Introduction and Chapter 1
"An Analytical Approach to
Investments, Finance and Credit"

INTRO TO INVESTMENTS, FINANCE & CREDIT

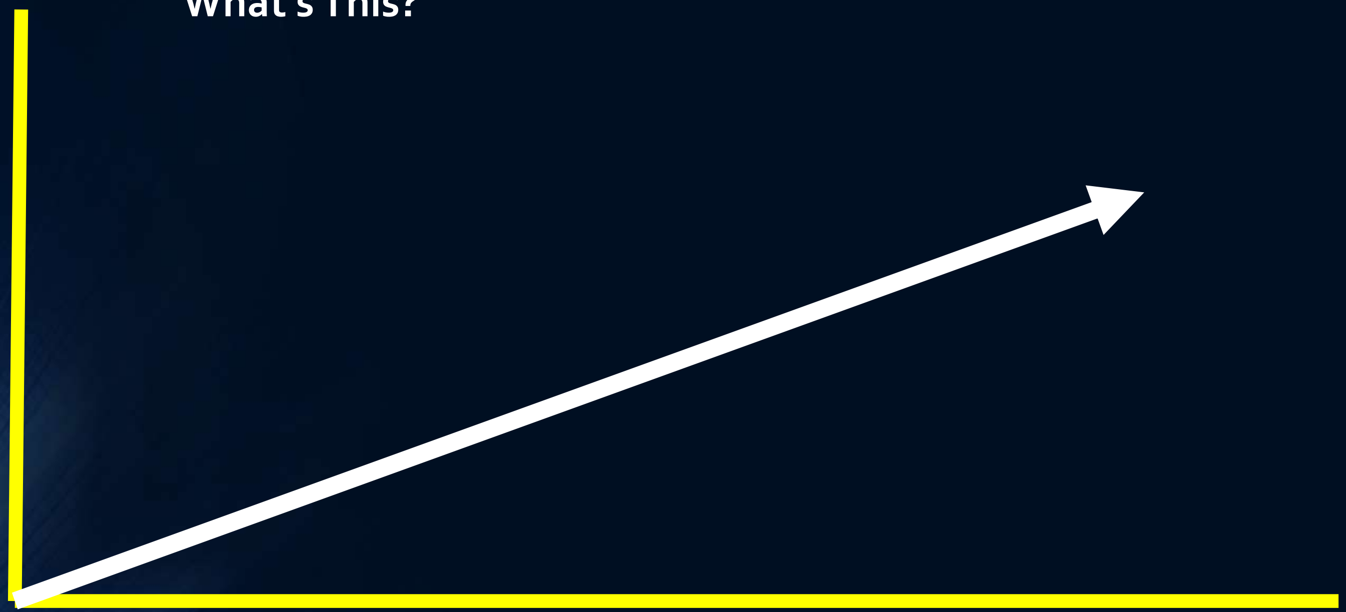
PORTFOLIO ANALYSIS CONCEPTS

Risk, Return, Time and Allocation

Introduction to Investments, Finance and Credit

INVESTMENTS, FINANCE AND CREDIT OVERVIEW

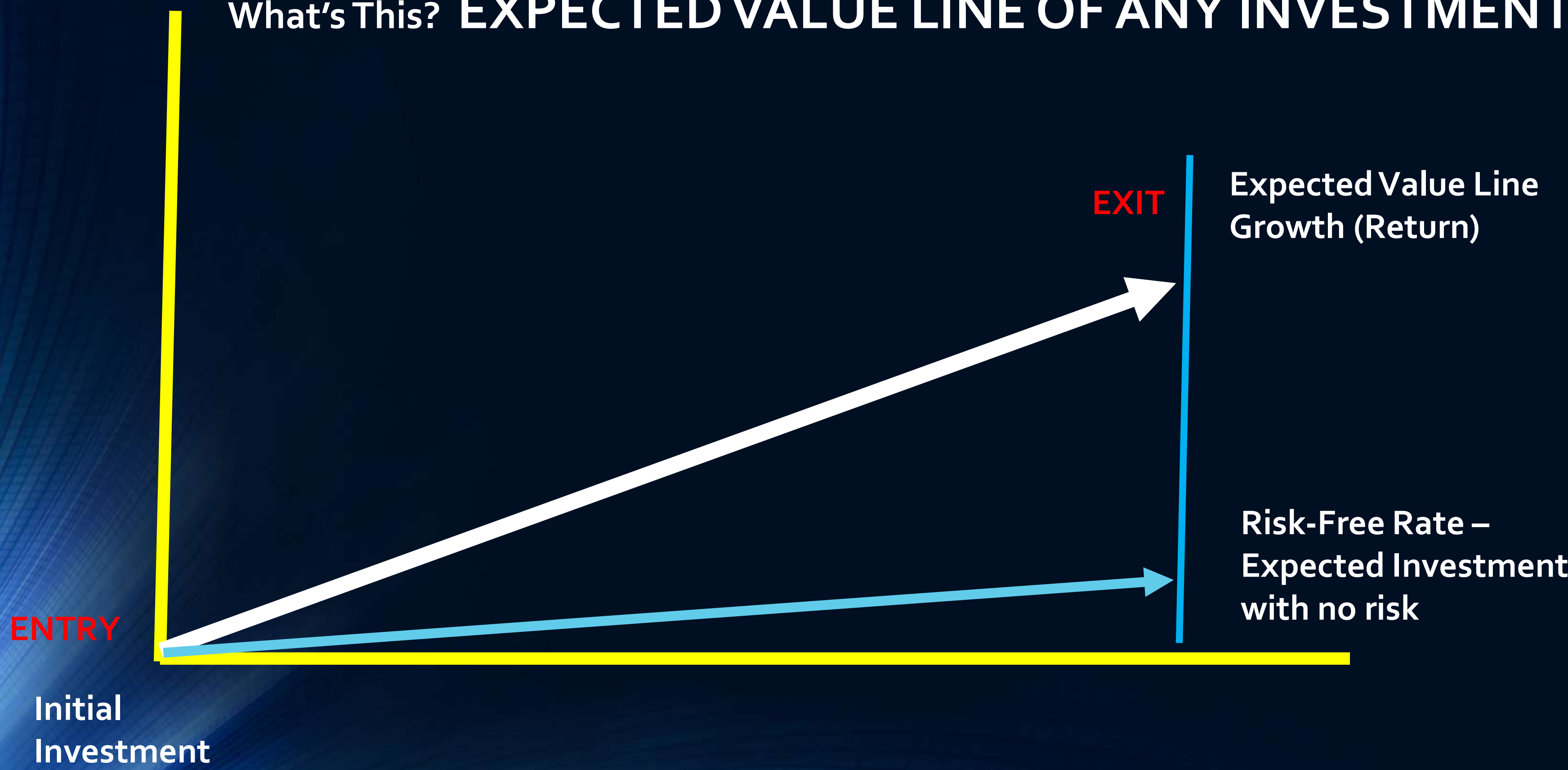
What's This?



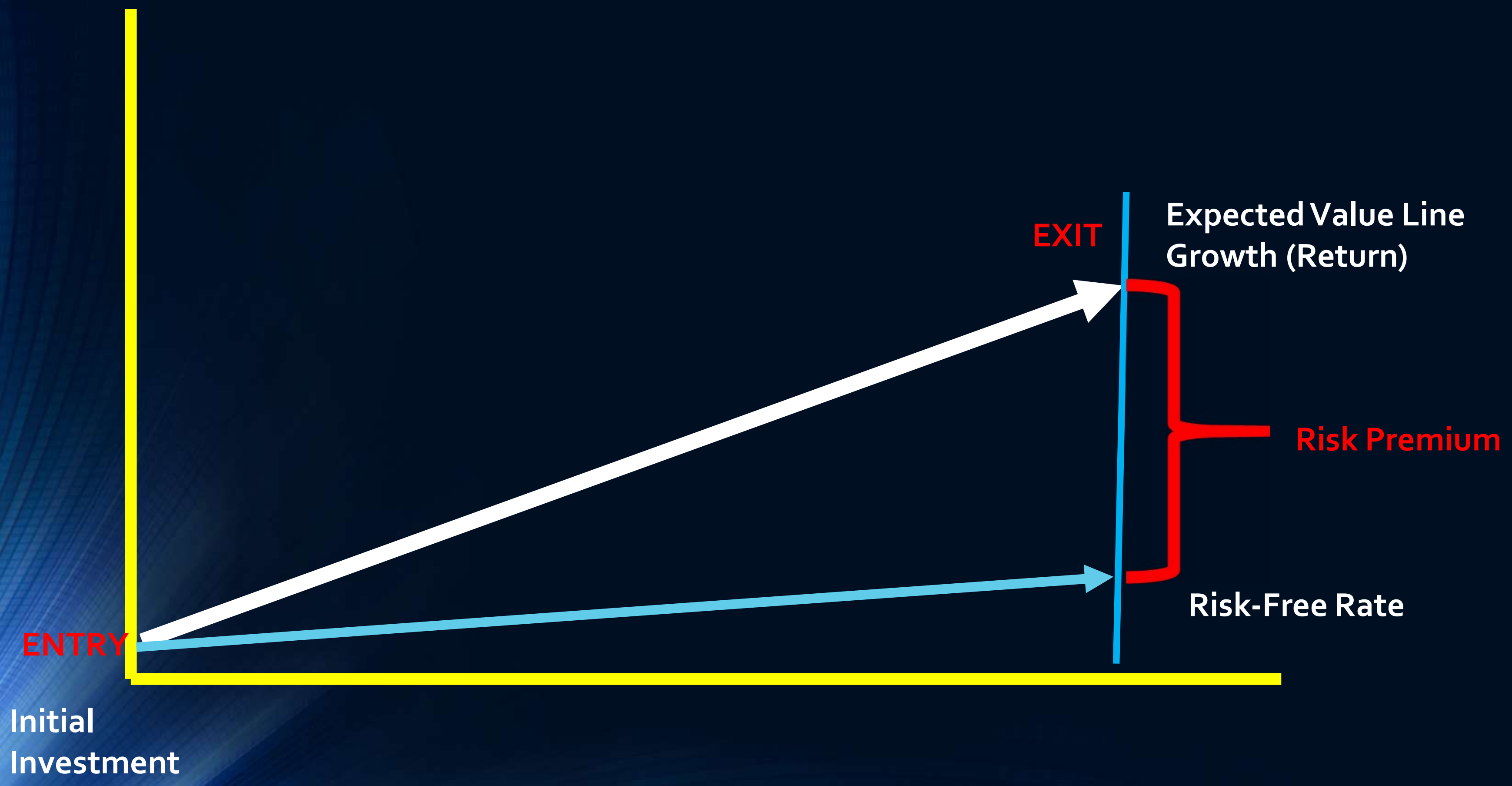
INVESTMENTS, FINANCE AND CREDIT OVERVIEW

INVESTMENTS, FINANCE AND CREDIT OVERVIEW

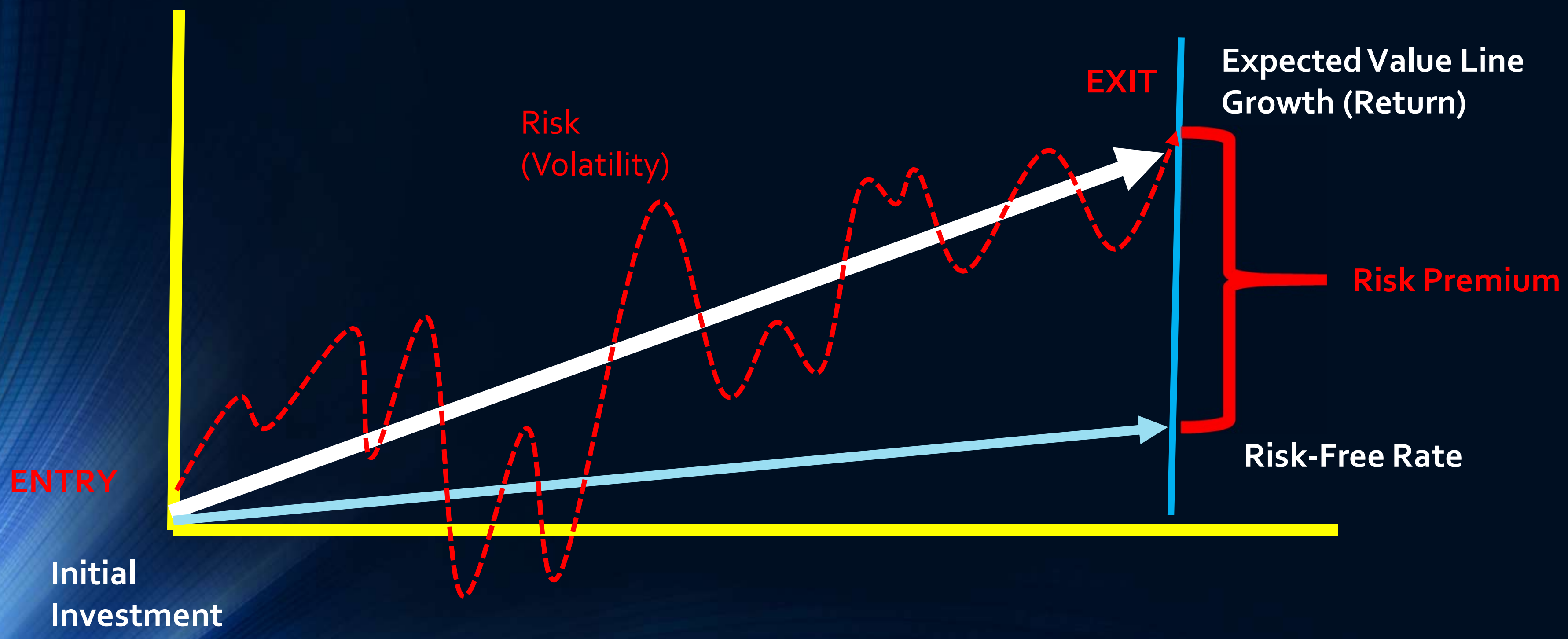
What's This? **EXPECTED VALUE LINE OF ANY INVESTMENT**



INVESTMENTS, FINANCE AND CREDIT OVERVIEW



INVESTMENTS, FINANCE AND CREDIT OVERVIEW



The Study of Finance

- 3 FACTORS BEFORE YOU **INVEST**
  - **Measure Expected Return**
  - **Quantify Risk**
  - **Set Time (Exit)**

- Buying Stocks / Buying Bonds
- Buying Assets / Equipment
- Starting a New Project
- Buying a Company
- Starting a new Company

1 more FACTOR BEFORE YOU **INVEST (discuss in detail later)**

- **Allocation / Diversifiaction**

The Study of Finance

- <u>3 FACTORS BEFORE YOU INVEST</u>
  - **Measure Expected Return**
  - **Quantify Risk**
  - **Set Time (Exit)**

<u>Game: Tossing a Coin to win $6 (Payoff):</u>

- **Measure Expected Return: $6**
- **Quantify Risk: 50/50 win/loss**
- **Time: in 2 seconds**
- **How much to Invest?**
  - **$3 - mathematically using probability theory is (50% x $6) + (50% x $0) = $3 + 0 = $3**

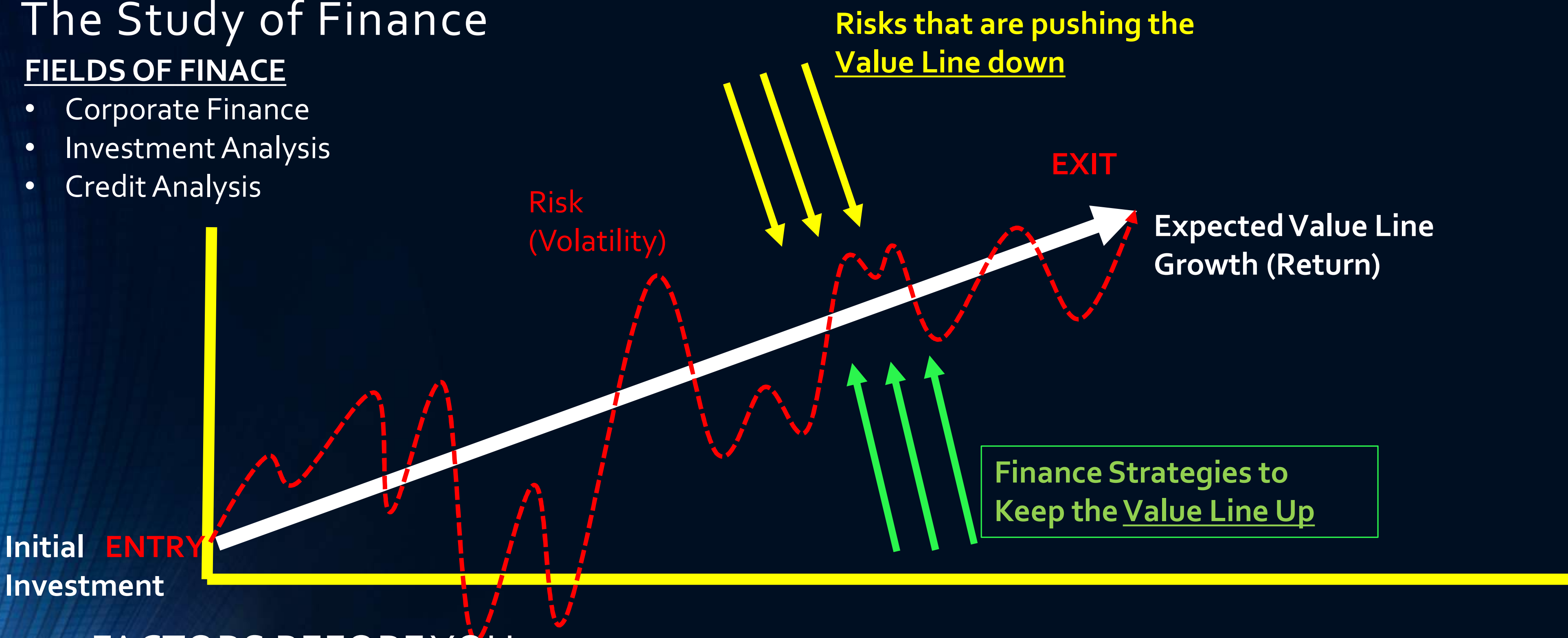
<u>Game: Tossing one dice to win $6 (Payoff):</u>

- **Measure Expected Return: $6**
- **Quantify Risk: 1/6 to win, 5/6 to lose**
- **Time: in 2 seconds**
- **How much to Invest?**
  - **$1 - mathematically using probability theory is (1/6 x $6) + (5/6 x $0) = $1 + 0 = $1**

The Study of Finance

FIELDS OF FINACE

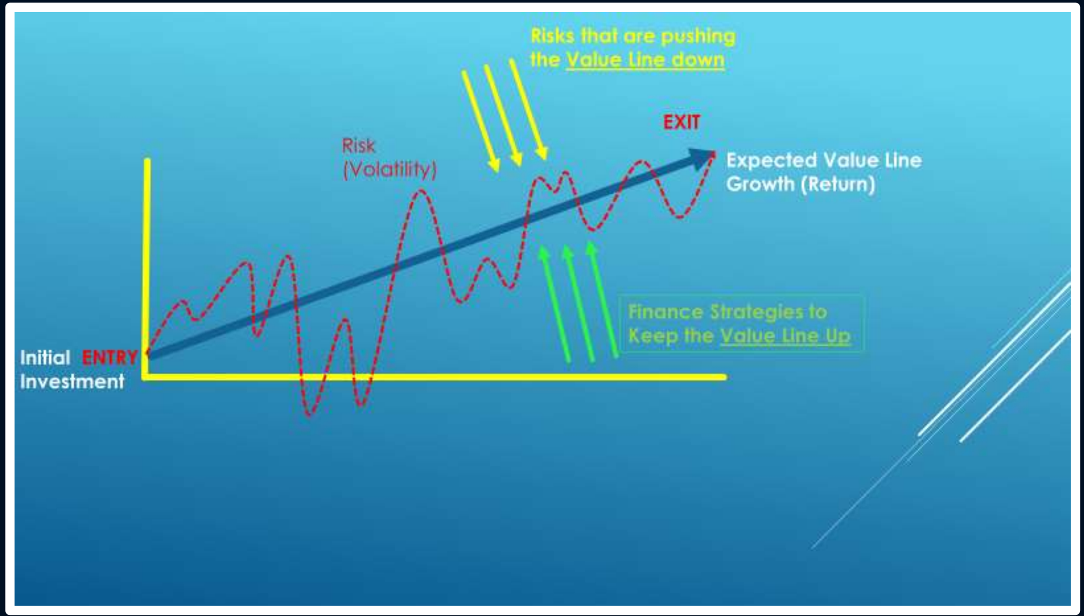
- Corporate Finance
- Investment Analysis
- Credit Analysis



- 3 FACTORS BEFORE YOU INVEST
  - **Measure Expected Return**
  - **Quantify Risk**
  - **Set Time (Exit)**

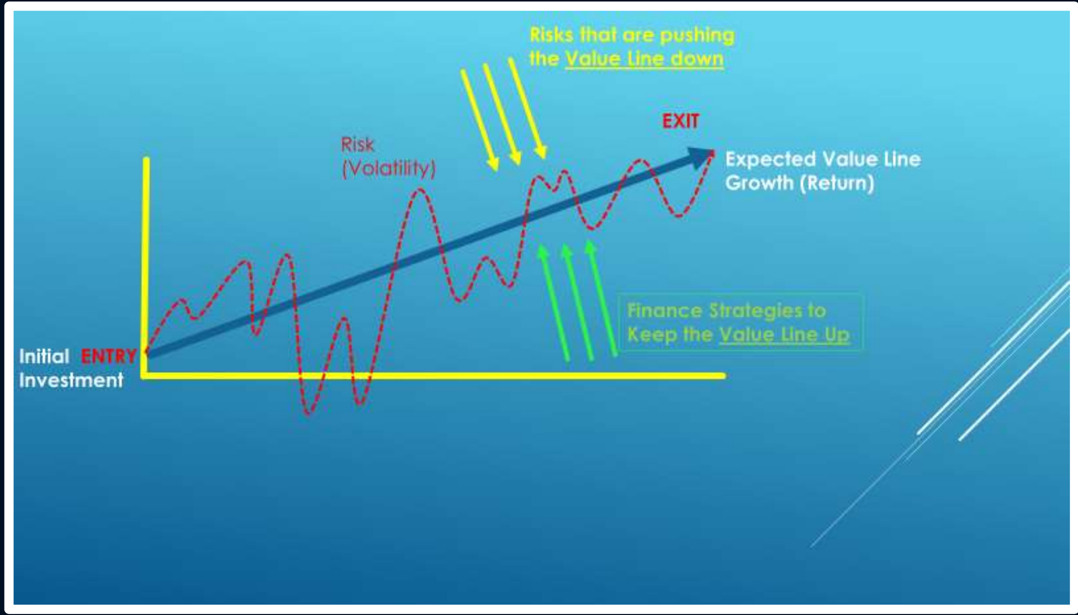
The Study of Finance

- **Corporate Finance**
  - **Risks that are pushing the Value Line Down:**
    - Economy
    - Competition
    - Government
    - Disasters
    - Other Systemic/Firm Specific Risks
  - **Strategies to Keep the Value Line Up**
    - Operating Strategies
    - Transactional Strategies
    - Financing Strategies
    - Social Responsibility



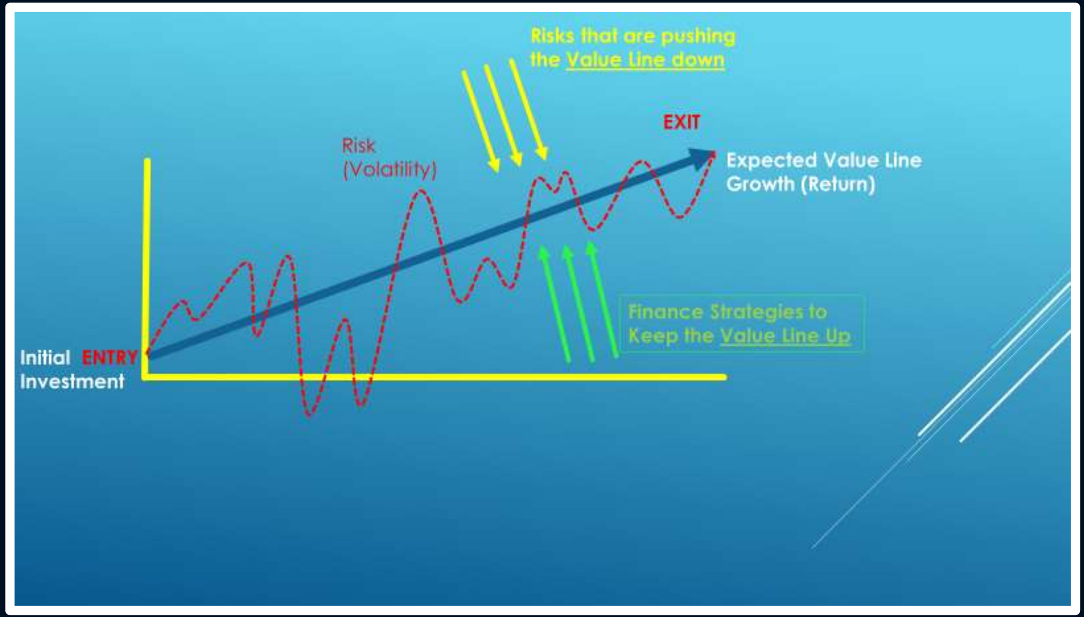
The Study of Finance

- <u>Investments</u>
  - <u>Risks that is pushing the Value Line Down:</u>
    - Economy and Markets
    - Government & Regulation
    - Liquidity
    - Other Systemic/Firm and Asset Class Specific Risks
  - <u>Strategies to Keep the Value Line Up</u>
    - Allocation/Diversification Strategies
    - Hedging Strategies (Using Derivatives)



The Study of Finance

- Credit Analysis
  - Risks that is pushing the Value Line Down:
    - Economy
    - Government
    - Other Systemic/Firm and Asset Class Specific Risks
  - Strategies to Keep the Value Line Up
    - Loan / Bond Structure
    - Debt Capacity Analysis



Chapter 1: Risk & Return Analysis

Risk & Return Analysis

- Before investing, the investor needs to consider the following four factors:
  1. Measurement of the expected return (Er)
  2. Quantification of the risk (σ)
  3. How to allocate the investments to achieve efficiency and optimization (A for Allocation)
  4. Time to determine the exit strategy or realization of the investment (t)

Time Value of Money Concepts

- One-Time Investment
- Annuities or Even Annual Cash flows
- Uneven Annual Cash Flows

One-Time Investment

FUTURE VALUE

$$\text{FV} = \text{PV}\ (1 + \text{i})^{\text{t}}$$

where FV is the future value of the investment, PV is the present value of the investment or the initial investment, i is the expected interest rate or rate of return of the investment, and t is time to realize such investment.

PRESENT VALUE

$$\text{FV} = \text{PV}\ (1 + \text{i})^{\text{t}},\ \textit{then}\ \ \text{PV} = \frac{\text{FV}}{(1+\text{i})^{\text{t}}}$$

As an example, assuming the investor targets an investment that is expected to receive $133.10 in 3 years, representing a 10% interest or expected return (sometimes referred to as the discount rate), the investment required today will be calculated as follows:

- $\text{PV} = \frac{\text{FV}}{(1+\text{i})^{\text{t}}} = \frac{133.10}{(1+.10)^{3}} = \frac{133.10}{1.331} = 100$

One-Time Investment

INTEREST RATES

If the investor knows the amount they are planning to invest today, and targets a specific investment payoff at a set time in the future, then the investor can rearrange the formula to calculate the interest (i) or discount rate that he or she will earn, as follows:

Starting at FV = PV $(1 + \mathrm{i})^{\mathrm{t}}$, *then* $(1 + \mathrm{i})^{\mathrm{t}} = \frac{\mathrm{FV}}{\mathrm{PV}}$, and

$$\mathrm{i} = \left(\frac{FV}{PV}\right)^{\frac{1}{t}} - 1$$

As an example, let's assume the investor invests $100 today and targets an investment that expects to receive $133.10 in 3 years. What will the annual rate of return be on such an investment?

$$\mathrm{i} = \left(\frac{FV}{PV}\right)^{\frac{1}{t}} - 1 = \left(\frac{133.10}{100}\right)^{\frac{1}{3}} - 1 = (1.331)^{\frac{1}{3}} - 1 = 1.10 - 1 = 0.10 = 10\%$$

One-Time Investment

TIME

If the investor knows the amount that they are planning to invest today, then sets a target payoff amount in the future and assumes a given rate of return, then he or she can calculate how long it will take to achieve the target. The time (t) to realize the targeted return is calculated by rearranging the formula as follows:

Starting at FV = PV $(1 + \mathrm{i})^{\mathrm{t}}$, *then* $(1 + \mathrm{i})^{\mathrm{t}} = \frac{\mathrm{FV}}{\mathrm{PV}}$, then adding ln on both sides, you get $\ln\,(1 + \mathrm{i})^{\mathrm{t}} = \ln(\frac{\mathrm{FV}}{\mathrm{PV}})$, $t\,[\ln(1 + i)] = \ln(\frac{\mathrm{FV}}{\mathrm{PV}})$, *and*

$$t = \frac{ln\,(\frac{FV}{PV})}{ln(1+i)}$$

- As an example, assume the investor invests $100 today and wants to find out how long it will take for the investment to reach $133.10 if invested at an annual rate of return of 10%. The time to reach the targeted future value of such investment is calculated as follows:
- $t = \frac{ln\,(\frac{FV}{PV})}{ln(1+i)} = \frac{ln\,(\frac{133.10}{100})}{ln(1+0.10)} = \frac{ln\,(\frac{133.10}{100})}{ln(1+0.10)} = \frac{ln\,(1.331)}{ln(1.100)} = \frac{0.2859}{0.0953} = 3 \text{ years}$

Annuities or Even Annual Cash flows

FUTURE VALUE

FVA = CF + CF (1 + i) + CF (1 + i) (1 + i), or FVA = CF ($\frac{\mathbf{(1+\mathit{i})^{\mathit{t}}-1}}{\boldsymbol{i}}$)

For example, if an investor invests $100 per year for 3 years and expects a 10% rate of return, then the value of such investment when it is cashed out in 3 years will be calculated as follows:

FVA = CF ($\frac{(1+i)^t-1}{i}$) $= 100\left(\frac{(1+0.10)^3-1}{.10}\right) = 100\left(\frac{(1.10)^3-1}{.10}\right) =$

$100\left(\frac{1.331-1}{.10}\right) = \ 331.00$

Annuities or Even Annual Cash flows

PRESENT VALUE

The present value of an annuity (PVA) can be calculated as follows:

PVA = $\frac{CF}{(1+i)^1} + \frac{CF}{(1+i)^2} + \frac{CF}{(1+i)^3} + \ldots\ldots + \frac{CF}{(1+i)^n}$, or PVA = **CF** $[\frac{1-\frac{1}{(1+i)^t}}{i}]$

For example, if an investor expects to receive $100 per year for 3 years, then what is the present value for an investment if the investor expects to receive a 10% annual rate of return? The calculation of the present value of such an investment is as follows:

PVA = CF $[\frac{1-\frac{1}{(1+i)^t}}{i}] = 100\ [\frac{1-\frac{1}{(1+.10)^3}}{.10}] = 100\ [\frac{1-\frac{1}{1.331}}{.10}] = 248.69$

Uneven Annual Cash Flows

- If the investment expected to produce uneven annual cash flows to the investor, called payments, for a set time, using the same expected rate of return, then the investment is calculated differently. The present value of such cash flows is the sum of all the future cash flows discounted back at a given expected rate of return, as follows:
- PV = $\frac{CF_1}{(1+i)^1} + \frac{CF_2}{(1+i)^2} + \frac{CF_3}{(1+i)^3} + \cdots \frac{CF_t}{(1+i)^t} \ldots . PV = \sum \frac{CF_t}{(1+i)^t}$
- For example, if an investor expects to receive \$95 the first year, \$92 the second year, and \$105 the third year, what is the present value for such an investment if the investor expects a 10% annual rate of return? The calculation of the present value of such investment is as follows:
- PV = $\frac{CF_1}{(1+i)^1} + \frac{CF_2}{(1+i)^2} + \frac{CF_3}{(1+i)^3} = \frac{95}{(1+0.10)^1} + \frac{92}{(1+1.10)^2} + \frac{105}{(1+1.10)^3} =$
- $86.36 + 76.03 + 78.89 = 241.28$

Excel based formulas:

Excel formulas for calculating all five variables including the present value, future value, rate of return, time and cash flows or payments (represent set additional payments received during the investment):

= PV (rate, years, payment, future value) or *=pv(rate,nper,pmt,fv)*

=FV (rate, years, payment, -present value) or *=fv(rate,nper,pmt,pv)*

=Rate (years, payment, - present value, future value) or *=rate(nper,pmt,pv,fv)*

=Nper (rate, payment, - present value, future value) or *=nper(rate,pmt,pv,fv)*

= Pmt (rate, years, -present value, future value) or *=pmt(rate,nper,pv,fv)*

Measuring Return and Return Expectation

- Before you invest your money in any securities or any businesses, it’s extremely important to consider and must measure the following four factors:
  1. **Return expectation**
  2. **Risk**
  3. **Allocation**
  4. **Time**

Objective of Return and Return Expectation

- As discussed previously, it is essential to measure the historical returns of a particular asset class and then set an expectation going forward based on various methods that we will examine in this section. The return analysis objectives are as follows:

  - **Trend Analysis**: To compare the return analysis to historical trends of the particular investment, project the trend going forward, and adjust such trends based on views for driving such investment
  - **Comparative Analysis**: To compare it to other asset classes and/or the market, and/or the risk-free rate.
  - **Expectation Analysis:** To compare it to last year's expectations and continue to test the performance versus expectation

Rates of Return: Holding Period Return (HPR)

HPR = $\frac{\text{CF}}{\text{I}}$

where CF is the cash flow (inflow and outflow) during the investment period and I is the initial investment.

For example, if an investor buys the stock for $100 and sells it for $120 and during the investment he or she received $2 in dividends, then the cash flow on the numerator is $120 of proceeds for selling the stock plus $2 of cash dividends received (cash inflow) minus the initial investment of $100 (cash outflow), and the net cash flow is $22 = ($120 + $2 - $100). The HPR will be then be calculated by dividing the net cash flow of $22 by the initial investment of $100 resulting in a 22% return:

$$\frac{(120 - 100 + 2)}{100} = \frac{22}{100} = 0.22 = 22\%$$

Rates of Return:
Annual Rate of Return (ROR) and Internal Rate of Return (IRR)

The more challenging calculation is if the payment is different every year, so the annual rate of return must be weighted based on size and the year paid sometime referred to as dollar weighted return. This type of rate return method is the internal rate of return. It’s challenging because each year the investment would have different payoffs and sometimes negative numbers. The best approach to calculate the IRR is using spreadsheet analysis. The formula on excel is as follows:

$=IRR(CF_0, CF_1, CF_2, CF_3 \ldots CF_t)$.

Rates of Return: Annual Rate of Return (ROR) and Internal Rate of Return (IRR)

INTERNAL RATE OF RETURN (IRR)

Dollar Weighted Return (Even Annual Payments)

	0	1	2	3	4
Net CF ($)	-100	5	5	5	105

EXCEL

	A	B	C	D	E	F
10	IRR	0	1	2	3	4
11	5.00%	-100	5	5	5	105

=IRR(B11:F11)

Dollar Weighted Return (Uneven Annual Payments)

	0	1	2	3	4
Net CF ($)	-100	-9	-5	26	110

1 = + (-0.1 / (1+IRR) + (-0.5 / (1+ IRR) ^2 + (0.8 / (1+ IRR)^3) + (1.0 / (1+IRR)^4

EXCEL

	A	B	C	D	E	F
10	IRR	0	1	2	3	4
11	4.96%	-100	-9	-5	26	110

=IRR(B11:F11)

Figure 1.1

Measuring Return and Quantifying Risk

- **Rate of Return: Average Annual Rate of Return**

  The average annual rate of return can be calculated by looking at 5 to 10 years of historical returns and averaging them to represent the annual return. It gives the investor an indication what to expect on an average. This method is used for comparing to other investments that were calculated the same way and by taking this number to the next level of assessment of volatility in the return as compared to the average on a given year.

- **Rate of Risk: Standard Deviation of Periodic Returns**

  The expected return on a risky asset such stocks and bonds depend on systematic risk, such as the overall market movements, and unsystematic risk or portfolio-specific risk. We will examine later in detail how the unsystematic or idiosyncratic risk can be minimized or eliminated through diversification. First, it's important to examine the relationship between the rate of return and risk such as volatility, or the standard deviation of these returns. There are two methods of calculating the risk-return: historical analysis and scenario analysis.

Measuring Return and Quantifying Risk

Historical Analysis Method

HISTORICAL RETURN ANALYSIS

PORTOLIO A

Year	ROR	Deviation to return (X-Avg(X))	SQR Deviation
1	12.9%	3.0%	0.089%
2	31.3%	21.4%	4.571%
3	5.0%	-4.9%	0.242%
4	-2.0%	-11.9%	1.421%
5	2.0%	-7.9%	0.627%
6	22.0%	12.1%	1.459%
7	12.0%	2.1%	0.043%
8	12.0%	2.1%	0.043%
9	-5.0%	-14.9%	2.226%
10	9.0%	-0.9%	0.008%
Total	99.2%		10.730%

Observations=	10	n
Average =	**9.920%**	Total ROR / n
Variance =	1.192%	Sqr Dev/ (n - 1)
Standard Dev.=	**10.92%**	

PORTOLIO B

Year	ROR	Deviation to return (X-Avg(X))	SQR Deviation
1	19.9%	10.0%	0.996%
2	15.0%	5.1%	0.258%
3	8.0%	-1.9%	0.037%
4	-11.0%	-20.9%	4.376%
5	7.0%	-2.9%	0.085%
6	14.0%	4.1%	0.166%
7	24.0%	14.1%	1.982%
8	20.0%	10.1%	1.016%
9	-5.4%	-15.3%	2.347%
10	7.7%	-2.2%	0.049%
Total	99.2%		11.314%

Observations=	10	n
Average =	**9.920%**	Total ROR / n
Variance =	1.257%	Sqr Dev/ (n - 1)
Standard Dev.=	**11.21%**	

Figure 1.2

Measuring Return and Quantifying Risk

Scenario Analysis Method

S T O C K S

SCENARIO PERFROMANCE ANALYSIS

Stocks (s)

Scenario (s)	Probability (p)	ROR % (r_s)	p * r_s %	Deviation for Exp. Ret. (Dev.)	Square Deviation (SD) Dev^2	p * SD
Recession (Sr)	**25.0%**	**-12.00**	-3.00	-23.70	561.69	140.42
Normal (Sn)	**45.0%**	**14.00**	6.30	2.30	5.29	2.38
Boom (Sb)	**30.0%**	**28.00**	8.40	16.30	265.69	79.71
	100.0%		**11.70** %		**Variance=**	**222.51**
					SD =	**14.92** %

Figure 1.3

B O N D S

SCENARIO PERFORMANCE ANALYSIS

Bonds (b)

Economic Scenario (s)	Probability (p)	ROR % (r_b)	p * r_b %	Deviation for Exp. Ret. (Dev.)	Square Deviation (SD) Dev^2	p * SD
Recession	**25.0%**	**14.00**	3.50	9.75	95.06	23.77
Normal	**45.0%**	**5.00**	2.25	0.75	0.56	0.25
Boom	**30.0%**	**-5.00**	-1.50	-9.25	85.56	25.67
	100.0%		**4.25** %		**Variance=**	**49.69**
					SD =	**7.05** %

Figure 1.4

Return, Return Expectation, Risk and Allocation

Return:

Then the combined portfolio shown in figure 1.5 consisting of 60% stock and 40% bonds shows an expected combined return, variance, and standard deviation of 8.72%, 38.99% or .39x, and 6.24%, respectively. As expected, as we moved from the stock portfolio of 100% to a portfolio of 60% stock and 40% bonds, the return is calculated at 8.72% measured as

(Ws . Rs) + (Wb . Rb) = = (.60) (11.70%) + (.40) (4.25%) = 7.02% + 1.7% = 8.72%

Risk:

The Risk is measured by the amount of volatility needed to achieve the expected returns. The volatility is basically the variance and standard deviation of the historical rate change of the stocks during the 3 scenarios. The formulas areas follows:

Variance = $\sigma_P^2 = w_s^2\sigma_s^2 + w_b^2\sigma_b^2 + 2w_s\sigma_s w_b\sigma_b\rho$

Standard Deviation = $\sigma_P = \sqrt{(}w_s^2\sigma_s^2 + w_b^2\sigma_b^2 + 2w_s\sigma_s w_b\sigma_b\ \rho)$

Measuring Return and Quantifying Risk

Scenario Analysis Method

PORTFOLIO ANALYSIS (Asset Allocation)

Asset Allocation	Weights (W%)
Stocks (Ws) =	60%
Bonds (Wb) =	40%

(Ws * rs) + (Wb * rb)

Scenario (s)	Probability (p)	ROR % (rs)	p * rs %	Deviation for Exp. Ret. (Dev.)	Square Deviation (SD) Dev^2	p * SD
Recession (Sr)	25.0%	-1.6	-0.40	-10.32	106.50	26.63
Normal (Sn)	45.0%	10.4	4.68	1.68	2.82	1.27
Boom (Sb)	30.0%	14.8	4.44	6.08	36.97	11.09
	100.0%		8.72 %		Variance=	38.99
					SD =	6.24 %

Figure 1.5