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Study regarding the structural discount of the price of Elsevier stock compared to the price of Reed stock

Abstract: This is the report of a limited study on the structural stock price differences between Reed and Elsevier. The purpose of this study is to provide an overview of the problem area and to formulate and discuss several hypotheses regarding the causes of this gap. The research was performed by interviewing bankers, financial analysts, academics and the Director Corporate Finance of Reed-Elsevier. Statistical evaluation was not the primary goal. A solution of the gap problem is not yet found.

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1. Introduction

Reed-Elsevier is a combination of public listed companies in the publishing industry.
It is a combination of the British publisher Reed International and the Dutch publisher Elsevier NV.
On Thursday, 17 September, 1992 the two companies announced their intention to merge their operations. It was agreed that the merger would take place on equal terms. Both Elsevier and Reed would obtain a 50% interest in the combined activities. However, in view of Reed's larger market capitalization Elsevier would issue a certain number of shares and hand them over to Reed.
Based on a NLG/GBP exchange rate of NLG 2.74 Elsevier gave Reed a 5.8% interest in its share capital and one Elsevier share has equivalent rights to 7.69 Reed shares.
The 5.8% reflects a valuation ratio of approximately 52.9 : 47.1 .
The equalisation ratio of 7.69 is based on this valuation and is calculated as:

$$\frac{52.9}{R} \times \text{Equalisation ratio} = \frac{47.1}{E}$$

where
R (the number of Reed shares) = 568,403,622 ;
E (the number of Elsevier shares)= 65,814,744 ;

This resulted in the following finance structure:

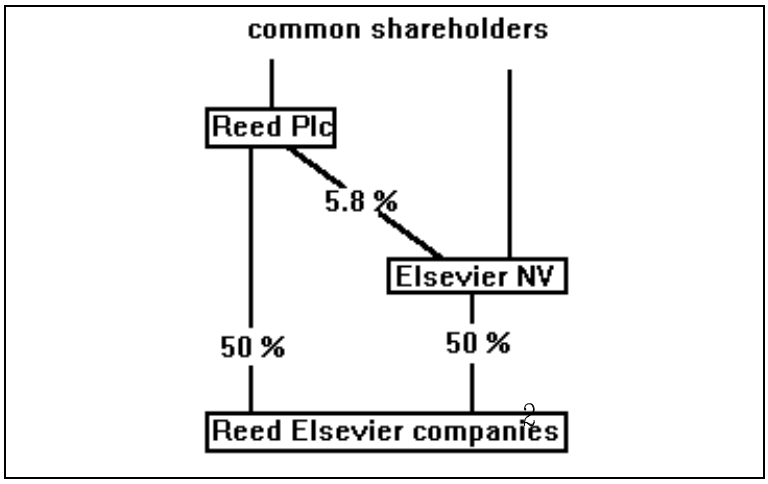

Fig.1: Corporate structure of Reed Elsevier

Thus, the separate shares of Reed and Elsevier remained. Reed shares are mainly traded in London, Elsevier shares are mainly traded in Amsterdam. Merger arrangements were based on equality to ensure equal rights to both kinds of shareholders. This resulted in an equal dividend policy and equal rights to the assets of the combination, measured against actual exchange rates.
Special care has been taken that different tax regulations in the United Kingdom versus the Netherlands would result in an equal gross-dividend.

Given these equalisation arrangements one may expect that the share prices of Reed and Elsevier tend to approach a 1 to 7.69 ratio, taking actual exchange rates into account.
In practice however, there seems to be a structural difference in the ratio of the share prices with respect to the expected ratio, with Elsevier shares trading at a lower than theoretical price. This discount between Reed and Elsevier prices is called the "gap".
In the literature no study on the Reed-Elsevier gap has been found. In this paper I will present some characteristics of this gap and discuss some hypotheses which could explain it. The objective of this report is to give an overview of possible causes of the gap. In this report, research into specific hypotheses is of limited extent.

1.1 Methodology

Several hypotheses about the causes of the gap were derived and formulated from discussions with financial professionals, and from literature on corporate finance. In the literature, no other publications on the Reed-Elsevier gap were found. This study is therefore meant to provide an introductionary view of the problem. The derived hypotheses are illustrated with Reed-Elsevier data and commented. Although some graphics and correlations are presented, this study is not intended to be statistical.

The hypotheses can be divided into two main groups: distortion of the equalisation arrangements and obstacles to arbitrage.

Distortion of the equalisation arrangements: The merger mechanics were designed to make Reed shares and Elsevier shares fully economic substitutable. Rights and dividends were made equal. However, it may be possible that there are more aspects than

rights and dividends that influence the value of the shares.

Obstacles to arbitrage: There may be characteristics of financial markets which prohibit the gap to be resolved.

First, the magnitude and nature of the gap will be discussed. Then, the hypotheses are presented and commented. This is ranked according the above mentioned groups. One of the more promising hypotheses relates to a stock split of Elsevier shares. The studied period is therefore divided into the period before the stock split, and the period round the stocksplit.

To broaden the view on the problem area, references are made to the Unilever case, which has some similarities to the Reed-Elsevier case. Finally, the hypotheses are summarized and some preliminary conclusions are drawn.

2. Calculation of the gap

To get a clear insight into the amount of the mentioned gap, a chart is presented of the price movements of both shares for the period of October 1992-1993. This covers the period in which most of the comments of the financial professionals were collected. Earlier prices are not relevant since the merger took place in October 1992.

To make both price movements comparable the prices of Reed have to be translated in Dutch Guilders (NLG). (A translation to GBP is also possible; this form was chosen for convenience.) This translation is based on the daily spot rates (closings), then this translated prices were multiplied by 7.69 (equalisation ratio as per annual report 1992).

The chart (Fig. 2) reveals a gap for Elsevier with a mean value of NLG 10.27 (for the period 1993). The correlation between both price movements is high: 98% for the 1993 period.

The high correlation between Reed and Elsevier prices might be caused by a mutual benchmarking of investors in London and Amsterdam: when considering to buy or sell shares, price movements on the other market may be a source of information of the (supposed) underlying market expectations.
For example: a Dutch investor considers buying Elsevier. He notes that on the London market, Reed prices are increasing. He might

believe that this rise is due to a change in the general market expectations regarding Reed Elsevier. To participate in this

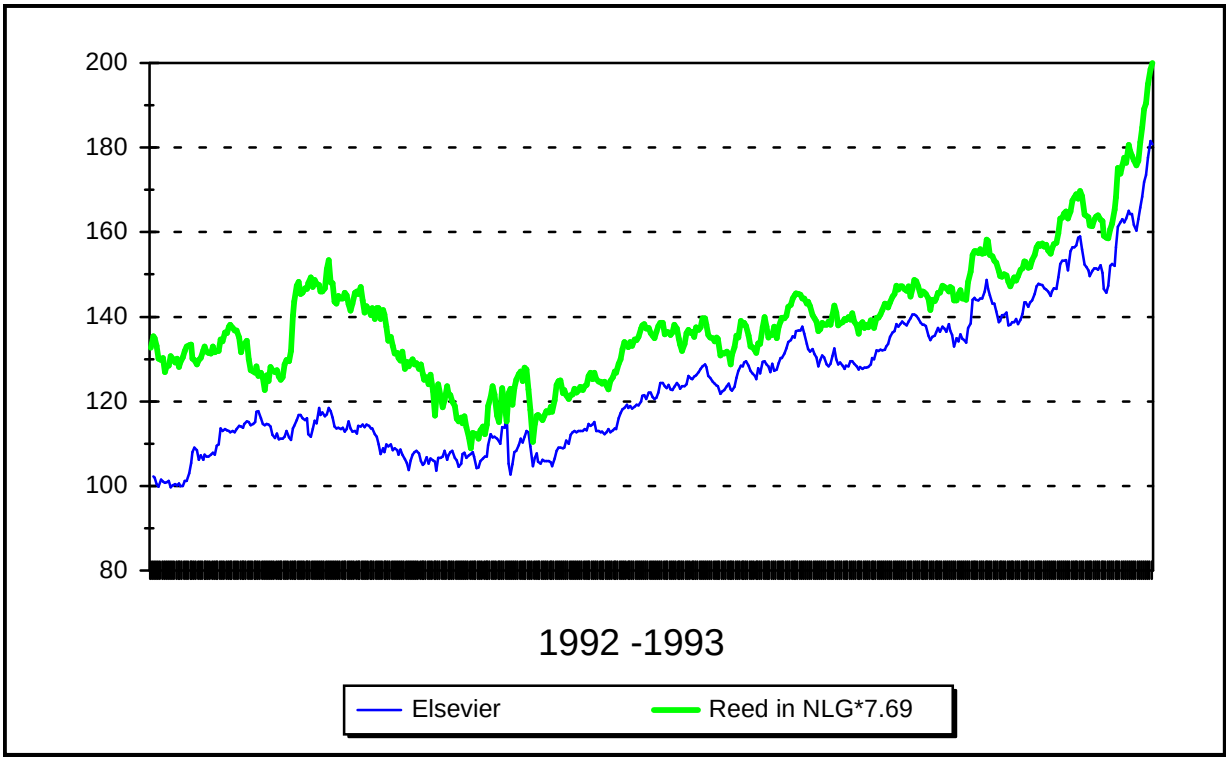

Fig 2. The Reed Elsevier gap in Dutch Guilders (NLG)

probably profitable rally, he is willing to pay more than the current level of Elsevier, which also causes an increase of the Elsevier prices.

The fluctuation of the gap is moderate and independent of the heights of the prices.

To reveal the effects of daily changes in the exchange rate I applied moving averages of the exchange rate. The use of moving averages for 5, 10, 20, 40 and 60 days made no significant change in the gap.

The financial analyst at Bank van Haften Labouchere in Amsterdam also noted the gap.
"Although it (the gap, BK) narrowed somewhat since the

announcement of the merger, this difference is still too large to be explained by factors such as the preference individual investors may have for Reed because of fiscal reasons. But although there clearly seems to be room for arbitrage here, no one seems called upon to do so. We therefore have no other choice than to explain the gap between theory and practice to imperfect market conditions like differences in liquidity of the two shares, a limited readiness of investors to invest in shares of a foreign company and costs involved in arbitrage."

Van Haften Labouchere points in this analysis three questions:
-is the gap caused by a difference in liquidity?
-why is the gap not solved by arbitrage? Are investors reluctant to invest in foreign companies?

He considers the fiscal reason not relevant without stating that he has actually proved this. These questions relate to characteristics of financial markets. Let us however first consider whether Reed and Elsevier shares are real substitutes to each other.

3. Distortions of equalisation arrangements

3.1 Disagreement on the merger mechanics

Rinse de Jong, Director Corporate Finance of Reed Elsevier, noted that investors may not agree to the conditions of the merger.
An important issue in these conditions is the equalisation ratio of 7.69. If investors perceive this term as not fair, can this result in a discount on Elsevier prices?

I calculated the equalisation ratio which minimizes the average gap when applied to the actual prices. This resulted in a equalisation ratio of 7.16. This is 6.8% lower than 7.69.

However, even if investors prefer a lower equalisation ratio, the actual ratio will be dominant. Whether or not the ratio of 7.69 reflects the real relative value of Reed to Elsevier shares, the actual dividends and other rights are related as 1:7.69.
If this statutory ratio is changed to, say, 1:8, based on financial terms, the ratio of share prices should be 1:8.

Another item in the merger mechanics is the 5.8% interest of Reed in Elsevier.
Both Reed and Elsevier have the right to 50% of the profit of the

Reed Elsevier companies. Owing to the 5.8% interest of Reed in Elsevier, 5.8% of the profit that Elsevier receives is owned by Reed. Thus Reed receives more than 50% of the profit. This agrees with the difference in overall value of both firms at the moment of the merger. This does however not result in a different dividend or rights per share. The equalisation is based on a higher level of the holding structure.

3.2 Differences in corporate structure

Although both Reed International Plc and Elsevier NV appear to have similar business activities, this is not necessary. Holding shares in associated companies is the major activity, but it need not be the only activity of these holding firms. If any additional activities differ between Reed Plc and Elsevier NV, this might cause the gap. These activities would remain unaffected by the equalisation arrangements, since these activities are not a part of the common companies, but belong to the holdings a level higher.

Examining Reed's profit and loss account reveals that the major component is the share of profit of Reed Elsevier combined results, (1993: 267 mln GBP) and the profit on the 5.8% Elsevier shares held (1993: 15 mln GBP).
Other components are taxation (73) and the correction to equal taxes to Elsevier(12).
Obviously, Reed Plc has no other significant activities besides holding the shares of the group.

The profit and loss account of Elsevier NV states 528 mln NLG as its share in the profit of associated companies and 24 mln NLG interest. This interest is received from associated companies. This extra interest income amounts to about 4% of the share in the profit of associated companies, but in correspondence with Rinse de Jong, I noted that the dividing of the common profit of Reed Elsevier to Reed and Elsevier is adjusted for these incomes. Thus any differences in earnings between the holdings are eliminated.

3.3 Different market risk characteristics (betas)

It may be that the beta (as defined in the Capital Asset Pricing Model (CAPM)) of Reed Elsevier on the Amsterdam exchange is different from that on the London exchange. Betas may influence the level of prices since the CAPM assumes a relation between

betas and demanded expected return. Since the par return for both Reed and Elsevier is the same, demanded expected return has to be realized by discounts on prices.

Betas for Reed and Elsevier may differ from each other.
The risk regarding the shares' fundamentals are the same for both markets, since the fundamentals are the same. The reference to the market return however, may cause deviating betas.
I calculated the betas for Reed and Elsevier. I used the EOE index as the market return for Amsterdam and for London, the FTSE-100 index.
The beta is defined as:

```
         covariance( return of fund / market )
beta =   ----------------------------------------
         variance( return of the market )
```

Notes on the beta computation:
-The concept of beta is ex-ante: the returns mentioned in the formula are expected returns. Brouwer et. al. (1992) proved that this formula can also be used in an ex-post approach.
-Return is defined as the quotient of the price at date and the price 3 months ago. The choice for a period of a quarter is arbitrary. In the literature (Handa et al., 1989) indicates that different time horizons result in different betas. The betas calculated here should therefore not be considered as unique values but are only intended to make movements in betas comparable.
-A small error could be present by omitting the dividends. Since the dividends of Reed and Elsevier are equal, and only affect prices round the announcement date, the distortion is limited.

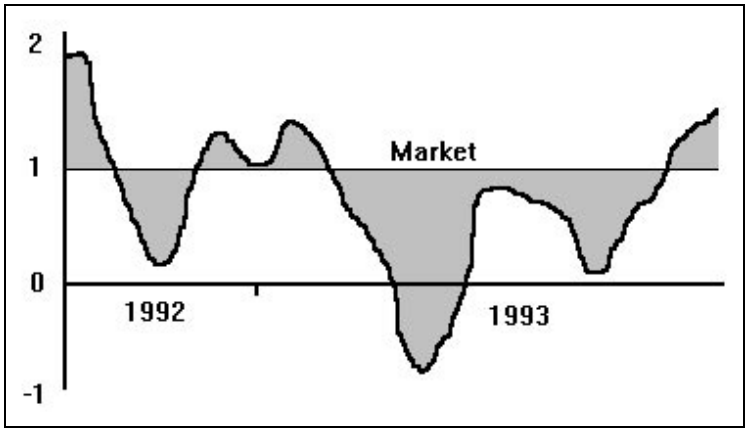

Figure 3: Elsevier's beta

The beta of Elsevier is sloping, with certain waves, from -.8 to 1.4. The Reed beta is swinging between 0.5 and 1.6 with long waves. The conformity of both betas

is rather low. Only at the end of the chart can a period of convergence be noticed.

The beta can give an indication of the conformity to market movements. The pattern of the Elsevier beta has a wider variance range than the pattern of the Reed beta. The average beta of Elsevier is lower than the average of the beta of Reed. This means that Reed is relatively more aggressive (beta > 1) than Elsevier in comparison to their respective home market. In theory, a higher beta requires a higher expected return. Since earnings are equal for both stocks, a higher expected return must be accomplished by a discount on Reed prices. This disconfirms the discount as found in practice (a discount on Elsevier instead of Reed).

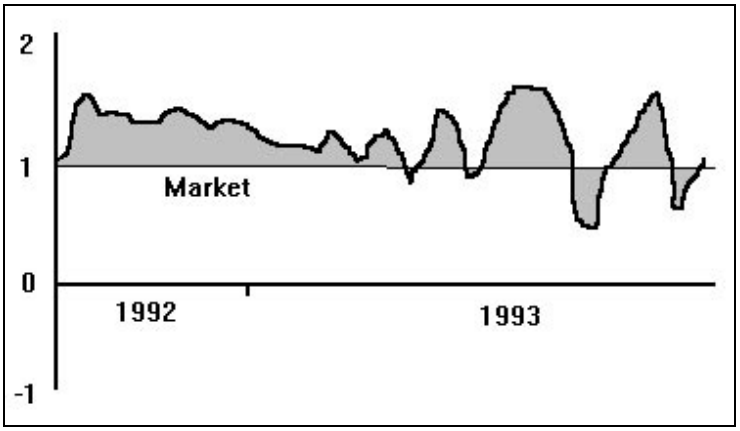

Figure 4: Reed's beta

In his annual report (1993) Mr. Vinken mentioned the popularity of Reed resulting from its relation to the FTSE-100 index. From this beta-analysis, one may conclude that this conformity to the local index favours Reed compared to Elsevier. The financial option market may try to influence the indices, or cover its positions by trading in Reed and Elsevier ("demand from the option market"). Elsevier may be less suitable to push or pull the market index than Reed since its pattern is less conform the index.This uncertainty towards the conformation to index movements might cause a discount.

4. Obstacles to arbitrage

4.1 Arbitrage

Van Haften Labouchere states that "there clearly seems to be room for arbitrage here." There are a number of ways in which this arbitrage could be realized.

Normally, if a commodity is traded on one market at a different price than on another market, risk free profit can be made by purchasing the commodity on the cheaper market, shipping it to the other market and selling it at a higher price.

In this particular case, there is the problem that the shares cannot be transferred from one market to another. Although an Elsevier share has the same fundamental characteristics as a Reed share, the shares are not interchangeable (fungible). An Elsevier share can not be traded as if it was a 7.69 Reed share. One can buy an Elsevier share relatively cheaply, but it cannot be sold at the Reed price. Elsevier and Reed shares remain separate entities. Thus classical arbitrage is not possible.

An alternative form of arbitrage.
If an investor wants to invest in Reed Elsevier, the cheapest way is to buy Elsevier. If this strategy is followed by many investors, the price of Elsevier will rise and prices of Reed will fall as a result of the shifting interest from Reed to Elsevier. This form of arbitrage is somewhat less attractive than the classical form. In the classical case, there is a risk free profit for anyone who wants to take it. As long as there is a difference between both share prices, this arbitrage profit is independent of the price movements. In the Elsevier case, the gap can be earned without risk, but the non-systematic risk remains. If prices fall, the investor will suffer a loss, since the investor has a long position in Elsevier shares. Thus, this form of arbitrage is only attractive for those who are willing to accept the non-systematic risk of Reed-Elsevier.

In correspondence with Rinse de Jong, it has been noted that there is a form of arbitrage. Rinse de Jong: "There is arbitrage, but within a certain discount range. It appears that 5% and 10% are the lower and upper limits."

If Reed and Elsevier prices result in a gap which is located in the lower region of the variation range, one can arbitrate by buying a put option Elsevier and buying a call option Reed. Since the gap is relatively small, one may expect that in the event of an upward price change, the change in Reed will be larger than the change in Elsevier (thus making the gap larger, away from the lower border). The profit on the Reed call will therefore be larger than the loss on the Elsevier put.
In the event of a decrease in prices, the decrease in Elsevier will be larger than the decrease in Reed. Thus the profit on the

Elsevier put will be larger than the loss on the Reed call.
If Reed rises and Elsevier falls (which also results in an increase of the gap), profit is made on both the Reed call and the Elsevier put.

This strategy offers a profit opportunity which has no non-systematic risk. This means that the return is not dependent on the fundamentals of Reed Elsevier. The only necessary assumption is that the gap will enlarge when it is located in the lower region of the variation range. (The same position can be reached by selling a Reed put and selling a Elsevier call.)
If the gap is located in the upper region of the variation range, an inverse strategy is applicable: buy an Elsevier call and a Reed put, or sell an Elsevier put and a Reed call.

As far as I can see, this form of arbitrage will diminish the variation of the gap, but not necessarily the average level of the gap. In fact, it is assumed that the gap will remain on its past average level. Thus the average gap is a equilibrium in this strategy.

4.1.1 Arbitrage lines

From Rinse de Jong several graphics used in his analysis were

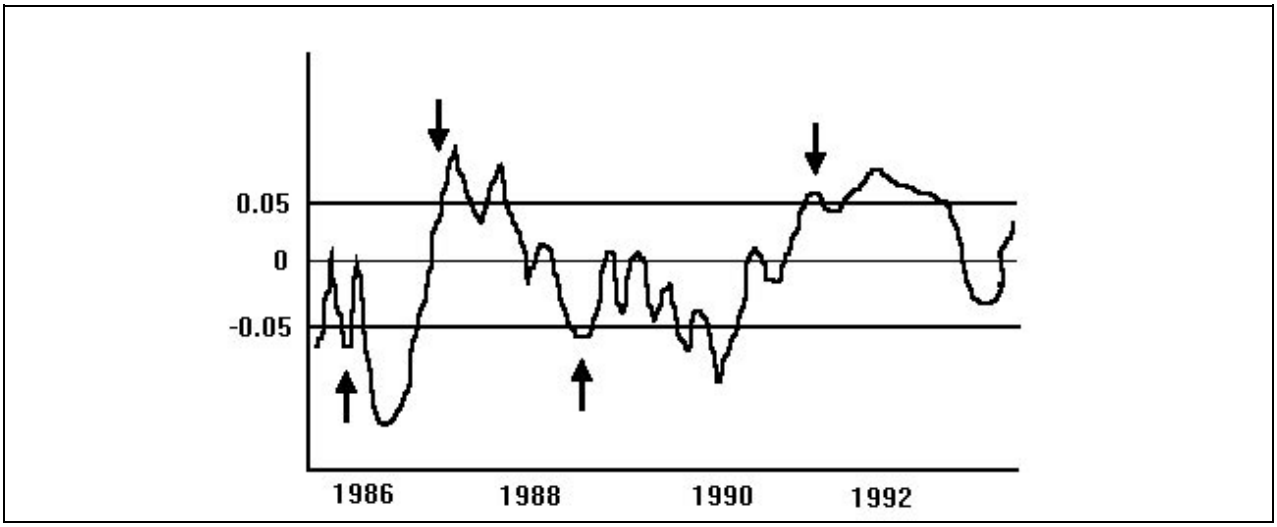

Fig. 5 Arbitrage moments at the Unilever gap

received, which also included analyses of the gap for Unilever and Royal Dutch. (I have some doubts whether the Royal Dutch case is relevant. In the annual report I found no statements regarding any equalisation arrangements between Royal Dutch and Shell.)
In the graphics showing the price movements arbitrage lines have been added to show the possibilities of arbitrage. I would like to comment on these lines.

A transaction has to be made when the price crosses one of the lines for the first time since the last crossing of the other line: if the price crosses one line several times without crossing the other line, it is only a reinforcement of the last signal so no change in position is required. Repeating the same transaction and thereby doubling the position is not recommended: if there is a change in the major trend, the exposure in the wrong direction will rise quickly. Second, why should the exposure on the first signal be smaller than the following reinforcing signals?

Applying this arbitrage rule to the Unilever graphic I count only 4 points where transactions have to be made; for Royal Dutch 5 points.
Given the period of 1986-1993 (8 years), this arbitrage is not very intensive. To influence prices by arbitrage, more transactions are required, so the arbitrage lines must be redrawn. It is important to realize that the movement of gaps are not very structured. Arbitrage is possible, but the implementation of decision rules is not straightforward.

Some other factors may form obstacles to this arbitrage:

-The transaction costs might be too high. The gap amounts to approximately 7.5% of the equivalent Reed price (1993). If the difference in transaction cost for Elsevier trading exceeds this 7.5%, the net result of the shift to Elsevier will be negative. Without knowing the exact costs of trading abroad, I am sure that the gap is far too large to be explained by these costs.
For local markets, the costs vary from 0.2% for floorbrokers to 2% for non-professionals.
Other costs are the research and analysis costs. For professionals, the spot prices of Reed are as easily available as for Elsevier (Stockdata, Reuter, Datastream). For non-professionals who depend on newspapers or teletekst this might be a problem (but non-professionals are less likely to arbitrage intensively). Since the fundamentals are the same for Reed and Elsevier, fundamental information such as annual reports and other

news is at the same effort available.

Another transaction related problem is the difference in settlement period in Amsterdam and London, as I noted in discussion with a broker from the Orco Bank. In Amsterdam, a seven day settlement period is standard. In London, settlement may take two or three weeks. This may cause interest costs problems when applied on a fast trading frequency during arbitrage.
This is, however, a general market condition and not specific to the Reed Elsevier case. (See the Unilever analogy.)

-Investors may be not aware of this difference. I expect that the major brokers in Amsterdam and London are aware of this gap but they might not want to arbitrate because of the exposure to the non-systematical risk. Brokers normally do not expose themselves to major positions.
On the other hand, since the gap is significant, it is worthwhile for advisory analysts and brokers to inform their clients about it. Rinse de Jong confirmed that some large brokers (Goldman Sachs, Smith New Court, Barclays de Zoete Wedd) have informed the market about the gap. However, in discussion with Mr. Blom (Financiele Diensten Amsterdam) I noted that advisors of FDA neglect such differences in stock prices. They focus on the fundamentals of companies, not on potential short term excess returns. For reasons of convenience, the clients are advised to trade on the local (Amsterdam) stock exchange. Although indeed the gap may be less attractive to small investors, it should be attractive for large professional investors. Blom did not have an explanation of long term sustained gaps like Reed Elsevier and Unilever.

In April 1994, the annual report of Reed Elsevier was presented. President of the board P.J. Vinken placed great emphasis on the gap in his report .
This report got a lot of attention in the press (for example, De Telegraaf, March 30, 1994, heading: "Elsevier executive yearning over too low share price"). If lack of awareness is a cause, there should be a significant change in the gap during the period following the publication of the annual report. (In the Reed report no special attention was given to the gap or the equalisation arrangements.)
I prepared a chart of Reed Elsevier prices for the period January 1, 1994 - April 18, 1994 (at that points, the most recent available data).
Price movements showed a decline in the gap, in absolute as well

as relative terms. The decline, however, did not match the date of publication and looks, in relation to the variation history, not significant. (This significance is examined on sight, no formal statistics regarding significance were applied.)

-Reluctance to invest abroad. In discussion with Mr. Wytzes from Robeco (which did not specifically focus on the Reed Elsevier case) I noted that the organizational structure may obstruct the consideration of both shares: management decides in which country how much will be invested. The portfolio manager on the level below gives direction to the branches to be chosen, and approves the selected shares to be bought.
Thus, the weighing of Reed versus Elsevier is not likely to be made, since the portfolio manager who considers buying Reed is not allowed to stray to the foreign Elsevier share, because this will disturb the (formal) country allocation. Moreover, he will face additional applications since he has to report this investment to the treasury department, which controls currency exposure.
This hypothesis was also mentioned by Mr. Vinken, and by Rinse de Jong regarding British institutions. However, when I tried to verify it by discussing it with Mr. Toppen, also from Robeco, I noted that this is not the practice at Robeco.
Choices regarding allocation to countries are indeed made at a high level, but substituting Elsevier for Reed at the operating level is not inconvenient.

Floorbrokers at Reed Elsevier were approached for more information on the arbitrage item, but without success (no reply).

4.2 General differences of p/e-ratios

On the stock market structural differences in price earning ratios are not rare. In general, the price earning ratios in Amsterdam are lower than the pe-ratios in London.

This phenomenon has been investigated by several researchers but no sound explanation has been found yet. At Reed Elsevier, Rinse de Jong performed an analysis on p/e-ratios. He tried to link the share prices to their home markets and see whether the gap was caused by a consistent price difference between London and Amsterdam. He used p/e-ratios for the market as a whole, for the industry groups (media) and for Reed and Elsevier. The patterns resulting from his (limited) exercise were not clear, but the relative standing of Reed and Elsevier vis-a-vis their peers seems equal.

The most recent conclusion in pe-ratio analysis is that we just have to accept these differences as a fact of life.

Further exploration of this phenomenon in the Reed Elsevier case is not worthwhile since:
-the p/e-ratio analysis is directed on the general market conditions, not on single shares; I doubt whether general market conditions cause the gap (see the Unilever analogy);
-the p/e-ratio analysis tries to explain different pe-ratios for different firms. Firms are compared on an industry basis between two stock markets. In the Reed Elsevier case, there is a much stronger relationship than industry resemblance: both shares are of the same business combination.

4.3 Influences of exchange rates

There are three levels on which exchange rates may influence share prices:
-at the moment of the merger;
-at the trading in foreign shares
-currency exposure of the company's earnings

Exchange rates at the moment of the merger:
At the time of the merger, the exchange rate of GBP/NLG played a role in comparing economic values of both firms. After a first estimation of the equalisation ratio, values were restated when the GBP fell.
After the merger this applied exchange rate was no longer relevant. It was a part of the merger transaction and after the settlement of the exchange of mutual shares, it is a "sunk cost". Both Reed and Elsevier have rights to 50% of the total assets of Reed Elsevier, independent of the "price" paid for it.

Exchange rates at the trading in shares:
A British investor buying Elsevier will be exposed to currency risk. The dividends of Reed and Elsevier are equivalent by order of the equality commitment (including the related tax credit), but the revenue on a sale of the Elsevier share is exposed to currency risk.

If a British oriented investor invests in Elsevier, he may want to hedge his currency exposure. The purchase of Elsevier implies a long position in Dutch Guilders (NLG), which can be offset by a short position at the future rate of exchange. The cost of this

hedge depends on the expectations of currency movements. In the studied period the GBP was considered as a weak currency. A weak currency will have a positive sloping term structure: as the exchange value of GPB drops, more GBP's are required to buy NLG. Since the investor is long in NLG, he earns a premium on a forward contract to sell NLG. This premium lowers the costs of investment in Elsevier. Therefore the British oriented investor would be willing to pay even more than the translated Reed price, since this mark-up is offset by the premium on the currency market.
In concluding, the hypothesis works in the opposite direction of the gap.

Currency exposure of earnings:
Since Reed Elsevier operates in several countries, both Elsevier and Reed shareholders are exposed to currency risk. The annual report 1993 describes the currency exposure in its section Currency Profile. The currency profile of pre-tax profit is illustrated with a pie chart:

UK sterling:	39%
Dutch guilders:	24%
US dollars:	26%
Other currencies:	11%

The table reveals that for Dutch investors the currency exposure is larger than for British investors, since the foreign currencies are 1 - 0.24 = 0.76 for Dutch oriented investors and 1 - 0.39 = 0.61 for UK oriented investors. This additional currency risk may cause the gap.
Only the currency results on operating transactions and monetary current assets affect net profit. In accordance with generally accepted accounting rules, exchange translation differences on foreign equity investments and the related foreign borrowings and differences between balance sheet and profit and loss account rates are taken to reserves.
Therefore the influence of the currency exposure on the distribution of the combined profit is limited. The correlation between the gap and the GBP/NLG exchange rate amounts to only 0.29.

4.4 Liquidity

Liquidity of a financial asset is defined as the ease with which shares can be traded. If sufficient traders are present on the stock market, an additional demand or supply would not cause a major price adjustment. Of course, also with large numbers of traders, large price changes are possible, but this will be caused by other matters, like changes in expectations of future profit or changes of market sentiment. The marginal demand or supply is then a relatively unimportant matter.

The overall liquidity of a share can influence prices in several ways.
Poor liquidity can result in a major price movement when a large party wants to buy or sell. Thus an additional cause of volatility appears when a share is illiquid.
In general, a higher risk rate (in terms of volatility (standard deviation)) requires a higher expected return, ceteris paribus. (In this case, the ceteris paribus assumption ("other circumstances equal") seems valid, as the underlying value for Reed and Elsevier shares is the same, since both companies have a 50% interest in Reed Elsevier.) A higher expected return is obtained if the required invested amount (i.e., the price) is lower.

4.4.1 Measuring liquidity

From the definition of liquidity one may relate daily volumes to daily price movements. In a stable environment, without unexpected changes in prospects, a characteristic of a non-liquid share is low volume with major price movement. A characteristic of a very liquid share is high volume with minor price movement.
Combinations of volumes and price movements for both Reed and Elsevier are presented in a chart. This presentation of course neglects the price effects of news coming to the market, but since the news and the timing of it will be quite similar for both Reed and Elsevier, a comparison remains valid. Price movements are calculated as the absolute value of the percentage change with respect to the previous day's closing price. Volumes are stated according to the common definition, i.e., including double counts. In discussion with a spokesman for the Amsterdam Stock Exchange, I noted that the measurement of volume in Amsterdam differs significantly from the measurement in London. In general, Amsterdam's volumes can be divided by two to derive the actual number of shares changing from owner. Due to the market maker

system in London which allows several forms of transaction parties combinations, derivation of the actual numbers of shares changing owner in London is almost impossible. The direction of any bias is unknown. Interpretation of any comparison should therefore be very cautious.

The chart does not reveal an obvious distinction for Reed and Elsevier regarding the relation price movements/volumes. Only the main corps of the scatter of Reed is located somewhat more at the lower side of volume axis compared to Elsevier, but this may be due to the different volume definitions. The standard deviation of Elsevier closing prices for the period 1993 is NLG 12.33 ; for Reed it is GBP 0.57, which is equivalent to NLG 12.16 (adjusted for an average exchange rate of 2.78 and 7.69). The volatility of Elsevier is therefore higher than the volatility of Reed, although the difference might not be significant.
The patterns of the volumes of Reed and Elsevier are rather wild. The correlation between Reed volumes and Elsevier volumes amounts to 0.33.
In discussion with Mr. Blom from FDA, Amsterdam, I noted that a difference in liquidity of two stocks has to be rather large to affect prices. Blom mentioned as example Dordtsche Petroleum, a small, illiquid fund which consists mainly of shares Royal Dutch. The discount on Dordtsche Petroleum is generally directed to the illiquidity. However, both Reed and Elsevier are major funds. Blom does not expect any influence of liquidity on Reed Elsevier stock prices.

4.4.2 Turnover of shares

In discussion with Mr. Duffhues, Tilburg University, Department of Business Administration, section Corporate Finance, I noted that liquidity may be influenced by the kind of investors holding the shares. He expects that large institutional investors have a more buy-and-hold strategy than small investors. If a major part of the total numbers of Elsevier shares is held by these institutional investors, fewer shares are available for daily trading. Mr. Duffhues expects this effect to be stronger on Elsevier than on Reed.
The Financieele Dagblad publishes an annual overview of the reported interest in equity and voting rights exceeding 5% by investors in major companies listed on the Amsterdam Stock exchange. This reporting is mandatory according to the Wet Melding Zeggenschap. In the May 6, 1994 issue for Elsevier two reports have been made for Elsevier: Reed International Plc: 5.79%; and

ING Groep: 9.42%.
Due to the threshold of 5%, long term investments below 5% are not reported. In correspondence with Rinse de Jong I noted that approximately 70% of the Reed shares are held by institutions. However, since lending of stocks is common practice in London, these shares are available for trading. Since no clear overview of interest in Reed is available and the volumes of Reed cannot be reliably derived, comparison of the turnover of Reed and Elsevier is not possible.

In summary, Elsevier seems to be somewhat more liquid than Reed. This disconfirms the hypothesis regarding the influence of liquidity on prices. According to this hypothesis, the liquidity of Elsevier should be lower than the liquidity of Reed, since Elsevier is relatively cheap to compensate for the inconvenience of a low liquidity.

To conclude, the hypothesis that liquidity is a factor causing the gap is not supported by the patterns of volume and price changes, and neither by a concentration of big holdings in the Elsevier stock.

4.5 "Expensive" Elsevier shares

Despite the actual measured liquidity, there may be a difference between actual liquidity and liquidity as perceived by investors. This deviation came up when I spoke to a stock broker from Orco Bank (the former ACC) on the subject. When I asked him if he had an opinion on the causes of the gap, he mentioned liquidity as a very important factor. He said it was much easier for him to trade 100,000 shares of Reed than to trade 100,000 shares of Elsevier. This number-of-shares orientation towards liquidity ignores the differences in the underlying values of both shares. A link may be made to the assumed increased liquidity at stock splits in general.

In discussion with Mr. Duffhues I noted that several small investment funds avoid shares with prices above NLG 150,- and analysts of Staal Bankiers also noted this price-of-shares liquidity perception when dealing with Heineken NV and Heineken holding. In my opinion, this aversion to "expensive" shares must be caused by some sort of psychological factors. Due to fixed transaction costs of stock trading, a minimal amount of approximately NLG 5000.- per transaction is required to earn these

costs back, assuming an average rate of return on stocks of 10-15%. In relation to this NLG 5000.- a price of NLG 150 for Elsevier is not very different from (translated) NLG 28 for Reed. The Staal Bankiers analysts regard this attitude as irrational, since the relative return remains the same whether NLG 10,000 is invested in shares costing NLG 20.- compared to NLG 10,000 invested in shares costing NLG 200.-.

(Note that the Heineken case is not comparable to Reed Elsevier since the absolute price difference amounts to only 11%, instead of more than 700% (1:7.69) for Reed Elsevier. Although Heineken Holding pays the same dividend as Heineken NV, the price of Heineken Holding is 11% lower than the price of Heineken NV. The analysts of Staal Bankiers recommend buying Heineken Holding to make an additional 11% return.)

It is generally believed that when a company announces a stock split, prices rise to a higher level. For the Dutch market, this is verified by Van Montfort (in: Bank- en Effectenbedrijf, June 1993).
Van Montfort gives two reasons for this increase:
-the split contains implicit information about prospects;
-the liquidity of the shares increases.

The first reason is hard to verify, because when a stock split is announced, often other information is also revealed, like financial reports, mergers, changes in legal features of the share, etc. In that case, it is hard to isolate the informative value of the stock split. Copeland stresses the effects of this other information. He argues that the stock split *per se* is not a cause for price increases. The stock split is just an instrument to communicate that earnings will keep increasing. Companies decide to split stocks to keep stock prices in a presumed optimal trading range. Copeland did not find any evidence that such an optimal trading range exists.

To assess the increase in liquidity, Van Montfort compares the sales amounts (volume times price) before and after the stock split. She finds that in most of the cases the liquidity *decreases* after a stock split. This confirms the findings of a similar study by Copeland.
According to Van Montfort this may be caused by differences in the mix of shareholders. She assumes, like Duffhues, that the liquidity effect of a stock split is more relevant to small investors than to large institutional investors. If a specific

share is mostly held by small investors, the liquidity effect may be larger. Copeland disagrees on this, since there are several methods by which small investors can mitigate the presumed disadvantages of "expensive" shares.

Fortunately, this hypothesis of the "expensive" share causing the gap can be tested. At the presentation of the half year report for 1994 on August 12, a stock split of 10:1 for the Elsevier shares was announced, to be effected on October 4, 1994. This stock split will make the price (per share) of Elsevier more comparable to the price of Reed. Like in other stock split cases, an incidental additional return is expected. If this return is due to implicit information about the firm's prospects, a similar return is expected for Reed, since the fundamentals are the same for both shares. In that case, the gap will remain. If this return is due to a perceived increase in liquidity, only the Elsevier share prices will rise, resulting in a diminishing gap.

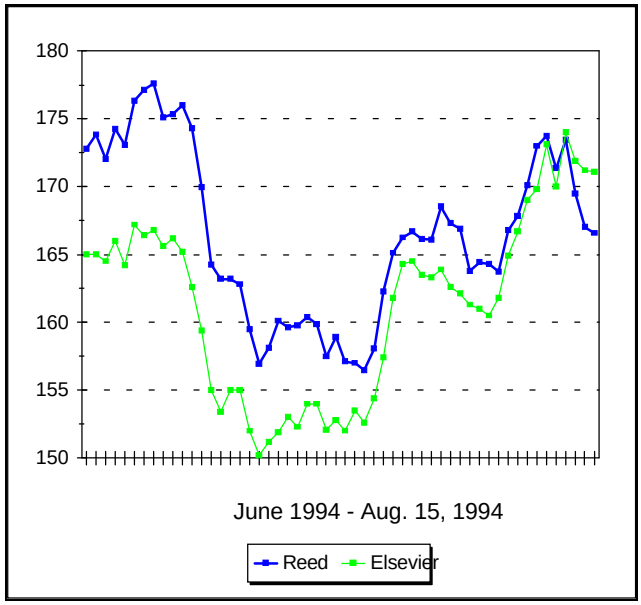

fig. 6 The Reed Elsevier gap in Dutch Guilders (NLG)

Fig. 6 shows the development of the gap around the date of the stock split announcement. Indeed, in August, the gap diminishes and even becomes negative. However, this decrease is not specifically related to the date of the stock split announcement.

In her study of Dutch companies, Van Montfort noted that only a day before the announcement a slight rise in prices can be noted, probably due to rumours or inside information. The expensive share hypothesis is therefore only supported to a limited extent.

The fact that the gap decreased disconfirms the hypothesis about the information content of a stock split, since any information on

future earnings should influence both Reed and Elsevier in the same manor, leaving the gap unchanged.

5. Resemblance to other cases: Unilever

The Reed Elsevier gap might not be unique. As described in the section regarding the pe-ratio, unexplainable price differences are common. Fortunately, there is a case which might be very comparable to the Reed Elsevier case.

Unilever is also a Dutch-British combination, and has equalisation arrangements of the same kind as Reed Elsevier. I examined the prices of Unilever looking for possible gaps.

To make the share prices of Unilever NV in Amsterdam and Unilever Plc in London ("Unilever Plc.") comparable, I translated Unilever Plc. prices to NLG.

In the general notes to the 1992 financial statements it states that, according to the equalisation arrangements, the dividend on a face value of NLG 12,- will be equivalent to the dividend on a face value of GBP 1,-.
Taking into account a face value per share of NLG 4,- and 5p respectively, three shares of Unilever equal NLG 12,- and twenty shares of Unilever Plc. equal GBP 1,-. Thus the correction multiplier amounts to 20/3 = 6.67 ("the Unilever 7.69").
The price movements reveal periods of positive gaps (Unilever NV cheaper than Unilever Plc.), but also periods of negative gaps and periods of conformity. For this analysis I used a larger time horizon: 1990 to 1993. The first chart I prepared contained only 1992 and 1993. This chart gives a misleading picture, as if the gaps are very stable and structural. For Reed Elsevier such a time horizon is not available since the merger took place only in 1992.

I contacted Mr. Ledeboer from Unilever. He told me that there was not any form of intervention that Unilever has made on the stock exchange to change the gap between Unilever NV and Unilever Plc. He is aware of the fact that both prices do not always match, but is not concerned about it.
He mentioned several other cases that had similar characteristics: for Unilever: the fund Calvé consists solely of Unilever shares but has different price movements; others: Heineken and Heineken Holding.
According to Mr. Ledeboer, these gaps are due to a very complex combination of factors like liquidity, currency differences,

interest differences, investor's preferences, etc.
He accepted such gaps as unchangeable characteristics of the capital market.

I prepared a set of charts to compare the patterns of the Unilver gap to the Reed Elsevier gap. Common characteristics, if any, may point to general market conditions causing the gaps.

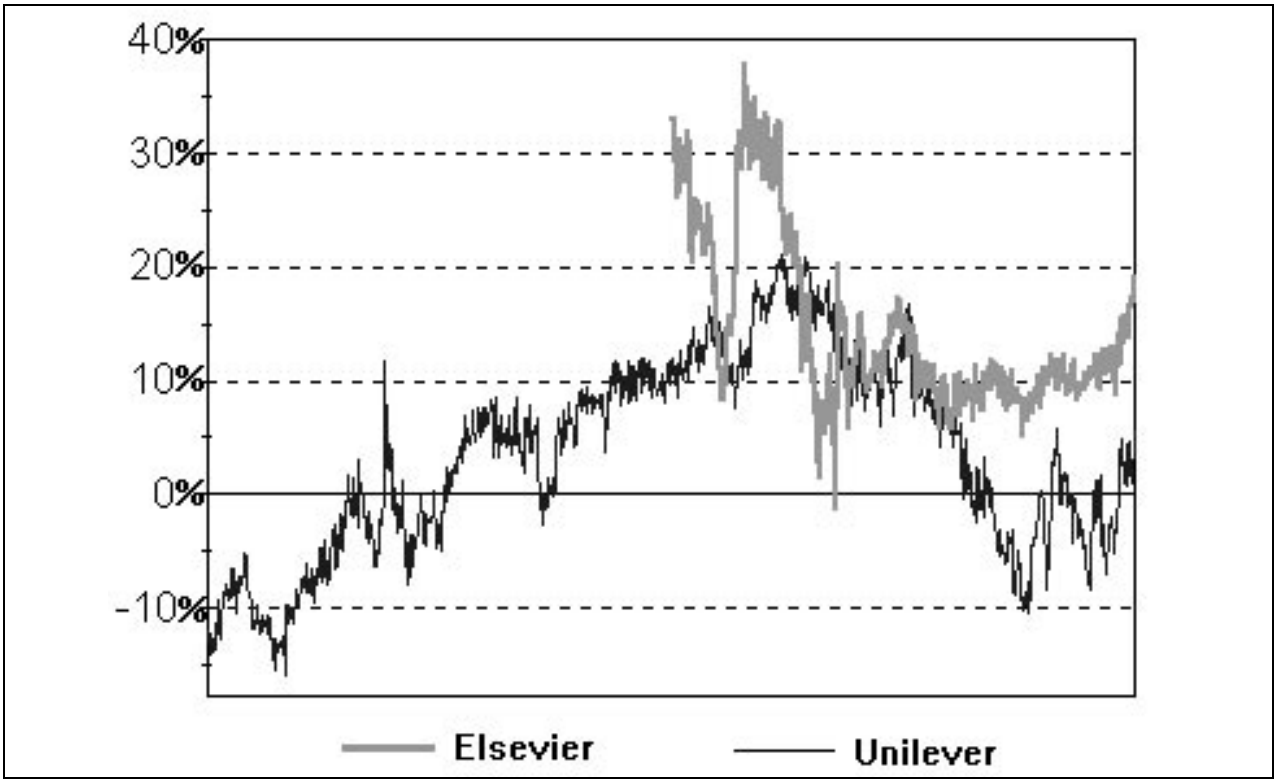

Fig. 7: Gaps as percentage of Amsterdam prices, for the period 1990-1993

The patterns of the gaps as percentage of the prices in Amsterdam show a moderate conformity (correlation 0.61). Some influence may be expected from general market factors such as interest, currency exchange rate and market sentiments.
There is, however, a fundamental difference between the monotone positive gap between Reed and Elsevier and the positive/negative switching gap of Unilever Plc. and -NV.

This variety in gap patterns between Reed Elsevier and Unilever gives less support to general market conditions like interest rates, required pe-ratios and currency exposure causing the gap.

The patterns of volumes of Unilever Plc. and - NV are more similar than the patterns of volumes of Reed and Elsevier. This may relate to more intense arbitrage in Unilever than in Reed Elsevier.

The characteristics of the betas of Unilever Plc. and -NV resemble Reed Elsevier: only at the end does a period of convergence appear. However, in this case the English firm has the widest variation range.
From the beta analyses I can not find a fundamental difference which might contribute to the difference in the gap of Unilever versus Reed Elsevier.

6. Summary and conclusions

Equalisation arrangements made at the merger were intended to make returns and rights on both shares equal. Reed Elsevier expected that this would result in an equal share price.

In practice, there was a periode with a rather stable gap between both prices. In this study I reviewed several possible causes of this gap. These hypotheses concern distortions of the equalisation arrangements and market conditions that prohibit arbitrage.

Hypothesis 1: Investors consider the 1:7.69 ratio not appropriate as a basis for the merger, and make an adjustment to reach a more acceptable ratio.
Even if investors do not like the 1:7.69 ratio, the ratio is enforced by the right and dividend policy.

Hypothesis 2: different financial structures of the holdings result in different expected returns and/or risk characteristics. However, the only activities of the holdings are holding the shares of the common group. Any other income is adjusted for when dividing the profit of the Reed Elsevier group.

Hypothesis 3: The gap is due to the general difference in p/e-ratios between Amsterdam and London.
This general market condition aspect is contradicted by the Unilever case. This is a similar case, but the gap is not constant.

Hypothesis 4: A difference in beta results in a correction to the prices.
Reed seems on the average to be more related to the market index than Elsevier.
This creates an additional risk on Reed which may result in a compensating discount. This hypothsis is disconfirmed by the empirical discount on Elsevier. This hypothesis is neither supported by the patterns of the Unilever betas.

Hypothesis 5: arbitrage resolving the gap is not performed due to:

-lack of awareness of investors;
When information regarding the gap is emphasized in the press, no significant change in gap occurs.

-reluctance to invest abroad;
This is not supported in discussion with investors from Robeco.

-lack of a reliable arbitrage strategy;
In this case arbitrage is not as straightforward as usual. Second, the pattern of the gap is not easily arbitraged. However, arbitrage is not necessary to resolve the gap. Ordinary shifts from Reed to Elsevier are sufficient.

-exposure to currency risk;
This is only applicable for short term investors. For longer horizons, currency risk is hedged by the equalisation arrangements. The correlation between the NLG/GBP exchange rate and the gap is not high.

-transaction costs;
The gap is too large to be explained by transaction costs.

Hypothesis 6: The gap is due to different currency exposure of Reed and Elsevier, which causes differences in the distribution of the total profit of Reed Elsevier to Reed and Elsevier.
The exposure in NLG is indeed larger than in GBP, but due to the accounting policy, currency results affect profit only to a limited extent.

Hypothesis 7: The gap is due to currency exposure during trading. Taking into account the weak GBP, one should expect an opposite gap.

Hypothesis 8: The gap is due to general market conditions like interest rates and acceptable p/e-ratios. If this hypothesis is valid, a similar pattern in the gap of Unilever is expected. This appears not to be the case.

Hypothesis 9: Elsevier is less liquid than Reed, resulting in a discount to compensate for this inconvenience.
The general perception of investors may conform to this hypothesis (liquidity measured in numbers of shares traded). I have however not found statistics to support this hypothesis as based on invested values traded. Elsevier may be perceived as less liquid because of its relatively high price. When this price was reduced by a stock split, the gap diminished, but this decrease started earlier than the announcement of the stock split. Secondly, there is no theoretical or empiric evidence supporting the generally believed idea that stock splits increases liquidity.
Measuring the turnover of the shares is not possible due to ill-defined volume figures on the London Stock Exchange.

In concluding, I have not found a satisfactory explanation for the gap. However, this report may be useful for other researchers as an introduction to the problem.

The study described in this report is limited by available time and budget.

The most interesting points for further study are:
-perceived liquidity by investors, especially at stock splits
-view on arbitrage by investors

This can be studied by questionnaire and interview techniques.

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Tilburg, May 1995

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