

Exhibit 2. Novo's B Share Prices Compared to Stock Market Indices 1977-1982

Morgan Guaranty established the ADR system for Novo in April 1981. The ADR system is used by nearly all foreign firms who wish to facilitate trading in their securities in the U.S. market. A U.S. bank or trust company holds a given number of underlying foreign securities. Then it issues American Depositary Shares (ADS) against these securities. The ADS may be issued at a different price than the underlying shares to conform to U.S. norms. This was the case with Novo's shares, which were split five for one in the U.S. market by issuing five times as many ADS as the underlying Danish kroner shares held in the bank. The main advantages of the ADR system are that: (1) U.S. shareholders are paid dividends in dollars rather than kroner; (2) they can trade the securities in dollars rather than kroner; and (3) they can transfer securities physically in the U.S. rather than abroad. The ADR system is also advisable for companies trying to attract U.S. institutional investors.

The U.S. Stock Issue

During the first half of 1981, under the guidance of Goldman, Sachs and the assistance of Morgan Grenfell and Copenhagen Handelsbank, a prospectus was prepared for S.E.C. registration of a U.S. stock offering and eventual listing on the New York Stock Exchange. The main barriers encountered in this effort, which would have general applicability, were connected with preparing financial statements which could be reconciled with U.S. accounting principles. and the higher level of disclosure required by the S.E.C. In particular, industry segment reporting was a problem both from a disclosure perspective and because the accounting data was not available internally in that format. As it turned out, the investment barriers in the U.S. were relatively tractable although expensive and time consuming to overcome.

The more serious barriers were caused by a variety of institutional and governmental regulations in Denmark. They were never designed for firms to issue stock at market value, since Danish firms typically issue stock at par value with preemptive rights. Even Novo's own stockholders had to be educated as to the value of giving up their preemptive rights, but, by this time, Novo's stock price — driven by continued foreign buying — was so high that vitually nobody in Denmark thought it was worth the price which foreigners were willing to pay. In fact, by May 1981 Novo's stock price had risen to over Dkr. 1500, before settling down to a level around Dkr. 1400. As of July 1981 foreign ownership had increased to over 75% of Novo's shares outstanding.

It should be noted that despite the shift to foreign ownership of the majority of shares, voting control remained in Denmark. Prior to going public in 1974 Novo's owners had established two classes of stock. The A shares were entirely assigned to the Novo Foundation and made nontransferable. The B shares were eventually

mostly sold to the public by the heirs of the founders. Each A share has 10 votes but each B share has only 1 vote. The Novo Foundation is run by an independent Board of Directors composed mainly of scientists, businessmen, and academicians. Its income is distributed primarily for scientific, humanitarian, and cultural purposes.

Market segmentation was very apparent during the fist half of 1981. Published and unpublished reports by Danish security analysts, bankers, and the popular press consistently claimed that Novo was seriously overvalued, while their foreign counterparts were consistently touting Novo as being undervalued. The difference in views was based partly on investor perceptions of the importance of biotechnology and Novo's role in this field.

One final piece of evidence on market segmentation can be gleaned from the way Danish and foreign investors reacted to the announcement of the proposed new U.S. share issue on May 29, 1981. Novo's stock price dropped 156 points the next trading day in Copenhagen, equal to about 10% of its market value. As soon as trading started in New York, the stock price immediately recovered all of its loss. The Copenhagen reaction was typical for an illiquid market. Investors worried about the dilution effect of the new share issue, since it would increase the number of shares outstanding by about 8%. They did not believe that Novo could invest the new funds at a rate of return which would not dilute future earnings per share. They also feared that the U.S. shares would eventually flow back to Copenhagen if biotechnology lost its glitter.

The U.S. reaction to the announcement of the new share issue was consistent with what one would expect in a liquid and integrated market. U.S. investors viewed the new issue as creating additional demand for the stock as Novo became more visible due to the selling efforts of a large, aggressive syndicate. Furthermore, the marketing effort was directed at institutional investors who were previously underrepresented among Novo's investors. This is because U.S. institutional investors want to be assured of a liquid market in a stock in order to be able to get out, if they desire, without depressing the stock price. The wide distribution effected by the new issue, plus S.E.C. registration and a New York Stock Exchange listing, all added up to more liquidity.

On July 8, 1981, Novo became the first Scandinavian firm to sell equity through a public issue in the U.S., as well as the first to list on the New York Stock Exchange. Novo had achieved an international cost of capital! The issue price was equivalent to Dkr. 1399 per share ($36 per ADS). Since July 1981, Novo's stock price has performed a little better than the U.S. market as a whole. As of January 1982 the price was around $50 per ADS. Thus the dilution effect feared by Danish investors was not realized. In addition to the predicted lowering of the cost of capital due to

access to an integrated capital market, the predicted liquidity improvement also occurred. The U.S. equity issue is partial evidence of this, but also the trading volume since listing on the New York Stock Exchange has been averaging about $2 million per day. This is approximately the same as the average daily trading volume of the combined stocks on the Copenhagen Stock Exchange.

Summary

We have attempted to show, both in theory and practice, that a firm which must source its capital in a segmented and illiquid domestic capital market will suffer a relatively high cost of capital. However, it is possible for some firms to overcome this disadvantage by internationalizing their sources of capital. This should both increase the availability of capital, through increased liquidity, and lower its cost, by permitting an international evaluation of the shares. Novo provides a good case example of a firm which succeeded in internationalizing its cost of capital through a conscious policy of increasing information available to international investors and removing institutional barriers to the purchase of its shares. Novo was particularly fortunate because of its technological leadership in biotechnology, an industry which became popular with U.S. and British investors during the critical time period. Other firms, which are specialized in more mundane industries, might have a much more difficult time attracting international investors.

Nevertheless, at least some firm located in countries with segmented capital markets should be able to lower their cost of capital by following in Novo's wake.

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