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Can the market divide and multiply? A case of 807 percent mispricing

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mispricing

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Abstract

Purpose – This paper documents a strong violation of the law of one price surrounding a large rights issue.

Design/methodology/approach – If prices are right, the relation between the prices of shares and rights follows the outcome of a simple calculation.

Findings – In the case of Royal Imtech N.V. in 2014, prices deviated sharply and persistently from the theoretical prediction. Throughout the term of the rights, investors were buying shares at prices that were many times what they should have been given the price of the rights. Short-selling constraints in the form of high recall risk and lacking stock lending supply are the most likely explanation for the failure of arbitrage as a safeguard of market efficiency. Still, it remains remarkable that investors were buying large volumes of shares at highly inflated prices in the presence of a cheap, perfect substitute.

Originality/value – The mispricing was special not just because of its severity but also because unlike previously documented cases there was no fundamental risk and no material noise trader risk.

Keywords Law of one price, Market efficiency, Mispricing, Limits to arbitrage, Short-sale constraints

Paper type Case study

1. Introduction

Under the efficient market hypothesis (EMH) “prices are right”: a security’s price reflects its fundamental value, the risk-adjusted present value of its future cash flows. Market efficiency is important because it helps to ensure the optimal allocation of scarce capital. The key concept underlying the idea of market efficiency is arbitrage. When there is mispricing, arbitrageurs buy and sell the same or essentially similar securities at advantageously different prices and as a result push prices back to the fundamental value (Friedman, 1953; Fama, 1965).

The textbook version of arbitrage entails no risk or other impediments. Real-world arbitrage, however, normally does entail risks (Shleifer and Vishny, 1997; Shleifer, 2000; Gromb and Vayanos, 2010; Barberis, 2018). First, arbitrageurs often face fundamental risk because securities are rarely perfectly identical. Second, even if perfect substitutes exist, arbitrageurs are generally still exposed to the risk that the mispricing increases. This so-called noise trader risk may force arbitrageurs to liquidate their position early at a loss (De Long *et al.*, 1990; Shleifer and Vishny, 1997). Third, arbitrageurs are exposed to the risk that borrowed stock is being recalled by the lender and that lending fees go up, which brings additional costs and can lead to early liquidation (Lamont, 2004; Engelberg *et al.*, 2018). In addition, real-world arbitrage comes with implementation issues in the form of, for example,

JEL Classification — G12, G14, G40

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transaction costs, information costs, stock loan fees and sometimes lacking stock lending supply (Saffi and Sigurdsson, 2011; [Boehmer and Wu, 2013](#)). As a result of these limits to arbitrage, mispricings can occur and persist.

The assessment of whether assets are correctly priced is difficult, because fundamental values are generally unobservable ([Fama, 1970, 1991](#)). There is, however, one basic implication of market efficiency that can be tested directly without knowledge of fundamental values: the law of one price, according to which identical assets should have identical prices. Violations of the law of one price have been observed in studies of twin stocks ([Rosenthal and Young, 1990](#); [Froot and Dabora, 1999](#); [De Jong et al., 2009](#)), cross-listings ([Grossmann et al., 2007](#); [Gagnon and Karolyi, 2010](#)), closed-end mutual funds ([Lee et al., 1990, 1991](#)) and parent companies ([Cornell and Liu, 2001](#); [Mitchell et al., 2002](#); [Lamont and Thaler, 2003a](#)).

The present paper adds to this literature by documenting a clear, persistent and unprecedentedly strong violation of the law of one price that took place at the time of a large rights issue. Throughout the term of the rights, investors were buying large numbers of shares at prices that were many times what they should have been given the price of the rights. The mispricing was special not just because of its severity, but also because unlike previously documented cases there was no fundamental risk and no material noise trader risk.

In 2014, the Dutch technical services company Royal Imtech N.V. (henceforth: Imtech) implemented a rights issue to reduce its pressing debt burden and improve its liquidity. For each share held at the close of trading on October 8, shareholders received the right to purchase 131 additional shares at a heavily discounted price. Holders of the rights could subscribe for the new shares until the close of trading on October 22. During the subscription period the rights were publicly traded for nine days, separately from the shares.

Under the law of one price, the relation between the price of the shares and the price of the rights should follow the outcome of a simple calculation. We show that the prices of the two securities deviated sharply from this theoretical prediction. On October 9, for example, the closing price of the shares was more than nine times what it should have been given the price of the rights at that time. The discrepancy decreased over time, but did not disappear and remained large. After one week of trading, for example, the shares were still changing hands at 3.75 times the value implied by the rights.

At first sight, this mispricing provided a lucrative arbitrage opportunity: an investor could buy one right and simultaneously short 131 shares. This strategy would have been devoid of fundamental risk and would have entailed barely any noise trader risk, because the rights were convertible into shares with a delay of at most about two weeks. The spectacular mispricing could most likely occur and persist because of frictions in the stock lending market. The arbitrage strategy required a share-to-right ratio of 131:1, whereas the ratio of outstanding shares and rights in the market was only 1:1 at the time the two securities were simultaneously traded. A shortage of shares that can be borrowed makes short selling difficult to implement and risky.

[Miller \(1977\)](#) already described how short-sale constraints can prevent negative information from being reflected in stock prices. Short-sale constraints, however, are not a sufficient condition for violations of the law of one price to occur ([Diamond and Verrecchia, 1987](#)). For mispricing it is necessary that some investors are buying the expensive security or selling the cheap one, for example (1) because they are forced to do so in response to a margin call or a recall of borrowed shares, (2) because they speculate that the price discrepancy will increase in the short run or (3) because they fail to see that the two securities are identical ([Lamont and Thaler, 2003b](#)). In the case of Imtech, investors were indeed buying large volumes of shares at highly inflated prices while a cheap alternative was available to them.

The following sections describe the details of the rights issue ([Section 2](#)), demonstrate the mispricing ([Section 3](#)), discuss the case and possible explanations ([Section 4](#)) and conclude ([Section 5](#)).

2. The Imtech rights issue

A rights issue is a way by which a listed company can raise additional capital. The company grants its shareholders the right to buy new shares in proportion to the number of shares they already hold, at a predetermined discounted price on a predetermined date in the near future. The rights are generally transferable and publicly traded until the expiry date. Holders of the rights can subscribe for the new shares within a fixed time period. If all shareholders exercise their rights or sell them in an efficient market, the method avoids the wealth transfer from existing to new shareholders that typically occurs with standard seasoned equity offerings (Holderness and Pontiff, 2016).

Imtech was an established Dutch technical services provider in the fields of electrical and mechanical engineering and automation. The company's shares were listed on Euronext in Amsterdam. In its peak years, shortly before its collapse, Imtech had approximately 30,000 employees and reported annual revenues of about €5 billion. In 2013, the company discovered that its activities in Germany and Poland were subject to extensive corruption and accounting fraud. These discoveries marked the start of a two-year period of financial distress and reorganizations. In these two years, Imtech completed two rights issues totaling €1.1 billion to reduce its pressing debt burden and improve its liquidity. The company was eventually declared bankrupt in August 2015 and delisted in January 2017.

The mispricing case pertains to the second rights issue, which was implemented in the fall of 2014. The details of the offering were announced on October 8, 2014. For each share held at the close of trading on Euronext in Amsterdam on October 8, shareholders received the right to purchase 131 additional shares at an issue price of €0.01 each. The subscription period lasted until the close of trading on October 22. With the exception of the last day of the subscription period, the rights were publicly traded. The new shares were assigned on October 24 and became listed and tradable on October 27. To increase the nominal price of the shares, a 500-to-1 reverse stock split was announced along with the rights issue and implemented before the start of trading on October 28. The rights issue was underwritten by ING, Rabobank, Commerzbank and ABN Amro. Because holders of the rights subscribed for only 52.44 percent of the issue, the four banks had to take up nearly half of the new shares. Prior to the rights issue, the number of Imtech shares outstanding was 458,642,404. The issue of 60,082,154,924 new shares generated approximately €600 million in gross proceeds and €567 million in net proceeds.

For our main analysis we use price and trading data that are publicly available on the website of Euronext [1]. Throughout the entire period of interest, the tick size of the shares and the rights was €0.0001. Figure 1 summarizes the development of the prices and trading volumes of Imtech's shares and rights for the period October 2–22, 2014. On October 8, the day of the announcement of the details of the rights offering, Imtech's share price dropped from €0.3763 to €0.3200. Apparently, the rights offering, and especially its size and apparent urgency, was seen as a negative signal about the financial position of the company. Throughout the following days, after every share had been converted into a share and a right, the decline continued at a steady pace. At the close of trading on October 21, the sum of the price of a share and the price of a right was down to a mere €0.0166, corresponding to a post-issue market capitalization of €1.0 billion.

Intraday volatility was high, especially during the first few ex-right days. On October 9, for example, the shares opened at €0.0300, closed at €0.1000 and reached high and low prices of €0.2530 and €0.0256 in between. A notable day for the rights was October 10, when the price in the very first minute of trading collapsed to €0.0010 and then rebounded immediately. Both the shares and the rights were actively traded, with the daily volume of the shares sometimes even approaching (October 9) or exceeding (October 22) the number of shares that were outstanding. In monetary terms, the average daily value of trading was €10.7 million for the shares and €2.0 million for the rights.

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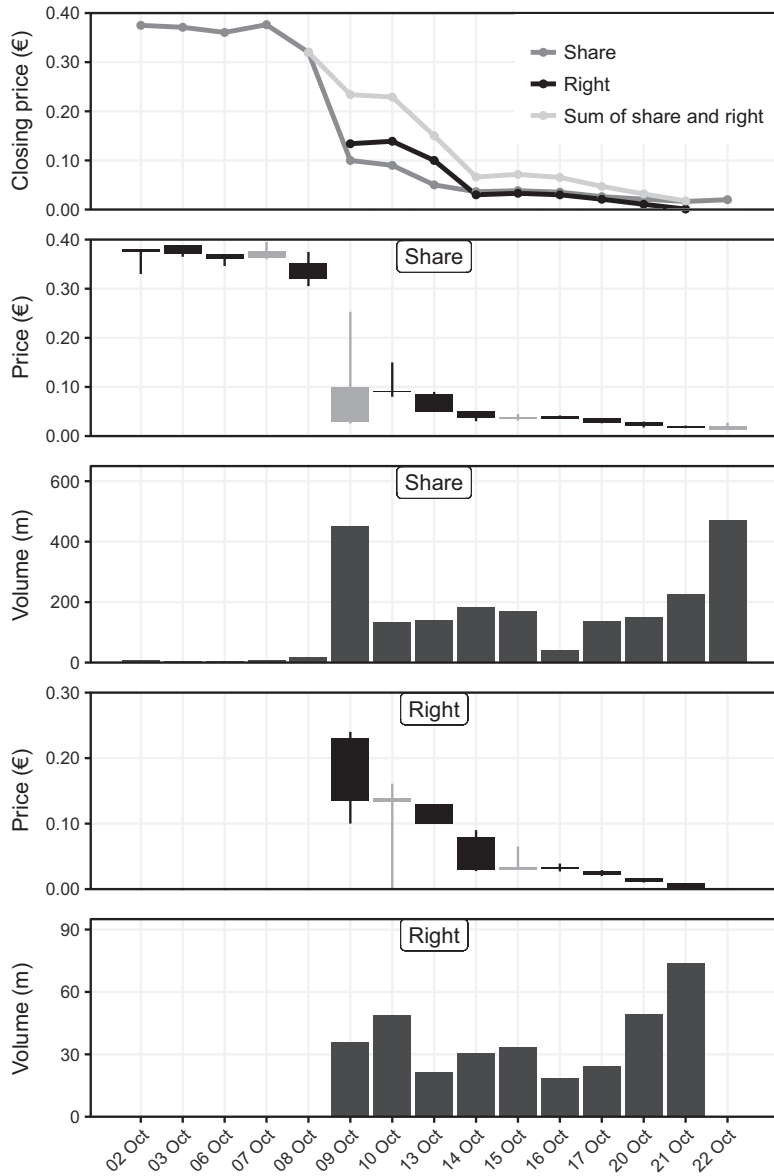


Figure 1.
Prices and trading
volumes

Note(s): The figure shows the daily closing prices (top chart), intraday price movements (candlestick charts; intraday up gray, intraday down black) and daily trading volumes (bar charts) of Imtech shares and rights for the period October 2–22, 2014. Prices are in euro, trading volumes are numbers of securities in millions

3. The mispricing

At the close of trading on October 8, the theoretical ex-rights price (TERP) of the shares was €0.0123. This value equals the price of one existing share (€0.3200) plus the proceeds from the issue of 131 new shares (€1.3100), divided by the number of shares per existing share in the new situation (132).

The second column of Table 1 lists the actual closing prices of Imtech shares for each of the nine days on which both the shares and the rights were traded. On October 9, the shares closed at €0.1000, which is considerably higher than the expected TERP of €0.0123.

Assuming that this surprisingly high share price was correct, we can calculate the theoretical price of the rights for the same point in time. Denoting the actual price of the shares by S , the implied price of the rights R^* is given by $131 \times (S - 0.0100)$ [2]. Column three and column five of Table 1 list the actual closing prices R and the theoretical closing prices R^* of the right. Given the share price of €0.1000 on October 9, the theoretical price of the rights was €11.790. In reality, however, the rights changed hands at €0.1340.

If we instead assume that the price of the rights was correct, the theoretical price of the shares S^* is given by $(R + 131 \times 0.0100) / 131$. Column four shows the implied closing prices of the shares. Given the actual closing price of the rights of €0.1340, the shares should have been worth €0.0110 on October 9. In contrast, the shares closed at €0.1000 that day, which is 807% higher than the theoretical price. The differences between the actual and theoretical prices signify dramatic mispricing.

In theory, an arbitrageur could exploit the mispricing by buying one right and simultaneously shorting 131 shares. On October 9, she would then receive the difference of €12.97 [3]. Upon completion of the rights issue, she closes her position by exchanging the right for 131 shares at a total price of €1.31. Ignoring costs, her net profit from this strategy would be €11.66 [4]. Because the rights were convertible into shares and because the strategy would take no more than a few days, the arbitrageur would bear neither fundamental nor any material noise trader risk.

The prices of the shares and the rights remained incompatible throughout the subsequent eight days the two securities were simultaneously traded. As shown in column six of Table 1, the ratio of the actual and the theoretical price of the shares decreased over time but remained large. For instance, after a full week of trading, on October 15, the share price was at 3.75 times the price implied by the rights. On October 21, when the final trades in the right took place, this ratio was still a non-negligible 1.65 [5].

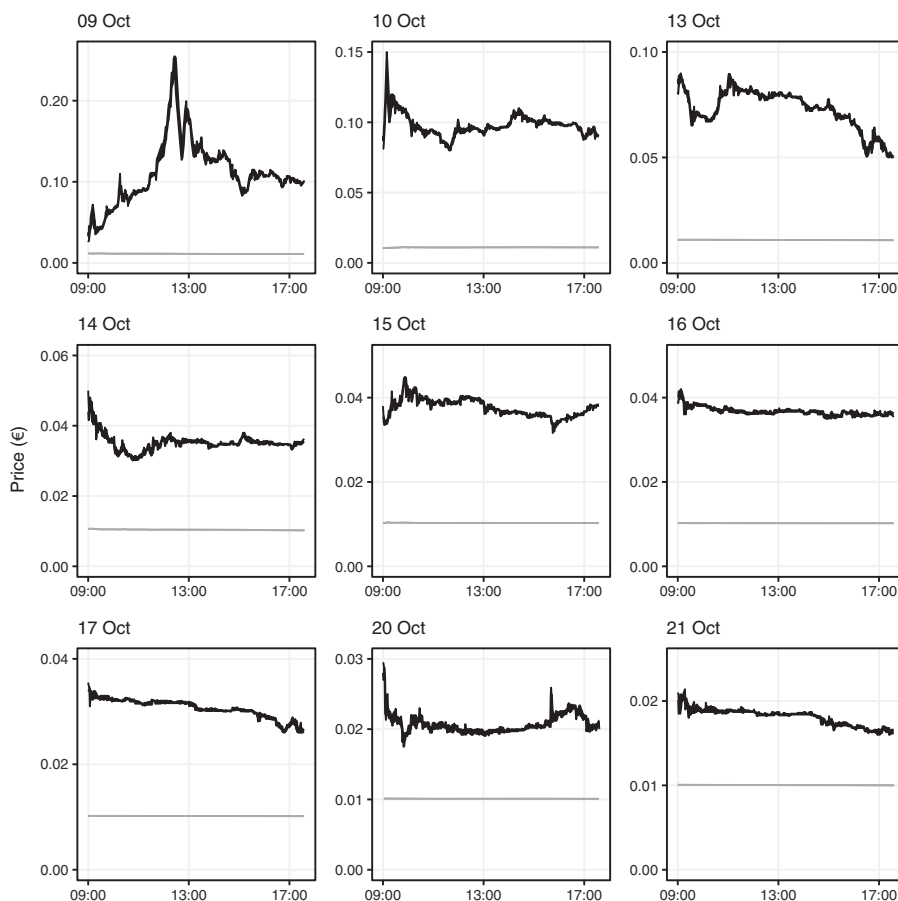
The mispricing was not limited to closing prices. Figure 2 shows the minute-by-minute evolution of bid and ask prices for each of the nine trading days. The width of the patterns in black represents the size of the interval between the lowest best bid price and the highest best ask

Date	S	R	S^*	R^*	S/S^*	R/R^*	A
9 Oct	0.1000	0.1340	0.0110	11.790	9.07	0.011	11.66
10 Oct	0.0900	0.1390	0.0111	10.480	8.14	0.013	10.34
13 Oct	0.0502	0.1000	0.0108	5.266	4.66	0.019	5.17
14 Oct	0.0363	0.0300	0.0102	3.445	3.55	0.009	3.42
15 Oct	0.0384	0.0331	0.0103	3.720	3.75	0.009	3.69
16 Oct	0.0354	0.0300	0.0102	3.327	3.46	0.009	3.30
17 Oct	0.0262	0.0210	0.0102	2.122	2.58	0.010	2.10
20 Oct	0.0211	0.0107	0.0101	1.454	2.09	0.007	1.44
21 Oct	0.0165	0.0010	0.0100	0.852	1.65	0.001	0.85

Note(s): The table shows the actual closing price of the shares (S) and of the rights (R), the implied closing price of the shares (S^*) and of the rights (R^*), the ratio of the actual price and the implied price for the shares (S/S^*) and for the rights (R/R^*) and the arbitrage gain from long in one right and short in 131 shares (A)

Table 1. Actual and theoretical closing prices (in euro)

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Note(s): On a minute-by-minute basis and for each of the nine trading days in the period of interest (October 9–21, 2014), the figure plots the intraday development of the lowest best bid price, the highest best ask price and the interval between these for the Imtech shares (“actual”; in black) and the share prices implied by the lowest best bid price, the highest best ask price and the interval between these for the Imtech rights (“theoretical”; in gray). The widths of the patterns thus represent upper bounds of the actual and implied real-time bid-ask spreads within a given minute. For the sake of visibility, the latter (gray) series are displayed thicker than the true implied widths. Prices are in euro, times are local times in Amsterdam

Figure 2.
Actual and theoretical
intraday bid and ask
prices of the shares

price of the shares. The width of the patterns in gray shows the theoretical counterpart, that is, the size of the interval of share prices implied by the lowest best bid price and the highest best ask price of the rights. The widths thus represent upper bounds of the actual and implied real-time bid-ask spreads within a given minute, and all transactions in the shares and the rights took place at prices within these intervals. Because the share prices implied by the bid and ask prices of the rights are always only marginally above €0.01 (the exercise price of the rights), the gray patterns visually resemble flat lines at €0.01. Clearly, the mispricing was constantly present throughout each entire trading day: both intervals are always far apart. When the difference was largest,

around noon on October 9, investors were bidding for the shares at a price that corresponded to approximately 22 times the price implied by the ask price of the rights.

The high daily trading volumes shown in Figure 1 already indicated that the mispricing cannot be explained by low intraday liquidity. The small widths of the black and gray patterns in Figure 2 confirm that the bid-ask spreads and intra-minute volatilities of the shares and the rights were always negligible as compared to the size of the mispricing [6]. Additionally, minute-by-minute data on volumes and numbers of trades show that both securities were actively traded throughout every entire trading day. In theory, therefore, extensive and highly profitable arbitrage could have taken place during the nine days.

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4. Discussion

Although we cannot give a conclusive answer as to whether either the shares or the rights (or both) were mispriced, it is most likely that the shares were overvalued. Just before ex-right trading, Imtech's share price and number of outstanding shares corresponded to a market capitalization of approximately €150 million. At the close of the next day, after the rights had been assigned and traded separately, the share price implied that Imtech's equity would be worth more than €6 billion after the completion of the €600 million issue. Such a valuation would be implausibly high for a troubled company that generated about €5 billion in revenues in its peak years, and such an overnight increase would have been unprecedented. Furthermore, throughout the first few months after the rights offering and the 500-to-1 reverse stock split, the prices of Imtech shares were within a range of about €3.40–€5.30. This range includes the post-reverse-split equivalents of the prices implied by the prices of the rights and is far off from the reverse-split adjusted prices of the shares.

The Imtech case is not the first case that is at odds with the notion of efficient markets. The degree of mispricing in the Imtech case, however, was of an unprecedented size, with a persistent overvaluation of the shares relative to the rights of hundreds of percentage points. What also makes the Imtech case unique is that short-selling constraints were the only plausible impediment to arbitrage. In the well-known twin-stock case of Royal Dutch and Shell, for example, arbitrageurs faced significant noise trader risk. In the carve-out case of Palm-3Com they arguably faced the fundamental risk that the full spin-off of the subsidiary would not occur (Cherkes *et al.*, 2013). With Imtech, there was no fundamental risk and no material noise trader risk, because the rights could be converted into shares within a time frame of at most about two weeks. Also, given the magnitude of the mispricing and the combination of negligibly small bid-ask spreads, small tick sizes, low intra-minute volatilities and high trading volumes, it is unlikely that transaction costs or other market microstructure aspects were material obstacles to arbitrage.

One short-selling constraint that allowed the mispricing to occur and persist was probably a lack of available shares. Arbitrage required a share-to-right ratio of 131:1, whereas the ratio of outstanding shares and rights in the market was only 1:1 [7]. The other likely impediment to short selling was high recall risk, resulting in reluctance among traders to speculate against the stock. Borrowed stock can be recalled at any time by the lender, and if this happens the arbitrageur is forced to close her position if she cannot find a new lender (Lamont, 2004). In the case of Imtech, any smart trader—favored or lucky enough to have access to a stock loan—will have understood that the chance of recall was high, because a lender becoming aware of the overvaluation would want to quickly recall the shares in order to sell them. Finding a new lender would then be difficult, and the resulting forced liquidation could easily leave her with large losses.

These two short-selling constraints can explain why insufficient attentive investors were entering the market to push the price of the shares down. Still, it remains remarkable that others were buying large volumes of shares at highly inflated prices in the presence of a cheap, perfect substitute. A small part of the explanation could be that short-sellers were

forced to buy the shares in response to the recall of previously borrowed shares [8]. A related partial explanation, put forward in personal conversations that we had with three (former) professional traders, could be that speculators were buying shares and then withdrawing these from the lending market in anticipation of—and to increase the likelihood of—a short squeeze, where the share price would spike due to price pressure from intraday short-sellers unable to rollover and forced to unwind their positions. The price developments on October 9 and perhaps October 10 (see Figure 2) may reflect such a short squeeze. Other possible explanations for why people were buying the shares and not the rights include inattention (unawareness of the cheap alternative), financial illiteracy (poor understanding of rights) and familiarity bias (a preference for the familiar shares over the unfamiliar rights).

5. Conclusion

In the present paper we have documented a clear and unprecedentedly strong violation of the law of one price. During nine trading days surrounding a large rights issue, the prices of the shares of Royal Imtech N.V. were between 1.6 and 22 times what they should have been given the prices of the rights. The failure of arbitrage as a safeguard of market efficiency appears to be almost exclusively attributable to short-selling constraints in the form of limited stock lending supply and recall risk.

This case of blatant mispricing in a modern stock market underlines that the efficiency of security prices cannot be taken for granted. In a frictionless world with arbitrageurs constantly monitoring markets, any occurrence of mispricing will be only small and short-lived. In the real world, however, impediments to arbitrage can allow prices to deviate sharply and persistently from their fundamental values, even if the mispricing is evident and easy to detect.

Notes

1. Shares: www.euronext.com/en/products/equities/NL0006055329-XAMS. Rights: www.euronext.com/en/products/equities/NL0010886883-XAMS.
2. For simplicity we assume that the time value of the rights is zero. This assumption is reasonable in the light of the short time to maturity and the high moneyness of the rights. With a positive time value, the reported mispricing would be even stronger.
3. Closing prices of the two securities were established through a closing auction at 17:30. The trades would therefore occur at precisely the same time.
4. This is the minimum profit of the strategy. If the share price would drop below the issue price of €0.01 she could instead undo her short position by buying 131 shares in the market for less than €1.31.
5. A risky alternative to arbitrage was to buy rights on the last trading day (October 21), exercise these and sell the acquired shares on the market once these were listed and tradable (October 27). Clearly, such a naked strategy was not without risk given the huge size of the share issue and the likelihood of similar intentions of other investors and would—with hindsight—not have worked because the share price fell from €0.0165 (close October 21) to €0.0089 (close October 27).
6. The daily average minute-by-minute difference between the highest best ask price and the lowest best bid price was between €0.00033 (October 21) and €0.00516 (October 9) for the shares and between €0.00040 (October 21) and €0.00635 (October 9) for the rights.
7. In reality, the ratio of shares available in the lending market to the number of outstanding rights was even worse than 1:1, because not all share holdings fall within the scope of a share lending program.
8. According to the prospectus, there were six holders of net short positions of at least 0.5% on September 30, for a total of 8.09% of the company's share capital (p. 169). Because of the reporting threshold of 0.5%, the number and size of smaller short positions is unknown. The net short positions register of the Dutch Authority for the Financial Markets (AFM) indicates that the short

interest declined sharply during the nine trading days of interest. Regardless of the exact overall short interest and even in the extreme case that all short positions were closed out, short covering can account for only a small part of the total trading volume.

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