



## **Global Equity Markets: The Case of Royal Dutch and Shell**

In early January 1996, Ms. Joanne Partridge, Director of Research at High Street Global Advisors ("High Street"), a Boston-based global investment management organization, was studying the price behavior of the shares of Royal Dutch Petroleum and Shell Transport and Trading. It seemed that Royal Dutch and Shell should trade in fixed proportions since they represented equivalent classes of shares of the same holding company. However, the ratio of share prices had been anything but constant. For example, Shell traded at a premium to Royal Dutch during 1990 and 1991, while Royal Dutch traded at a premium to Shell subsequent to 1991. Presently, the premium of Royal Dutch over Shell was at an all-time high of almost 12%.

Joanne Partridge was trying to understand the opportunities presented by the Royal Dutch/Shell pricing discrepancy. Several of High Street's U.S. domestic equity and global equity portfolios currently held significant positions in Royal Dutch. These positions could potentially be sold and replaced with equivalent-sized positions in Shell. In addition, the firm had recently landed several new accounts, and would soon be investing the funds. It would have to decide whether these new accounts should own Royal Dutch or Shell. Finally, High Street managed a hedge fund, High Street Partners, which could attempt to arbitrage the price discrepancy by taking a long position in Shell and an offsetting short position in Royal Dutch.

### **High Street Global Advisors**

High Street Global Advisors managed approximately \$40 billion of tax-exempt assets for pension funds, foundations and endowments, and about \$15 billion in mutual funds held by individual investors. Most of these assets were in equity portfolios, whose investment mandates ranged from purely U.S. domestic to non-U.S. to fully global.

High Street viewed the world as consisting of one global economy. Accordingly, it emphasized appraising investment opportunities in a global context. At the core of the firm's equity investment capability was a team of analysts who followed global industries such as chemicals, pharmaceuticals, autos, and oil, and who recommended their best stock selections within these industries to the various equity portfolio managers. Partridge played a key role in giving direction to these analysts and in managing the flow of ideas between them and the portfolio managers.

---

*Professors Kenneth A. Froot and André F. Perold prepared this case as the basis for class discussion rather than to illustrate either effective or ineffective handling of an administrative situation. Much of the data in the case is drawn from Kenneth A. Froot and Emil Dabora, "How are Stock Prices Affected by the Location of Trade?," Harvard University, May 1996.*

Copyright © 1996 by the President and Fellows of Harvard College. To order copies or request permission to reproduce materials, call 1-800-545-7685 or write Harvard Business School Publishing, Boston, MA 02163. No part of this publication may be reproduced, stored in a retrieval system, used in a spreadsheet, or transmitted in any form or by any means—electronic, mechanical, photocopying, recording, or otherwise—without the permission of Harvard Business School.

Portfolio management at High Street was generally governed by a value-investing philosophy according to which securities were purchased if their prices were attractive relative to underlying company fundamentals. In the case of Royal Dutch, the oil analyst was recommending the company on the basis of its lower price-to-book and price-earnings ratios than the major U.S. oil firms and because the company was contemplating certain refinery shutdowns and other operating restructurings that would improve its competitiveness.

## Royal Dutch Petroleum and Shell Transport and Trading

Royal Dutch Petroleum and Shell Transport and Trading were not independent companies. The two were linked to one another by corporate charter, which mandated that cash flows to the equity holders of each company should be distributed in a 60/40 ratio. (See **Exhibit 1** for balance sheets and income statements of the combined Group companies.) The companies stated that, "the Royal-Dutch/Shell Group of companies has grown out of a 1907 alliance between Royal Dutch and Shell Transport by which the two companies agreed to merge their interests on a 60/40 basis while remaining separate and distinct entities."

The organizational structure of the Group companies is depicted in **Exhibit 2**. All subsidiary companies' shares were held by the Group Holding Companies, which in turn were owned by the two parent companies, Royal Dutch Petroleum and Shell Transport & Trading, in the ratio of 60/40. Royal Dutch and Shell were independently incorporated in the Netherlands and England, respectively. The companies' alliance meant that all inflows from and outflows to shareholders were split 60/40.<sup>1</sup> Combining this 60/40 split with the number of shares of Royal Dutch and Shell outstanding, meant that one share of Royal Dutch was entitled to the same cash flows as 9.2744 shares of Shell.<sup>2</sup>

The Group had attempted to make information widely available concerning parent company linkages. In addition to being explained at the beginning of each Annual Report, the corporate connections were detailed in 20F submissions to the U.S. SEC. The linkages were also the subject of a dedicated analyst/investor guide. While the Group actively attempted to split the cashflows according to the 60/40 ratio, there were a number of factors that caused dividend payments to deviate away from that ratio. These issues are discussed in the Appendix below. Analysts at High Street believed these factors to be relatively minor.

Royal Dutch and Shell were listed on nine exchanges in Europe and the United States. Most of Royal Dutch's trading activity took place in the United States and the Netherlands markets, whereas Shell's trading occurred predominantly in the U.K. market. In New York, however, Shell shares did trade as American Depositary Receipts (ADRs), with one ADR being equivalent to six shares of Shell Transport and Trading. Thus, 1.5457 (9.2744/6) Shell ADRs were equivalent to one share of Royal Dutch. Geographical ownership information for Royal Dutch and Shell are shown in **Exhibit 3**. **Exhibit 4** contains information on the trading volume of Royal Dutch and Shell in New York, London, and Amsterdam since 1991. Royal Dutch had long been included in the S&P 500 and the most popular Amsterdam stock index, the CBS Herbeleggings. Similarly, Shell had long been

---

<sup>1</sup>"Royal Dutch and Shell Transport shall share in the aggregate net assets and in the net aggregate dividends and interest received from Group companies in the proportion of 60/40. It is further arranged that the burden of all taxes in the nature of or corresponding to an income tax leveeable in respect of such dividends and interest shall fall in the same proportion." Royal Dutch 20-F, 1993, pp. 1-2. Specifically, the company distributed corporate tax shields (generated by Shell's dividends under UK tax law) on a 60/40 basis to the shareholders of both companies (see the Appendix below).

<sup>2</sup>As of January 1996, there were 536,074,088 shares of Royal Dutch and 3,314,503,242 shares of Shell outstanding.

included in the major index of U.K. stocks, the Financial Times Allshare Index (FTSE).<sup>3</sup> Although Royal Dutch was a foreign-owned corporation, it was considered a U.S. stock by many institutional investors by virtue of its inclusion in common U.S. stock indexes. Major institutional holdings of Royal Dutch and Shell are listed in **Exhibits 5 and 6**.

It appeared that arbitrage across markets disciplined the price of Royal Dutch, so that it was essentially equal around the world. That is, at a given time, it would cost an equivalent amount to buy a share of Royal Dutch in Amsterdam as it would in New York. The same was true of Shell prices in London and New York, although for Shell the geographic disparities were generally somewhat larger. (See **Exhibit 7** for historical geographic price disparities of Royal Dutch and Shell and **Exhibit 8** for current pricing differentials.) However, the price of Royal Dutch fluctuated considerably when compared with the price of Shell. For example, on January 3, 1996, shares of Royal Dutch and Shell closed in Europe at  $\text{fl}227.800^4$  (Amsterdam) and £8.6300 (London), respectively. At prevailing exchange rates, these prices were close to those that prevailed on the same day at the close of the New York markets.<sup>5</sup> (See **Exhibit 9**.) However, in both Europe and the United States, Royal Dutch was considerably more expensive than Shell (see **Exhibits 8 and 9**).

Partridge was curious about the nature of the pricing differential. She wondered whether the strong performance of the S&P 500 compared to international stocks in 1995 might explain part of the current premium on Royal Dutch shares.<sup>6</sup> In particular, Partridge wondered whether Royal Dutch would appear more highly correlated with the United States and Netherlands markets than Shell, and, similarly, whether Shell would appear more highly correlated with the U.K. market than Royal Dutch. If so, then an increase in, say, U.S. stocks would, all else equal, result in an increase in the price of Royal Dutch relative to that of Shell.

To investigate this, Partridge had an analyst compare the betas of Royal Dutch and Shell. The analyst regressed the *difference* between the returns on Royal Dutch and Shell on both market index and currency returns. (The betas of the Royal Dutch / Shell return differential are reported in **Exhibit 10**.) For example, a beta of 0.2 against the S&P 500 would indicate that a 1% increase in U.S. stocks (holding other countries' stock prices and currencies constant) would be associated with a 20 basis point increase in the price of Royal Dutch relative to that of Shell.

Partridge also knew that dividend withholding taxes might alter investor perceptions of relative stock value. This should not have been very important for private investors in the United Kingdom, Netherlands, and United States, all of whom faced symmetric withholding taxes on the dividends of Royal Dutch and Shell. However, pension funds sometimes faced tax asymmetries with respect to the two stocks. For example, U.K. pension funds were exempt from withholding taxes on Shell, but not on Royal Dutch, and conversely, Netherlands pension funds were exempt from withholding taxes on Royal Dutch, but not on Shell. Partridge wondered whether tax issues could explain the behavior of the relative price of Royal Dutch versus Shell. **Exhibit 11** shows the dividend and withholding taxes faced by different investor groups.

<sup>3</sup> The total capitalizations of these market indexes as of December 29, 1995 were (in US\$ millions): S&P 500, \$4,548,616; FTSE, \$1,297,852; and CBS Herbeleggings, \$313,343.

<sup>4</sup> *fl* represents Netherlands guilders.

<sup>5</sup> Because of time zone differences, New York markets typically closed between 5 and 6 hours after European markets.

<sup>6</sup> During 1995, the total returns on the S&P 500 and FTSE were 37.84% and 17.58%, respectively.

## Analysis of the Investment Opportunities

Before suggesting any trades based on the price differential between Royal Dutch and Shell, Partridge wanted to better understand the costs that might be involved. To do so, she enlisted the help of High Street's trading desk and also a prominent Wall Street firm through which High Street funneled much of its volume in international stocks, and which High Street also used for customized derivatives transactions.

Partridge began by thinking through the economics of selling Royal Dutch and purchasing Shell. This would be relevant for the portfolios in which Royal Dutch was presently being held, and which had a mandate for owning "foreign" as well as "domestic" shares. Some of High Street's clients had given it strict "U.S.-only" mandates which permitted it to hold Royal Dutch but not Shell.

On the New York Stock Exchange, both Royal Dutch and Shell ADRs were typically quoted at a 25¢ bid-offer spread in small-sized quantities (one thousand to five thousand shares). The spread usually would be wider for large sized trades. In addition, for trades in listed stocks, High Street paid its brokers a one-way commission of 5¢ per share. In Amsterdam, Royal Dutch was typically quoted at a spread of f10.3 for small trades, and, in London, Shell was typically quoted at a spread of £0.03 for small trades. In both Amsterdam and in London, High Street would pay one-way commissions on top of these spreads of 30 basis points. The United Kingdom also imposed Stamp Tax, a 50 basis point transfer tax on purchases of U.K. stocks, including Shell.<sup>7</sup> Trades in Royal Dutch in Amsterdam and in Shell in London would also require the conversion from guilders and pounds to dollars. These currencies tended to trade at bid-ask spreads of six basis points.

If High Street's hedge fund were to attempt to arbitrage the price discrepancy, one alternative would entail selling short shares of Royal Dutch and purchasing shares of Shell. In a short sale, the hedge fund would borrow shares of Royal Dutch, sell the shares, and later repurchase them and return them to the lender. The hedge fund would have to reimburse the lender for any dividends paid on Royal Dutch shares during this interim period. In addition, the hedge fund would have to pay a fee for borrowing the shares. This tended to run about 40 basis points per annum. This fee usually took the form of an interest rate give-up on the proceeds of the short sale. The proceeds of a short sale would usually be held as cash collateral to protect the lender against borrower default. The cash would be invested in short-term instruments earning LIBOR or slightly less, and all but 40 basis points of this interest income would be rebated to the hedge fund. The hedge fund also would have to finance its long position in Shell. Presently, it was able to borrow at a rate of LIBOR + 75 basis points (on a fully collateralized basis). The hedge fund often took significantly leveraged positions, especially in situations where the risk was deemed minimal.<sup>8</sup>

There were other alternatives available to the hedge fund involving the use of derivatives. One set of strategies involved the use of exchange-traded put and call options. There were fairly active options markets for Royal Dutch in the United States and Shell in the United Kingdom. These were short-term options, however, with maturities of six months or less. The options were usually slightly cheaper to trade than the underlying shares, although with rollovers they would become more expensive. A potentially attractive feature of options-related strategies was that they permitted the hedge fund to easily tailor its risks in an asymmetric fashion.

A second derivatives-related strategy involved the use of a privately-negotiated total return swap. The simplest total return swaps involved two counterparties agreeing to exchange the total return on one instrument for the total return on another, plus or minus a fee, where the total return on

---

<sup>7</sup> No Stamp Tax was levied on purchases of Shell ADRs, however.

<sup>8</sup> On its hedge fund, High Street received a management fee of 1% per annum on net assets plus 20% of profits earned in excess of LIBOR.

an instrument is its price appreciation or loss during the holding period, plus interest or dividend income paid on the instrument during the holding period. Swaps could be customized in almost any way, for example, to allow the exchange of total returns on differing underlying amounts (“notional amounts”), or to include option-like features. Swaps also could be written for just about any maturity. The fee charged by the issuer of the swap typically depended on the ease of trading in the underlying instruments, the use of options and other features which might be embedded in the swap, and the credit-worthiness of the counterparty.

The Wall Street firm gave Partridge an example of a swap that might apply in this situation. The swap was intended to create payoffs similar to what could be achieved through a position that represented a long position of 1.5457 shares of Shell ADRs for every share sold short in Royal Dutch. The quoted swap was based on an assumed long position of 610,687 Shell ADRs (or \$50 million initial market value at \$81.875 per share) and a short position of 395,088 shares of Royal Dutch (or \$55,855,518 initial market value at \$141.375 per share). Specifically, under the swap, the Wall Street firm would pay High Street Partners:

- a) The total dollar return on 610,687 shares of Shell ADRs;

and High Street Partners would pay the Wall Street firm:

- b) 4% p.a. on \$50 million + the total dollar return on 395,088 shares of Royal Dutch.

The swap would mature in 12 months and be settled on a quarterly basis. Settlement would be based on the net difference between the amounts a) and b). High Street Partners could terminate the swap whenever it wished during the 12-month period, and settle up based on the difference between a) and b). There would be no other fees or expenses involved.

### **Actions to Recommend**

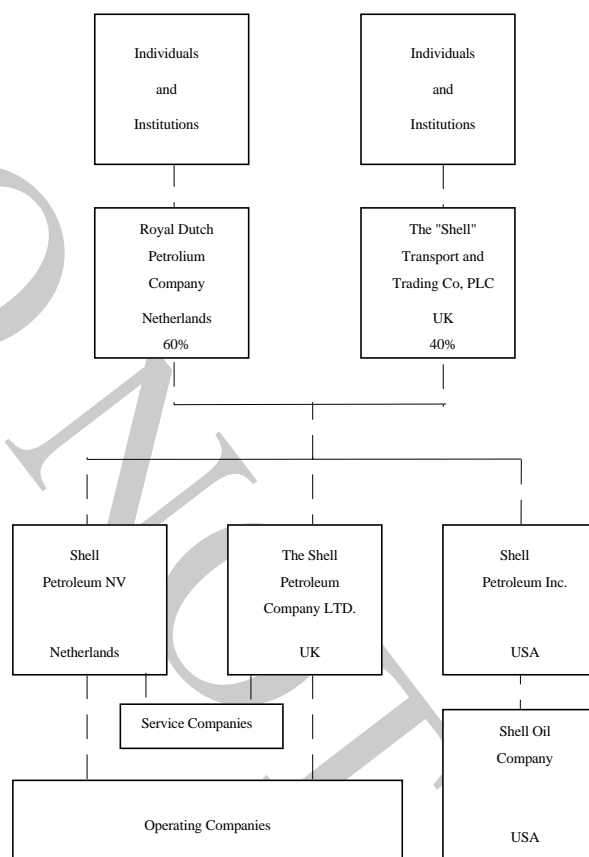
In the light of the above information and analysis, Joanne Partridge had to decide what recommendations to make to the managers of the interested portfolios. She also wanted to lay out the full range of options available to the manager of High Street Partners. As she thought about the choices, it occurred to her that there were an interesting set of hedging possibilities in the light of the regression analysis shown in **Exhibit 10**.

**Exhibit 1** Balance Sheets for Combined Royal Dutch/Shell Group (\$ millions)

	December 1990	December 1991	December 1992	December 1993	December 1994
<b>ASSETS</b>					
Cash and Equivalents	8,513.0	8,794.0	8,575.0	9,589.0	11,601.0
Net Receivables	16,282.0	14,223.0	13,119.0	12,167.0	13,650.0
Inventories	10,079.0	8,399.0	7,711.0	6,627.0	7,032.0
Current Assets - Other	2,151.0	2,366.0	2,515.0	3,040.0	3,607.0
Current Assets - Total	37,025.0	33,782.0	31,920.0	31,423.0	35,890.0
Net Property, Plant, and Equipment	61,563.0	63,804.0	60,624.0	60,048.0	63,128.0
Investments at Equity	7,113.0	7,184.0	7,605.0	7,766.0	7,873.0
Other Investments	730.0	763.0	670.0	593.0	961.0
<b>TOTAL ASSETS</b>	<b>106,431.0</b>	<b>105,533.0</b>	<b>100,819.0</b>	<b>99,830.0</b>	<b>107,852.0</b>
<b>LIABILITIES</b>					
Long Term Debt Due in One Year	1,085.0	935.0	1,180.0	1,634.0	1,520.0
Notes Payable	5,615.0	4,686.0	4,053.0	3,781.0	4,139.0
Accounts Payable	8,606.0	7,166.0	6,588.0	6,204.0	6,797.0
Taxes Payable	3,906.0	3,055.0	2,611.0	1,853.0	3,206.0
Accrued Expenses	3,599.0	3,503.0	3,408.0	3,651.0	3,725.0
Other Current Liabilities	11,085.0	11,523.0	10,718.0	11,198.0	12,442.0
Total Current Liabilities	30,297.0	27,365.0	25,150.0	24,670.0	28,104.0
Long Term Debt	4,482.0	6,708.0	7,038.0	6,126.0	5,952.0
Deferred Taxes	12,054.0	11,367.0	9,454.0	9,085.0	7,638.0
Minority Interest	1,233.0	1,170.0	1,329.0	1,563.0	1,880.0
Other Liabilities	4,608.0	4,918.0	5,997.0	6,795.0	8,136.0
Total Equity	53,757.0	54,005.0	51,851.0	51,591.0	56,142.0
<b>TOTAL LIABILITIES AND EQUITY</b>	<b>106,431.0</b>	<b>105,533.0</b>	<b>100,819.0</b>	<b>99,830.0</b>	<b>107,852.0</b>

**Exhibit 1 (continued)**      Income Statements for Combined Royal Dutch / Shell Group (\$ millions)

	December 1990	December 1991	December 1992	December 1993	December 1994
Sales	106,479.0	102,697.0	96,625.0	95,173.0	94,830.0
Cost of Goods Sold	75,931.0	75,906.0	70,454.0	70,393.0	68,832.0
S, G, & A Expenses	11,845.0	12,386.0	12,082.0	11,242.0	11,103.0
Operating Income	18,703.0	14,405.0	14,089.0	13,538.0	14,895.0
Depreciation & Amortization	5,833.0	6,423.0	6,554.0	6,184.0	6,897.0
Operating Profit	12,870.0	7,982.0	7,535.0	7,354.0	7,998.0
Interest Expense	1,611.0	1,529.0	1,518.0	1,352.0	1,194.0
Non-Operating Income/Expense	3,027.0	3,236.0	4,501.0	2,685.0	3,344.0
Special Items	0.0	0.0	(1,162.0)	0.0	0.0
Pretax Income	14,286.0	9,689.0	9,356.0	8,687.0	10,148.0
Total Income Taxes	7,597.0	5,403.0	3,933.0	4,175.0	3,801.0
Minority Interest	156.0	(2.0)	54.0	15.0	115.0
Net Income	6,533.0	4,288.0	5,369.0	4,497.0	6,232.0
EPS, Fully Diluted (\$/share)	7.8	5.3	6.4	5.4	7.4
Dividends Per Share (\$/share)	4.3	4.2	4.9	4.7	4.8

**Exhibit 2** Corporate Structure of Royal Dutch / Shell

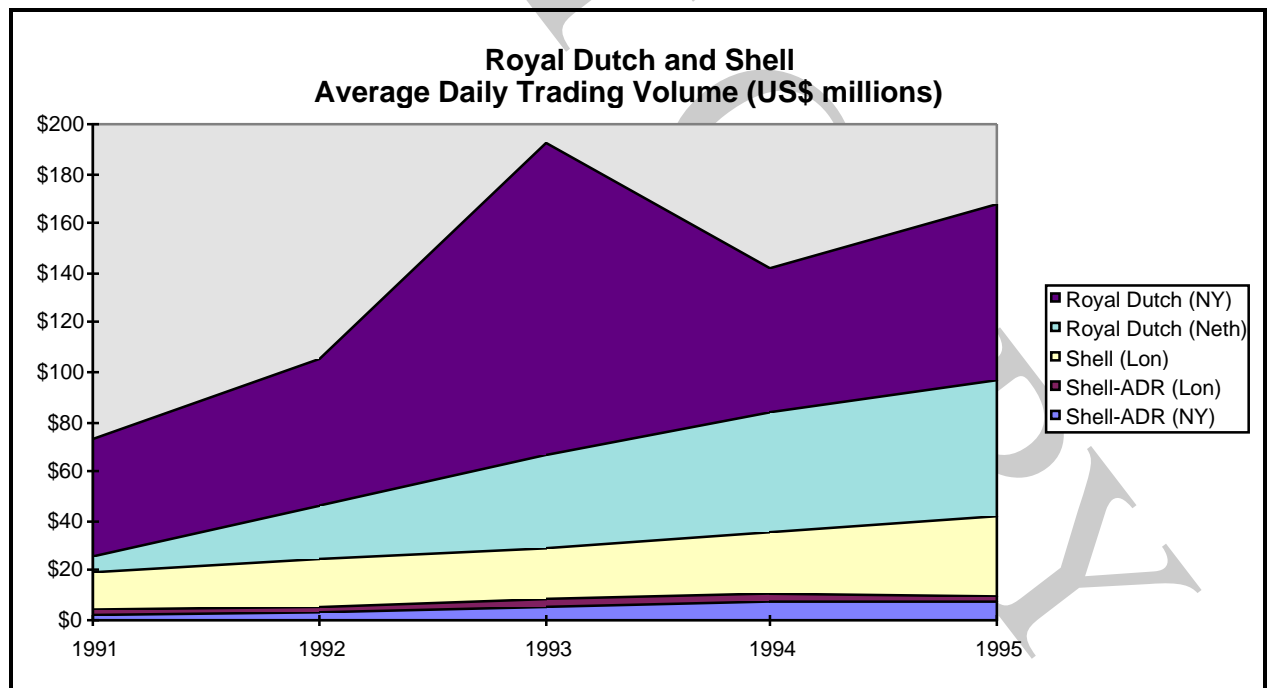
Source: Royal Dutch 20-F statements.



**Exhibit 3** Geographical Percent Ownership of Royal Dutch/Shell

Year	Royal Dutch			Shell		
	UK	US	Netherlands	UK	US	Netherlands
1980	5.4	25.3	33.0	97.2	1.0	1.0
1981	7.4	24.3	31.3	98.0	1.0	1.0
1982	8.0	24.0	33.0	98.0	1.0	1.0
1983	6.0	28.0	32.0	98.0	1.0	1.0
1984	5.0	33.0	29.0	98.0	1.0	1.0
1985	4.0	39.0	27.0	91.0	8.0	1.0
1986	2.0	34.0	35.0	92.0	7.0	1.0
1987	2.0	33.0	36.0	94.0	5.0	1.0
1988	2.0	32.0	37.0	96.0	3.0	1.0
1989	1.0	36.0	36.0	96.0	3.0	1.0
1990	1.0	37.0	36.0	97.0	2.0	1.0
1991	2.0	40.0	35.0	97.0	3.0	1.0
1992	1.0	42.0	36.0	97.0	3.0	1.0

Source: Royal Dutch 20-F statements.

**Exhibit 4** Daily Trading Volume

Source: Bloomberg.

**Exhibit 5** The 40 Largest Institutional US Holders of Royal Dutch filing with the US Securities and Exchange Commission (September 30, 1995)

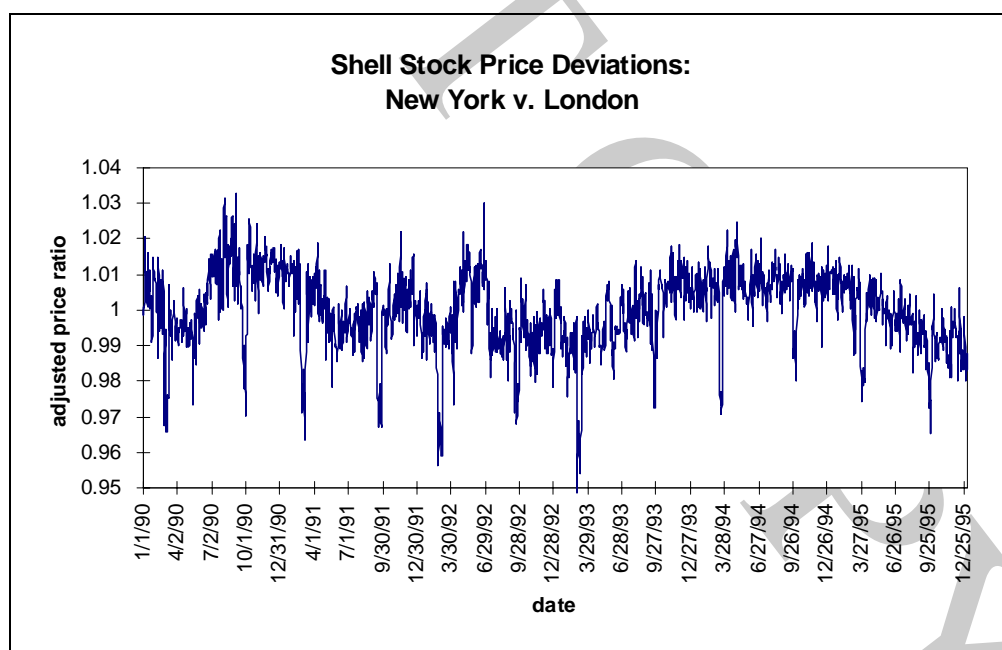
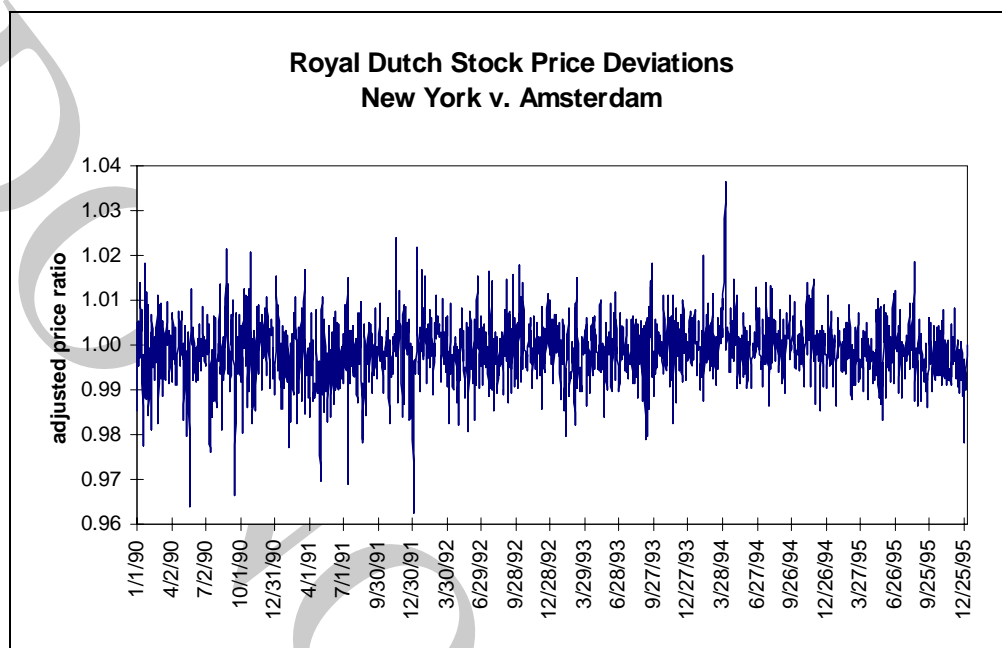
Client Name	Shares Held	Latest Change
BZW Barclays	10,128,000	122,903
Capital Research Management	5,904,000	85,000
Bankers Trust	4,975,000	120,520
Fayez Sarofim	4,624,000	-34,270
American Express Financial Assets	4,109,000	265,410
Bernstein Asset	3,993,000	121,112
Mellon Bank N A	3,717,000	-72,522
Morgan Guaranty	3,283,000	3,283,000
Invesco Capital Management	3,018,000	733,711
New York State Pension Fund	2,888,000	-178,000
State Street Boston & Trust	2,777,000	-1,410,000
Travelers Investment	2,507,000	378,153
Texas Teacher Retirement	2,462,000	830,000
Capital Guardian Trust	2,112,000	-19,700
Morgan JP Investment	2,033,000	-3,046,000
Prudential Investment	1,913,000	442,950
Merrill Lynch Asset Management	1,800,000	-65,047
General Electric Investment	1,760,000	124,415
Northern Trust	1,755,000	46,456
Lazard Freres Associate	1,736,000	-365,000
Cooke & Bieler	1,687,000	-87,900
Fidelity Management & Research	1,633,000	67,717
State of Wisconsin Investment	1,485,000	-75,400
Boatmen's Trust	1,382,000	45,500
Wellington Management	1,353,000	36,250
RCM Capital Management	1,325,000	-128,000
Scudder Stevens	1,321,000	-186,000
Putnam Investment	1,289,000	2,710
Miller Anderson	1,272,000	45,700
Alliance Capital Management	1,269,000	2,250
T Rowe Price	1,224,000	108,100
Dean Witter	1,201,000	36,810
Wilmington Trust Co	1,179,000	-167,000
Van Kampen	1,106,000	781,244
Tradestreet	1,068,000	133,667
United States Trust Co NY	1,049,000	31,961
Aeltus Investment Management	990,400	-192,000
PNC Bank N A	970,909	-28,812
ANB Investment Management & Trust	898,182	4,800
BOFA Capital Management	868,983	23,078

Source: Bloomberg.

**Exhibit 6** The 40 Largest Institutional Holders of Shell ADRs filing with the US Securities and Exchange Commission (September 30, 1995)

Client Name	Shares Held	Latest Change
Capital Guardian Trust	1,011,000	89,500
World Asset Management	437,244	-89,000
Franklin Resources	357,400	
Invesco Capital Management	279,250	8,100
Capital Research Management	235,000	
Aeltus Investment Management	219,700	-1,800
State Street Research & Management	200,000	
Thompson, Siegel	174,127	500
Palley-Needelman	120,890	96,575
Wellington Management	104,500	72,700
Composite Research & Management	92,900	6,105
Brundage Story	85,900	-780
Adams Express Co	80,000	
Robert Fleming	75,000	
Reaves W H & Co	69,950	8,200
Voyageur Asset	67,400	8,700
GNL Electric Investment	65,808	
State of Wisconsin Investment	62,000	62,000
Tradestreet	56,084	7,075
Invesco Trust Co	56,000	56,000
Wachovia Asset	54,636	-2,100
Marshall & Ilsley Investment Management	54,280	-2,500
Seligman JW & Co	50,000	
New York State Pension Fund	50,000	
Treadneedle Investment	50,000	-25,000
YMCA Retirement Fund	47,000	
Mellon Bank N A	39,318	-1,300
United States Trust Co NY	35,340	-400
Carret & Co Inc	31,948	
Morgan Asset	31,800	-600
Frank Russell Co	30,600	20,600
Kaplan J L Associate	28,425	-100
AMBS Investment	27,853	2,403
First Security Investment Management	25,824	
Johnson Investment Company	24,355	
Fiduciary Trust Company	23,400	200
Shawmut Bank National	23,367	-700
Lane Capital Management	22,770	22,770
Lazard Freres Asset Management	22,700	-1,746
PNC Bank N A	22,350	-200

Source: Bloomberg.

**Exhibit 7** Royal Dutch and Shell: Stock Price Deviations across Markets

Notes: Stock prices each day recorded at the close of European and US markets. Currency values recorded at 3 pm New York time. See **Exhibit 8** below.

**Exhibit 8** Prices on Royal Dutch and Shell, January 3, 1996

<b>Security Price/Location</b>	<b>Royal Dutch (a)</b>	<b>Shell (b)</b>
1. Quoted share price in Europe <sup>a</sup>	f1227.800 <sup>b</sup>	£8.6300
2. Exchange Rate <sup>c</sup>	1.6114 (f1/US\$)	0.6443 (£/US\$)
3. Imputed US\$ price of shares in Europe (1 / 2)	\$141.368	\$13.394
4. Number of shares in Europe to that in US	1	6
5. Imputed US\$ price of shares in Europe (3 x 4)	\$141.368	\$80.366
6. Quoted US\$ price of shares in New York <sup>d</sup>	\$141.375	\$81.875
7. Geographic differential (5 / 6 - 1)	-0.14%	-1.84%
8. Royal Dutch / Shell equivalent price <sup>e</sup>		
Europe	\$141.368	\$124.222
New York	\$141.375	\$126.554
9. Royal Dutch / Shell Differential (8a / 8b)		
Europe	13.80%	
New York	11.71%	

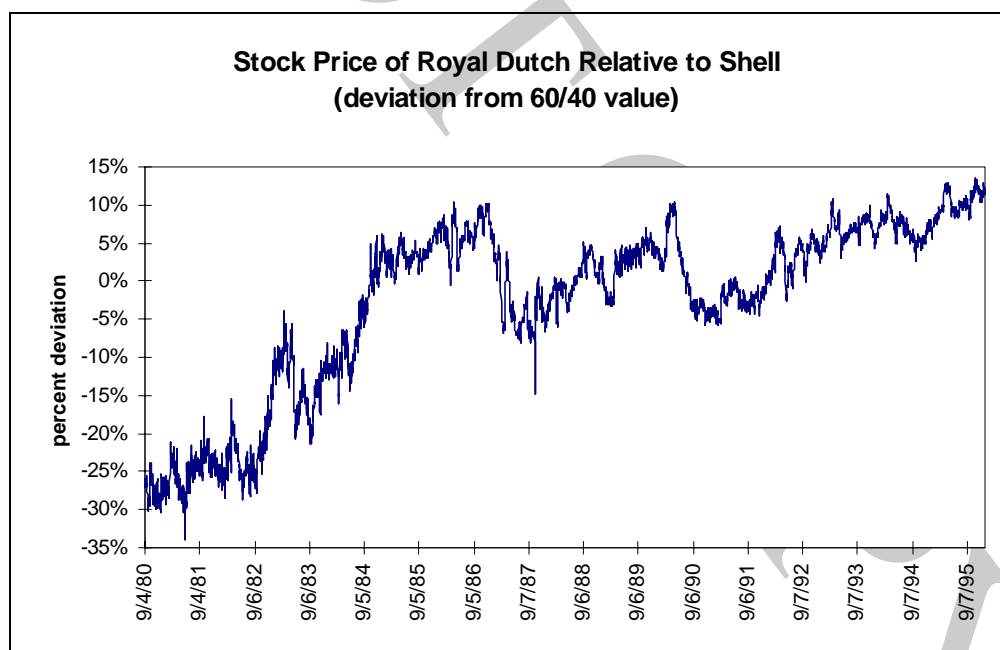
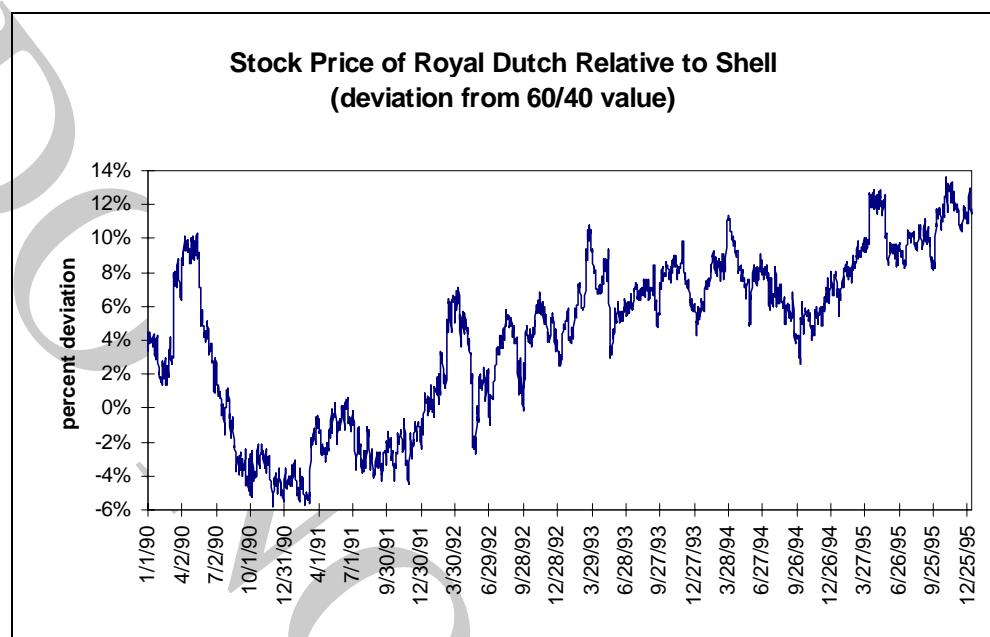
<sup>a</sup>Prices from close of Amsterdam and London markets, respectively.

<sup>b</sup>f1 represents Netherlands guilders.

<sup>c</sup>Quoted at 3:00 p.m., New York time.

<sup>d</sup>Prices from close of New York market.

<sup>e</sup>According to the alliance between Royal Dutch and Shell, one share of Royal Dutch received the cash flows of 1.5457 Shell ADRs.

**Exhibit 9** Royal Dutch and Shell: Deviations in Share Price from Theoretical 60/40 Split

Notes: Prices on Royal Dutch and Shell are closing prices in New York.

**Exhibit 10** Beta Coefficients of Return Differential Between Royal Dutch and Shell

Year(s)	Return Horizon	R <sup>2</sup>	Degrees of Freedom	Beta on S&P500, \$	Beta on FTSE, £	Beta on Dutch Index, f/	Beta on \$/£ Exchange Rate	Beta on \$/f/ Exchange Rate
1980-1992	1 day	0.13	3140	0.336***	-0.397***	0.078**	-0.302***	0.201***
1980-1992	2 days	0.19	1678	0.334***	-0.425***	0.067***	-0.236***	0.126***
1980-1992	5 days	0.22	667	0.146***	-0.354***	0.095***	-0.404***	0.301***
1980-1992	15 days	0.27	218	0.092**	-0.309***	0.103***	-0.348***	0.255***
1980-1992	50 days	0.54	60	0.209***	-0.451***	0.158***	-0.410***	0.207**
1980	1 day	0.18	236	0.147	-0.540***	0.195**	-0.405	0.021***
1981	1 day	0.18	239	0.197	-0.661***	0.334	-0.217*	0.294
1982	1 day	0.15	240	0.551***	-0.697***	-0.156*	-0.336	fc0.369
1983	1 day	0.20	239	0.530***	-0.447***	0.020	-0.273*	0.230
1984	1 day	0.25	234	0.645***	-0.512***	0.109	-0.203	0.243
1985	1 day	0.13	231	0.145*	-0.379***	0.077	-0.173***	0.271
1986	1 day	0.22	233	0.189***	-0.395***	0.072	-0.304***	0.387***
1987	1 day	0.46	230	0.341***	-0.298***	0.071	-0.356***	0.587*
1988	1 day	0.10	232	0.046	-0.296***	0.135**	-0.281**	0.369
1989	1 day	0.17	227	0.242***	-0.241**	0.027	-0.247***	0.519
1990	1 day	0.13	233	0.180***	-0.229**	0.054	-0.208*	0.298
1991	1 day	0.10	233	0.162***	-0.133*	0.072	-0.265	0.101
1992	1 day	0.12	213	0.214***	-0.269***	-0.110	-0.057*	0.184
1994-95	1 day	0.08	478	0.206***	-0.345***	0.144***	-0.025	0.085

Notes: The regressions in this table used the difference between Royal Dutch and Shell ADR returns from New York as the dependent variable. The return differential was regressed on three indices and two exchange rates. Betas were estimated against daily index and currency returns (allowing for differences in hours of operations of different markets). All indexes were expressed in local currency. The table also reports R<sup>2</sup> (the fraction of variation in the return differential explained by the regression), the degrees of freedom (the number of free data points), the beta on the S&P index returns expressed in US dollars (S&P, \$), the beta on the Financial Times Allshare index returns in British pounds (FTSE, £), the beta on the returns on a composite Dutch Index (excluding Royal Dutch) in Dutch guilders (Dutch Index, f/), the beta on changes in the \$/£ exchange rate (\$/£), and the beta on changes in the \$/Dutch guilder exchange rate (\$/f/). Statistical significance at the 10%, 5% and 1% levels was indicated by the symbols, \*, \*\*, \*\*\*, respectively.

Source: Kenneth A. Froot and Emil Dabora, "How are stock prices affected by the location of trade?," Harvard University, May 1996.

**Exhibit 11** Current Taxation of Dividends Received by Different Investor Classes<sup>a</sup>

Country	Investor Class	Tax Rate on Royal Dutch Dividends	Tax Rate on Shell Dividends	Preference	Difference in Annual Return from Tax Differential <sup>b</sup>
U.K.	Private Investors	20%	20%	Indifferent	-
	Companies	33%	20%	Shell	-0.64%
	Pension Funds	15%	-	Shell	-0.74%
Netherlands	Private Investors	25%	25%	Indifferent	-
	Companies	25%	25%	Indifferent	-
	Pension Funds	-	25%	Royal Dutch	1.23%
US <sup>c</sup>	Private Investors	15%	15%	Indifferent	-
	Companies	15%	15%	Indifferent	-
	Pension Funds <sup>d</sup>	-	15%	Royal Dutch	0.74%

<sup>a</sup>Taxes represented: withholding tax, dividend tax, and ACT. Tax treatment of capital gains on Royal Dutch and Shell were equivalent for all shareholder groups, and are therefore not reported.

<sup>b</sup>Average of Royal Dutch and Shell dividend/price ratios (4.92% in 1993) times the difference between Shell and Royal Dutch rates of dividend taxation.

<sup>c</sup>In the United States, withholding taxes were reclaimable from income tax for corporations and individuals. Withholding taxes on foreign securities could either be deducted against U.S. personal or corporate income taxes, or, under current tax treaties, refunded directly from the United Kingdom and Netherlands tax authorities.

<sup>d</sup>U.S. pension and endowment funds were generally not able to deduct foreign taxes paid against U.S. tax obligations. However, beginning in 1994, withholding taxes were more easily refundable from the Netherlands government than the UK government, with appropriate documentation from the U.S. Internal Revenue Service. Prior to January 1, 1994, U.S. pension funds could not obtain withholding-tax refunds on either Netherlands or UK stocks, such as Royal Dutch and Shell.

Source: Kenneth A. Froot and Emil Dabora, "How are stock prices affected by the location of trade?," Harvard University, May 1996.



## Appendix

### Sources of Deviation from 60/40 Ratio of Dividend Payments

The Group companies attempted to ensure that cashflows to shareholders were split on a 60/40 basis. Even the tax shields that accrued from Shell's dividend payments were so divided. (Under UK tax law, dividend payments are deductible from corporate taxes. See **Exhibit A1** below for a numerical example of how earnings distributed to shareholders were divided in order to split the tax shield.)

The parent companies, Royal Dutch and Shell, received dividends from the Group in the 60/40 ratio. However, the funds were not necessarily fully paid out to shareholders. A portion of the funds went to cover parent expenses. (**Exhibit A2** below reports parent company expenses.) In addition, a portion of the parent dividends were distributed on a deferred basis. Distributed funds were sometimes withheld by the parents (in the form of cash reserves) and paid out to shareholders later. (**Exhibit A3** shows a graph comparing the average value of Royal Dutch's dividends over time with those of Shell.) Also, dividends to Shell were paid in pounds; those to Royal Dutch were paid in guilders. Funds were transferred into these currencies on the announcement date prior to the ex-dividend date. During this time, fluctuations in currencies would affect the relative value of the dividend payment. (See **Exhibit A4** for information on the effect of currency fluctuations on the relative value of Royal Dutch versus Shell.)

**Exhibit A1** Impact of Marginal Increase in Earnings on the Royal Dutch/Shell Group Company

Division of Group Company earnings:

\$1 Undistributed Earnings (retained by the Group)

\$1 Distributed Earnings (dividends)

Division of Income:	Royal Dutch	Shell
Undistributed	\$ 0.60	\$ 0.40
Distributed	\$ 0.652	\$0.348 <sup>a</sup>
<b>Total</b>	<b>\$ 1.252</b>	<b>\$ 0.748</b>

Value of Income, Incl. Shell Income Tax Credit:	Royal Dutch	Shell
Undistributed	\$ 0.60	\$ 0.40
Distributed + Tax Credit	\$ 0.652	\$0.435 <sup>b</sup>
<b>Total</b>	<b>\$ 1.252</b>	<b>\$ 0.835</b>

Note: The ratios 0.652 / 0.435 and 1.252 / 0.835 equal 60/40.

<sup>a</sup>This number can be obtained as follows. Let  $a$  represent the percent of each dollar of distributed dividends received by Shell shareholders and  $r$  represent the after-tax-credit value per dollar of distributed dividends.  $r$  must satisfy two conditions. First, Royal Dutch shareholders, who are entitled to 60% of after-tax value, must receive  $.6r = 1 - a$ . Second, Shell shareholders receive a value  $r$  which is augmented by their tax credit. The magnitude of the tax credit is  $\tau / (1 - \tau)$ , where  $\tau$  is the rate of corporate tax shield (currently,  $\tau = 0.20$ ). Thus, Shell shareholders must receive  $r = 1 + a\tau / (1 - \tau)$ . Solving for  $a$  yields:  $a = 0.348$  and  $1 - a = 0.652$ .

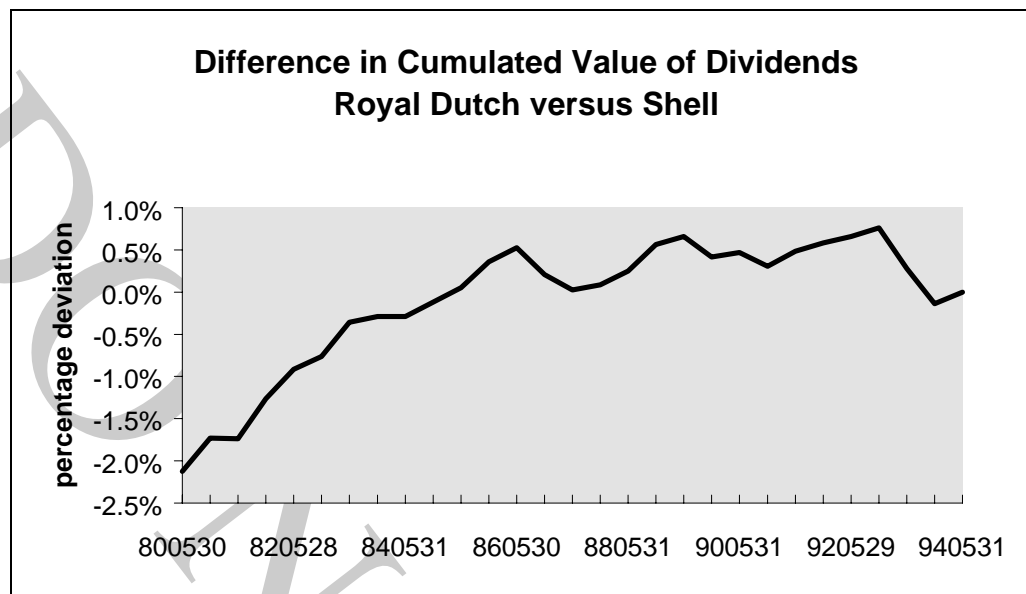
<sup>b</sup> $0.348/(1-0.2) = .435$ .

Source: Kenneth A. Froot and Emil Dabora, "How are stock prices affected by the location of trade?," Harvard University, May 1996.

**Exhibit A2** Expenses of Royal Dutch and Shell, 1993 (£ millions)

	Royal Dutch	Shell	Deviation from 60:40 Ratio	Deviation as % of Group Earnings
Interest Income	£12.419	£7.500	£0.779	0.026%
Administrative Expenses	-5.061	-4.000	0.626	0.021%
Taxes	-2.692	-1.200	-0.595	0.020%
Parent Earnings	4.666	2.000	1.111	0.037%
<b>Total</b>	<b>9.332</b>	<b>4.300</b>	<b>1.921</b>	<b>0.064%</b>

Source: Kenneth A. Froot and Emil Dabora, "How are stock prices affected by the location of trade?," Harvard University, May 1996.

**Exhibit A3** Cumulative Present Value of Dividends on Royal Dutch Relative to Shell

Source: Kenneth A. Froot and Emil Dabora, "How are stock prices affected by the location of trade?," Harvard University, May 1996.

**Exhibit A4** Stock Price Fluctuations Induced by Differences in the Currency of Dividend Denomination**Interim Dividend**

Year	Days between Announcement and Ex-Dividend Dates <sup>a</sup>	Average FX Volatility over Period (%) <sup>b</sup> (1)	Dividend/ Price Ratio (%) (2)	Interim Dividend/ Total Dividend <sup>c</sup> (%) (3)	Induced Volatility in Stock Return (%) =(1)x(2)x(3)
1991	4	2.00	5.48	41.5	0.05%
1992	4	2.00	5.75	41.5	0.05%
1993	4	2.00	4.92	41.5	0.04%

**Final Dividend**

Year	Days between Announcement and Ex-Dividend Dates <sup>a</sup>	Average FX Volatility over Period (%) <sup>b</sup> (1)	Dividend/ Price Ratio (%) (2)	Interim Dividend/ Total Dividend <sup>c</sup> (%) (3)	Induced Volatility in Stock Return (%) =(1)x(2)x(3)
1991	85	9.22	5.48	58.5	0.30%
1992	78	8.83	5.75	58.5	0.30%
1993	85	9.22	4.92	58.5	0.27%

<sup>a</sup>For Royal Dutch.

<sup>b</sup>Based on currency volatility of 1.00% per day.

<sup>c</sup>Average of ratios interim and final dividends, 1992-1994.

Source: Kenneth A. Froot and Emil Dabora, "How are stock prices affected by the location of trade?," Harvard University, May 1996.