“IP Valuation - INCOME APPROACH”

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Outline of Income Approach assignment

What has been covered in this paper?

- Various steps of valuation
- Formulas used in the Income Approach.
- For each formula the numerical example should be given.
- What is Discount Rate
- Significance of Discount Rate
- Calculation of Discount Rate on the basis of WACC & CAPM Model
- Importance of WACC & CAPM Models in ascertainment of Discount Rate
- Advantages of Income Approach over the other Techniques
- Disadvantages & Limitations of Income Approach.
- Critique of Income Approach
Valuation Steps

A. Data Collection and Analysis

- Information checklist request
- Internal sources
- External sources
- Prior transactions or offers
- Management interview

B. Valuation Approaches or Methods

- Income Approach
- Cost Approach
- Market Approach

C. Economic Life Analysis

D. Value Conclusion

E. Reporting
**Income Approach:**

The *income approach* attempts to calculate the *present value* of the *projected future income flow* arising from the subject IP (patent) during its economic life.

When using the Income Approach, particular attention is paid to five main parameters that determine value:

- revenue or income associated with the use of the IP;
- expected growth characteristics of the identified revenue or income;
- expected duration of the revenue or income; risk associated with generating the estimates of revenue or income; and,
- the proportion of the revenue or income that is attributable to the subject IP.

The Income Approach utilizes the ability of the intellectual property to generate cash flow. The Income Approach is generally applicable to most situations and intangible assets.

This approach is based on discounted cash flow theory and defines the value of the subject property as the present value of the anticipated net economic benefits to be achieved over the duration of the property’s useful life. When using the Income Approach to value intellectual property, future income or cash flow related to the business, business segment or product line under consideration is estimated. The forecasted cash flow is then discounted via present value calculations to determine the current value of the operation. At this point, it is necessary to ascertain the portion of this value that is attributable to the intellectual property.

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These parameters are based on observations of relevant markets, including size, growth trends, market share dynamics among participants and overall market risk characteristics. Comprehensive knowledge of the attributes of the specific intangibles is also important, including stage of development, unique characteristics such as bankruptcy or market leadership, and relevant pricing information associated with the products that feature the subject IP.

Producing an accurate forecast of revenue is dependent upon accurate knowledge of the competitive and economic environment in place during the appropriate timeframe for the valuation. It will also need to accurately depict an appropriate estimate of the property’s remaining economic life. The estimation of a property’s useful economic life must incorporate a variety of factors such as potential obsolescence, historical usage, expiration of patents, etc. For example, a forecast of future revenue should not extend beyond the protection offered by a patent. On the other hand, a two or three-year expected lifespan may be too conservative when analyzing a trademark with a 25 year history of success in the marketplace. Keep in mind that the estimate for the remaining economic life of the assets is dependent on the projected prospects of the property and the history of the assets.

The discount rate used in the calculations must incorporate all of the risks that have an impact on the generation of the future income or cash flow. Risks to consider when determining the discount rate to use in the calculations include the overall market risk, specific industry risk and risks associated with the specific intangibles and operation being analyzed. Several methods are available to calculate an appropriate discount rate, including the capital asset pricing model (“CAPM”), the weighted average cost of capital (“WACC”) and the Arbitrage Pricing Theory model (“APT”).

As stated above, it is important to differentiate between the business enterprise value and the value of the intellectual property that supports the business. Two of the
more effective techniques for separating these two elements are Relief from Royalty and Technology Factor.

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**Economic Benefits or Amount of Income:** Estimating the amount of income that intellectual property is capable of producing in the future can be the most difficult element in a valuation. It can involve much detective work and a good knowledge of the marketplace. Generally speaking, intellectual property usually provides either revenue enhancement or expense reduction. Either (or both) will produce profits, which is the objective. We must also decide what form of exploitation is likely to be the “greatest and best use” of the property.

Examples of the economic benefit that can result from the exploitation of technology include the following:

- It allows less material, or lower-cost materials to be used;
- It lessens the amount of production labor;
- It increases speed of production;
- It improves quality;
- It eliminates or lessens environmental or safety hazards;
- It results in premium pricing;
- It acts as the basis for a new product or business.
However that we do have to use the NET cash flow as the basis for valuation. Therefore we must also consider the costs of commercialization, which can include:

- Research to “scale up” the technology to commercial levels;
- Design and construction of prototypes, pilot plants and full manufacturing facilities;
- Testing, clinical trials, market research;
- Government approvals;
- Advertising for a new product or service;
- Development of employee infrastructure.

Finally, we must estimate the TIMING of both economic benefit and costs, because the present value is very sensitive to when benefits will be received and when costs will be borne.

**Duration of Income or Economic Life**

It is far easier to estimate the economic life of a building or machine than that of intellectual property. First, it is tempting to fall into the trap of focusing on the legal life of intellectual property:

- Trademark rights are perpetual, if continually used in commerce;
- Patent rights last 20 years;
- Copyright remains in force for the author’s life plus 60 years;
- Proprietary technology is in force for as long as it is secret.

We must however be concerned with the economic life of the intellectual property, or the period during which the intellectual property can be expected to afford its owner an economic benefit. This is usually not the same as legal life:
• The average life of a U.S. patent is about five years. Two-thirds of U.S. patents have not been renewed by the 11 1/2-year stage. Technology moves on; in some sectors such as the semiconductor industry, the technology is obsolete before a patent application can be prosecuted;

• With the mobility of people and information, proprietary technology can be very difficult to retain.

We must also realize that the decline in value of most intellectual property over time is not linear, so the economic benefit may vary greatly from year to year.

**Discount Rate or Risk of Income:** The elements of risk are many, but there are some basic and critical questions to ask about the realization of future income:

• Will we receive it?
• Will we receive it in the expected amount?
• Will we receive it when expected?
• How long will we have to wait before receiving it?

As to costs:

• Do we have to invest at all?
• Do we have to invest in “big lumps?”
• Are there milestones in the development, or do we have to complete the whole project before receiving any indications of success or failure?
• When should we invest?
**Discounted Cash Flow – Net Present Value method (DCF – NPV Method)**

allows an estimated future income flow to be converted to a present value by discounting future income estimates flow with an appropriately selected discount rate\(^1\).

One of the most difficult challenges in this approach is how to set a *discount rate*.

In finance, the discounted cash flow (or DCF) approach describes a method to value a project or an entire company. The DCF methods determine the present value of future cash flows by discounting them using the appropriate cost of capital. This is necessary because cash flows in different time periods cannot be directly compared since most people prefer money sooner rather than later (put simply: a dollar in your hand today is worth more than a dollar you may receive at some point in the future). The same logic applies to the difference between certain cash flows and uncertain ones, or "a bird in the hand is worth two in the bush". This is due to opportunity cost and risk over time.\(^2\)

DCF procedure involve three problems

- the forecast of future cash flows,
- the incorporation of taxes (firm income taxes as well as personal income taxes),
- the determination of the appropriate cost of capital.

A valuation method used to estimate the attractiveness of an investment opportunity. Discounted cash flow (DCF) analysis uses future free cash flow projections and discounts them (most often using the weighted average cost of capital) to arrive at a present value, which is used to evaluate the potential for investment. If the value arrived at through DCF analysis is higher than the current cost of the investment, the opportunity may be a good one.\(^3\)

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\(^1\) The interest rate used to compute the present value of future cash flows. [www.cbu.edu/~lschmitt/I351/glossary.htm](http://www.cbu.edu/~lschmitt/I351/glossary.htm) last visited on 06 October, 2006


\(^3\) [http://www.investopedia.com/terms/d/dcf.asp](http://www.investopedia.com/terms/d/dcf.asp) last visited on 06 October, 2006
Factors affecting the discount rate include

- **Inflation**: Inflation can diminish the purchasing power of the future economic benefits that are achieved. The discount rate used must include assumptions about inflation to compensate for this loss of purchasing power. This is needed to compensate for the negative affects upon the purchasing power of the expected cash flow.

- **Liquidity**: Liquidity is another risk that must be considered. Liquidity represents the relative difficulty with which an investment can be quickly converted into cash. Many financial securities can be traded on active public exchanges for cash at any time. IP investments, especially those during embryonic development (living being in its earliest stages of development), do not possess this strong characteristic of investment liquidity. Additional return to the investor is warranted and should be reflected in the discount rate when liquidity is lacking.

- **Real interest**: Real interest represents the component of return on investment associated with sacrificing use of the invested funds. It is the reward for deferring consumption in favor of investment. The typically higher rates that are paid by investments reflect compensation for the risk elements that are introduced by inflation, illiquidity, and risk premiums.

\[
DCF = \frac{CF_1}{(1+r)^1} + \frac{CF_2}{(1+r)^2} + \ldots + \frac{CF_n}{(1+r)^n}
\]

CF = Cash Flow  
\( r \) = discount rate (WACC)

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4 A rise in the general price level in the economy that results in a decline in the purchasing power of money.  
[www.senate.michigan.gov/sfa/StateBudget/glossary.html](http://www.senate.michigan.gov/sfa/StateBudget/glossary.html) last visited on 06 October, 2006

5 The ease and speed with which an investment can be converted into cash.  
- **Risk premium**: Risk premium is the added amount of return that investors demand for the assumption of risk in excess of real interest in a risk free investment when there is the possibility of loss and/or an unanticipated variability in earnings. The amount of risk premium varies according to the type of property and the type of property and the industry. An element of risk is the likelihood of competitive technologies that could make the owned property obsolete.

  Computer software products are an example of intellectual property that quickly loses out to improved and more powerful products within very short time periods. Compensation for this risk requires a premium.

It is also important to take into account that when the direct income stream from the subject IP (patent) is not available, it is required to isolate its value from the aggregated income stream of the projects.

**Advantages of Income Approach over the others approach:**

1. **NO NEED FOR MARKET TRANSACTIONS**: Captures expected future returns to owner without the need for comparable market transactions.

2. **FORCASTED CASH FLOWS REQUIRED**: Based on cash flows or earnings generated by the technology; or based on the costs saved by the technology.

3. The income approach calculates the present value of cash flows from an IP asset, on the basis of discount rate which takes into account the systematic risk.

4. It shows the relationship between returns on investment on a security and the returns on overall market portfolio.
5. Income approach takes into account the systematical component of risk which is calculated by the CAPM technique, the statistical measure of systematic risk is shown by \( \beta \) (Beta).

**Disadvantages of Income Approach**

- Requires subjective cash flow allocation
- Translation of theory into practice requires assumptions which are limiting.
- Relevant information is not always readily accessible from internal reporting systems.

**Weighted Average Cost of Capital (WACC)**

The cost of capital to a firm may be defined as a weighted average of the cost of each type of capital. The weight of each type of capital is the ratio of the market value of the securities representing that source of capital to the market value of all securities issued by the company. The term security includes common and preferred stocks and all interest-bearing liabilities, including notes payable. It is sometimes stated that the weighted average cost capital of a firm may be used to evaluate investments whose cash flows are perfectly correlated with the cash flows from the firm’s present assets. With perfect correlation between the two sets of cash flows, the risk is the same. The usual definition of the weighted average cost of capital is to weight the after-tax cost of debt by the percentage of debt in the firm’s capital structure and add the result to the cost of equity multiplied by the percentage of equity.

**Calculation, ignoring tax implications**

\[
\text{WACC} = r_{\text{equity}} \times (\% \text{ equity}) + r_{\text{debt}} \times (\% \text{ debt})
\]

- \( r_{\text{equity}} \) = current expected rate of return on stock
- \( r_{\text{debt}} \) = current rate of (borrowing) debt
Example: Electron-X is a start-up company

Equity
– Will sell $10 million of common stock
– Estimate of expected returns is 15%

Debt
– Will issue $5 million of debt
– Bonds to sell for $1,000 and pay $100 (10%)

\[
\text{WACC} = 15\% \times \frac{10}{10+5} + 10\% \times \frac{5}{10+5} \\
= 13.33\%
\]

Calculation, including tax implications

\[
\text{WACC} = \text{Re} \times \frac{\text{E}}{\text{V}} + \text{Rd} \times (1 - \text{Tc}) \times \frac{\text{D}}{\text{V}}
\]

where
\[
\begin{align*}
\text{Re} &= \text{cost of equity capital} \\
\text{Rd} &= \text{cost of debt capital} \\
\text{Tc} &= \text{effective corporate tax rate} \\
\text{E} &= \text{market value of equity} \\
\text{D} &= \text{market value of debt} \\
\text{V} &= \text{market value of the firm (D+E)}
\end{align*}
\]

Example: assume a firm has a capital structure of 50% common stock, 10% preferred stock, 40% long term debt.

Rates of return required by the holders of each are common, 10%; preferred 8%; pre-tax debt, 7%. The firm’s income tax rate is 30%.

Solution:

\[
\begin{align*}
\text{WACC} &= (\text{cost of common stock}) \times (\text{common stock proportion}) + (\text{cost of preferred stock}) \times (\text{preferred stock proportion}) + (\text{after tax cost of debt}) \times (\text{debt proportion}) \\
\text{WACC} &= (0.5 \times 0.10) + (0.10 \times 0.08) + (0.40 \times (0.07 \times (1-0.30))) \\
&= 7.76\% \text{ pa, after tax.}
\end{align*}
\]
The cost of capital combines in one discount rate an allowance for the time value of money and an allowance for risk. To apply the same cost of capital to cash flows that occur at different points in time, the magnitude of these allowances (i.e., the percent per unit of time) must remain constant over time.

A specific asset might have a smaller or larger amount of risk, thus should have a smaller or larger discount rate. The WACC is the correct discount rate only for one level of risk. For a given capital structure, the weighted average cost of capital to a firm reflects the characteristics of the firm’s assets, and particularly their average risk, but also the timing of the expected cash proceeds.

**Capital Asset Pricing Model (CAPM)**

CAPM is an equilibrium model of asset pricing that states that the expected return on a security is a positive linear function of the security’s sensitivity to changes in the market portfolio’s return. The key variable in the CAPM is called “beta”, a statistical measure of risk which has become as familiar as—and, indeed, interchangeable with—the CAPM itself. Financial managers have long realized that some projects were riskier than others, and that these projects require a higher rate of return. A risky investment is, of course, one whose return is uncertain in advance; and in such a case, it is only the expected or average rate of return that can be projected. To justify undertaking the risky project, a higher payout in the event of success is required.

The simple CAPM Model captures this perspective. According to the simple CAPM, an investment’s required rate of return increases in direct proportion to its beta. The CAPM also implies that investors, in pricing common stocks, are concerned exclusively with systematic risk. A security’s systematic risk, as measure by beta, is the sensitivity (or co-variance) of its return to movements in the economy as a whole. Asset with high betas exaggerate general market developments, performing exceptionally well when the market goes up and exceptionally poorly when the market goes down.
The simple CAPM model states:

$$E(R) = R_f + \left[ E(R_m) - R_f \right] \beta$$

where: $E(R)$ = The required rate of return (or rate of return)  
$R_f$ = The Risk-free rate (the rate of return on a “risk-free investment”, like U.S. government treasury bonds)  
$\beta$ = Beta (A measure of risk appropriate for diversified investors)

$E(R_m)$ = the expected return on the overall stock market

**The Beta Factor and Risk Free Rate of Return**

A share’s beta factor is the measures of measure of its volatility in terms of market risk. The beta factor of the market as a whole is 1.0. Market risk makes market returns volatile and the beta factor is simply a yardstick against which the risk of other investments can be measured. Risk or uncertainty describes a situation where there is not first one possible outcome but array of potential returns. Risk is measured as the beta factor or B.

- The market as a whole has B = 1  
- Risk free security has a B = 0  
- A security with a B < 1 is lesser risky than average Market  
- A security with a B > 1 has risk above market

**Example of CAPM model:**

Company X and Y both pay annual dividend of 40 tambala to their shareholders and this is expected to continue in perpetuity. The risk-free rate of return is 6% and the current average market rate of return is 10%. Company X’s β is 1.1 and for Y is 0.8. What is the

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6 [http://cbdd.wsu.edu/kewlcontent/cdoutput/TOM505/page42.htm](http://cbdd.wsu.edu/kewlcontent/cdoutput/TOM505/page42.htm) last visited on 6 October, 2006
expected rate of return for each company and what would the share price of each company be?

**Solution:**

a) The expected return for X is $6\% + (10\%-6\%) \times 1.1 = 10.4\%$

b) The expected return for Y is $6\% + (10\% - 6\%) \times 0.8 = 9.2\%$

The dividend valuation model can now be used to derive the expected share prices.

c) The predicted share value of X is $\frac{40}{0.104} = 385$ tambala.

d) The predicted share value of Y is $\frac{40}{0.092} = 435$ tambala.

The actual share price can be lower or higher than the one predicted using CAPM. The CAPM acts as a guide in predicting the levels where share prices are expected to be.

**The Usefulness and Limitation of CAPM**

The expected return calculated using CAPM is an important tool in project appraisal. It can be used to compare projects of all different risk classes and is therefore superior to a Net present value (NPV) approach which uses only one discount rate for all projects, regardless of their risk.

The practical problems with the use of CAPM in investment appraisal are follows:

1. It is hard to estimate the risk free rate of return on projects under different economic environment.
2. The CAPM is really just a single period model. It is not possible to use the CAPM for projects which last for more than one year.
3. It may be had to estimate the risk-free rate of return.
4. Complications in decision-making cannot be modeled easily.

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7 [http://cbdd.wsu.edu/kewlcontent/oroutput/TOM505/page42.htm](http://cbdd.wsu.edu/kewlcontent/oroutput/TOM505/page42.htm) last visited on 06 October, 2006