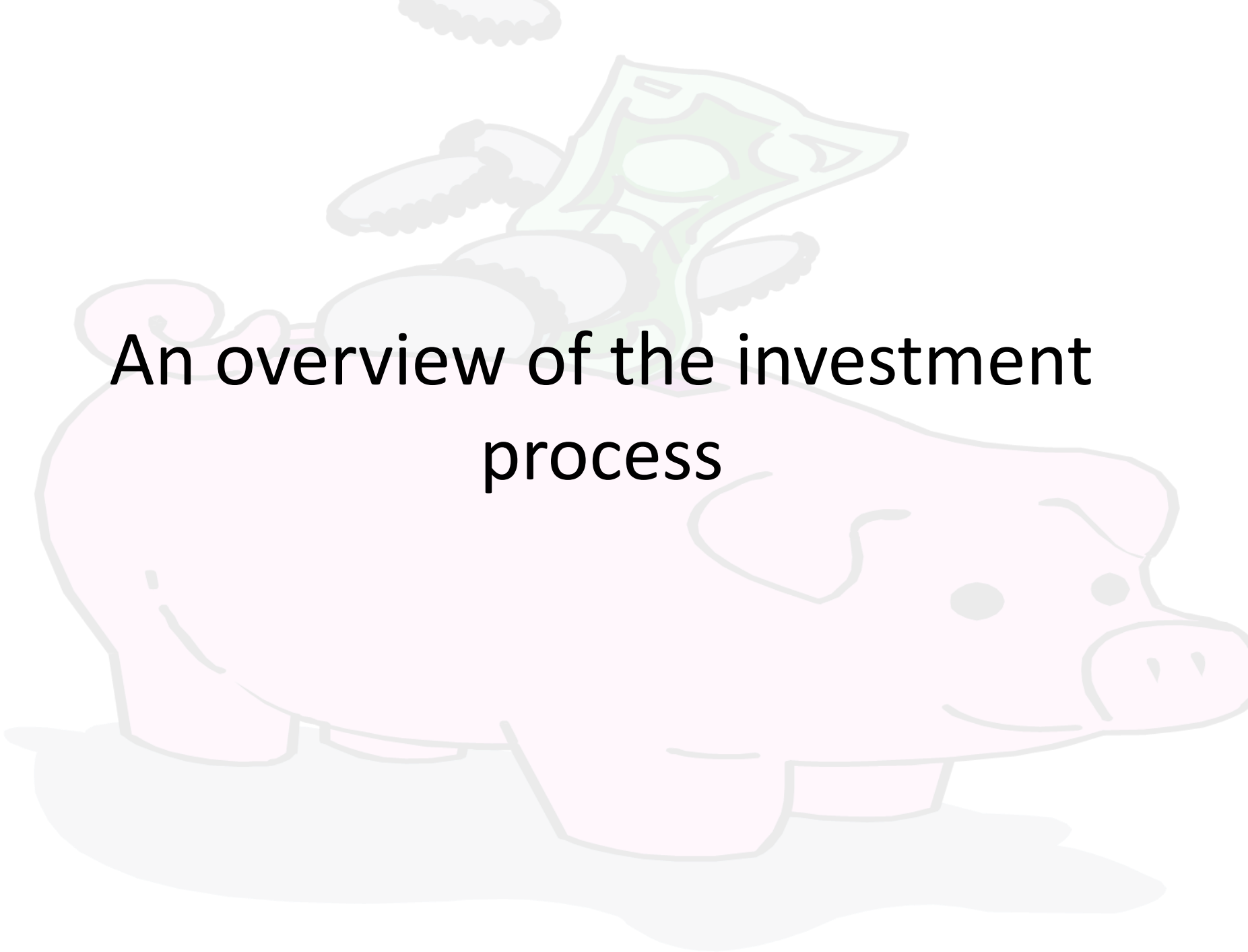


An overview of the investment process

Why investors invest?

- By saving instead of spending,
- Individuals trade-off
- Present consumption
- For a larger future consumption

How Do We Measure The Rate Of Return On An Investment ?

The pure rate of interest is the exchange rate between future consumption and present consumption. Market forces determine this rate.

$$SR1.00 + 4\% = SR1.04$$

How Do We Measure The Rate Of Return On An Investment ?

People's willingness to pay the difference for borrowing today and their desire to receive a surplus on their savings give rise to an interest rate referred to as the pure time value of money.

How Do We Measure The Rate Of Return On An Investment ?

If the future payment will be diminished in value because of inflation, then the investor will demand an interest rate higher than the pure time value of money to also cover the expected inflation expense.

How Do We Measure The Rate Of Return On An Investment ?

If the future payment from the investment is not certain, the investor will demand an interest rate that exceeds the pure time value of money plus the inflation rate to provide a risk premium to cover the investment risk.

Defining an Investment

A current commitment of $ for a period of time in order to derive future payments that will compensate for:

- **the time the funds are committed**
- **the expected rate of inflation**
- **uncertainty of future flow of funds.**

Measures of Historical Rates of Return

Holding Period Return

$$HPR = \frac{\text{Ending Value of Investment}}{\text{Beginning Value of Investment}}$$

$$= \frac{SR220}{SR200} = 1.10$$

Measures of Historical Rates of Return

Holding Period Yield

$$HPY = HPR - 1$$

$$1.10 - 1 = 0.10 = 10\%$$

Measures of Historical Rates of Return

Annual Holding Period Return

$$\text{Annual HPR} = \text{HPR}^{1/n}$$

where n = number of years investment is held

Annual Holding Period Yield

$$\text{Annual HPY} = \text{Annual HPR} - 1$$

Measures of Historical Rates of Return

Arithmetic Mean

$$AM = \sum HPY / n$$

where :

$\sum HPY$ = the sum of annual holding period yields

Measures of Historical Rates of Return

Geometric Mean

$$GM = \left[\pi \, HPR\right]^{1/n} - 1$$

where:

π = the product of the annual holding period returns as follows:

$$\left(HPR_1\right) \times \left(HPR_2\right) \ldots \left(HPR_n\right)$$

A Portfolio of Investments

The mean historical rate of return for a portfolio of investments is measured as the weighted average of the HPYs for the individual investments in the portfolio.

Computation of Holding Period Yield for a Portfolio

Stock	# Shares	Begin Price	Beginning Mkt. Value	Ending Price	Ending Mkt. Value	HPR	HPY	Market Wt.	Wtd. HPY
A	100,000	$ 10	$ 1,000,000	$12	$ 1,200,000	1.20	20%	0.05	0.010
B	200,000	$ 20	$ 4,000,000	$21	$ 4,200,000	1.05	5%	0.20	0.010
C	500,000	$ 30	$15,000,000	$33	$16,500,000	1.10	10%	0.75	0.075
Total			$20,000,000		$21,900,000				0.095

$$\text{HPR} = \frac{\$21{,}900{,}000}{\$20{,}000{,}000} = 1.095$$

$$\text{HPY} = 1.095 - 1 = 0.095$$

$$= 9.5\%$$

Expected Rates of Return

- Risk is uncertainty that an investment will earn its expected rate of return
- Probability is the likelihood of an outcome

Expected Rates of Return

$$\text{Expected Return} = E(R_i)$$

$$\sum_{i=1}^{n} (\text{Probability of Return}) \times (\text{Possible Return})$$

$$[(P_1)(R_1) + (P_2)(R_2) + ... + (P_n R_n)$$

$$\sum_{i=1}^{n} (P_i)(R_i)$$

Risk Aversion

The assumption that most investors will choose the least risky alternative, all else being equal and that they will not accept additional risk unless they are compensated in the form of higher return

Measuring the Risk of Expected Rates of Return

$$\text{Variance}(\sigma) =$$

$$\sum_{i=1}^{n} (\text{Probabilit y}) \times (\text{Possible Return} - \text{Expected Return})^2$$

$$\sum_{i=1}^{n} (P_i)[R_i - E(R_i)]^2$$

Measuring the Risk of Expected Rates of Return

Standard Deviation is the square root of the variance

$$\sqrt{\sum_{i=1}^{n} P_i [R_i - E(R_i)]^2}$$

Measuring the Risk of Expected Rates of Return

Coefficient of variation (CV) a measure of relative variability that indicates risk per unit of return

$$\text{CV} = \frac{\text{Standard Deviation of Returns}}{\text{Expected Rate of Returns}} = \frac{\sigma_i}{E(R)}$$

Measuring the Risk of Historical Rates of Return

$$\sigma^2 = \sum_{i=1}^{n} [HPY_i - E(HPY)]^{2/n}$$

$\sigma^2 =$ variance of the series

$HPY_i =$ holding period yield during period i

$E(HPY) =$ expected value of the HPY that is equal to the arithmetic mean of the series

$n =$ the number of observations

Determinants of Required Rates of Return

- Time value of money
- Expected rate of inflation
- Risk involved

The Real Risk Free Rate (RRFR)

- Assumes no inflation.
- Assumes no uncertainty about future cash flows.
- Influenced by time preference for consumption of income and investment opportunities in the economy

Adjusting For Inflation

Real RFR =

$$\left[\frac{(1+\text{Nominal RFR})}{(1+\text{Rate of Inflation})}\right]-1$$

Nominal Risk-Free Rate

Dependent upon

- Conditions in the Capital Markets
- Expected Rate of Inflation

Adjusting For Inflation

Nominal RFR =

(1+Real RFR) x (1+Expected Rate of Inflation) - 1

Facets of Fundamental Risk

- Business risk
- Financial risk
- Liquidity risk
- Exchange rate risk
- Country risk

Business Risk

- Uncertainty of income flows caused by the nature of a firm's business
- Sales volatility and operating leverage determine the level of business risk.

Financial Risk

- Uncertainty caused by the use of debt financing.
- Borrowing requires fixed payments which must be paid ahead of payments to stockholders.
- The use of debt increases uncertainty of stockholder income and causes an increase in the stock's risk premium.

Liquidity Risk

- Uncertainty is introduced by the secondary market for an investment.

  How long will it take to convert an investment into cash?

  How certain is the price that will be received?

Exchange Rate Risk

- Uncertainty of return is introduced by acquiring securities denominated in a currency different from that of the investor.
- Changes in exchange rates affect the investors return when converting an investment back into the “home” currency.

Country Risk

- Political risk is the uncertainty of returns caused by the possibility of a major change in the political or economic environment in a country.
- Individuals who invest in countries that have unstable political-economic systems must include a country risk-premium when determining their required rate of return

Risk Premium

f(Business Risk, Financial Risk, Liquidity Risk, Exchange Rate Risk, Country Risk)

or

f(Systematic Market Risk)

Risk Premium and Portfolio Theory

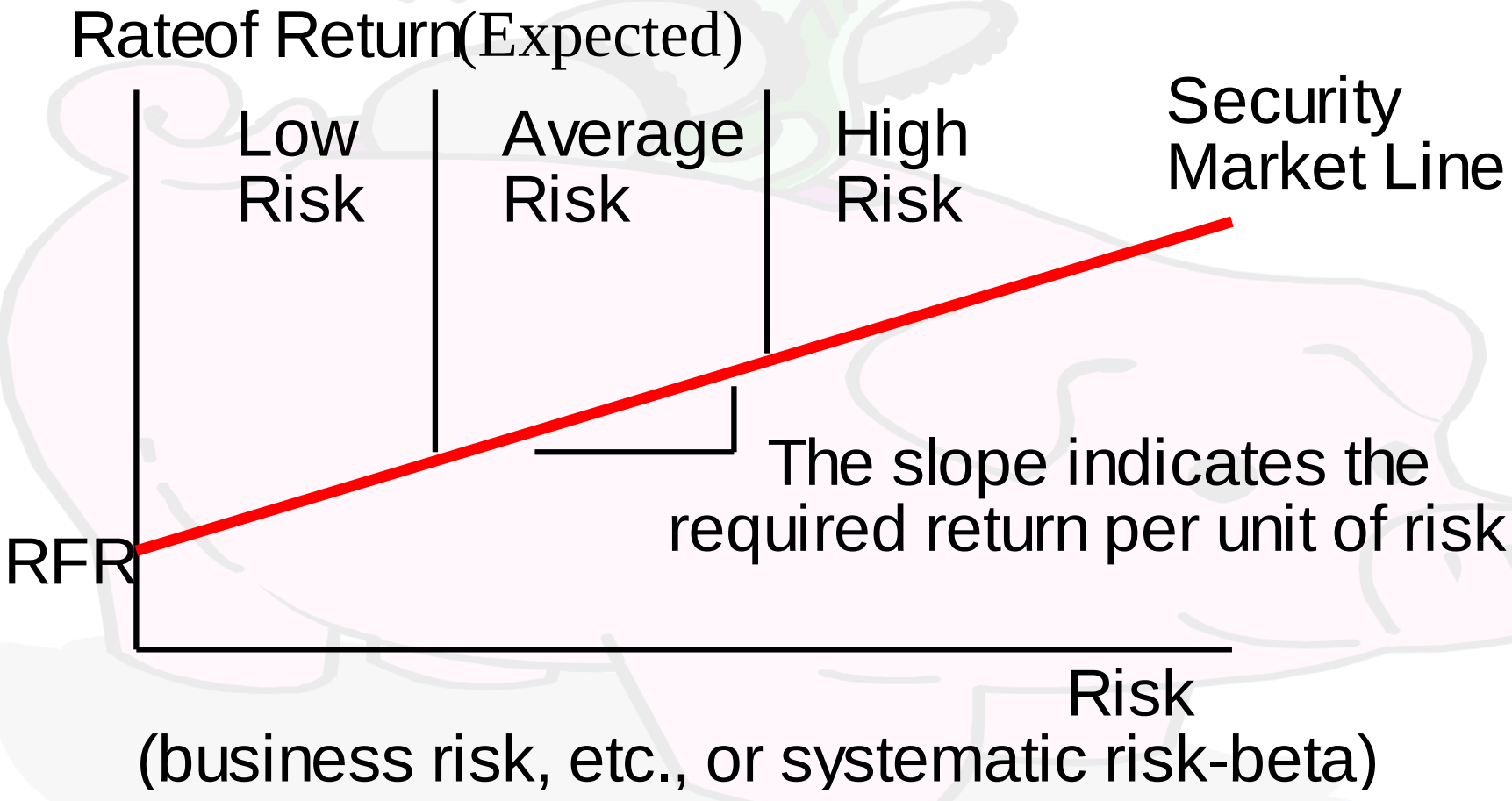
- The relevant risk measure for an individual asset is its co-movement with the market portfolio
- Systematic risk relates the variance of the investment to the variance of the market
- Beta measures this systematic risk of an asset

Fundamental Risk versus Systematic Risk

- Fundamental risk comprises business risk, financial risk, liquidity risk, exchange rate risk, and country risk
- Systematic risk refers to the portion of an individual asset's total variance attributable to the variability of the total market portfolio

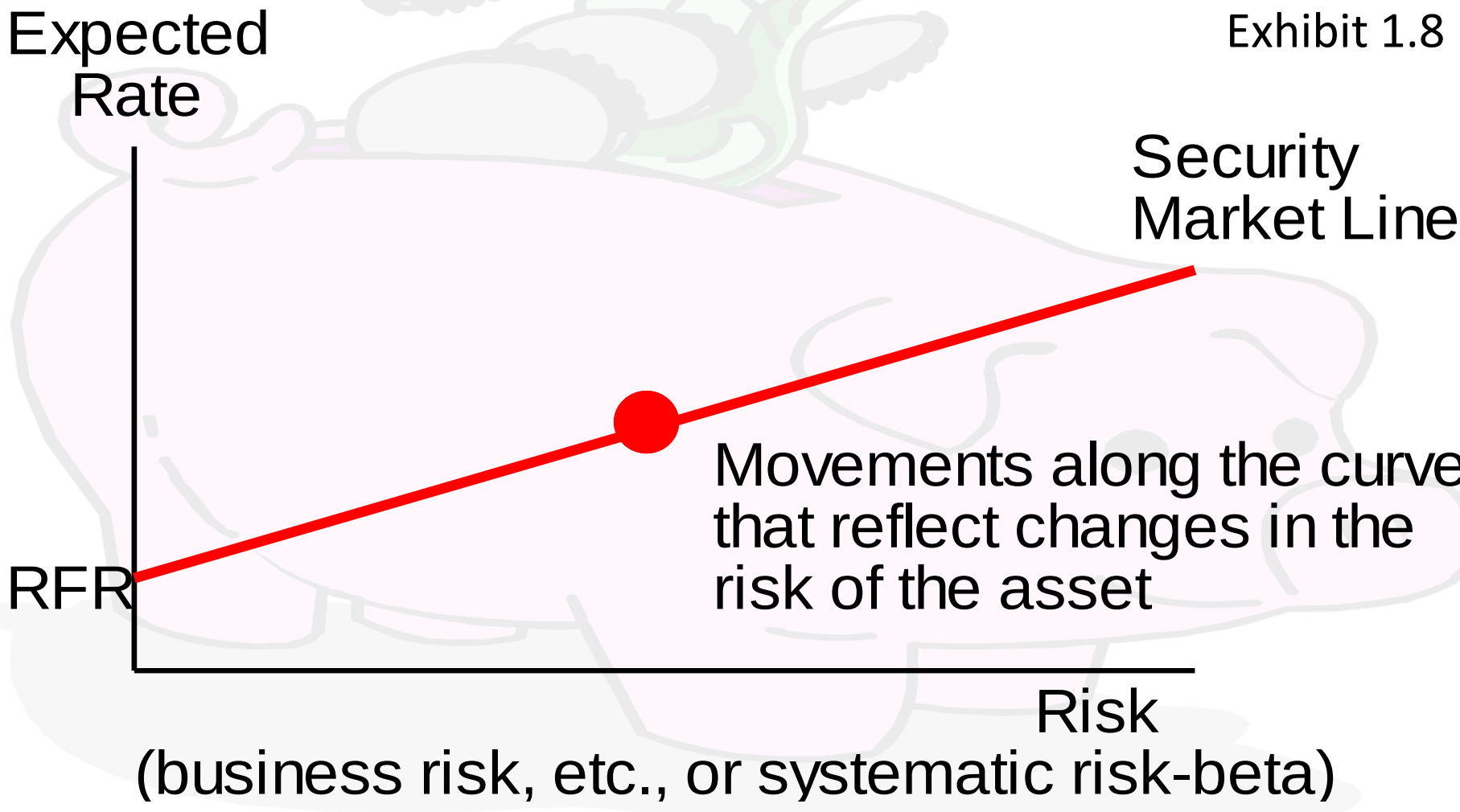
Relationship Between Risk and Return

Exhibit 1.7



Changes in the Required Rate of Return Due to Movements Along the SML

Exhibit 1.8



Changes in the Slope of the SML

$$RP_i = E(R_{i)} - NRFR$$

where:

RP_i = risk premium for asset *i*

$E(R_{i)}$ = the expected return for asset *i*

NRFR = the nominal return on a risk-free asset

Market Portfolio Risk

The market risk premium for the market portfolio (contains all the risky assets in the market) can be computed:

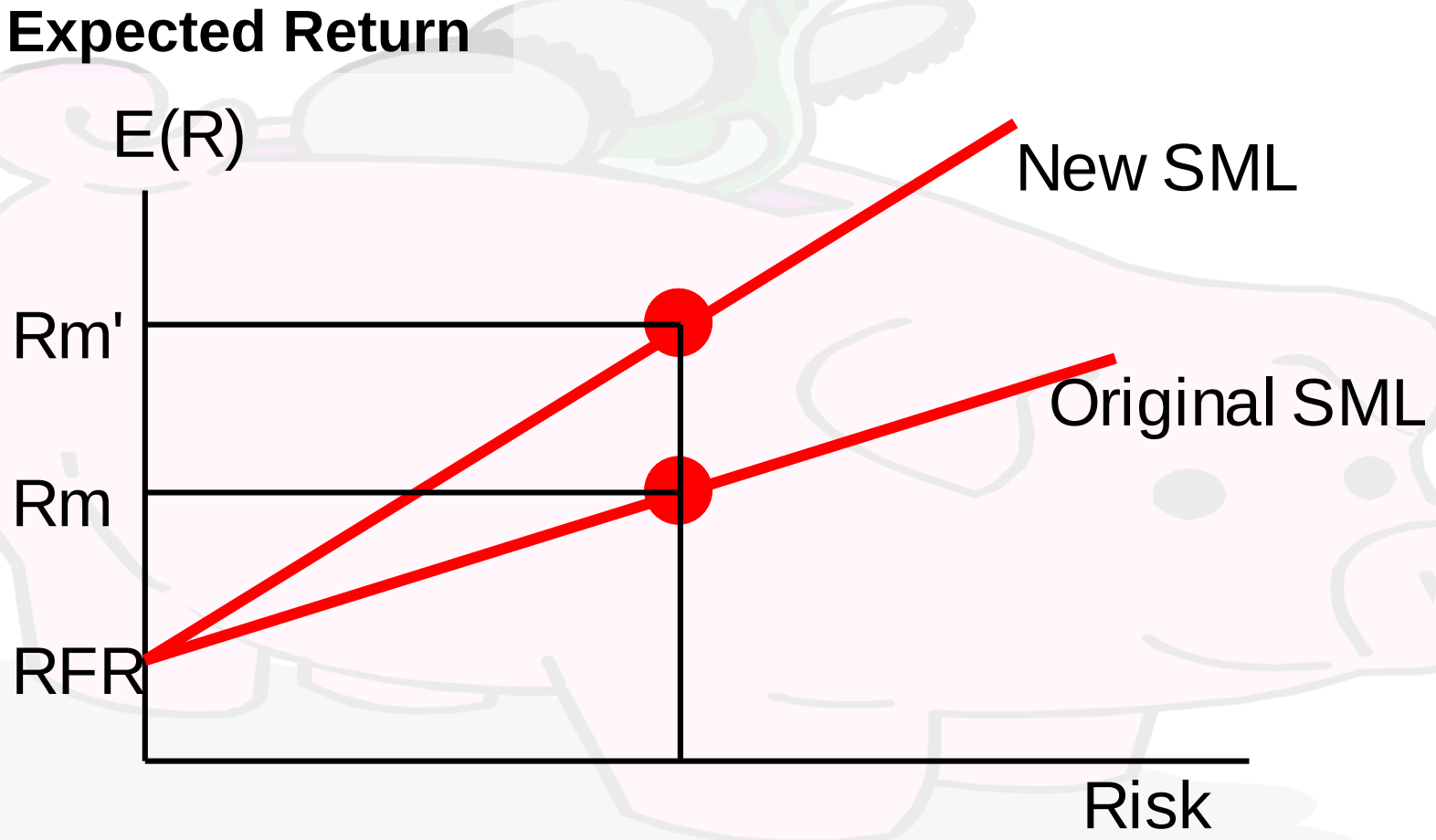
$RP_m = E(R_m)$- NRFR where:

RP_m = risk premium on the market portfolio

$E(R_m)$ = expected return on the market portfolio

NRFR = expected return on a risk-free asset

Change in Market Risk Premium



Capital Market Conditions, Expected Inflation, and the SML