

Total Returns Broken Down

- Asset classes and the different names for income returns.
- Total, capital and income returns.
- Inflation, real and nominal returns.
- Book versus market values.
- Business decisions.
- Limited liability.

(CD's) and promissory notes (PN's) generally only pay principal, there are no periodic payments.

There are other important investable asset classes, such as human capital including education, which is also very valuable and which we are all heavily investing in, but its returns are not easily measured so we exclude them from our discussion.

Derivatives such as options, futures, forwards and swaps are not usually considered an investable asset class. They are quite different because they are mostly used for hedging (reducing risk and return) and speculating (gaining risk and return), not as a store of value. They tend to be short-term instruments and their value is often derived from the 3 main investable asset classes.

Asset Classes

The main investable asset classes are:

- Equity, also known as stocks and shares. Dividends are the periodic cash income from equity.
- Property such as real estate (land or buildings) and equipment. Rent is the periodic cash income from property.
- Debt, which is usually divided into:
 - Long term debt such as bonds or loans. Coupons are the periodic cash income from bonds. Loan payments are the periodic cash income from loans. Both bonds and loans pay the principal or face value at maturity.
 - Short term debt with a maturity of less than 1 year such as bank accepted bills (BAB's), certificates of deposit

Income, Capital and Total Returns

Total returns on stocks, bonds, real estate, and any asset can be broken into two parts, the income return and the capital return.

Income return is the proportion of the asset's price that is paid out in cash per time period.

$$r_{income,0-1} = \frac{C_1}{P_0}$$

Where C_1 is the cash flow at $t=1$ and P_0 is the price at $t=0$.

The cash flow income:

- from equity is called dividends or drawings,
- from debt is called coupon or loan payments,
- from real estate is rent.

Capital return is the rate of increase in the asset's price per time period.

$$r_{capital,0-1} = \frac{P_1 - P_0}{P_0}$$

When a dividend is paid (actually when the ex-dividend date occurs), the stock price falls. Therefore, all things remaining equal, dividends (income returns) come at the expense of price (capital returns).

Total return is the sum of the income and capital returns.

$$\begin{aligned} r_{total,0-1} &= r_{capital,0-1} + r_{income,0-1} \\ &= \frac{P_1 - P_0}{P_0} + \frac{C_1}{P_0} = \frac{P_1 - P_0 + C_1}{P_0} \end{aligned}$$

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Calculation Example: Components of Returns

Question: A stock was bought for \$10 at t=0.

At t=1 the stock paid a dividend of \$1 and immediately afterwards the price of the stock was \$9.50.

At t=2 the stock paid no dividend and its price was \$12.

All time periods are measured in years.

Find the total, dividend and capital returns of the stock over the first and second years.

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Answer:

Over the first year (from t=0 to t=1):

$$r_{income,0-1} = \frac{C_1}{P_0} = \frac{1}{10} = 0.1 = 10\%$$

$$r_{capital,0-1} = \frac{P_1 - P_0}{P_0} = \frac{9.50 - 10}{10} = -0.05 = -5\%$$

$$\begin{aligned} r_{total,0-1} &= r_{income,0-1} + r_{capital,0-1} \\ &= 0.1 + -0.05 = 0.05 = 5\% \end{aligned}$$

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Over the second year (from t=1 to t=2):

$$r_{income,1-2} = \frac{C_2}{P_1} = \frac{0}{9.50} = 0 = 0\%$$

$$r_{capital,1-2} = \frac{P_2 - P_1}{P_1} = \frac{12 - 9.50}{9.50} = 0.263157895 = 26.32\%$$

$$\begin{aligned} r_{total,1-2} &= r_{income,1-2} + r_{capital,1-2} \\ &= 0 + 0.263157895 \\ &= 0.263157895 = 26.32\% \end{aligned}$$

Note that all of these returns are effective annual rates.

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Questions: Income and Capital Returns

<http://www.fightfinance.com/?q=476,490,478,508,477,136,151,21,404>.

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Inflation, Nominal and Real Returns

Inflation is the increase in the general level of prices in an economy.

Positive inflation reduces the buying power of money.

Nominal returns measure proportional dollar increases in wealth. Most returns or interest rates quoted by banks are nominal rates. Assume that all rates are nominal unless specifically stated.

Real returns measure proportional increases in the *buying power* of your wealth (in goods or services such as apples). Gross Domestic Product (GDP) growth is one of few rates that economists normally quote as a real rate rather than a nominal rate.

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Fisher Formula Converts Nominal to Real

The approximate version of the Fisher equation is easy to remember but is not exact (\approx means approximately equal to):

$$r_{real} \approx r_{nominal} - r_{inflation}$$

The exact Fisher equation is: $1 + r_{real} = \frac{1 + r_{nominal}}{1 + r_{inflation}}$

Note: The rates used in these equations should be effective rates, not APR's.

The Fisher equations only work with the total or capital returns, they don't work with the income (dividend or rental) returns. To find the real income return, you can discount the income cash flow by the inflation rate.

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Calculation Example: Inflation Erodes Nominal Wealth

Question: You currently have \$100 in a bank deposit paying 8% pa interest. Apples currently cost \$1 each at the shop and inflation is 3% pa which is the expected apple price growth rate. Find the missing variables **V**, **P**, **n** and **r_{real}** in 1 and 2 years.

Wealth in Dollars and Apples						
Time (years)	Bank account wealth (\$)	Apple price (\$/apple)	Wealth in apples (apples)	r _{nominal} (pa)	r _{inflation} (pa)	r _{real} (pa)
0	100	1	100			
1	V ₁	P ₁	n ₁	0.08	0.03	r _{real 0→1}
2	V ₂	P ₂	n ₂	0.08	0.03	r _{real 1→2}

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Answer: Let's work out the figures at time 2.

Bank wealth $V_{T \text{ nominal}}$ grows by the 8% pa nominal interest rate:

$$V_{T \text{ nominal}} = V_0 \cdot (1 + r_{\text{nominal}})^T$$

$$V_{2 \text{ nominal}} = 100 \times (1 + 0.08)^2 = 116.64$$

The apple price $P_{T \text{ nominal}}$ grows by the 3% pa inflation rate:

$$P_{T \text{ nominal}} = P_0 \cdot (1 + r_{\text{inflation}})^T$$

$$P_{2 \text{ nominal}} = 1 \times (1 + 0.03)^2 = 1.0609$$

The number of apples n_T at time 2 equals nominal bank wealth divided by the nominal apple price:

$$n_T = \frac{V_{T \text{ nominal}}}{P_{T \text{ nominal}}}$$

$$n_2 = \frac{116.64}{1.0609} = 109.9443868 \text{ apples, a measure of real wealth.}$$

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Use the exact Fisher formula to find $r_{\text{real } 1 \rightarrow 2}$:

$$1 + r_{\text{real}} = \frac{1 + r_{\text{nominal}}}{1 + r_{\text{inflation}}}$$

$$1 + r_{\text{real } 1 \rightarrow 2} = \frac{1 + 0.08}{1 + 0.03}$$

$$r_{\text{real } 1 \rightarrow 2} = \frac{1.08}{1.03} - 1 = 0.048543689$$

Wealth in Dollars and Apples						
Time (years)	Bank account wealth (\$)	Apple price (\$/apple)	Wealth in apples (apples)	r_{nominal} (pa)	$r_{\text{inflation}}$ (pa)	r_{real} (pa)
0	100	1	100			
1	108	1.03	104.8544	0.08	0.03	0.048544
2	116.64	1.0609	109.9444	0.08	0.03	0.048544

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Notice that the real return between time 1 and 2 can also be found by calculating the growth rate of your wealth in apples:

$$r_{\text{real } 1 \rightarrow 2} = \frac{n_2}{n_1} - 1 = \frac{109.9443868}{104.8543689} - 1 = 0.048543689$$

This makes sense since your wealth in apples is a real measure of wealth.

Wealth in Dollars and Apples						
Time (years)	Bank account wealth (\$)	Apple price (\$/apple)	Wealth in apples (apples)	r_{nominal} (pa)	$r_{\text{inflation}}$ (pa)	r_{real} (pa)
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Confusion: The Term 'Nominal' is Ambiguous

Be aware that Annualised Percentage Rates (APR's) are also sometimes called 'nominal rates' even though they have nothing to do with the concept of inflation.

This is very confusing. In these notes, when a 'nominal rate' is mentioned, it means a rate that is not adjusted for inflation.

Unfortunately many writers do not explicitly specify which definition of 'nominal' they are using so you have to infer the meaning based on the context.

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Calculation Example: Inflation and Returns

Question:

Fred bought an investment property for \$500,000 (t=0).

He rented it for one year at \$30,000 paid at the end of the year (t=1). He sold it at the end of that year for \$520,000 (t=1).

Over that time the Consumer Price Index (CPI) rose from 110 to 123.2.

What were the nominal and real total, capital and income returns on the investment property?

Note that since the rent and sale prices weren't stated as being real, you would assume that they are nominal amounts.

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These are all effective annual rates, and they are also **nominal** rates of return since they haven't been reduced by inflation. To find the real rate of return, we first find the inflation rate from the consumer price index (CPI).

$$CPI_0 = \frac{CPI_T}{(1 + r_{inflation})^T}$$

$$110 = \frac{123.2}{(1 + r_{inflation})^1}$$

$$r_{inflation} = \frac{123.2}{110} - 1 = 0.12$$

which is a 12% effective annual rate.

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Answer: For the nominal total, capital and income (rental) returns:

$$\begin{aligned} r_{total\ nominal} &= r_{capital\ nominal} + r_{income\ nominal} \\ &= \frac{P_1 - P_0}{P_0} + \frac{C_1}{P_0} \\ &= \frac{520,000 - 500,000}{500,000} + \frac{30,000}{500,000} \\ &= 0.04 + 0.06 \\ &= 0.1 \end{aligned}$$

The nominal capital return was 4%, the nominal income return 6%, and the total nominal return was 10% over the past year.

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We can use the Fisher equation to find the real total and capital returns on the property. For the total real return:

$$1 + r_{total\ real} = \frac{1 + r_{total\ nominal}}{1 + r_{inflation}}$$

$$1 + r_{total\ real} = \frac{1 + 0.1}{1 + 0.12}$$

$$\begin{aligned} r_{total\ real} &= \frac{1 + 0.1}{1 + 0.12} - 1 \\ &= -0.017857143 \\ &= -1.786\% \end{aligned}$$

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So the investment property was actually not a great investment since its real total rate of return was negative.

However, if Fred didn't buy the property and just kept his cash under his bed, he would have had a real return of -10.714%: $(=(1+0)/(1+0.12)-1)$.

This is because the prices of a typical consumers' "basket of goods and services" would have risen by 12% over the year.

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To find the real capital return we use the Fisher equation:

$$1 + r_{capital\ real} = \frac{1 + r_{capital\ nominal}}{1 + r_{inflation}}$$

$$1 + r_{capital\ real} = \frac{1 + 0.04}{1 + 0.12}$$

$$\begin{aligned} r_{capital\ real} &= \frac{1 + 0.04}{1 + 0.12} - 1 \\ &= -0.071428571 \end{aligned}$$

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To find the real income or rental return, we **can't** use the Fisher equation. There are two ways to do it:

Method 1 for real income return:

$$r_{total\ real} = r_{capital\ real} + r_{income\ real}$$

$$-0.017857143 = -0.071428571 + r_{income\ real}$$

$$\begin{aligned} r_{income\ real} &= -0.017857143 + 0.071428571 \\ &= 0.053571428 \end{aligned}$$

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Method 2 for real income return:

$$\begin{aligned} r_{income\ real} &= \frac{C_1\ real}{P_0} \\ &= \frac{\left(\frac{C_1\ nominal}{(1 + r_{inflation})^1} \right)}{P_0} \\ &= \frac{\left(\frac{30,000}{(1 + 0.12)^1} \right)}{P_0} \\ &= \frac{26,785.71429}{500,000} \\ &= 0.053571428 \end{aligned}$$

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Notice that the income return is barely affected by inflation, but the total and capital returns are.

Another interesting thing is that the real total return (-1.179%) is approximately equal to the nominal total return minus inflation -2% (= 10% - 12%). Similarly for the real capital return.

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Questions: Inflation

<http://www.fightfinance.com/?q=278,295,456,353,363,407,155>.

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Book Values, Market Values and the Balance Sheet

The 'balance sheet', also called the 'statement of financial position', shows how the book value of assets (A) equals the book value of liabilities (L) plus the book value of owners equity (OE):

$$A = L + OE$$

The finance version is very similar, but it uses market values instead of book values. The market value of assets (V) equals the market value of debt (D) plus the market value of equity (E):

$$V = D + E$$

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Book Values: $A = L + OE$

Book values are accounting figures usually taken from a balance sheet, also known as the statement of financial position. Since most balance sheet items are recorded at historical cost, book values are:

- + accurate when first recorded, but
- old, stale and out of date.

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Market Values: $V = D + E$

Market value is the current price that an asset is actually traded at. If the asset was sold, then the market value would be the cash flow received. Market values are:

- + timely and useful but
- can be difficult and costly to measure, especially if the asset is illiquid (doesn't trade often). Also,
- if the market price can't be observed, then estimation is needed which is inaccurate.

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Book Value of Equity (OE)

$OE = \text{Contributed equity} + \text{retained profits} + \text{reserves}$

The book value of equity (OE) is 'Contributed Equity' plus 'Retained Profits' plus 'Reserves'.

- **Contributed Equity** is the amount of shares first bought when the company floated or had its IPO (Initial Public Offering). Other names included paid-up capital or shareholders' equity.
- **Retained Profits** is the accumulation of net income less dividends since the IPO.
- **Reserves** includes things like Asset Revaluation Reserve and Foreign Currency Translation Reserve.

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Market Value of Equity (E)

$E = \text{share price} \times \text{number of shares outstanding}$

$$= P_{\text{share}} \times n_{\text{shares}}$$

The market value of equity (E) is the share price trading on the ASX multiplied by the total number of shares outstanding.

The market value of equity is also called the market capitalisation of equity or just 'market cap'.

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Contrasting Book and Market Values of Equity

When a new firm first floats its shares in an initial public offering (IPO), the book value of equity will equal the market price.

But after the moment when the shares are first sold in the IPO, then the market value of equity will go up and down as the stock is traded on the exchange.

The book value of equity will only change when the firm makes a profit (or loss) and increases its retained profits or when the firm raises more contributed equity in a rights issue or other form of capital raising.

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If a firm (the acquirer) wants to take over another firm (the target), it will have to buy all of the target firm's equity, or at least a controlling stake. The acquirer will have to pay the market value of equity to the target firm's shareholders, which is often much higher than the book value.

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Equity Value of Just Jeans Group

Just Jeans' is a retail clothing company that had a \$4.00 share price in July 2008, and 201 million shares outstanding.

Just Jeans' market value of equity was:

$$\begin{aligned} E &= \text{share price} \times \text{number of shares outstanding} \\ &= \$4 \times 201m = \$804m \end{aligned}$$

From its detailed online financial statements, the book value of equity was:

$$\begin{aligned} \text{OE} &= \text{Contributed Equity} + \text{Retained Profits} + \text{Reserves} \\ &= \$14m + -\$8m + \$51m \\ &= \$57m \end{aligned}$$

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Equity Value of Just Jeans Group - Takeover

In March 2008 Premier Investments (PMV) launched a hostile take-over bid for Just Jeans, offering a price of around \$4.10 per share. Prior to the takeover bid the Just Jeans share price was trading at around \$3.30.

In September 2008 PMV completed the takeover. They paid around \$4.25 per share. This shows that it is the market cap of equity, not the book value, which determines the actual price of a company's shares.

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Calculation Example: Asset, Debt and Equity Valuation from Market Prices

A mining company is funded by:

- 100,000 bonds which currently trade in the over-the-counter (OTC) debt markets for \$60 each.
- 4 million shares which currently trade on the stock exchange for \$1 each.

Question: A big private equity fund would like to buy all of this mining firm's assets, including its machinery, land, brand name, intellectual capital and everything. What is the fair price of all of its assets? Assume that no premium is offered.

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Answer: The value of the mining firm's assets is the value of the debt and equity that fund the assets. This can be calculated as:

$$V = D + E$$

$$\begin{aligned} &= n_{bonds} \cdot P_{bond} + n_{shares} \cdot P_{share} \\ &= 100,000 \times \$60 + 4,000,000 \times \$1 \\ &= \$6m + \$4m \\ &= \$10m \end{aligned}$$

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Questions: Book and Market Values Of Equity

<http://www.fightfinance.com/?q=473,482,467,461>,

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Question: A private equity fund would like to pay the minimum amount necessary to control the majority of all shareholder votes of the target mining firm. How much will this cost? Assume that no premium is offered.

Answer:

The private equity firm will need at least 50% of the shareholder votes, so it will need to buy at least half of the shares:

$$\begin{aligned} 0.5 \times E &= 0.5 \times n_{shares} \times P_{share} \\ &= 0.5 \times 4m \times \$1 \\ &= \$2m \end{aligned}$$

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Balance Sheet Equations

The balance sheet can be represented as an equation:

$A = L + OE$ in book values or $V = D + E$ in market values.

Book total assets (A) can be broken into:

- Current assets (CA) such as cash, inventory and accounts receivable (or trade debtors) which are generally expected to last for less than one year.
- Non-current assets (NCA) such as property, plant and equipment (PPE), copyrights, patents, deferred tax assets and other things which last for more than one year.
- $A = CA + NCA$

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Similarly for total liabilities (L) which can be broken into:

- Current liabilities (CL) such as short term loans including overdrafts, accounts payable (or trade creditors), which generally must be paid in less than one year.
- Non-current liabilities (NCL) such as bonds, loans and deferred tax liabilities which last for more than one year.
- $L = CL + NCL$

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Business Decisions

Most of the business decisions are related to the balance sheet:

$A = L + OE$ in book values or $V = D + E$ in market values.

The book assets and liabilities can be broken into their current and non-current parts:

$CA + NCA = CL + NCL + OE$

Investment decision: Which assets (V or A) to buy?

Financing decision: Which type of funding (L or OE)?

Working capital decision: How much working capital ($CA - CL$)?

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Payout policy decision: How much to pay out to equity holders (OE) in the form of dividends and buybacks (also called repurchases)?

The investment decision is the most important. The idea is to accept the most positive net present value (NPV) projects since that will maximise the business's market value of assets (V) and therefore also maximise shareholders' wealth.

Throughout the course we'll be looking at all of these decisions.

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Questions: Business Decisions

<http://www.fightfinance.com/?q=444,446,445,447,443>.

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Business Structures

There are three main forms of business structure which are:

- Sole trader, who is the sole equity owner.
- Partnership, where two or more partners own the equity in the business.
- Corporation, also called a company or a firm, where shareholders own the equity in the business.

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Unlimited liability: Sole Traders and Partners

Sole traders and partners have unlimited liability.

It's possible for them to be sued and lose not only all of their business assets, but their personal assets as well.

Sole traders and partners face unlimited potential losses on their equity. So the lowest possible equity price is negative infinity ($-\infty$) and the lowest possible return on equity is also negative infinity ($-\infty$).

There is also no limit on how high the equity price and return could be, each has no limit (positive infinity, ∞).

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$$-\infty < E_{\text{sole traders and partners}} < \infty$$

$$-\infty < r_{E, \text{sole traders and partners}} < \infty$$

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Calculation Example: Unlimited liability

Question: Bob just began running a courier business as a sole trader. The business's only asset is a delivery van worth \$100,000, funded by equity. The business has no debt.

Bob's personal assets are the \$100,000 equity in the courier business and his \$500,000 house. He has no personal debt.

On his first day, Bob accidentally crashes his delivery van into a Ferrari sports car. Both the Ferrari and delivery van are totally written off. The Ferrari driver demands payment of \$800,000 as compensation. Bob has no insurance.

Calculate Bob's return on his business's equity assuming that he does not declare personal bankruptcy.

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Answer: Since he's a sole trader he has unlimited personal liability.

Bob's business's assets are worthless since the van is a write-off. Therefore to pay the \$800,000 compensation to the Ferrari driver, he'll have to sell his personal asset which is his house for \$500,000.

To avoid paying the remaining \$300,000 he'll have to declare personal bankruptcy. Since we assume that he won't do this, he'll have to work to pay off the remaining debt.

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To find the return on equity:

$$\begin{aligned} r_{0 \rightarrow 1} &= \frac{P_1 - P_0 + C_1}{P_0} \\ r_{E,0 \rightarrow 1} &= \frac{E_1 - E_0 + \text{Dividends}_1}{E_0} \\ &= \frac{-800,000 - 100,000 + 0}{100,000} \\ &= -9 \end{aligned}$$

So the return on equity is -900% which is upsetting for Bob.

Bob started (time 0) with \$100,000 of business assets and no debt, so he had \$100,000 of business equity.

$$V_0 = D_0 + E_0$$

$$100,000 = 0 + E_0$$

$$E_0 = 100,000$$

After the crash (time 1) he had no business assets, a debt of \$800,000, and because he has unlimited liability, his equity is worth -\$800,000.

$$V_1 = D_1 + E_1$$

$$0 = 800,000 + E_1$$

$$E_1 = -800,000$$

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Limited Liability: Corporations

Corporations have limited liability, so shareholders cannot lose more than the value of their equity, the shares. Shareholders in a corporation cannot be sued for their personal assets.

This is unlike sole traders and partners who face unlimited liability.

Therefore the lowest possible share price in a corporation is zero.

$$0 \leq E_{\text{corporation}} < \infty$$

The lowest possible return is therefore negative one (-1 or -100%).

$$-1 \leq r_{E,\text{corporation}} < \infty$$

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Business Funding

Corporations can be financed by:

- Ordinary shares (also called common stock),
- Preference shares,
- Bonds,
- Loans,
- Short term debt such as overdrafts or money market securities including bank accepted bills (BAB's) or promissory notes (PN's, also known as commercial paper).

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Corporate Insolvency (or Bankruptcy)

When a firm is insolvent it cannot pay its debts when they're due, usually because its current liabilities (CL) are too high compared to its current assets (CA).

The business assets will be distributed to debt and equity holders.

- Debt holders are paid first. The most senior debt holders are paid very first, then the next most senior, all the way down to the most subordinated debt if any assets remain.
- Equity holders are then paid the residual amount, if there is anything. Preferred stock holders are paid first and common stock holders last.

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Questions: Limited Liability and Business Structure

[http://www.fightfinance.com/?q=221,120,466,452,](http://www.fightfinance.com/?q=221,120,466,452)

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