IESE Business School
University of Navarra

FocusedCase

ADFC-5-E
November 2015

Kapoor's Portfolio

Building a Portfolio

It is the first day at her new job and Isha Kapoor is feeling both excited and nervous. Kapoor is a recent MBA graduate and has been hired as a trainee portfolio manager at a financial conglomerate in Mumbai, India. This job is an important stepping-stone in her career as an investment manager and she wishes to make a good first impression. Her supervisor has asked her to build an investment portfolio based on the equity returns of the firms listed on the National Stock Exchange of India Ltd. (NSE). She is to consider several key sectors of the Indian economy: automotive, banking, capital goods, consumer durables, fast-moving consumer goods, healthcare, information technology, metals and mining, oil and gas, power, and telecommunications.

First, Kapoor will collect daily data on equity prices as listed on the NSE. The NSE, located in Mumbai, is the leading stock exchange in India, with a market capitalization of more than US$1.65 trillion. She can find the historical prices of companies belonging to the aforementioned key sectors of the Indian economy on Yahoo Finance. Her data set will cover the 10-year period from January 1, 2005, to December 31, 2014. According to her supervisor's instructions, Kapoor is to include one company from each sector. Her choices are shown in the table below.

This Focused Case was prepared by Professor Miguel Ángel Canela and Inés Alegre, Professor at the Universitat Internacional de Catalunya, and Melina Moleskis, PhD Candidate, as the basis for class discussion rather than to illustrate either effective or ineffective handling of an administrative situation. November 2015.

Last edited: 12/17/15

Sector	Company	Company description
Automotive	Tata Motors	An Indian multinational automotive manufacturing company.
Banking	HDFC Bank	The largest private-sector bank in India by market cap (as of February 2014).
Capital goods	Larsen & Toubro	An Indian multinational conglomerate active in engineering, construction, manufacturing goods, information technology, and financial services.
Consumer durables	TKK Prestige	India's largest kitchenware company.
Fast-moving consumer goods	Dabur India Ltd.	Present in key consumer product categories such as hair care, oral care, healthcare, skin care, home care and food.
Healthcare	Sun Pharmaceuticals	An Indian multinational pharmaceutical company.
Information technology	Wipro Ltd.	An Indian multinational IT consulting and systems integration company.
Metals and mining	Tata Steel	An Indian multinational steel-making company.
Oil and gas	Indian Oil	India's largest commercial enterprise, with interests in the entire hydrocarbon value chain, from the refining, transportation and marketing of petrol, to exploration and the production of crude oil and gas.
Power	National Thermal Power Corporation Ltd. (NTPC)	Controlled and partially owned (70%) by the Ministry of Power, NTPC is engaged in the business of power generation and related activities.
Telecommunications	Bharti Airtel	An Indian multinational telecommunications services company headquartered in New Delhi.

The data are presented in open-high-low-close (OHLC) format. The fields are:

- DATE: YYYY-MM-DD.
- OPEN: Price when the market opens.
- HIGH: Highest price during the day.
- LOW: Lowest price during the day.
- CLOSE: Price when the market closes.
- VOLUME: Volume traded.
- ADJCLOSE: Closing price, adjusted for all applicable splits and dividend distributions.

Kapoor chooses to follow the adjusted closing prices (ADJCLOSE) in order to filter out the effect of dividends and splits. Furthermore, she will have a look at the returns of a general index. She picks the S&P CNX 500, which is the first broad-based stock market index of the Indian stock market. As of March 31, 2015, the S&P CNX 500 represents about 96% of the free-float market capitalization of the stocks listed on the NSE and about 92% of the traded value of all stocks on the NSE. Kapoor prefers this index to, for example, the Nifty 50 index, because the CNX 500 offers wider coverage of the Indian market and can thus represent the market with greater accuracy, thereby increasing the reliability of the betas computed using the CAPM model.

After a preliminary analysis, the expected returns look promising in spite of remarkable differences between one sector and another. Before performing a complete analysis of the data, Kapoor reviews her university notes in order to refresh her understanding of returns, risk assessment, diversification and systemic risk (see **Exhibit**).

Suggested Analysis

Kapoor would like to calculate the expected portfolio return in addition to the risk of the investment. In order to resolve these issues she plans to:

- Calculate daily returns for the 11 sectors of the Indian economy over the 10-year period of 2005 to 2014;
- Compute the expected (mean) return and the standard deviation of each sector;
- Obtain a beta for each sector (using the returns of the S&P CNX 500 index for the expected market returns).

She performs the analysis above and then asks some additional questions:

- How should the beta values be interpreted? Can the betas be taken as constant over the entire period, or do they have to be updated from year to year?
- How can the sectors with the least systemic risk be identified?
- If Kapoor tries the same analysis using logarithmic returns instead of simple returns, will she get similar results?

Exhibit

Isha Kapoor's University Notes

Financial Returns

When investors evaluate an asset as a potential investment they concentrate on the asset's returns. Returns can be calculated in two ways: as simple (or arithmetic) returns and as logarithmic (or geometric) returns. Simple returns are given by:

Simple Return (t) = [Price (t) – Price (t–1)] / Price (t–1) = [Price (t) / Price (t–1)] – 1.

Logarithmic returns are evaluated using natural logarithms as follows:

Logarithmic Return (t) = log [Price (t) / Price (t–1)] = log [Price (t)] – log [Price (t–1)].

In the formulas above, *t* denotes time, which can be the day (daily returns), the week (weekly returns), the month (monthly returns) and so on. Since simple returns are proportions, they are usually expressed as percentages. Log returns can also be expressed in this way, although they are not true proportions. For example, the values of the CNX 500 on February 24 and February 25, 2014, are 4783.15 and 4793.90 respectively. As such, the simple and log returns for February 25 are calculated as:

Simple Return = [(4793.90 – 4783.15) / 4783.15] * 100 = 0.0023 or 0.23%,

Log Return = log (4793.90) – log (4783.15) = 0.0022 or 0.22%.

Returns can be combined in different ways. Simple returns are averaged across assets, whereas log returns are aggregated across time. Indeed, since an investment portfolio consists of multiple assets, the simple returns of the individual assets can be averaged to compute the portfolio return. For instance, if a portfolio consists of 70% of Tata Motors shares and 30% of Tata Steel shares, with respective daily returns for January 2, 2008, of 4.00% and 0.14%, then the portfolio return is calculated as:

Portfolio Return = 0.7 * 4.00% + 0.3 * 0.14% = 2.84%.

On the other hand, the log return for a portfolio over a period is the sum of the log returns of subdivisions of that period. For example, the weekly return, which is calculated using the closing value of the index, coincides with the sum of the returns of the days of that week. For instance, on Friday, January 4, 2008, the value of the CNX index is 5502.6. On the following Friday, January 11, it has gone down to 5348.2. Therefore, the weekly return is:

Weekly Return = log (5348.2) – log (5502.6) = –0.012%.

This coincides with the sum of the returns on the days from Monday, January 7, to Friday, January 11. So, each type of return has an advantage over the other in that simple returns average across assets whereas log returns aggregate across time. Nonetheless, when [Price (t) / Price (t–1)] is close to 1 (i.e., when the change in price is relatively small), ordinary returns and logarithmic returns are very close, as seen in the example above.

Exhibit (Continued)

Expected Return and Financial Risk

Investors decide where to invest according to both the expected return and the level of risk they are willing to assume. It is generally agreed that, once a particular level of risk has been decided, money should be placed in the investment that presents the highest expected return. How can we measure this? The *expected return* is calculated as the mean of the returns during a recent period. Since the *risk* of an investment is derived from the variability of the corresponding return, it is measured by the standard deviation of the returns. The (annualized) standard deviation of the return is sometimes called *volatility*.

A financial risk is generally considered to have two components: systemic and non-systemic risk. Normally, returns on shares tend to rise and fall in unison, depending on general economic conditions. For instance, news about a slowdown in the growth of the Chinese economy is likely to have repercussions on stock markets worldwide. In other words, there is a common risk that affects the returns on all investments, albeit to a different extent, and that depends on economic circumstances. We call this the *systemic risk*. Systemic risk, also known as market risk, captures individual investments' responsiveness to market variation. Not all investments are affected to the same degree by systemic risk since some are more sensitive to general economic conditions. A popular measure of the systemic risk of an investment is the beta, which is explained below.

The rest of the variation of a return, which depends on the specific circumstances of the investment, is the *non-systemic risk*. For example, the return on a company's shares depends partly on circumstances affecting that particular company, such as a contract signing or news about a merger. Unlike systemic risk, non-systemic risk does not reflect the variation of market conditions and can thus be reduced or eliminated through risk management techniques such as diversification or hedging, leaving behind only systemic risk.

Diversification and *hedging* are techniques employed by risk-averse investors to reduce their risk exposure. These techniques do not shield the investor from market variations but can protect against the stocks' non-systemic risk (i.e., the particular circumstances of the firm). The rationale is that non-systemic variations in the return of an investment tend to be cancelled out, or at least not reinforced, by the variations of other investments, provided that the correlation between the returns of the different investments is negative or close to zero, respectively. While diversification relies on the lack of a close positive correlation between the assets (meaning that correlations need to be near zero), hedging relies on negative correlations between the assets (strictly less than zero).

The Capital Asset Pricing Model

Risk can be avoided completely by investing in a *risk-free asset*. An asset whose possibility of loss is considered to be non-existent or extremely low may be considered risk-free for practical purposes. A typical choice is the one-year Treasury Bill backed by the U.S. government, which on January 2, 2008, had a yield of 3.17%.

Exhibit (Continued)

Most assets are not risk-free, however. Thus, in order to predict the return of an asset over and above the risk-free rate, investors turn to the *Capital Asset Pricing Model* (CAPM). According to the CAPM, the amount by which the expected return of an investment exceeds the return of the risk-free asset is proportional to the amount by which the expected market return exceeds it. This relationship is depicted in the equation below. The proportion is denoted as the *beta* (β) of the investment. Each particular investment has its own beta and the model assumes that the beta does not change over time.

$$\text{Asset Return (t)} - \text{Risk-Free Rate (t)} = \beta * [\text{Market Return (t)} - \text{Risk-Free Rate (t)}] + \text{Error (t)}.$$

In practice, to estimate the beta, we take the risk-free rate as constant, even though in reality it never is. Then, by rearranging the terms of the equation we see that the return of an investment corresponds to a constant (which can be shown mathematically to equal $[1-\beta]$ * Risk-Free Rate) plus some proportion of the market return, as given by the beta of the investment. The error term (i.e., the deviation from the model) accounts for the non-systemic risk.

$$\text{Asset Return (t)} = \text{Constant} + \beta * \text{Market Return (t)} + \text{Error (t)}.$$

In practice, the returns of a general index, such as the CNX 500 in this case, are used to provide a value for the expected market returns. The wider the coverage of the index, the more representative it is of the market and hence, the more accurate the estimates. Furthermore, β is computed as the slope coefficient in a linear regression of the past returns of the investment against those of the general index.

Interpretation of Beta Values

The following examples illustrate how to interpret the betas in practice:

- For an investment with $\beta = 1$, when the market return varies by 1%, the return varies by 1% on average. We say "on average" because the investment will also be affected by its specific, non-systemic risk.
- If $\beta = 2$, for every 1% variation in the market return, the return varies by 2% on average.
- An investment with $0 < \beta < 1$ is less affected by general economic conditions.
- If $\beta < 0$, the return (on average) goes in a direction opposite to that of the market and, therefore, to that of most other investments. This property makes it useful for risk-reduction strategies.