Transforming Projects into Superior Investment Strategies Using Cash Flow Statement Analysis

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1. Introduction

Every project is fundamentally made up of cash flows. An investor may rent a factory, buy raw materials, hire workers, manufacture a product or fund an advertising campaign, all with the purpose of selling a product or service to make a profit. Every part of the project or investment opportunity results in a combination of positive and negative cash flows. Investment opportunities are assessed by estimating and valuing the cash flows that a project will generate. An optimal investment decision balances project returns against project risks and seeks the maximum return per unit risk.

Cash flow statement analysis is a vital skill required to identify superior investment opportunities and to transform mediocre projects into superior investment strategies. They help the active project manager boost returns and eliminate risks, identifying project strengths to harness and weaknesses to prune.

Firstly we review and explain the key items on cash flow statements. Secondly we show how to compute a project's free cash flows. Thirdly we discuss how to evaluate the cost of capital and project risk. Fourthly we outline how to calculate the Net Present Value (NPV) of a project and discuss optimal investment criteria. We conclude with a case study and perform a detailed project valuation using cash flow statement analysis. An Excel example workbook is provided with this paper[1].

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[1] Kindly contact the author should you wish to receive a copy of the Excel case study workbook.

2. Cash Flow Statements

To determine whether to invest in a project an understanding of cash flow statements is required to accurately assess the future free cash flows to be generated by the project.

It is a vital skill required to identify superior investment opportunities and to transform mediocre projects into superior investment strategies. It helps active project managers boost returns and eliminate risks, identifying project strengths to harness and weaknesses to prune.

2.1 Marginal Cash Flows

When estimating the value of a project we only consider the marginal cash flows of the project. Existing cash flows, income, and expenditures should not be included in the project valuation, such as current work force costs, office & property costs, factory and other rental costs. Subtle costs such as existing project manager costs should also be excluded.

2.2 Project Costs & Inflation

Project costs are typically adjusted for inflation, especially long-dated projects. Some short-dated projects may overlook inflation adjustments in low inflation regimes. To adjust a cash flow for inflation we use the following formula.

Formula 1 Inflation Adjustments

$$Inflation\ CF = CF\ (\ 1 + i\ )^t$$

where inflation CF represents a cash flow (CF) adjusted for inflation, i the rate of inflation and t the number of years until cash flow payment.

2.3 Marginal Expenses

The total marginal expenses for the project is made up of COGS and SG&A.

2.3.1 Cost of Goods Sold, COGS

The total 'variable' cost of producing the goods and services sold.

2.3.2 Sales, General & Administrative Costs, SG&A

The total ‘non-variable’ or fixed costs from running the project. Operating expenses such as advertising, marketing, factory costs, etc.

2.4 Capital Expenditure, CapEx

Capital Expenditure or CapEx is the capital invested in **fixed asset purchases** to set-up and maintain a project e.g. factory equipment purchases. For tax rebate purposes CapEx is not included in taxable earnings and EBIT calculations directly, but is applied indirectly via depreciation items on the cash flow statement. Capital expenses have to be pro-rated over the useable life of asset for tax rebate purposes.

2.5 Depreciation

Depreciation is a pro-rated measure of capital expenditure. It is not a real cash flow but rather an accounting number used for tax rebates. It is a **tax mechanism** that allows a company to spread the cost of its assets over several years of the life of the asset. A company’s taxable earnings are reduced by its depreciation costs. The most common type of depreciation is straight line depreciation.

Example 1 Straight-Line Depreciation

Consider a purchase of a factory for £1,000,000 today with straight line depreciation over 5 years. In this case the capital expenditure today of £1,000,000 would be split into 5 equal depreciation amounts of £200,000 to be applied evenly over years 1 to 5 as expenses to reduce taxable income or EBIT in equal instalments.

2.6 Earnings before Interest and Taxation, EBIT

A project’s or firm’s operating profit before interest and taxes. EBIT is an annual calculation that measures the **taxable income** of a project each financial year. It is calculated as sales turnover minus costs.

For EBIT calculations depreciation is included a cost, whereas capital expenditure is excluded to prevent double-counting. Depreciation reduces taxable earnings, but CapEx does not.

Formula 2 **EBIT Calculation**

EBIT = Turnover – Costs - Depreciation

EBIT can also be calculated as,

Gross Profit *= Turnover – COGS*

Operating Income *= Gross Profit – SG&A – Depreciation*

EBIT *= Operating Income – Other Income & Expenses*

Similar to EBIT we also have **EBITDA**, which is Earnings before Interest, Taxation, Depreciation and Amortization, which is the same as EBIT, but with depreciation and amortization expenses removed.

2.7 Working Capital

EBIT assumes for accounting purposes that all income and costs are realised on the same date, namely the company's financial year end reporting date. This is convenient for accounting purposes, but not strictly accurate.

Working capital makes the necessary cash flow **timing adjustments** to the EBIT calculation to reflect actual dates of cash flow payments and receipts. Like EBIT working capital is an annual figure representing timing adjustments for each financial year and comprises of current assets and current liabilities, which we discuss below.

For project valuation purposes we are interested in the change in working capital, which represents the project investment in working capital required.

Formula 3 **Working Capital**

Working Capital = Current Assets – Current Liabilities

2.8 Current Assets

Current assets reflect stock, inventory and services for which the project is yet to receive payment. It is considered a debit and money owed to the project and due for payment within the financial year.

2.9 Current Liabilities

Similarly current liabilities reflect the cost of raw materials, goods and services required that have been received and not yet paid for. It is considered a credit and money borrowed by the company that is due for payment within the financial year.

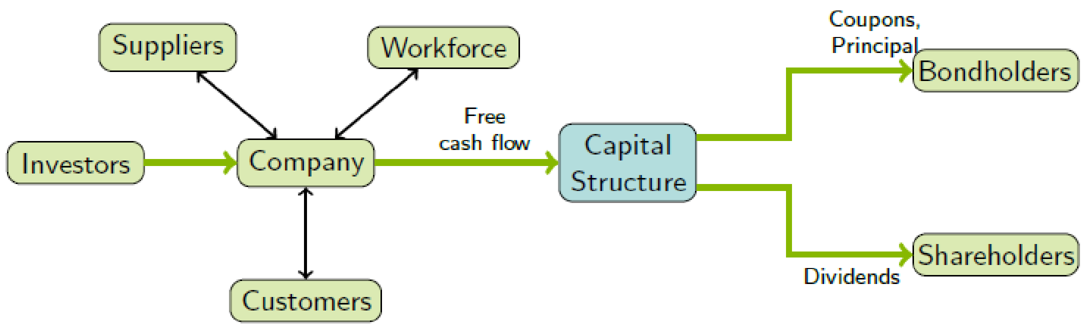
3 Project Valuation

Analysing the components of the cash flow statement we can determine the free cash flows of a project. These cash flows can then be risk-adjusted or discounted using the cost of capital to arrive at the project net present value. We outline the steps to be taken to value a project and provide detailed case studies to walk through the process in detail below.

3.1 Free Cash Flows

To be able to calculate the fair value of a company or project we need to be able to price and value their **free cash flows** (FCFs), which are the collective cash-flows of the company or project to be paid to investors after tax and expenses.

Figure 1 Free Cash Flow Illustration



Formula 4 **Free Cash Flow Calculation**

$$FCF = EBIT\ (1 - Tax) + Depreciation - CapEx - Change\ in\ NWC$$

Note in this formula depreciation, CapEx and Change in Net Working Capital (NWC) are expressed in absolute terms as positive numbers.

3.2 Cost of Capital

When deciding to invest in a project, not only do we need to accurately assess the potential free cash flows to be generated, but also the riskiness of the project.

The **cost of capital**[2] is the rate of return investors demand to be willing to accept the risk and invest in a company or project. It is similar to a bond yield and incorporates project risk. It is used to discount the free cash flows of a project and is required to calculate the project net present value, see (Burgess 2020).

For an equity the cost of capital is calculated using the Capital Asset Pricing Model formula (CAPM), see formula 5. For debt securities the cost of capital is the par yield of the bond and for a corporation comprising of both equity and debt we can use the weighted average cost of capital or WACC, see formula 6. For a detailed overview of cost of capital evaluation, the CAPM model and WACC calculations, see (Berk and DeMarzo, 2016) and (Brealey et al, 2014).

Formula 5 **Capital Asset Pricing Model (CAPM)**

$$r_E = r_F + \beta\ (r_M - r_F)$$

where r_E is the equity cost of capital, r_F the risk-free rate typically associated with government bonds and treasury securities, β the measure of equity returns relative to the market and r_M the market return often measured as the returns generated by the principal equity index for the respective market e.g. FTSE 100 for GBP, Dow Jones or S&P 500 for USD, DAX Index for EUR etc.

[2] The capital asset pricing model or CAPM model is often used to evaluate the cost of capital for a company or project.

Formula 6 **Weighted Average Cost of Capital (WACC)**

$$WACC = r_E (E / V) + r_D (D / V)$$

where r_E is the equity cost of capital, r_D is the debt cost of capital, E the present value of equity, D the present value of debt and V the total value of the firm i.e. V = E + D. This formula assumes a constant debt to value (D / V) relationship, which is a reasonable assumption.

3.3 Discount Factors

Discount Factors are needed to calculate the present value of a cash flow. Only cash flows to be received future or today have value and cash flows in the past have no value. Think what would you pay for cash you have already received?, that's right, nothing!!! As outlined with examples in (Burgess 2020) and summarized here we must scale future cash flows by the discount factor[3]. The discount factor also incorporates project risk, making risky cash flows worth less and risk-free cash flows worth more.

Formula 7 **Discount Factor**

$$\text{Discount Factor} = \frac{1}{(1+r)^t}$$

where r is the cost of capital and t represents the number of periods or years.

The cost of capital is required to imply the discount factors required to value the free cash flows of a project. If we know a company or project will generate a stream of future cash flows, what would we be willing to pay today for these future cash flows? This value is the net present value, discussed next.

3.4 Net Present Value, NPV

The Net Present Value (NPV) of a project is calculated as the sum the project free cash flows scaled by their corresponding discount factors. NPV calculations discount cash flows to incorporate the time value of money and project risk. Cash flows from

[3] Note this formula assumes simple compounding.

a low risk project are discounted at a low rate and conversely high risk projects are discounted at a high rate.

The interest rate used for discounting is the cost of capital, which is the minimum return or yield required of a project for investors to accept project risks. We should accept all positive NPV projects and reject negative NPV projects.

4. Case Studies

Putting it all together, we can use cash flow statement analysis to determine the free cash flows of a project. Once we know the free cash flows of a project, we discount these cash flows using the cost of capital to incorporate the correct level of risk and arrive at the project net present value (NPV). Projects with a positive NPV should be accepted since they generate an excess return over the risk-adjusted value and likewise projects with a negative NPV should be rejected.

In this section we consider two case studies. Firstly we consider how to evaluate the cost of capital and fair value of a project. Secondly we perform a detailed project valuation using cash flow statement analysis.

Case Study 1, Cost of Capital & Fair Value

LogoLand is a British advertising and marketing company. LogoLand expects to generate an annual EBIT of £1.3 million in year 1 and this figure is not expected to change. LogoLand makes fixed capital investments of £200,000 every year, its depreciation expense is constant at £50,000 per year and its working capital balances are expected to stay constant at £100,000.

The firm has no debt and 250,000 shares outstanding. LogoLand's equity beta is 1.2, the risk free rate is 1% and the market risk premium is 5%. The corporate tax rate is 35%. What is LogoLand's cost of capital and its current share price fair value?

Firstly we calculate the cost of capital for an equity project using the CAPM formula

Capital Asset Pricing Model Formula

$$r_E = r_F + \beta \, (r_M - r_F)$$

This gives us the cost of capital for the project and measures the return required to accept LogoLand equity risk, as follows,

Cost of Capital for Equity	
Cost of Capital, r_E	**7.00%**
risk-free rate, r_F	1.0%
beta, β	1.2
risk premium, $(r_M - r_F)$	5.0%

Secondly we calculate the free cash flows of the project,

Free Cash Flow, FCF	**£695,000**
EBIT	£1,300,000
Tax	35%
Depreciation	£50,000
Capital Expenditure	£200,000
Change in Net Working Capital	£0

Thirdly we know that the annual free cash flows of this project are constant for the foreseeable future, therefore we can evaluate the fair value of the company as a perpetuity. Perpetual cash flows can be valued using the perpetuity formula outlined in (Burgess, 2020) namely,

Perpetuity Formula

$$PV(Perpetuity) = C / r$$

Fourthly we calculate the value of LogoLand's perpetual cash flows as,

Present Value of Perpetuity Free Cash Flows	
PV(Perpetuity)	**£9,928,571**
Free cash flow, C	£695,000
Cost of capital, r	7.00%

Finally we estimate the current share price fair value as follows,

Share Price Fair Value

Share Price = Market Cap / No. Shares

Share Price	**£39.71**
Market Cap	£9,928,571
No Shares	250,000

Case Study 2, Project Valuation using Cash Flow Statements

Crash Landing (CL) is an aviation company that refurbish retired aircraft; they also manufacture parachutes and provide life insurance. It is negotiating a 12 year contract to refurbish and maintain a 70 year old fleet of planes for commercial use in the Democratic Republic of Yemenistan. Is the project worth undertaking?

Project Highlights

Factory Cost	£1,600,000	
Supply Limit	60 planes per year	
Capacity Increase	Extra 120 planes per year at one-off cost of £650,000	
Worker Pay	£28,000	
Work Rate	Two workers can refurbish 20 planes per year	
Raw Materials	Glass	£10,000
	Rubber	£3,000
	Aluminium	£2,000
	Parachutes	£3,000
Storage Costs	£50,000	

Sales Person	Existing person £40,000 per year
Sales Assistant	£20,000, required if more than 40 planes sold per year
Revenue	£28,500 per refurbished plane

Working Capital Arrangements

Raw Materials	Paid for 2 weeks after arrival at factory
Factory	3 weeks to complete plane refurbishment process
Plane Inventory	Planes sit in warehouse on average for 6 weeks until delivery
Plane Payment	Half paid as they leave the warehouse
	Half paid after 4 weeks (interest-free credit)

Sales Estimates

Year 1	15 planes
Year 2	20 planes
Year 3	30 planes

Sales expand by 10 planes each year for 3 years

Followed by 5 planes a year for the next 4 years

Thereafter they reach a steady state

Capital Costs

Capital Expenditure	Straight-line depreciation over 5 years
Corporation Tax	40%, settled immediately
Cost of Capital	10%
Inflation Rate	3%
Project Unwind	Assume project is costlessly unwound after 12 years

Step 1: CapEx, Depreciation, Costs and Turnover (Inflation Adjusted)

Firstly we reflect CapEx charges and the corresponding straight line depreciation over 5 years. Secondly we reflect unit values for labour, raw materials, storage and sales staff. We note that the sales head is already employed by the company and hence this cost is not a marginal cash flow and therefore excluded from the project. Thirdly we include unit revenue and turnover.

We include sales volume and note that we require a 2 workforce headcount per 20 sales units i.e. to refurbish 20 planes per year. Sales Assistant costs are not materialized until year we reach a sales volume of 40 plan refurbishments. Finally all costs and revenue is inflation adjusted at a rate of 3% using formula 1 quoted below.

$$Inflation\ CF = CF\ (\ 1 + i\ )^{t}$$

Table 1 **CapEx, Depreciation, Costs and Turnover**

					Labor	Materials	Storage	Head Sales	Assistant	Turnover
Inflation	3.00%			Unit Value	28,000	18,000	50,000	0	20,000	28,500
			Sales	**Labour Cost**		**Raw Materials**		**Sales Staff**		**Turnover**
Year	CapEx	Depreciation	Volume	Size	Cost	Cost	Storage	Head	Assistant	Revenue
0	-1,600,000									
1	0	-320,000	15	2	-57,680	-278,100	-51,500	0		440,325
2	0	-320,000	20	2	-59,410	-381,924	-53,045	0		604,713
3	0	-320,000	30	4	-122,385	-590,073	-54,636	0		934,282
4	0	-320,000	40	4	-126,057	-810,366	-56,275	0	-22,510	1,283,080
5	0	-320,000	50	6	-194,758	-1,043,347	-57,964	0	-23,185	1,651,966
6	0	-320,000	60	6	-200,601	-1,289,576	-59,703	0	-23,881	2,041,829
7	-650,000		65	8	-275,492	-1,438,952	-61,494	0	-24,597	2,278,341
8	0	-130,000	70	8	-283,756	-1,596,130	-63,339	0	-25,335	2,527,206
9	0	-130,000	75	8	-292,269	-1,761,444	-65,239	0	-26,095	2,788,953
10	0	-130,000	80	8	-301,037	-1,935,240	-67,196	0	-26,878	3,064,129
11	0	-130,000	80	8	-310,068	-1,993,297	-69,212	0	-27,685	3,156,053
12	0	-130,000	80	8	-319,370	-2,053,096	-71,288	0	-28,515	3,250,735

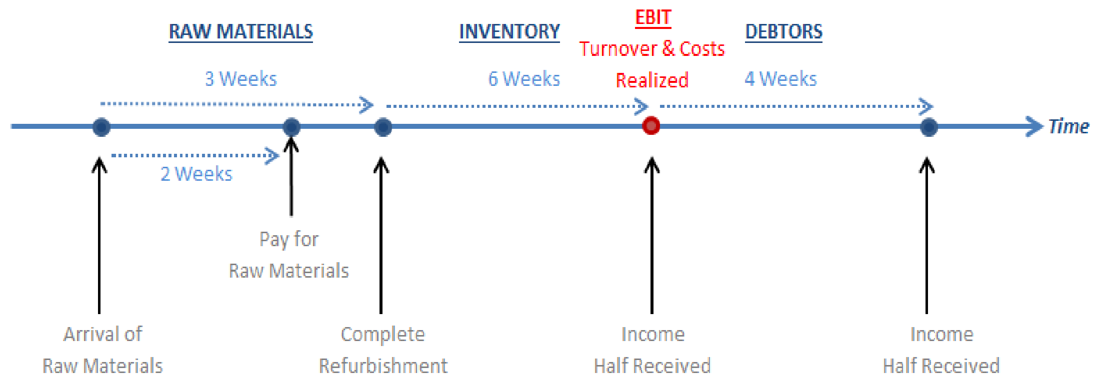
Step 2: Working Capital Timing Adjustments

Secondly we calculate the working capital and cash flow timing adjustments, which can make a large difference to the net present value of the project. Working capital corrects EBIT accounting cash flows and adjusts for timing mismatches. It is calculated using formula 3 as follows.

Working Capital = Current Assets – Current Liabilities

Current Assets adjust for cash flows that are realised on the company accounts, however yet to be received. This is money owed to project, a **cash flow debit**. Current Liabilities represent payments that the company has yet to make that are reflected on company accounts. This is money borrowed, a **cash flow credit**.

Figure 2 **Project Timeline**



Raw material, inventory and debtor timing delays to project cash flows.

Project cash flow timing adjustments are displayed in figure 2. In the working capital calculation we incorporate a 2 week adjustment (2/52) for payment of raw materials after receipt. A 3 week adjustment (3/52) is applied to allow for raw materials to be converted into goods for sale. Furthermore a 6 week adjustment (6/52) is used to reflect inventory and goods remain in storage until sold. Finally we reflect goods are paid for 50% at the point of sale and 50% 4 weeks later as a trade credit, hence 50% of turnover is adjusted by 4 weeks i.e. 50% x Turnover x (4/52).

Table 2 **Working Capital & Timing Adjustments**

No. Weeks		2/52		6/52	3/52	50% x 4/52				
Year Fraction		0.0385		0.1154	0.0577	0.0385				
Year	Raw Materials	Raw Mat Payment	Turnover	Inventory Stock	Raw Mat Stock	Debtors	Current Assets	Current Liabilities	Working Capital	Change in Working Cap
0										
1	278,100	10,696	440,325	50,807	16,044	16,936	83,787	10,696	-73,090	-73,090
2	381,924	14,689	604,713	69,775	22,034	23,258	115,067	14,689	-100,377	-27,287
3	590,073	22,695	934,282	107,802	34,043	35,934	177,778	22,695	-155,083	-54,706
4	810,366	31,168	1,283,080	148,048	46,752	49,349	244,149	31,168	-212,981	-57,898
5	1,043,347	40,129	1,651,966	190,611	60,193	63,537	314,342	40,129	-274,213	-61,232
6	1,289,576	49,599	2,041,829	235,596	74,399	78,532	388,526	49,599	-338,927	-64,714
7	1,438,952	55,344	2,278,341	262,886	83,016	87,629	433,531	55,344	-378,186	-39,259
8	1,596,130	61,390	2,527,206	291,601	92,084	97,200	480,885	61,390	-419,496	-41,310
9	1,761,444	67,748	2,788,953	321,802	101,622	107,267	530,691	67,748	-462,944	-43,448
10	1,935,240	74,432	3,064,129	353,553	111,648	117,851	583,053	74,432	-508,621	-45,677
11	1,993,297	76,665	3,156,053	364,160	114,998	121,387	600,545	76,665	-523,879	-15,259
12	2,053,096	0	3,250,735	0	0	0	0	0	0	523,879

We are only interested in the project **investment in working capital**, which is the change in working capital.

Step 3: Free Cash Flows, Discounting & Net Present Value

To determine the project net present value, we calculate the project free cashflows using formula 4 as follows,

$$FCF = EBIT\ (\ 1 - Tax\ ) + Depreciation - CapEx - Change\ in\ NWC$$

In table 3 below we apply this as follows. Firstly we calculate taxable income (EBIT) and deduct taxes. Secondly we subtract depreciation, since it is not a cash flow but an accounting figure for tax rebates. Thirdly we add CapEx which was not included in the EBIT calculation and fourthly we add the investment or change in net working capital.

Table 3 Free Cash Flows, Discounting & Net Present Value

Year	CapEx	Depreciation	Labour	Raw Materials	Sales Staff	Total Costs	Turnover	EBIT	Tax	Chg in Work Cap	FCF	Discount Factor	Present Value
0	-1,600,000										-1,600,000	1.0000	-1,600,000
1	0	-320,000	-57,680	-329,600	0	-387,280	440,325	-266,955	106,782	-73,090	86,737	0.9091	78,851
2	0	-320,000	-59,410	-434,969	0	-494,379	604,713	-209,666	83,867	-27,287	166,913	0.8264	137,945
3	0	-320,000	-122,385	-644,709	0	-767,094	934,282	-152,813	61,125	-54,706	173,607	0.7513	130,433
4	0	-320,000	-126,057	-866,642	-22,510	-1,015,209	1,283,080	-52,129	20,852	-57,898	230,825	0.6830	157,657
5	0	-320,000	-194,758	-1,101,310	-23,185	-1,319,254	1,651,966	12,712	-5,085	-61,232	266,395	0.6209	165,410
6	0	-320,000	-200,601	-1,349,279	-23,881	-1,573,761	2,041,829	148,069	-59,227	-64,714	344,127	0.5645	194,251
7	-650,000	0	-275,492	-1,500,446	-24,597	-1,800,535	2,278,341	477,806	-191,122	-39,259	-402,575	0.5132	-206,585
8	0	-130,000	-283,756	-1,659,469	-25,335	-1,968,561	2,527,206	428,646	-171,458	-41,310	345,878	0.4665	161,355
9	0	-130,000	-292,269	-1,826,682	-26,095	-2,145,047	2,788,953	513,906	-205,562	-43,448	394,896	0.4241	167,474
10	0	-130,000	-301,037	-2,002,435	-26,878	-2,330,351	3,064,129	603,778	-241,511	-45,677	446,590	0.3855	172,180
11	0	-130,000	-310,068	-2,062,508	-27,685	-2,400,262	3,156,053	625,792	-250,317	-15,259	490,216	0.3505	171,818
12	0	-130,000	-319,370	-2,124,384	-28,515	-2,472,269	3,250,735	648,465	-259,386	523,879	1,042,959	0.3186	332,319
											Total		**NPV**
											1,986,566		**63,107**

We should **accept the project** since it generates a **positive NPV of £63,107**, which indicates the project generates an excess return over the cost of capital required to assume the risk of the project.

5. Conclusion

An optimal investment decision balances project returns against project risks and seeks the maximum return per unit risk. In this paper we provided the reading with the necessary tools to make such decisions.

Firstly we reviewed and explained the key items on cash flow statements. Secondly we showed how to compute a project's free cash flows. Thirdly we discussed how to evaluate the cost of capital and project risk. Fourthly we outlined how to calculate the net present value of a project and discussed optimal investment criteria and finally we concluded with case study examples and performed a detailed project valuation using cash flow statement analysis, highlighting how to imply free cash flows, make working capital adjustments and appropriately discount to determine the net present value of a project.

Cash flow statement analysis can help active project managers to boost returns and eliminate risks, identifying project strengths to harness and weaknesses to prune. It is an essential skill required to transform mediocre projects into superior investment strategies and offers vital expertise to identify superior investment opportunities.

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Corporate & Project Finance Valuation Techniques for Maximizing Returns & Superior Growth Strategies

Available at https://papers.ssrn.com/sol3/papers.cfm?abstract_id=3679413