# Performance Measurement

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ERSTE Asset Management

What happens if individuals' current income is not sufficient to cover their consumption? They will need to borrow the difference. On the other hand, when individuals' current income exceeds their consumption, they tend to save the excess. This imbalance creates a market: individuals can give up immediate possession of their savings for a higher level of future consumption by lending their savings.

**This is called investment.**

# Return Components

**Returns consist of two elements**:

- Capital Gain or Loss: the change in price of the assets
- Income returns: periodic cash flows as interest or dividends; yield measures relate income return to a price for the security

**Total Return = Income + Capital Gain/Loss**

**Holding period return**: rate of return over a given period

- For an asset paying no dividends or coupon, such as gold, the rate of return equals the percentage change in the price of the asset: $R = \frac{P_t - P_{t-1}}{P_{t-1}}$,

Example: an investor buys one ounce of gold at time t=0 for EUR 350 and sells it at time t=1 at EUR 400. Over the period, the investor's return is: $R = \frac{400-350}{350} = 14.29\%$

However, most financial assets have intermediate cash flows taking the form of dividends or coupon payments. If the return on these assets is computed immediately after the dividend or coupon payment, the return equals: $R = \frac{D_t + P_t - P_{t-1}}{P_{t-1}}$

Example: an investor buys a stock at time t=0 for EUR 350; at time t=1 a dividend of EUR 20 is paid; at the same time, the stock is priced at EUR 400. Over the period, the investor's return is: $R = \frac{20+400-350}{350} = 20\%$

It is a common practice to assume that one time period is one year. In most cases, payments are made during the time period; the easiest way to measure returns in the presence of intermediate cash flows is to consider that the dividend payments are directly reinvested into the asset itself. Then the holding period return could be computed as:

- $R = \frac{D_t \times \frac{P_t}{P_\tau} + P_t - P_{t-1}}{P_{t-1}}$, where $P_\tau$ is the price of asset at which the dividend was reinvested

# Arithmetic versus Geometric Mean

Arithmetic mean does not measure the compound growth rate over time

- Does not capture very well the realized change in wealth over multiple periods
- Does capture typical return in an single period

Geometric mean reflects compound, cumulative return over more than one period

An investor will typically hold assets over more than one time period and will be probably interested in computing the average return per period on his investment. Take for instance an investment horizon (the holding period) of two years. The first and intuitive approach is to take the arithmetic average of the holding period returns over the period considered (the sum of the holding period returns divided by the number of compounding periods in the holding periods):

| | t=0 | Period 1 | | Period 2 | |
|---|---|---|---|---|---|
| | Price | Price | Period return | Price | Period return |
| A | EUR 100 | EUR 110 | 10% | EUR 121 | 10% |
| B | EUR 100 | EUR 150 | 50% | EUR 121 | -19.3% |

$$For\ A\colon R = \frac{10\% + 10\%}{2} = 10\%$$

$$For\ B\colon R = \frac{50\% - 19.3\%}{2} = 15.33\%$$

The appropriate way to average holding period returns is to take the geometric average of the holding period returns over the period under consideration: this is because holding period returns are multiplicative, but not additive: $R = \sqrt[T]{(1+R_1)\times(1+R_2)\times\cdots\times(1+R_3)} - 1$

$$For\ A\colon R = \sqrt[2]{(1+0.1)\times(1+0.1)} - 1 = 10\%$$

$$For\ B\colon R = \sqrt[2]{(1+0.5)\times(1-0.193)} - 1 = 10\%$$

# Required versus Expected Return

The required rate of return is what investors who lend their savings will demand in order to compensates them for the time, the expected rate of inflation and the uncertainty of the return.

$$E(R_A) = r_f + \beta_A[E(R_M) - r_f],$$

where $[E(R_M) - r_f]$ = *Equity risk premium*

The expected return is the return that an investor expects to earn on an asset, given its price, growth potential, etc. It is based on expected cash flows which are uncertain. It is calculated using weighted average of all possible returns.

The exact expected return is hardly ever achieved and the investor will probably earn more or less than expected.

# Components of Risk

When an investor buys asset, he must consider the risk involved

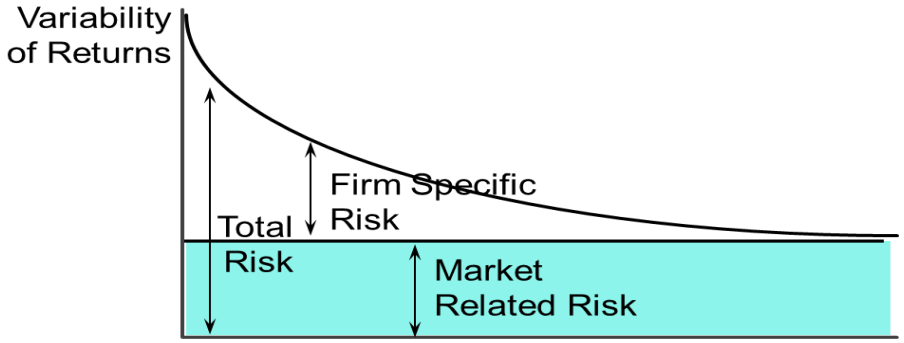
**Diversifiable (Unsystematic) Risk (firm – specific risk)**

- Results from uncontrollable or random events that are firm-specific
- Can be reduced through diversification
- Examples: labor strikes, lawsuits

**Non-diversifiable (Systematic) Risk (market risk)**

- Attributable to forces that affect all similar investments
- Cannot be eliminated through diversification
- Examples: war, inflation, political events

**Total risk = Non-diversifiable risk + Diversifiable risk**




**Beta: A Popular Measure of Risk**

- A measure of non-diversifiable risk
- Indicates how the price of a security responds to market forces
- Compares historical return of an investment to the market return (the S&P 500 Index)
- The beta for the market is 1.00
- Stocks may have positive or negative betas.
- Stocks with betas greater than 1.00 are more risky than the overall market.
- Stocks with betas less than 1.00 are less risky than the overall market.

**Interpreting Beta**

- Higher stock betas should result in higher expected returns due to greater risk
- If the market is expected to increase 10%, a stock with a beta of 1.50 is expected to increase 15%
- If the market went down 8%, then a stock with a beta of 0.50 should only decrease by about 4%

# Case study: OMV Petrom

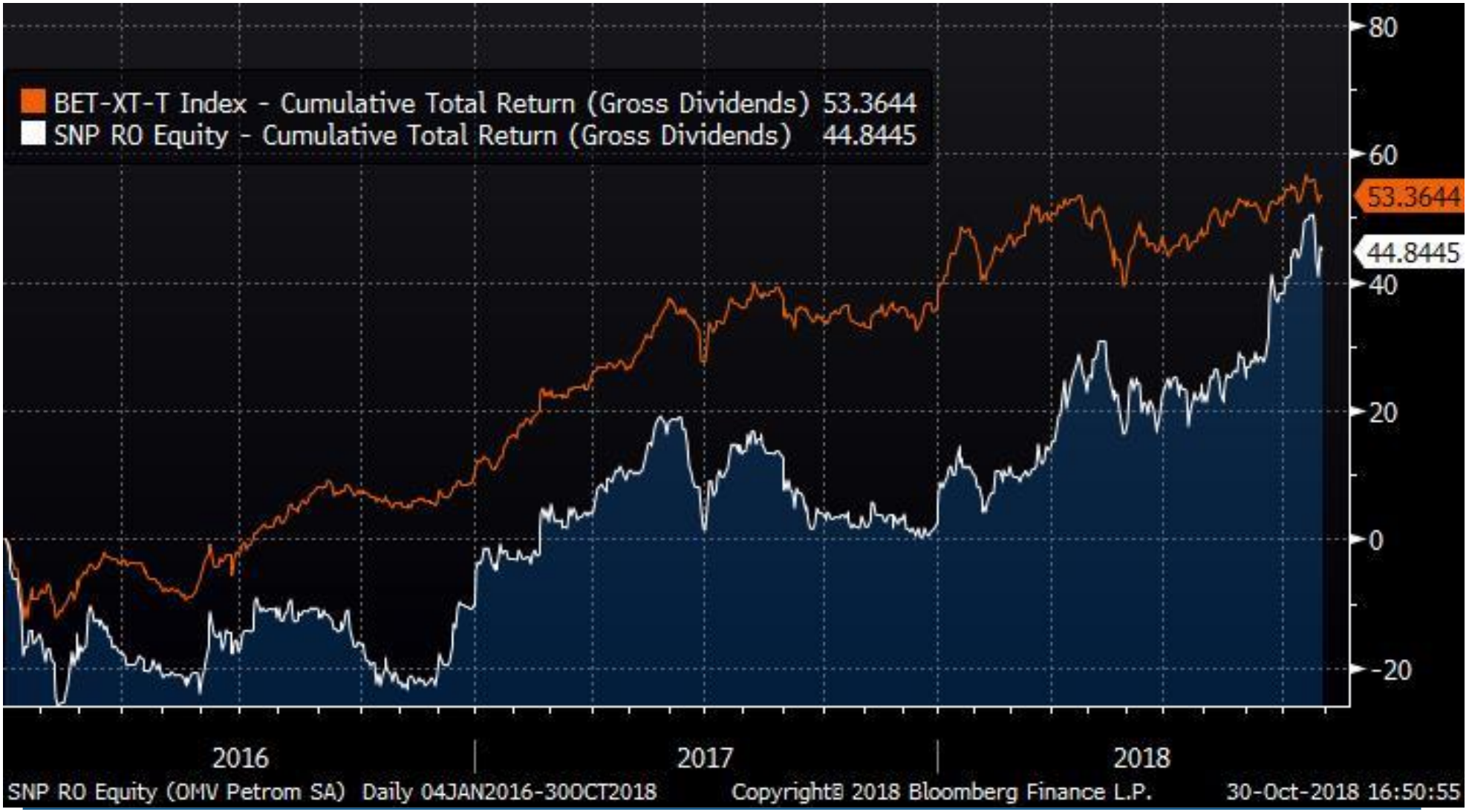
| Year | Dividend | GSM Date | Recording date | Ex-dividend date | Ex-dividend price | Year end price | Total Return | Average return (geometric mean) | Average return (arithmetic mean) |
|---|---|---|---|---|---|---|---|---|---|
| **2018** | | | | | | 0.3895 | 44.67% | | |
| **2017** | 0.0200 | 04/26/2018 | 05/25/2018 | 05/24/2018 | 0.3210 | 0.286 | 14.61% | 28.77% | 29.64% |
| **2016** | 0.0150 | 04/25/2017 | 05/23/2017 | 05/22/2017 | 0.3265 | 0.261 | -10.00% | 14.28% | 16.43% |
| **2015** | | | | | | 0.29 | -26.83% | 2.22% | 5.61% |
| **2014** | 0.0112 | 04/28/2015 | 05/21/2015 | 05/20/2015 | 0.3814 | 0.408 | -7.03% | 0.30% | 3.09% |
| **2013** | 0.0308 | 04/29/2014 | 05/16/2014 | 05/14/2014 | 0.4365 | 0.4698 | 16.84% | 2.89% | 5.38% |
| **2012** | 0.0280 | 04/22/2013 | 05/14/2013 | 05/10/2013 | 0.4326 | 0.4281 | 60.70% | 9.65% | 13.28% |
| **2011** | 0.0310 | 04/27/2012 | 05/17/2012 | 05/15/2012 | 0.3500 | 0.29 | -9.75% | 7.02% | 10.40% |
| **2010** | 0.0177 | 04/26/2011 | 05/12/2011 | 05/10/2011 | 0.4155 | 0.335 | | | |

*0.3895 = pret de referinta 31.10.2018

$$Average\ return\ using\ the\ geometric\ mean\ 2016-2018$$
$$= \sqrt[3]{(1-0.1)\times(1+0.1461)\times(1+0.4170)}-1 = 14.28\%$$

$$Total\ return\ 2017\ = \frac{0.015\times\frac{0.286}{0.3265}+0.286-0.261}{0.261} = 14.61\%$$

# OMV Petrom performance vs BET-XT TR




Source: Bloomberg

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# OMV Petrom – share price performance


Source: Bloomberg

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