

Stocks and Dividends

Many companies are publicly traded. This means that the company issues stock certificates which can be bought and sold on an exchange. Investors buy stock certificates mainly because they can sell them in the future, perhaps making a profit, and because companies pay dividends, a share of the company's profit, to each shareholder. Figures A.3 and A.4 show the scale of price fluctuations and of accumulated dividends.

Task

Compare the income (or loss) that comes from buying and selling a stock certificate to the income that comes from dividends over the same period. Answer these questions:

- Which source of income is bigger?
- Is there any correlation between the income from dividends and the income (or loss) from buying and selling?

Getting Price Data

Sites such as `finance.yahoo.com` collect and distribute information about individual companies. You can use the `readStockPrices()` function (in the `DataComputing` package) to read such data directly from Yahoo into R.

For example, here are some automotive stocks and their daily prices from 2010 to 2015.

```
companies <- c("F", "TM", "HMC")
```

```
Prices <-
```

```
read_stock_prices(companies, what="daily", start_year=2000, end_year=2015)
```

- Choose a few companies of interest to you. You can find stock company symbols at `finance.yahoo.com`. (Suggestion: pick a sector of the economy, e.g. energy, high-tech, consumer products, etc. and use companies from that sector.)

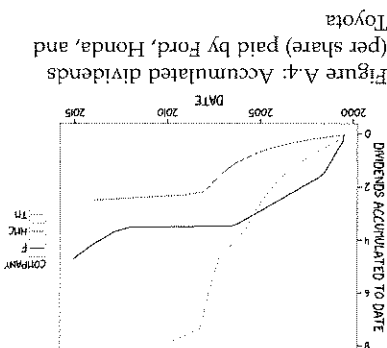


Figure A.4: Accumulated dividends (per share) paid by Ford, Honda, and Toyota

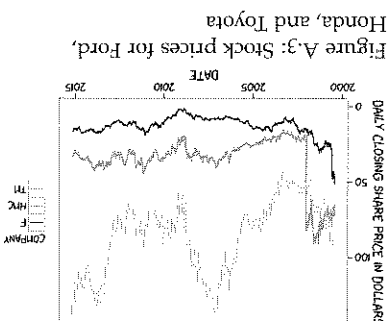


Figure A.3: Stock prices for Ford, Honda, and Toyota

- Plot out the "closing price" (Close) versus date to get a graphic like Figure A.3.

Buy/Sell Profit

Pick a buy date and a sell date. You can use a command like this to create a Table like that shown in Table A.2.

```
Actions <-
data.frame(
  action = c("buy", "sell"),
  date = ymd(c("2006-01-03", "2014-12-30")))
```

Combine Prices and Actions to produce a table like SalesDifference in Table A.3:

Hints: (1) What kind of join should you use so that you get only those cases that match one of the dates in the Actions table? (2) The wide-vs-long techniques in Chapter 11 will be useful.

From the data table with buy and sell prices, calculate the dollar amount of profit (or loss) and the percentage change, as in Table A.4.

Indexing Prices

Since stock prices vary markedly from one company to another, a common practice is to "index" the price to a particular date as in Figure A.5. (Question: In the graph, roughly which date was used for the reference?)

- Pick a single date of your choice and extract the stock price information for each company on that date. In the result, there should be one case for each company. Select just the date, company, and close variables, renaming close as standard. Call the resulting data frame Reference.

```
ref_date <- ymd("2005-01-03")
Reference <-
Prices %>%
  filter(date==ref_date) %>%
  select(company, standard=close)
```

- You now need to combine the Reference with each day's price data for that company. You'll find the standardized price on each day by creating a new variable which is the ratio of the day-to-day price (use Close) to the standard for that company. Before you can do this, you'll need to combine the Prices and Reference

| Actions | |
|---------|------------|
| action | date |
| buy | 2006-01-03 |
| sell | 2014-12-30 |

Table A.2: A suggested table format for the buy and sell dates.

| SalesDifference | | |
|-----------------|--------|--------|
| company | buy | sell |
| F | 7.83 | 15.50 |
| HMC | 29.36 | 29.60 |
| TM | 106.85 | 125.91 |

Table A.3: Profits from buying at the start of 2006 and selling at the end of 2014. The dollar amount is profit per share.

| company | profit | percent |
|---------|--------|---------|
| F | 7.67 | 98.00 |
| HMC | 0.24 | 0.82 |
| TM | 19.06 | 17.80 |

Table A.4: Profit from each of the stocks.

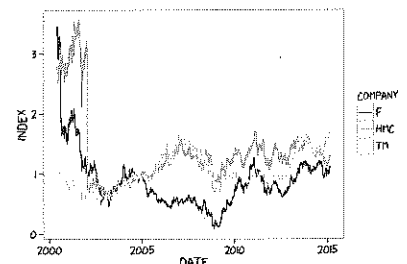


Figure A.5: Indexed stock prices for Ford, Honda, and Toyota

data tables. You'll use a *join* verb to do this. In order to check your results, sketch out what you think the result *should* be before you do the join.

Dividends

You can read in dividend data like this:

```
Dividends <-
```

```
read_stock_prices(companies, what="dividends")
```

Once you have the dividend data, extract out the dividends for

all dates between your buy and sell dates. (Hint: Join Dividends to Actions using company to match. The result will have two. When)

The dividend amount is actually a rate: the dividend paid (in

dollars) divided by the stock price. Find the dollar amount of each dividend payment for one *share* of stock rather than one *dollar* of

stock. This involves multiplying the dividend rate by the stock

price on that date.

Find the total amount of dividends for each company during the

period of interest. Compare this amount to the profit (or loss) from buying and selling the stock certificates. For the car companies,

the result for the period 2005-01-01 through 2014-12-31 is shown in

Table A.5.

| company | total_dividend |
|---------|----------------|
| F | 1.75 |
| HMC | 1.89 |
| TM | 5.44 |

Table A.5: Dividends (in dollars per share) paid out by each company over the interval 2005 through 2014.