



ARGUS
Developer™

Calculations Manual

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ARGUS Software: ARGUS Developer Calculations Manual

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Chapter 1

Valuation

Valuation is the process of calculating the worth of an asset.

The value of a property investment generally relates to the income-generating capability of the property or completed development, i.e. its value to the investor is based on the annual rental income from tenants of the property.

Valuation

The capital value of an investment property is calculated by capitalising the net rental income stream from the property.

The yield, used to capitalise the rental income, reflects the return required by investors in the open market for a type of investment.

In simple terms, the **yield** is the income from an investment expressed as a proportion of the investment's capital value, or Capitalised Rent (CR).

$$\text{Yield(\%)} = \frac{\text{Net Rental Income}}{\text{Capital Value}} \times 100$$

From this simple formula, we can calculate the capital value of a property when the rent and yield are known.

Example

Assuming a property is let at a net rental income of £1,500,000 pa and applying a yield of 8%, the valuation is:

$$8 = \frac{1,500,000}{\text{CR}} \times 100$$

So

$$\text{CR} = 1,500,000 \times \frac{100}{8}$$

$$\text{CR} = 1,500,000 \times 12.5 = 18,750,000$$

Therefore, the capital value (CR) of the property is £18,750,000.

This example valuation is displayed in the Summary screen of ARGUS Developer as follows:

Project Definition Project Cash Flow Summary Data Checker					
Summary Appraisal for Part 1 Office Building					
REVENUE					
Rental Area Summary					
	Units	ft²	Rate ft²	Initial MRV/Unit	Net Rent at Sale
Office Building	1	50,000	£30.00	£1,500,000	1,500,000
Investment Valuation					
Office Building					
Current Rent	1,500,000	YP @	8.0000%	12.5000	18,750,000
GROSS DEVELOPMENT VALUE				18,750,000	
Purchaser's Costs		5.76%	(1,021,599)		
NET DEVELOPMENT VALUE				<u>17,728,401</u>	
Income from Tenants				3,000,000	
NET REALISATION				20,728,401	

So the basic formula for valuation is:

Capitalised Rent = Net Rental Income × Years Purchase

The multiplier 12.5 (see the above example) is calculated from $\frac{100}{8}$ and is known as the **Years Purchase** or **YP**.

The YP in perpetuity is calculated as follows:

YP in perp = $\frac{100}{y}$ where y is the yield expressed as a percentage (in the above example, 8%).

This can also be expressed as follows: YP in perp = $\frac{1}{i}$ where i is the yield (in the above example 0.08).

The above formula may be used to calculate the capital value of simple, rack rented freehold investments (where the rent passing is equal to the market rent). However for more complex valuations which take account of, for example, future changes in income, the formula must be expanded (see **“Hardcore Method”** on page 6).

Net Rent

To value a property investment, any non-recoverable costs must be deducted from the gross annual rent to calculate the actual net rental income receivable by the investor, or the Net Operating Income. Such costs might include ground rent and other non-recoverable outgoings such as void costs and non-recoverable service charge or insurance. The net rent is then capitalised to calculate the value of the investment.

In ARGUS Developer, the net operating income is identified as the **Net Rent**, and is displayed in the Capitalised Rent form, as follows:

Heading		Office Building Prelet A		Gross Unit Area ft ²	10,000	Additional Unit Area ft ²	0
Unit Number		Gross Area ft ²		10,000		Additional Area ft ²	0
Use Type	Undefined	Net Unit Area ft ²		10,000		Alternate Area	0
Number of Units	1	Net Area ft ²		10,000		ITZA Area ft ²	0
Parking Spaces	0.0	Gross/Net Ratio		100.00%	<input type="checkbox"/> Locked		

Construction Cost		Rent		Rent Capitalisation	
Rate pF	0.00	MRV Rate pF pa	50.00	Tenure	Leasehold
Rate Additional pF	0.00	MRV / Unit pa	500,000	Gross Rent at Sale	500,000
Cost / Unit	0	MRV (Gross pa)	500,000	Total Non-Recov. Cost	51,000
Cost / Parking Space	0	Rental Growth	(None)	Total Ground Rent Deduct	25,500
Parking Spaces Cost	0	Step Rent Profile	(None)	Turnover Rent	0
Gross Cost	0	Start Rent (Gross pa)	500,000	Net Rent at Sale	423,500
Stage	Construction	% Non-Recov. Cost	10.000%	Yield%	8.0000%
Starts in	Apr 2010	Fixed Non-Recov. Cost	1,000	YP	12.4046
Distribution Months	12	Total Non-Recov. Cost	51,000	Capital Value	5,253,339
TI Rate pF (Letting)	0.00	Ground Rent Deductions	25,500	Manual Capital Value	0
TI % Rate (Letting)	0.000%	Start Rent (Net pa)	423,500	Stage	Sale
TI Cost (Letting)	0	Rent Free Period (Months)	0	Starts in	Apr 2014
		Lease Comm. Profile	(None)	Distribution Months	1
		Lease Comm. Distribution			

The basic formulae to calculate the Net Rent are as follows. This example assumes no rental growth.

$$\text{Net Rent} = \text{Annual Gross Rent} - (\text{Total Non-Recov Cost} + \text{Total GR Deduction})$$

Where:

$$\text{Total Non-Recov Cost} = (\% \text{ Non-Recov Cost} \times \text{Annual Gross Rent}) + \text{Fixed Non-Recov Cost}$$

$$\text{Total GR Deduction} = (\text{LH Gearing\%} \times \text{Annual Gross Rent}) + \text{Fixed GR Deduction}$$

[Note: GR refers to ground rent.]

Example

A leasehold property, with ground rent calculated as 5% tenants' rents plus a fixed ground rent of £500 pa. The property is let at a gross rent of £500,000 pa, and there are non-recoverable outgoings of £1,000 pa and 10% rent passing.

Using the above example (also see variables input in the graphic above) the Net Rent is calculated as follows:

$$\text{Total Non Recov Cost} = (10\% \times 500,000) + 1,000 = 51,000$$

$$\text{Total GR Deduction} = (5\% \times 500,000) + 500 = 25,500$$

Therefore:

$$\text{Net Rent} = 500,000 - (51,000 + 22,500) = 423,500$$

The Net Rent is £423,500 per annum.

Rental Growth

If rental growth is applied from the project start date, then the initial rent will include growth at the specified rate for the period from the project start date to the letting date. Ground rent and other deductions, where these are specified as a percentage of rent, are calculated on the inflated annual gross rent. Fixed deductions are not grown.

The formula to calculate rental growth is as follows:

$$R \times \left[\left(1 + \frac{i}{100} \right)^{\frac{n}{12}} \right]$$

Where:

R = Rent to be inflated

i = Annual rate of rental growth, as a percentage

n = Growth period in months

The net rent is then calculated as follows:

Net Rent =

(Annual Gross Rent \times Rental Growth) – (Total Non Recov Cost + Total GR Deduction)

where Total Non Recov. Cost and Total GR Deduction (where specified as a % rent) are calculated on the inflated annual gross rent.

Example

A leasehold property, with ground rent calculated as 5% tenants' rents plus a fixed ground rent of £500 pa. The property is let at a gross rent of £500,000 pa. There are non-recoverable outgoings of £1,000 pa and 10% rent passing.

Assuming that the building is let 24 months after the project start date and that rental growth of 3% per annum is applied from the project start date, the graphic below displays the resultant Net Rent.

The inflated Annual Gross Rent is the rent at which the building is assumed to let, taking into account rental growth (in this example at 3% pa) from the project start date to the letting date. It is important to note that deductions are calculated on the inflated Annual Gross Rent, so that the calculation of the Net Rent in the above example is as follows:

$$\text{Inflated Annual Gross Rent} = 500,000 \times \left[\left(1 + \frac{3}{12} \right)^{\frac{12}{24}} \right] = 530,450$$

Deductions from the inflated annual gross rent are then calculated as follows:

$$\text{Total Non Recov Cost} = (10\% \times 530,450) + 1,000 = 54,045$$

$$\text{Total GR Deduction} = (5\% \times 530,450) + 500 = 27,022.5$$

So

$$\text{Net Rent} = 530,450 - (54,045 + 27,022.5) = 449,382.5$$

Rounding to the nearest whole number gives a Net Rent of £449,383 per annum.

Capitalisation Method

A valuation is undertaken for each tenant/unit in the Capitalised Rent form in Argus Developer, provided a yield, or cap rate, is entered.

There are three capitalisation options available for the valuation. These methods can be selected from the **Capitalisation Method** drop-down in the Receipts tab of the Assumptions for Calculation window.

The options are:

- Hardcore;
- Initial Yield;
- Capitalise 12 month NOI. See

- Capitalise 12 month NOI” on page 9.

These methods of calculation are outlined below.

Initial Yield Method

The initial yield valuation method capitalises the net rent at the sale date into perpetuity, as outlined in the Valuation section at the start of this chapter. The basic formula is:

CR = NI × Years’ Purchase into perpetuity

$$CR = NI \times \frac{1}{i}$$

Where:

CR = Gross capital value, or capitalised rent.

NI = Net current rent per annum (net of any deductions and ground rent) i.e. Net Rent.

I = Yield or capitalisation rate.

Please note that if the rent is zero at the sale date (for example, if there is a void or a rent free period in effect), then zero rent will be capitalised.

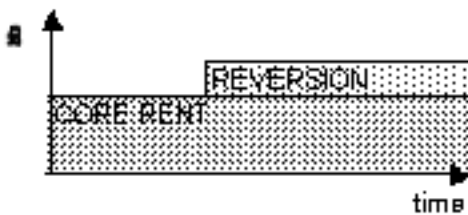
Hardcore Method

When the Hardcore method of valuation is used, ARGUS Developer takes the Net rent at the sale date and the market rental value (MRV) at that date, if different, and applies the appropriate capitalisation yield to calculate the capital value.

The Hardcore method values rental income in layers. The “**core**” net rental income is valued into perpetuity at the yield or “hardcore rate”, as outlined in the Valuation section above.

If the property is reversionary, i.e. the market rental value is higher than the current rent, then the future uplift in income, or “**reversion**”, is also capitalised. This future increase in rental income is valued at the same yield and discounted to a present value.

This can be illustrated as follows:



The basic formula for valuation by the hardcore method is as follows:

$$CR = [NI \times \text{Years' Purch into perp}] + [(NR - NI) \times \text{Years' Purch into perp} \times \text{Present Value}]$$

$$CR = \left[NI \times \frac{1}{i} \right] + \left[(NR - NI) \times \frac{1}{i} \times (1 + i)^{-n} \right]$$

where:

CR = Gross capital value, or Capitalised Rent

NI = Net current rent per annum (net of any deductions and ground rent) i.e. Net Rent

NR = Net open market rental value (MRV) per annum (net of any deductions and ground rent)

i = Hardcore rate (yield)

n = Number of years from the valuation date to the reversion to market rent

Details of rents and yields are entered in ARGUS Developer in the Capitalised Rent form. Years' Purchase and Present Value multipliers may be sourced from valuation tables.

Example

As an example, assuming a freehold property let at a net rent of £100,000 per annum, with a reversion to market rental value (MRV) of £115,000 per annum at the next rent review in four years' time, and adopting a hardcore rate (yield) of 8.00% (annually in arrears), the valuation is calculated as follows:

$$CR = \left[100,000 \times \frac{1}{0.08} \right] + \left[15,000 \times \frac{1}{0.08} \times (1 + 0.08)^{-4} \right]$$

$$CR = 1,250,000 + 137,818 = 1,387,818$$

So the gross capital value of the property is £1,387,818.

This example valuation is displayed on the Summary page of ARGUS Developer as follows:

Project Definition Project Cash Flow Summary Data Checker					
Summary Appraisal for Part 5 Office Bldg C					
REVENUE					
Rental Area Summary					
	Units	ft²	Rate ft²	Initial MRV/Unit	Net Rent at Sale
± Office Building C	1	5,000	£20.00	£100,000	100,000
Investment Valuation					
Office Building C					
Current Rent	100,000	YP @	8.0000%	12.5000	1,250,000
Reversion	15,000	YP @	8.0000%	12.5000	
		PV 4yrs @	8.0000%	0.7350	137,818
					1,387,818

Voids and Rent Free Periods

The user may specify void and rent free periods in the Capitalised Rent form in ARGUS Developer.

Rent free periods may be applied at the start of the lease and on a renewal lease. A **void period** may be entered on lease expiry (or break) prior to re-letting. In these cases, the valuation should reflect the lack of rental income during these periods.

The following formula is used to value rental income, allowing for a void and/or rent free period on lease expiry/break, followed by a reversion to market rent, following the hardcore method of valuation.

$$CR = [NI \times YP \text{ into perp}] - [NI \times YP \times \text{Present Value}] + [(NR - NI) \times YP \text{ into perp} \times \text{Present Value}]$$

$$CR = \left[NI \times \frac{1}{i} \right] - \left[NI \times \frac{1 - (1+i)^{-d}}{i} \times (1+i)^{-n} \right] + \left[(NR - NI) \times \frac{1}{i} \times (1+i)^{-(n+d)} \right]$$

where:

CR = Gross capital value, or Capitalised Rent

NI = Net current rent per annum (net of any deductions and ground rent) i.e. Net Rent

NR = Net open market rental value (MRV) per annum (net of any deductions and ground rent)

YP_d = YP (single rate) for d years

i = Hardcore rate (yield)

n = Number of years from the valuation date to the start of the void or rent free period

d = Total duration of the void and/or rent free period in years

Example

Assuming a rack rented property, let at £100,000 pa on a lease expiring in four years' time.

On lease expiry it is estimated that there will be a 6 month void, before the property is relet at the market rent of £115,000 per annum with an initial 3 month rent free period. There will therefore be a total period of 9 months during which the property will be non-income-producing.

Adopting a yield of 8%, the valuation is as follows:

$$CR = \left[100,000 \times \frac{1}{0.08} \right] - \left[100,000 \times \frac{1 - (1 + 0.08)^{-0.75}}{0.08} \times (1 + 0.08)^{-4} \right] + \left[15,000 \times \frac{1}{0.08} \times (1 + 0.08)^{-4.75} \right]$$

So

$$CR = 1,250,000 - 51,532 + 130,088 = 1,328,557$$

The gross capital value of the property is therefore £1,328,557.

This example valuation is displayed on the Summary page of ARGUS Developer as follows:

Project Definition Project Cash Flow Summary Data Checker					
Summary Appraisal for Part 6 Office Bldg C w Void/RF					
REVENUE					
Rental Area Summary					
	Units	ft²	Rate ft²	Initial MRV/Unit	Net Rent at Sale
± Office Building C	1	5,000	£20.00	£100,000	100,000
Investment Valuation					
Office Building C					
Current Rent	100,000	YP @	8.0000%	12.5000	1,250,000
Re-Letting Void & Rent Free	(100,000)	YP 0yrs 9mths @	8.0000%	0.7011	(51,532)
		PV 4yrs @	8.0000%	0.7350	
Reversion	15,000	YP @	8.0000%	12.5000	130,088
		PV 4yrs 9mths @	8.0000%	0.6938	
					1,328,557

Capitalise 12 month NOI

Calculations

The “Capitalise 12 month NOI” option uses the following calculation methodology:

1. **Base Rental Income** - includes the following:
 - Base Rent from current term at the time of sale and continuing as per the actual term of the lease (such as growth or steps if any).
 - If the current term ends during the 12 month period, market rental value during any void and/ or free rent periods.
 - Renewal rent for any subsequent term(s) that fall within the 12 month period.

All of these are subject to any void percentage or fixed amount that was applied at the point of sale (in other words, under the Capitalisation section of the Area form). The sum of these is the basis of capitalisation for the base income component. No further adjustment is made where there is rental loss due to voids or free rent.

2. **Turnover Rent** - if there is any turnover rent calculated, it would only apply for the remainder of the term in effect at the time of sale (maximum of 12 months), plus any renewal (only where there is no void or free rent between terms) that falls within the 12 month period. No adjustment would be made for “market” percentage rent or any renewals where there has been a void or free period.
3. **Rent Additions and Costs** - only those that are capitalised are included. Rent Additions and Costs are calculated during rent free periods, so only the treatment of Rent Additions and Costs during voids need be considered. Since Base Rent is being calculated during periods of voids, Rent Additions and Costs are included also to simulate having a lease in place. Therefore, Rent Additions and Costs are included during the entire 12 month period, with no need to do separate calculations for each base term/void/renewal segment that could be included in the 12 months. These are not subject to voids at this time.
4. **TIs and Lease Commissions** - it is possible to have TIs and/or Commission costs payable in respect of a new or renewal lease that would commence during the 12 month projection. On the Receipts tab in the “Capitalisation” area, if the **Deduct Post-Sale TI Costs and Lease Commissions from Capital Value** check box is checked on, this reduces the proceeds of sale when this Capitalisation method is active.

Growth and Inflation

During the 12 month run off period, it is assumed that growth will continue on rent, turnover (percentage) rent and Additional Rent revenues. Inflation will continue on TI costs and Additional Rent costs.

Historic Data Files

Existing files are defaulted to calculate according to the current calculation methodology, in respect of capitalisation (in other words, “off”) so values will not change on existing files.

Years' Purchase

Years' Purchase multipliers may be sourced from Valuation Tables. Basic formulae to calculate the Years' Purchase into perpetuity are set out below for both Annually in Arrears and Quarterly in Advance.

These formulae are single rate; for leasehold properties Years' Purchase dual rate may be used to provide for leasehold sinking fund and tax.

YP Annually in Arrears

$$YP = \frac{1}{i}$$

YP Quarterly in Advance (Effective)

$$YP = \frac{1}{4 \times \left[1 - (1+r)^{-\frac{1}{4}} \right]}$$

where r = yield (effective)

YP Quarterly in Advance (Nominal)

$$YP = \frac{1}{4 \times \left[1 - (1+r)^{-\frac{1}{4}} \right]}$$

where:

$$r = \left(1 + \frac{i}{4} \right)^4 - 1$$

i = yield (nominal)

r = yield (effective)

Gross Development Value

The Gross Development Value is the sum of the following:

- Capitalised Rent: the capitalisation of net rental income before deduction of acquisition fees (from the Capitalised Rent form in ARGUS Developer);
- Gross sales receipts (from the Sales form in ARGUS Developer).

Project	Definition	Project Cash Flow	Summary	Data Checker	
Summary Appraisal for Part 7					
REVENUE					
Sales Valuation					
Two Bed Apartments	Units	ft ²	Rate ft ²	Unit Price	Gross Sales
	1	20,000	£250.00	£5,000,000	5,000,000
Rental Area Summary					
Office Building	Units	ft ²	Rate ft ²	Initial MRV/Unit	Net Rent at Sale
	1	50,000	£30.00	£1,500,000	1,500,000
Office Building A1 Prelet	1	10,000	£50.00	£500,000	423,500
Totals	2	60,000			1,923,500
Investment Valuation					
Office Building	1,500,000	YP @	8.0000%	12.5000	18,750,000
Office Building A1 Prelet	423,500P	145yrs 6mths @	8.0000%	12.4046	5,253,339
Current Rent					24,003,339
GROSS DEVELOPMENT VALUE					29,003,339
Purchaser's Costs		5.76%	(1,307,829)		
NET DEVELOPMENT VALUE					27,695,510

Net Development Value

The Net Development Value is calculated as the Gross Development Value less Purchaser's Costs.

$$NDV = GDV - A$$

where:

NDV = Net Development Value

GDV = Gross Development Value

A = Acquisition costs (also referred to as purchaser's costs - see below)

Purchaser's Costs

Purchaser's costs, or acquisition costs, are calculated on the price paid for an investment, i.e. on Capitalised Rent. These are generally not deducted from gross sales receipts (Sales), although the user may select this option (Apply to Direct Sales) in the Expenditure tab of the Assumptions for Calculation form.

Purchaser's costs comprise agents fees, legal fees and any other acquisition costs, totalled to give a single percentage figure.

Costs are generally residualised on the total Capitalised Rent and are calculated by the following formula:

$$A = CR - \left(\frac{CR}{(1+a)} \right)$$

where

CR = Capitalised Rent

a = Purchaser's costs, expressed as a percentage

A = Purchaser's costs, expressed as an amount

In ARGUS Developer, in the Expenditure tab of the Assumptions for Calculation form, users may specify whether Purchaser's Costs are calculated on the Gross Development Value (i.e Capitalised Rent before deduction of purchaser's costs) or Net Development Value. The above formula assumes Purchaser's Costs are calculated on the Net Development Value.

If the Gross Development Value is selected for calculation, the formula for calculating Purchaser's Costs on the Capitalised Rent is as follows:

$$A = CR \times a$$

In the Expenditure tab of the Assumptions for Calculation form, the user may also select whether Purchaser's Costs are to be deducted from revenue or added to costs.

Net Realisation

Net Realisation is the Net Development Value plus any rental income received from tenants during the project or phase where tenants' income stream has been enabled.

Gross Initial Yield

The sum of gross exit rents divided by the total Capitalised Rent (gross).

$$GIY = \left(\frac{GI}{CR} \right) \times 100$$

where:

GI = Total gross exit rent per annum (before deduction of non-recoverable costs and ground rent)

CR = Total Capitalised Rent (gross)

Net Initial Yield

The sum of exit rents, net of any deductions and ground rent, divided by the total Capitalised Rent (gross).

$$NIY = \left(\frac{NI}{CR} \right) \times 100$$

where:

NI = Total net exit rent per annum (net of deductions and ground rent)

CR = Total Capitalised Rent (gross)

Equivalent Yield (EY)

The equivalent yield is the discount rate applied to the income flow from a property or portfolio, expected during the life of the investment, so that the total income discounted at this rate equals the initial capital outlay, or capital value. The equivalent yield is growth implicit.

The equivalent yield is calculated by solving the following expression iteratively for the term “ r ”:

$$CR_t = \left[\frac{NI_{(t+1)}}{(1+r)^1} \right] + \left[\frac{NI_{(t+2)}}{(1+r)^2} \right] + \dots + \left[\frac{NI_{(t+(n-1))}}{(1+r)^{(n-1)}} \right] + \left[\frac{NR}{r(1+r)^n} \right]$$

where:

r = Equivalent yield

CR = Capitalised Rent

NI_t = Net annual rental income (net of deductions and ground rent) at a given date “ t ”

NR = Net market rental value (MRV) per annum (net of deductions and ground rent)

n = Number of years which must elapse from year t before all tenancies have been reviewed to full market rent

The display of the equivalent yield in ARGUS Developer varies depending on the Valuation Tables selected in the Receipts tab of the Assumptions for Calculation form:

If Annually in Arrears tables are selected then the **Nominal Equivalent Yield** is displayed, together with the **True Equivalent Yield** (Quarterly in Advance).

If Quarterly in Advance (Effective) tables are selected then the True Equivalent Yield is displayed and if Quarterly in Advance (Nominal) tables the Nominal Equivalent Yield is displayed.

Turnover Rents

Turnover rent calculations are based on Sales Volume or turnover.

Details of the anticipated Sales Volume per annum must be entered. A multiplier is then applied to the Sales Volume to calculate the Turnover Rent.

The Sales Volume may be defined as a fixed annual amount throughout the cash flow. Alternatively, the user can apply growth to the Sales Volume by applying a Rental Growth Set, and specify whether the Sales Volume grows during the income period or for the whole cash flow period.

There are three “Breakpoint Type” options available for the calculation of turnover rents.

Zero Breakpoint

When zero breakpoint is selected, the % Turnover multiplier is applied to the entire Sales Volume p.a. to calculate the rent payable. The rent payable will therefore rise and fall depending on turnover.

Turnover Rent pa = Sale Volume pa × % Turnover

Example

Assuming an Annual Sales Volume of £1,000,000 and % Turnover set at 7%, the Turnover Rent is calculated as follows:

Turnover Rent pa = 1,000,000 × 0.07 = 70,000

Natural Breakpoint

This is used when the total rent payable comprises a core, or base, rent together with an additional turnover rent. In this case the rent payable will never fall below the base rent. For example, a lease may guarantee the landlord a percentage of total sales subject to a minimum core rent.

In order to calculate the “Natural Breakpoint”, the core rent is calculated as an equivalent value in terms of Sales Volume, by dividing the rent by the % Turnover. This equivalent value is the Natural Breakpoint.

Natural Breakpoint = $\frac{\text{Base Rent}}{\% \text{ Turnover}}$

Only Sales Volume in excess of this Natural Breakpoint is used for the calculation of Turnover Rent. In this case, the Turnover Rent is calculated as follows:

Turnover Rent pa = (Sale Volume – Natural Breakpoint) × % Turnover

The total rent payable is then calculated:

Total Rent Payable pa = Base Rent + Turnover Rent

Example

Assuming Sales Volume pa of £1,000,000, Base rent of £10,000 pa and % Turnover of 8%, the calculation is:

Natural Breakpoint = $\frac{10,000}{0.08} = 125,000$

Turnover Rent pa = (1,000,000 – 125,000) × 0.08 = 70,000

Total Rent Payable pa = 10,000 + 70,000 = 80,000

Arbitrary Breakpoint

The Arbitrary Breakpoint may be entered as an amount per month per unit area (in sq ft or sq m) or as a total annual amount. Only Sales Volume in excess of the Arbitrary Breakpoint is used to calculate the Turnover Rent. So:

$$\text{Turnover Rent pa} = (\text{Sales Volume} - \text{Arbitrary Breakpoint}) \times \% \text{ Turnover}$$

Example

Assuming a Sales Volume pa of £1,000,000, Rent £100,000 pa, Arbitrary Breakpoint set at £200,000 and % Turnover of 8%, the rent payable is calculated as follows:

$$\text{Turnover Rent pa} = (1,000,000 - 200,000) \times 0.08 = 64,000$$

$$\text{Total Rent Payable pa} = 100,000 + 64,000 = 164,000$$

Operated Asset Valuations

In ARGUS Developer, any property type whose income is derived from operations, such as hotels, golf courses, marinas or amusement parks, is valued on a different basis to the more usual commercial leases.

The valuation is based on the Net Operating Income (NOI) projected twelve months into the future starting on the Capitalisation Date. The total Net Operating Income for this period is divided by a Capitalisation Rate to calculate the Capital Value.

Net Operating Income comprises several key elements: base revenue generated from operations, direct operating expenses, indirect operating expenses and, possibly, management charges, allowances for replacement of fixtures and fittings and insurance. The exact mix of revenues and costs will be determined by the asset type.

To establish the Net Operating Income for an operated asset, a profile that holds the number of units, rates per unit and frequency of use must be defined. The rates in each of the tables may be constant or they can vary in value month by month.

Other operating revenues can be expressed as a percentage of the Base Revenue, or can be specified by a number of different calculation methods which will be discussed later.

Direct and Indirect operating expenses can be calculated as a percentage of their associated operating revenue types, but, again, different calculation methods are available.

Occupancy and Rate Profiles

A profile is a collection of tables that describe the physical dimensions of the asset, the number of units, the rates charged for using the asset and the frequency of use, or occupancy. Each table allows the entry of data that can remain constant, or that may vary, month by month.

Taking an hotel as an example, the base revenue is typically calculated as:

$$\text{Total Base Revenue} = \text{Number of Rooms} \times \text{Room Rate} \times \text{Occupancy}$$

The calculation is performed for each period of the projection, building up a cash flow of operating revenue. Once the Base Revenue has been established, any other operating revenues and expenses can be calculated.

Where the number of years specified in the tables is less than the number of years in the cash flow projection, the program will use the data from the final year in each table for the remainder of the projection.

Calculation Methods

The calculation methods available to define operated assets are selected from the Operating Revenues/Expenses tab in the Operated Assets Editor. The Calculation Type drop down selector is used to select a calculation method for the Revenue or Expense.

Base Income

The Base Income calculation method is used to specify the basic core revenue for an asset. For hotels, this would be room revenue, for marinas, this would be berthing charges.

The Base Income method takes as its parameters a list of tables that have been set up on the Occupancy and Rates tab. The calculation multiplies the rate in each period of a table with the corresponding period rate in the next table, and so on. The result of each of these calculations is then multiplied by the number of units on the Area Record. So, if there are three tables used to define the revenue, the calculation would be as follows:

$$\text{Total Base Income} = \text{Number of Units} \times (T1_1 \times T2_1 \times T3_1) + (T1_2 \times T2_2 \times T3_2) + \dots + (T1_n \times T2_n \times T3_n)$$

Where:

Number of Units = number of units entered in the area record

$T1_1$ = value in the first period of Table 1

$T2_1$ = value in the first period of Table 2

$T3_1$ = value in the first period of Table 3

The result of each period's multiplication is placed in the cash flow as the base revenue for the month.

Percent of Base Income

This calculation method is used to multiply a percentage rate against each months' Base Revenue. The percentage rate may be a single rate for all periods, or may vary month by month. It will not include any items that are defined as 'Other Income'.

$$\text{Total \% of Base Income} = (BI_1 \times \%BI_1) + (BI_2 \times \%BI_2) + \dots + (BI_n \times \%BI_n)$$

Where:

BI_1 = Base Income in month 1

$\%BI_1$ = % of Base Income in month 1

Other Income

The Other Income calculation method is similar to the Base Income type, in that it takes a list of Occupancy and Rate tables and performs the same type of rate calculations. The difference is that it is not included in the 'Percent of Base Income' calculations.

Percent of Section Total

The Percent of Section Total calculation is used to multiply a percentage rate against the monthly total of all revenues or expenses held in a Section. A Section is defined on the Operating Revenues/Expenses tab and is used to group similar types of revenues or expenses. The percentage rate may be a single rate for all periods, or may vary month by month. It can be used on any section in a profile.

$$\text{Total \% of Section Total} = (ST_1 \times \%ST_1) + (ST_2 \times \%ST_2) + \dots + (ST_n \times \%ST_n)$$

Where:

ST_1 = Section Total in month 1

$\%ST_1$ = % of Section Total in month 1

Percent of Line Item

The Percent of Line Item calculation is used to multiply a percentage rate against the monthly total of any other revenue or expense item. The percentage rate may be a single rate for all periods, or may vary month by month. It can be used on any line item in any section in the profile.

$$\text{Total \% of Line Item} = (LI_1 \times \%LI_1) + (LI_2 \times \%LI_2) + \dots + (LI_n \times \%LI_n)$$

Where:

LI_1 = Line Item amount in month 1

$\%LI_1$ = % of Line Item amount in month 1

Amount per Occupied Asset

The Amount per Occupied Asset calculation method is used to multiply an amount against the number of times an asset is occupied or used, per day, per week, or, per month.

This calculation method takes as its parameters the number of units entered into the Area Record and a list of tables that define the occupancy or use, a rate type – daily, weekly, or monthly, and a rate. The rate may be constant for all periods, or may vary month by month.

Where the rate is specified as a daily or weekly rate, it will be multiplied by the number of days or weeks in each month to calculate the monthly amount.

$$\text{Total Amount per OA} = \text{Number of Units} \times (U_1 \times O_1 \times R_1) + (U_2 \times O_2 \times R_2) + \dots + (U_n \times O_n \times R_n)$$

Where:

Number of Units = number of units entered into the area record

U_1 = number of units in the first period of Table 1

O_1 = occupancy rate in the first period of Table 2

R_1 = rate per occupied unit in the first period

Amount per Available Asset

The Amount per Available Asset calculation method is used to multiply an amount against the number of times an asset is available per month.

This calculation method takes as its parameters the number of units entered into the Area Record and a table that defines the number of available units, a rate type – daily, weekly, or monthly, and a rate. The rate may be constant for all periods, or may vary month by month.

Where the rate is specified as a daily or weekly rate, it will be multiplied by the number of days or weeks in each month to calculate the monthly amount.

$$\text{Total Amount per AA} = \text{Number of Units} \times (U_1 \times R_1) + (U_2 \times R_2) + \dots + (U_n \times R_n)$$

Where:

Number of units = number of units entered into the area record

U_1 = number of units in the first period of Table 1

R_1 = rate per available unit in the first period

Amount per Unit

The Amount per Unit calculation method is used to multiply a rate against the number of units in each month of the projection.

This calculation method takes as its parameters a table that defines the number of available units and a monthly rate. The rate may be constant for all periods, or may vary month by month.

$$\text{Total Amount per Unit} = (U_1 \times R_1) + (U_2 \times R_2) + \dots + (U_n \times R_n)$$

Where:

U_1 = number of units in the first period of Table 1

R_1 = rate per unit in the first period

Amount per Month

The Amount per Month calculation method is used to place a monthly amount in each month of the cash flow projection. The amount can be constant for all periods, or may vary month by month.

Amount per Week

The Amount per Week calculation method is used to place a weekly amount in each month of the cash flow projection. The amount can be constant for all periods, or may vary month by month.

The Weekly amount will be automatically multiplied by the number of weeks in each month to calculate the monthly amount.

$$\text{Total Amount per Week} = \left(WR_1 \times \frac{Days_1}{7} \right) + \left(WR_2 \times \frac{Days_2}{7} \right) + \dots + \left(WR_n \times \frac{Days_n}{7} \right)$$

Where:

WR_1 = Weekly rate

$Days_1$ = Number of days in the month

Amount per Activity

The Amount per Activity calculation method is used to multiply an amount by the number of activities that take place, either daily, weekly or monthly.

This calculation method takes as its parameters a table that defines the number of activities – either daily, weekly or monthly, and rate. The rate may be constant for all periods, or may vary month by month.

The calculation will automatically recognise whether the table of activities is specified in terms of daily or weekly activities and will multiply the rate by the number of days or weeks in each month as appropriate.

$$\text{Total Amount per Activity} = (A_1 \times R_1) + (A_2 \times R_2) + \dots + (A_n \times R_n)$$

Where:

A_1 = number of activities in the first period of Table 1

R_1 = rate per activity in the first period

Percent of Section Total (Net)

The Percent of Section Total (Net) calculation is used to multiply a percentage rate against the monthly total of all revenues or expenses held in a Section and where the item itself is included in the total. To be able to calculate the Section Total, there must be at least item whose value is already established and in this calculation method, it is a Base Income that must be present.

A Section is defined on the Operating Revenues/Expenses tab and is used to group similar types of revenues or expenses. The percentage rate may be a single rate for all periods, or may vary month by month. It can be used on any section in a profile.

The calculation for each item is:

$$\text{Total \% of Section Total (Net)} = (BI_1 \div (1 - \sum \%ST_1) \times \%R_1) + (BI_2 \div (1 - \sum \%ST_2) \times \%R_2) + \dots + (BI_n \div (1 - \sum \%ST_n) \times \%R_n)$$

Where:

BI_1 = Base Income in month 1

$\sum \%ST_1$ = Total % of Section Total in month 1

$\%R_1$ = % rate in month 1

Rate per Linear foot/metre

The Rate per Linear foot/metre calculation method is used to multiply a rate by the number of linear feet/metres for an asset in each month of the projection. This is typically used in Marina valuations where the berth length, or dock length is used as a basis for calculation.

The units of measurement are the same as those used throughout the system and can be converted between Imperial and metric.

This calculation type takes as its parameters a table of linear measurements and a rate. The rate may be a single rate for all periods, or may vary month by month.

The calculation for each item is:

$$\text{Total Rate per Linear foot} = (A_1 \times R_1) + (A_2 \times R_2) + \dots + (A_n \times R_n)$$

Where:

A_1 = the linear measurement in either feet or metres in the first period of Table 1

R_1 = rate per linear measurement in the first period

Rate per Square foot/metre

The Rate per Square foot/metre calculation method is used to multiply a rate by the number of square feet/metres for an asset in each month of the projection.

The units of measurement are the same as those used throughout the system and can be converted between Imperial and metric.

This calculation type takes as its parameters a table of square measurements and a rate. The rate may be a single rate for all periods, or may vary month by month.

The calculation for each item is:

$$\text{Total Rate per Square foot} = (A_1 \times R_1) + (A_2 \times R_2) + \dots + (A_n \times R_n)$$

Where:

A_1 = the square measurement in either feet or metres in the first period of Table 1

R_1 = rate per square measurement in the first period

Example

To use a simple example for illustrative purposes:

An hotel with 125 double rooms, all of which are available at a rate of £80 per night. The average occupancy is 70% and the projection period is two years, starting in January. There are no leap years in the projection period. The hotel is sold at the end of the two year projection period.

Operating Revenues are generated at a rate of 50% of Room Revenues and Operating Expenses are incurred at a rate of 35% of Gross Operating Revenue.

The revenue per occupied room per night is calculated as:

Number of Rooms × Room Rate × Occupancy

$$125 \times 80 \times 0.70 = 7,000$$

The Room Revenue per month, say January, is calculated as:

Revenue per night × Number of nights in month

$$(7,000 \times 31) = 217,000$$

And the Room Revenue for the two years' projection is:

$$[(7,000 \times 31) + (7,000 \times 28) + \dots + (7,000 \times 31)] \times 2$$

$$[(217,000) + (196,000) + \dots + (217,000)] \times 2 = 5,110,000$$

Operating Revenues are calculated as:

Room Revenue × Operating Rate

$$[(217,000 \times 0.5) + (196,000 \times 2) + \dots + (217,000 \times 0.5)] \times 2$$

$$[108,500 + 98,000 + \dots + 108,500] \times 2 = 2,555,000$$

So, Gross Operating Revenue is:

$$[(217,000 + 108,500) + (196,000 + 98,000) + \dots + (217,000 + 108,500)] \times 2 = 7,665,000$$

Operating Expenses are calculated as:

Gross Operating Revenue × Operating Rate

$$[((217,000 + 108,500) \times 0.35) + ((196,000 + 98,000) \times 0.35) + \dots + ((217,000 + 108,500) \times 0.35)] \times 2$$

$$[37,975 + 34,300 + \dots + 37,975] \times 2 = 894,250$$

So, Net Operating Income is:

Gross Operating Revenue – Operating Expenses

$$[(325,000 - 37,975) + (294,000 - 34,300) + \dots + (325,000 - 37,975)] \times 2$$

$$[287,525 + 259,700 + \dots + 287,525] \times 2 = 6,770,750$$

The Net Operating Income is capitalised after two years to produce the capital value for the hotel. The method adopted for operated assets is to capitalise the the final year's Net Operating Income on an Initial Yield basis.

The Capital Value is calculated as:

NOI from 12 month projection period × 100 ÷ Yield%

$$[287,525 + 259,700 + \dots + 287,525] \times 100 \div 9$$

$$3,385,375 \times 11.1111 = 37,615,278$$

The Capital Value for the hotel is, therefore £37,615,277

Chapter 2

Stamp Duty

Stamp Duty, or Property Transfer Tax, is the tax payable by the purchaser when acquiring land or property, generally calculated as a percentage of the purchase price. In ARGUS Developer, this is calculated on the Land Acquisition Price.

Stamp Duty can be entered as a single percentage rate or amount in the Stamp Duty field in Definition or, when the tax is calculated at different %s based on stepped thresholds, a tax profile can be created using the **Stamp Duty Schemes** form in **File | Administration**.

Bands are defined by specifying lower and upper band limits and the percentage tax rate applicable to each band. The calculation of tax may also be as cumulative or non-cumulative, and fixed amounts can be manually specified for each band if required.

Lower Limit	Upper Limit	Percentage	Cumulative	Cumulative Amount
0	125,000	0.000%	<input type="checkbox"/>	0.00
125,001	250,000	1.000%	<input type="checkbox"/>	0.00
250,001	500,000	3.000%	<input type="checkbox"/>	0.00
500,001	1,000,000	4.000%	<input type="checkbox"/>	0.00
1,000,001	(No Limit)	5.000%	<input type="checkbox"/>	0.00

Cumulative Bands

In some countries, Stamp Duty, or transfer tax, is calculated as a continual accumulation from one band to the next (as opposed to a single percentage applied to the total value). In this case the tax bands are **cumulative**, with differing rates applied to different tranches of the purchase price. These are totalled to calculate the total tax payment.

For example, purchase tax on a 1,000,000 acquisition, based on the Stamp Duty Scheme set out below, would be calculated as follows:

Cumulative Stamp Duty Scheme:

Lower Limit	Upper Limit	Percentage
	55,000	0.50%
55,001	250,000	1.00%
250,001	No Limit	1.50%

Tax calculation:

55,000	@ 0.50%	275
195,000	@1.00%	1,950
<u>750,000</u>	<u>@1.50%</u>	<u>11,250</u>
1,000,000		13,475

So the Stamp Duty payable would be £13,475.

Non-Cumulative Bands

When bands are non-cumulative, tax is calculated on the whole purchase price at the single % rate applicable to the band within which the total purchase price falls.

For example, stamp duty on a 450,000 acquisition, based on the Stamp Duty Scheme set out below, would be calculated as follows:

Non-Cumulative Stamp Duty Scheme:

Lower Limit	Upper Limit	Percentage
	125,000	0.00%
125,001	250,000	1.00%
250,001	500,000	3.00%
500,001	No Limit	4.00%

Tax is calculated on the whole purchase price at 3.00%, since the property purchase price of 450,000 falls within the band 250,001-500,000.

So the Stamp Duty payable is:

$$450,000 \times 3.00\% = \text{£}13,500$$

Chapter 3

Cash Flow

Internal Rate of Return and Net Present Value

The Internal Rate of Return (IRR) is the discount rate which, when applied to each positive and negative amount in the cash flow, results in a figure (called the Net Present Value or NPV) equal to zero. The IRR represents the return to an investor of the performance of his money, in terms of expenditure on purchase, construction costs and fees, rental income and the sales receipt at the end of the project.

The cash flow in ARGUS Developer follows the standard formulae for computation of the Internal Rate of Return and Net Present Value. Basically, this is the sum of discounted successive positive and negative amounts.

The standard formula applied in the mathematics is:

$$V_0 = \left(\frac{R_{x1}}{1+a} \right) + \left(\frac{R_{x2}}{(1+a)^{x2}} \right) + \dots + \left(\frac{R_{x(n-1)}}{(1+a)^{x(n-1)}} \right) + \left(\frac{R_{xn} + V_{xn}}{(1+a)^{xn}} \right)$$

Where:

V_0 = Initial value, or Acquisition Price, as a manual figure or residual through iteration mathematics.

a = Discount rate

n = Number of periods

x = Measure standard for the period (i.e. monthly)

R = Net Income after operating costs and ground rent

V_{an} = Valuation net of associated costs

The Cash Flow works through each period, resulting in the accumulation by:

$$V_0 = \sum_{i=1}^{xn} \frac{R_i}{(1+a)^i} + \frac{V_{xn}}{(1+a)^{xn}}$$

where:

R_i = Recurring periodic net revenue

The practical effects of x and n are illustrated below.

The standard principles for discounting are applied so that the NET PRESENT VALUE is ZERO.

The program finds the IRR by iterating (*producing multiple calculated guess rates*) over the time-based series of costs and revenues in the cash flow spreadsheet, until the difference between the sum of the discounted receipts and the sum of the discounted costs is zero.

An Initial IRR guess rate must be entered in the Calculation tab in Assumptions for Calculation.

Monthly Discounting

ARGUS Developer calculates the IRR based on monthly discounting where all future figures are assumed to be timed at the start of each month. The aggregate figure for each month is discounted from the first of the month. Therefore, the total expenditure in, say, month 4 of the cash flow is discounted from the 1st day of the 4th month back to the project start date.

Example

Total expenditure in month 4 of £100,000 discounted at 12% (PV of £1 for 4 months).

To be precise, it is discounted by the number of days from the first of the (4th) month back to the project start date.

The formula used is as follows:

$$(1 + i)^n$$

where i = IRR and n is the fractional number of days $(122 / 365) = 0.3342$

$$(1 + 0.12)^{0.3342} = 1.03860$$

So the calculation is:

£100,000 divided by 1.03860

= **£96,283**

Manual Discount Rate for Present Value

In ARGUS Developer, the user may specify a manual discount rate for the calculation of the Present Value of the project.

This is entered in the Calculation tab in Assumptions for Calculation. ARGUS Developer will then calculate the Present Value based on this manually entered discount rate. If this option is selected, the Present Value and discount rate are displayed in the Performance Measures section of the Summary report.

IRR Scenarios

The IRR calculation relies on the dates for the occurrence of each positive and negative amount in the cash flow.

The default setting for the calculation of the IRR for any selected phase in ARGUS Developer takes into account all inflows and outflows from the cash flow from phase start date to phase end date. In a multi-phase project where all phases are linked, the IRR is calculated for the linked phase project from project start to project end date. In addition separate IRRs are calculated for each individual phase reflecting the cash flow start and end dates for each phase.

The IRR scenario form allows you to specify different start and end dates for the calculation of the IRR within the project/phase timescale.



Scenario Name	Start Timing	End Timing	IRR
IRR	Project Start	Project End	22.3212%
IRR Construction to End	Construction	Project End	59.8229%
IRR Letting to End	Operations Start	Project End	Out of Range

The IRRs and IRR dates are displayed on the Summary page (see graphic below) when these options are selected on the Summary tab of the Options form in the Tools menu.

TOTAL COSTS		81,194,707
PROFIT		12,068,192
Performance Measures		
Profit on Cost%		14.86%
Profit on GDV%		13.18%
Profit on NDV%		13.18%
Development Yield% (on Rent)		4.75%
Equivalent Yield% (Nominal)		7.34%
Equivalent Yield% (True)		7.69%
IRR	Apr 2012to Mar 2015	10.73%
IRR Construction to End	Oct 2012to Mar 2015	11.45%
IRR Letting to End	Sep 2013to Mar 2015	17.98%
Rent Cover		5 yrs 3 mths
Profit Erosion (finance rate 12.000%)		1 yr 2 mths

Interest in IRR Calculations

When finance is applied to a project the user may specify whether the calculation of the IRR takes account of interest payments. This option is set in the Finance tab of the Assumptions for Calculation form.

Inflation and Rental Growth

Inflation and rental growth are calculated period by period from the start of the project or phase, and can be applied in advance or in arrears, by selecting the required setting in the Finance tab of Assumptions for Calculation.

The formula for applying growth (rental growth and cost inflation) to an amount is:

$$C \times \left[\left(1 + \frac{i}{100} \right)^{\frac{n}{12}} \right]$$

Where:

C = Amount to be inflated

i = Annual rate of growth/inflation

n = Growth period in months from project/phase start

For example, assume a cost of £1,000,000 payable monthly from the project start over a period of 4 months, with inflation at 3% per annum. The inflated cost is calculated as follows:

Total Cost	1,000,000
Distribution Months	4
Inflation Rate	3%

Month	Cost	In Arrears		In Advance	
		Inflation Factor	Inflated Cost	Inflation Factor	Inflated Cost
1	250,000	1.0000	250,000	1.0025	250,617
2	250,000	1.0025	250,617	1.0049	251,235
3	250,000	1.0049	251,235	1.0074	251,854
4	250,000	1.0074	251,854	1.0099	252,475

Chapter 4

Finance

There are two financing methods available in ARGUS Developer:

- Basic (Interest sets)
- Structured Finance

The financing method is selected in the Finance tab of Assumptions for Calculation.

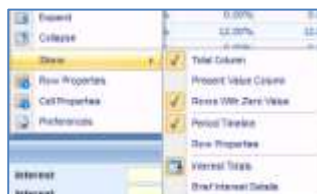
Basic Finance (Interest Sets)

When the Basic (Interest Sets) financing method is selected, interest is calculated on the net total amount in each period, which is detailed in the **Period Total for Interest** row of the Finance Cash Flow (see graphic below). The calculated monthly interest amounts are shown in the Total Interest rows.

Where the net period total is negative, i.e. an outflow, then the debit rate is applied; where the net period total is positive (an inflow) the credit rate is applied.

Project: Defaults	Project: Cash Flow	Summary: Data Checker	1	2	3	4	5	6	7	8	9	10
Yearling	Total		Apr 2012	May 2012	Jun 2012	Jul 2012	Aug 2012	Sep 2012	Oct 2012	Nov 2012	Dec 2012	Jan 2013
				Purchase	0.0							
							Own Assets		Pre Construction			
Acquisition Costs												
Parcel A	(2,700,000)	(2,700,000)				(270,000)		(2,000,000)				
Parcel B	(3,000,000)	(3,000,000)										
Legal Fee	(8,000)			8,000								
Master Planning	(100,000)	(11,810)	(11,210)	(6,127)	(4,162)	30,880	9,000	(6,141)	(8,000)	(7,400)		
30 Year Carry	(10,000)						(2,500)	(2,500)				
Assess Right												
Total for Acquisition Costs	(6,808,000)	(3,811,810)	(35,210)	(10,727)	(282,880)	(12,138)	(2,011,891)	(11,245)	(8,000)	(7,400)		
Construction Costs												
City Levy	(180,790)											
Offsite Services												
Cost - Apartment Condomino	(94,307,610)											
Cost - Condo (40%)	(1,258,790)											
Total VAT paid												
VAT recovered on code date												
Net period total	(3,811,810)	(35,210)	(10,727)	(140,682)	11,864	(1,987,791)	22,918	10,000	(8,400)	(7,400)		
Period Total for Interest		(3,811,810)	(35,210)	(140,682)	11,864	(1,987,791)	22,918	10,000	(8,400)	(7,400)		
0% Rate use = 0.00% var		0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%		
12% Prof Return: Debt Rate is = 12.00%		0.00%	12.00%	12.00%	12.00%	12.00%	12.00%	12.00%	12.00%	12.00%		
12% Prof Return: Credit Rate is = 0.00%		0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%		
Total for 12% Prof Return		(34,596)	(34,792)	(34,410)	(34,027)	(33,643)	(33,259)	(32,875)	(32,491)	(32,107)		
Total Interest (All Sets)		(34,596)	(34,792)	(34,712)	(34,163)	(34,647)	(33,340)	(32,875)	(32,491)	(32,107)		
Period Total For Int	(3,811,810)	(34,870)	(140,140)	(177,042)	(14,813)	(2,022,438)	35,236	10,000	(8,400)	(7,400)		
Cumulative Total C/P	(3,811,810)	(3,846,680)	(3,912,290)	(4,052,332)	(4,186,395)	(4,314,182)	(4,436,367)	(4,552,366)	(4,662,366)	(4,766,366)		

To view all the total interest rows as shown in the picture above, right-click on the rows at the top half of the Cash Flow grid and uncheck the **Brief Interest Details** menu option:



Interest Rate Type

Nominal and Effective Rates

The interest rate type to be used in ARGUS Developer may be set in the Finance tab of the Assumptions for Calculation form.

An **Effective** rate, or APR, is the final rate achieved at the end of the year including compounding.

This is calculated as follows:

$$\left(1 + \frac{i}{p}\right)^p - 1$$

where:

i = Nominal annual rate of interest (%)

p = Number of compounding periods per year

For example, an interest rate of 10% per annum compounded quarterly would produce:

$$\left(1 + \frac{0.1}{4}\right)^4 - 1 = 0.1038 \text{ i. e. } 10.38\% \text{ Effective rate}$$

A **Nominal** rate is the 10% which produces the 10.38% effective rate above.

Debit and Credit Rates

The **debit** rate is the rate of interest charged by the lender on the loan amount and represents an outflow from the cash flow. The **credit** rate is the rate at which interest is earned when the finance arrangement is in credit. It represents an inflow of money to the cash flow.

Interest Calculation

Interest is calculated on a monthly basis on the Period Total for Interest row in the Finance Cash flow in ARGUS Developer. The basic formulae are as follows:

Nominal Rates of Interest

$$C \times \left[\left(\frac{i}{i} \right) \times \frac{1}{\left(\frac{12}{p} \right)} \right]$$

where:

C = Total monthly cost

i = Annual rate of interest (%)

p = Number of compounding periods per year

Effective Rates of Interest

$$C \times \left[\left((1 + i)^{\frac{1}{p}} - 1 \right) \times \frac{1}{\left(\frac{12}{p} \right)} \right]$$

where:

C = Total monthly cost

i = Annual rate of interest (%)

p = Number of compounding periods per year

Breakdown of Interest

It should be noted that the breakdown of interest is provided for information purposes only. It is not used when calculating the total interest charge. The breakdown is approximate only due to the way in which additional revenues and other income are used to offset the Building Interest charges.

Interest is reported as follows:

Land Interest

This is the total amount of interest attributable to the land costs from the start of the phase to the beginning of the Letting Void period.

Building Interest

This is the total amount of interest attributable to everything other than land costs. This includes any income from Additional Revenues and Capitalisation. The interest is accrued from the beginning of the phase to the start of the Letting Void period.

Void Interest

This is the interest attributable to all costs from the start of the Letting Void to the end of the Letting Void period.

Other Interest

This is the interest attributable to all costs from the end of the Letting Void period to the end of the phase. Interest is shown in several circumstances:

- If a phase is part of a linked multi-phased scheme and does not realise a profit - interest accrues on outstanding costs if the phase length is shorter than the project length.
- If a phase is part of a linked multi-phased scheme and realises a profit - interest accrues on the profit amount if the phase length is shorter than the project length. A Credit Interest rate must be entered for this to happen.
- If a phase has a duration entered for the stage after the Letting Void. If the phase realises a profit and a Credit Interest rate has been entered, interest is earned on the profit amount.

Structured Finance

When Structured Finance is selected, users can set up multiple equity partners, interim loans during construction (as debt sources of finance) and mortgages to look at financing scenarios for projects.

Project	Developer	Project Cash Flow	Finance Cash Flow	Summary	Data Checker	1	2	3	4	5	6	7	8
Heading:		Total											
				Apr 2012	May 2012	Jun 2012	Jul 2012	Aug 2012	Sep 2012	Oct 2012	Nov 2012		
Finance - Project Cash Flow Pre-Finance				IRR: 21.4%									
Finance - Developer				IRR: 18.0% ROI: 283.0% Profit Amount: \$2,200,415									
Finance - Equity Investor 1				IRR: 31.0% ROI: 88.0% Profit Amount: \$8,335,792									
Timed Contributions: Project													
Auto Project Contribution		(10,315,988)		(5,190,585)	(18,807)	(20,687)	(148,041)	(15,588)	(1,842,270)	(572,477)	(1,828,776)		
Total Contribution		(10,315,988)		(5,190,585)	(18,807)	(20,687)	(148,041)	(15,588)	(1,842,270)	(572,477)	(1,828,776)		
Interest		\$		\$	\$	\$	\$	\$	\$	\$	\$	\$	\$
Timed Repayments: Project													
Auto Repayment		18,315,888		\$	\$	\$	\$	\$	\$	\$	\$	\$	\$
Total Repayment		18,315,888		\$	\$	\$	\$	\$	\$	\$	\$	\$	\$
Closing Balance		\$		(5,190,585)	(5,329,212)	(5,249,888)	(5,389,700)	(5,406,518)	(5,448,586)	(7,021,873)	(8,848,840)		
Timed Profit Participation		\$		\$	\$	\$	\$	\$	\$	\$	\$	\$	\$
Auto Profit Participation		8,335,792		\$	\$	\$	\$	\$	12,888	12,888	12,888	12,888	12,888
Total Profit Participation		8,335,792		\$	\$	\$	\$	\$	12,888	12,888	12,888	12,888	12,888
Net Cash Flow (IRR)		8,335,792		(5,190,585)	(18,807)	(20,687)	(148,041)	(5,588)	(1,818,270)	(560,477)	(1,818,776)		
Cumulative Net Cash Flow		\$		(5,190,585)	(5,329,212)	(5,249,888)	(5,338,700)	(5,354,318)	(5,384,586)	(6,820,573)	(7,641,849)		
Finance - Equity Investor 2				IRR: 25.0% ROI: 74.0% Profit Amount: \$7,714,883									
Finance - Construction Loan				IRR: 5.0% Profit Amount: \$8									
Finance - Mortgage				IRR: 7.0% Annual Int. Rate Comp: 6.0% Monthly Annual Payment: \$ 12,694.80 DS Ratio: 1.61 Initial Loan Value Ratio: 88.00									
Finance - Balancing Account				IRR: 5.0%									
Finance - Combined Sources				IRR: 21.0%									

For further information on setting up, and options for, Structured Finance please see the ARGUS Developer Reference Manual.

Finance Fees

Finance fees may be defined either as fixed amount fees or calculated as a related %. Finance fees calculated as a related amount may be linked to:

- Drawn Amount. The fee is calculated as a percentage of the amount contributed.
- Fixed Loan Amount. The fee is calculated as a percentage of a fixed amount specified by the user.
- Undrawn Amount. The fee is calculated as a percentage of the difference between the amount committed at the start and the amount actually contributed in any period.
- Fixed Undrawn Amount. The fee is calculated as a percentage of a fixed amount specified by the user.

The Finance Fee tab of the Finance form also presents the user with options to specify when fees are first charged and the charging period.

For fees calculated as a percentage of the Undrawn Amount, the user may specify whether this is charged if the loan remains undrawn at the end of the project financing.

Mortgage

A mortgage loan can be applied when Structured Finance is used to calculate the financing of a project appraisal. ARGUS Developer calculates interest and principal (capital repayments), amortising down to zero for the specified amortisation period.

The total monthly payment (DS) to the mortgage lender (principal plus interest) is calculated as follows:

$$\frac{(1+f)^N \times f}{(1+f)^N - 1} \times L$$

where

$$L = \text{Loan amount}$$

N = Mortgage loan term, or amortisation period, in months

f = interest factor, calculated from the formula below:

$$f = \left(1 + \frac{i}{p}\right)^{\frac{1}{n}} - 1$$

where:

i = Interest rate

n = Compounding period (see table below)

p = Dividing factor for each compounding period option (see table below)

For example:

	Compound Period (months) (n)	Dividing Factor (p)
Monthly	1	12
Quarterly	3	4
Six Monthly	6	2
Annual	12	1

This total monthly mortgage payment amount (DS) comprises principal and interest.

The interest payment each period is calculated as follows:

Outstanding loan balance \times f

where f is the interest factor, calculated as set out above.

The principal may then be calculated as the total mortgage payment less this interest payment.

Debt Service Ratio

This is the ratio of net operating income to annual mortgage repayment.

$$\frac{\text{Net Operating Income}}{\text{Annual Mortgage Repayment}}$$

A ratio of 1.0 indicates a break even situation where the net operating income is just enough to cover mortgage payments. A higher ratio indicates that the income from the project is more than sufficient to service the debt

Cash on Cash Return

The Cash on Cash return for Equity Sources is the ratio of Net Annual Cash Flow to the Total Capital Invested, expressed as a percentage. The formula takes into account the Profit Distribution and the total Equity invested over the life of the project.

The Cash on Cash analysis can be found on the Funding Source Report, available either from the Finance Cash Flow, or from the Report Setup form.

The Cash on Cash analysis begins on one of two dates – either the Mortgage Start Date, if a mortgage has been used, or the Stabilised Income Month for Ratio Analysis date, if a Mortgage has not been used. This Stabilised Income Month can be specified on the General tab in the Finance Setup area.

Beginning on the Cash on Cash analysis date, the calculation works forward through the cash flow in one year cycles, taking the year's Profit and dividing by the total Equity invested. If, in the closing periods of the cash flow, there are not a full 12 months remaining, the program will annualise the return by dividing the part-year's Profit by 12 and multiplying by the number of months remaining. This annualised, final period can give a distorted return where the length of the final period projection is significantly shorter than 12 months.

Chapter 5

Performance Measures

Performance measures are used to assess the return from a project, to analyse the degree of risk associated with a project and to compare returns from different projects. These measures are displayed on the Summary page in ARGUS Developer, and can also be viewed in the KPI Dashboard.

The Performance Measures calculated in ARGUS Developer are summarised below, with the exception of the Internal Rate of Return (IRR) which is detailed in ‘**Internal Rate of Return and Net Present Value**’ on page 23, and the Equivalent Yield, Gross Initial Yield and Net Initial Yield which are detailed in **Chapter 1 on page 12**.

For a project to be financially viable and attractive to a developer, the developer will seek a margin for risk and profit. This will vary according to the scheme proposed and the state of the market. A developer’s target profit margin is generally expressed as a yield calculated in terms of either total costs or total capital value (gross or net development value), as shown below.

Profit on Cost%

Profit on Cost is the Profit expressed as a percentage of Total Costs (including interest).

$$\frac{\text{Profit}}{\text{Total Costs}}$$

Profit on GDV%

The Profit expressed as a percentage of the Gross Development Value. The Gross Development Value is the sum of Total Sales and Capitalised Rent.

$$\frac{\text{Profit}}{\text{Gross Development Value}}$$

Profit on NDV%

The Profit expressed as a percentage of the Net Development Value. The Net Development Value is the sum of Total Sales and Capitalised Rent, less purchaser’s costs.

$$\frac{\text{Profit}}{\text{Net Development Value}}$$

Development Yield

The Development Yield reflects the investment yield plus the annual return to cover risk and profit, and is used to assess a scheme’s viability.

The Development Yield is then calculated as the exit Rent or MRV per annum, inclusive of rental growth if applied, expressed as a percentage of Total Costs (including interest

$$\frac{\text{Rent or MRV}}{\text{Total Costs}}$$

In ARGUS Developer, the user may also specify further calculation options on the Calculation Tab of the Assumptions for Calculations form. These options specify whether the calculation of the Development Yield is to include any Turnover Rent and whether it is to be net of non-recoverable costs, ground rent and rent additions/costs.

The user may also select whether to include tenants with no capital value.

It should be noted that the development yield will be distorted where there is residential accommodation, for example, which is to be sold to owner occupiers which will not, therefore, be income-producing. This accommodation contributes to total costs but not rental value. A possible solution to this problem would be to create separate phases for the part of the development which is to be sold to owner occupiers and that which is to be let and income-producing. The land cost must then be apportioned between these two phases.

Note: The options to calculate the Development Yield are hidden unless Show Net Development Yield Options has been checked on the Country tab of System Configuration, under Administration in the File menu.

Profit Erosion

The period, in years, in which the profit would be wholly eroded by interest charges if the letting or sale were not to take place. This enables the developer to assess the impact of potential letting risk on his profit margin. The Profit Erosion is available only when the Basic Fiance (Interest Sets) metho of financing is selected.

For any project which fails to let, the developer's profit will be eroded by the shortfall in rental income, following completion of the project, and by accumulating interest on the total development costs until either the development is fully let or the profit is wiped out. Profit Erosion is the time it will take to erode all of the developer's profit in this way.

In ARGUS Developer the user may specify a manual finance rate for the calculation of Profit Erosion in the Calculation tab of the Assumptions for Calculation form.

The calculation of Profit Erosion (expressed in years) is as follows:

$$\text{Profit Erosion} = r1/r2/d$$

where:

$$r1 = \text{Ln} \left[1 + \frac{\text{Total Profit}}{-(\text{Total Costs})} \right]$$

$$r2 = \text{Ln} \left[1 + \frac{i/100}{d} \right]$$

where:

Total Costs = Total project or phase costs, **excluding interest**

Ln = Log to base_e i.e. natural logarithm

i = Interest rate or Manual finance rate for calculation of Profit Erosion if specified

d = Dividing factor for each compounding period option (see table below)

	Compound Period (months)	Dividing Factor
Monthly	1	12
Quarterly	3	4

Six Monthly	6	2
Annual	12	1

Rent Cover

The period in years during which a building, if let, will realise a profit.

Users may specify on the Calculation tab in Assumptions for Calculation whether Rent Cover is calculated using the Rent or MRV at the Sale Date.

Rent Cover is the Profit expressed as a percentage of the exit Rent or MRV (including rental growth).

$$\frac{\text{Profit}}{\text{Rent or MRV}}$$

This may be used when, for example, the developer guarantees the rent from the end of any letting void period allowed for in the appraisal until the scheme is income-producing, as part of a funding arrangement. Rent Cover enables the developer to assess the period within which the building must be let in order to realise a profit.

As for the development yield calculation, the user may specify whether the calculation of Rent Cover is to include any Turnover Rent and whether it is to be net of non recoverable costs, ground rent and rent additions/costs, in the Calculation tab of the Assumptions for Calculation form.

The user may also select whether to include tenants with no capital value.

Cap Rent per net sq ft/sq m

The Capital Value, or capitalised rent, expressed as an amount per net floor area, in sq ft or sq m. This may be displayed in the KPI Dashboard.

$$\frac{\text{Capital Value}}{\text{Net Floor Area}}$$

Cost per gross sq ft/sq m

The total project or phase cost (including interest) expressed as an amount per gross floor area, in sq ft or sq m. This may be displayed in the KPI Dashboard.

$$\frac{\text{Total Costs}}{\text{Gross Floor Area}}$$

Cost per net sq ft/sq m

The total project or phase cost (including interest) expressed as an amount per net floor area, in sq ft or sq m. This may be displayed in the KPI Dashboard.

$$\frac{\text{Total Costs}}{\text{Net Floor Area}}$$

Land Cost per Measurement Unit

The Total Land Cost divided by the Site Area in Acres, Hectares, sq ft or sq m. The denominator in this measure is the selection made in the "Land Measured in" option on the General tab in the Options dialog.

If a single phase is selected, the Site Area of the current phase is used. If merged phases is selected, the total Site Area is the sum of all Site Areas in each merged phase. This may be displayed in the KPI Dashboard.

$$\frac{\text{Residual Land Price} + \text{Fixed Land Price}}{\text{Current Land Measurement Units}}$$

Land Cost per Acre

The Total Land Cost divided by the Site Area in Acres.

If a single phase is selected, the Site Area from the current phase is used. If merged phases is selected, the sum of all Site Areas from each merged phase is used. If the Site Area is not currently expressed in Acres, the calculation will be automatically convert it to Acres.

This may be displayed in the Result Bar.

$$\frac{\text{Residual Land Price} + \text{Fixed Land Price}}{\text{Site Area in Acres}}$$

Land Cost per Hectare

The Total Land Cost divided by the Site Area in Hectares.

If a single phase is selected, the Site Area from the current phase is used. If merged phases is selected, the sum of all Site Areas from each merged phase is used. If the Site Area is not currently expressed in Hectares, the calculation will be automatically convert it to Hectares.

This may be displayed in the Result Bar.

$$\frac{\text{Residual Land Price} + \text{Fixed Land Price}}{\text{Site Area in Hectares}}$$

Land Cost per Square Foot

The Total Land Cost divided by the Site Area in Square Feet.

If a single phase is selected, the Site Area from the current phase is used. If merged phases is selected, the sum of all Site Areas from each merged phase is used. If the Site Area is not currently expressed in Square Feet, the calculation will be automatically convert it to Square Feet.

This may be displayed in the Result Bar.

$$\frac{\text{Residual Land Price} + \text{Fixed Land Price}}{\text{Site Area in Square Feet}}$$

Land Cost per Square metre

The Total Land Cost divided by the Site Area in Square metres.

If a single phase is selected, the Site Area from the current phase is used. If merged phases is selected, the sum of all Site Areas from each merged phase is used. If the Site Area is not currently expressed in Square metres, the calculation will be automatically convert it to Square Metres.

This may be displayed in the Result Bar.

$$\frac{\text{Residual Land Price} + \text{Fixed Land Price}}{\text{Site Area in Square Metres}}$$

Plot Ratio

This is a measure of the density of development on the site and is calculated by the total gross floor area expressed as a proportion of the total site area. This may be displayed in the KPI Dashboard.

$$\frac{\text{Total Gross Floor Area}}{\text{Total Site Area}}$$

Vacancy %

This is an average vacancy over the entire project. It is defined as:

$$\frac{(\text{Total Gross MRV} - \text{Total Net MRV})}{\text{Total Gross MRV}} \%$$

Total Gross MRV and *Total Net MRV* are taken from capitalised rent areas, not including operated assets.

Development Yield Initial %

This is the development yield calculated over the entire project. It is defined as:

$$\frac{\text{Stabilised Income}}{\text{Total Construction Cost (excl Interest \& Fees)}} \%$$

Stabilised Income is defined as rental income, additional rent revenue and turnover (percentage) rent. It is assessed for one year from the earliest lease start date.

Total Construction Cost is defined as all costs of base construction and construction breakdown from project start to the earliest lease start date.

Equity Multiple

The Equity Multiple is calculated over the entire project for all consolidated equity partners. It is defined as:

$$\frac{(\text{Capital Repayments} + \text{Profit})}{(\text{Capital Contributions} + \text{Interest})}$$

Loan to Cost Ratio

The Loan to Cost Ratio is calculated over the entire project. It is defined as:

$$\frac{\text{Peak Financing Amount}}{(\text{Peak Financing Amount} + \text{Total Equity Injection})}$$

Return on Equity (ROE)

This is a measure of the return on capital invested in a project to an individual Equity source, when Structured Finance is applied. This may be displayed on the KPI Dashboard.

$$\frac{\text{Source Profit Share}}{\text{Peak Financing Amount}}$$

Combined Return on Equity (ROE)

This is a measure of the return on capital invested in a project to all Equity sources, when Structured Finance is applied. This may be displayed on the KPI Dashboard.

$$\frac{\text{Total Equity Source Profit Share}}{\text{Total Equity Source Peak Financing Amount}}$$

Pre Finance IRR

This is the Internal Rate of Return calculated on the project cash flow before finance i.e. excluding interest and finance fees.

For further information on the IRR calculation, please see **Internal Rate of Return** and Net Present Value on page 23.

IRR

This is the Internal Rate of Return calculated on the project cash flow after finance i.e. including interest and finance fees.

For further information on the IRR calculation, please see **Internal Rate of Return** and Net Present Value on page 23.

Equity IRR

This is the overall Internal Rate of Return for all equity funding sources in a project, when Structured Finance is applied. This is calculated from the combined net cash flow for all Equity funding sources.

For further information on the IRR calculation, please see **Internal Rate of Return** and Net Present Value on page 23.

Peak Financing

This is the point where the highest outstanding balance is reached for each of the structured financing sources in the project. The balance is taken from the Loan Balance cash flow line and includes capital contributions, interest and capital repayments. It is displayed on the Performance Measures tab and the funding source reports..

The peak financing calculation returns the highest balance and the period in which it occurs.

Breakeven Point

This is the point where the costs of constructing the project equal the revenues received from rents, sales or operations. There is no profit made or loss incurred at this point.

In Developer, it is the point at which the cumulative net cash flow turns from a negative balance to a zero or positive balance. Where the balance changes from negative to zero or positive more than once during the course of the project, the Breakeven Point will be the date at which this first occurs.

The Breakeven point is expressed in two different fields on the KPI Dashboard – as a Period and as a Date. Where a Breakeven point cannot be calculated, each of these fields will show ‘N/A’.

Chapter 6

Distribution

ARGUS Developer provides pre-defined curve types for distributing cost and revenue items in the cash flow over the timescale of the project. The S Curve and Weighted Curve types are detailed below.

S Curve

S Curve distribution is typically used to spread construction and associated costs over a project contract period. The curve imitates the actual spend pattern in a typical building contract.

The S Curve shows a slow initial spend rate, rising to a peak after the mid point of the construction period and then falling in the period to completion. The resultant cumulative spend curve broadly follows an “S” shape, hence the name of this distribution type.



The formula for the standard construction distribution curve, the “S Curve”, is as follows:

Starting with:

$$Old\ Val = 0$$

Then loop through each period with the following equations:

$$CM = \frac{\text{Period Number}}{\text{Number of Periods}}$$

$$\text{New Val} = \text{Total Value} \times \left[\text{CM} + (0.15 \times \text{CM}^2) - (0.15 \times \text{CM}) - \frac{(6\text{CM}^3 - 9\text{CM}^2 + 3\text{CM})}{3.8} \right]$$

$$\text{Period Val} = \text{New Val} - \text{Old Val}$$

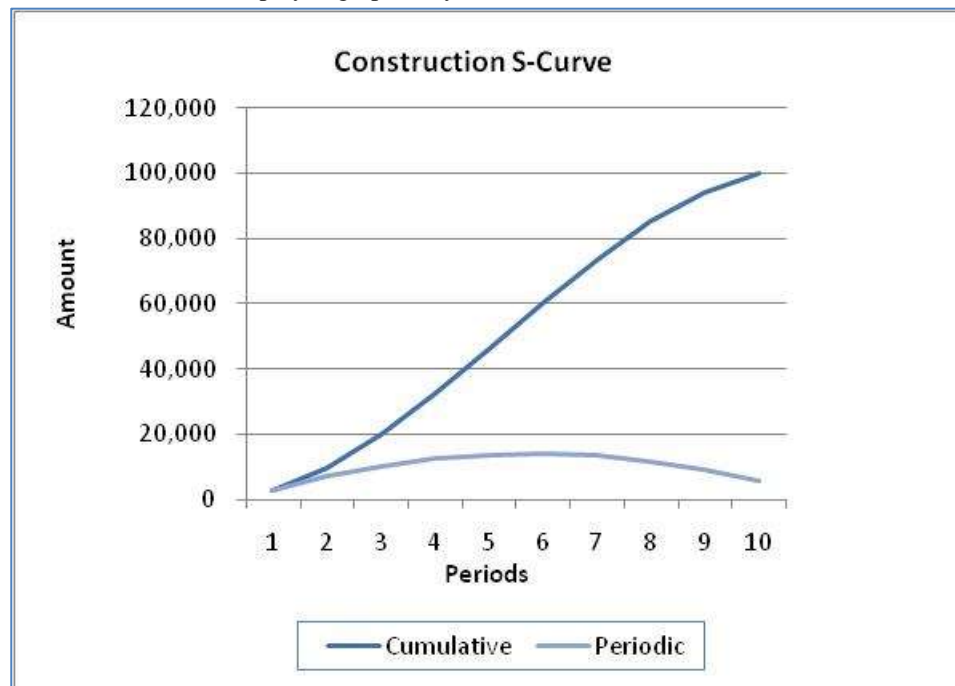
$$\text{Old Val} = \text{Period Val}$$

Example

This can be illustrated by the following example, assuming a total cost of £100,000 to be distributed using the S curve over 10 months:

Total Cost	100,000	Periods	cm Factor	Cumulative	Period Value
Number of Periods	10	1	0.1	2,966	2,966
		2	0.2	10,021	7,055
		3	0.3	20,218	10,197
		4	0.4	32,611	12,392
		5	0.5	46,250	13,639
		6	0.6	60,189	13,939
		7	0.7	73,482	13,292
		8	0.8	85,179	11,697
		9	0.9	94,334	9,155
		10	1	100,000	5,666
Total S-Curved Amount				100,000	

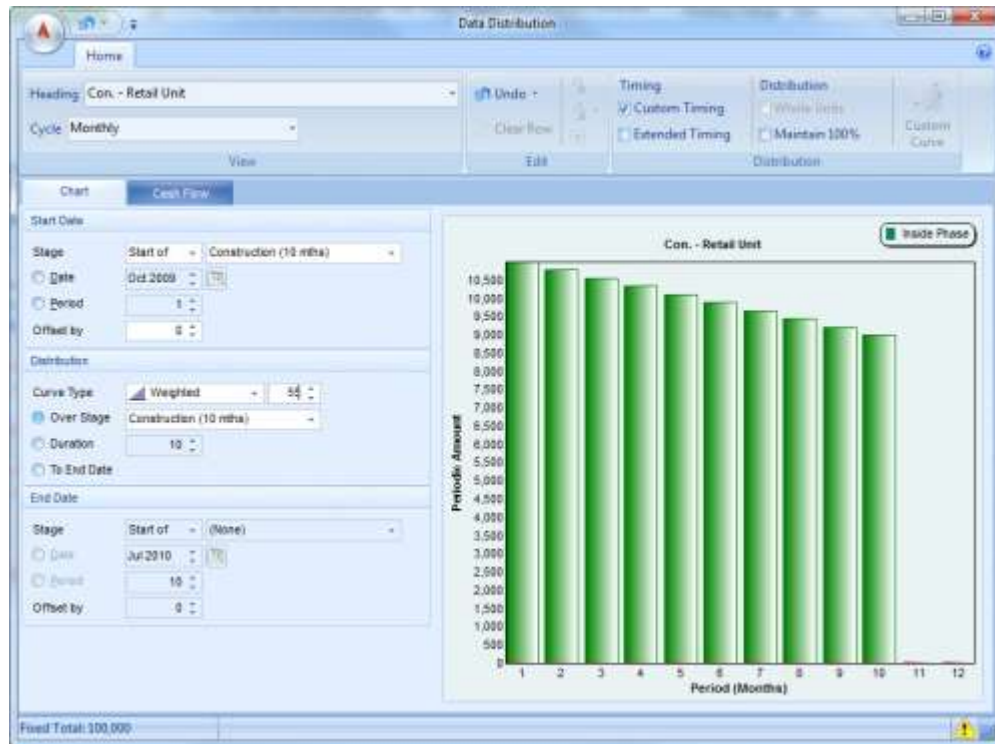
These values can be displayed graphically as follows:



Weighted Curve

Weighted curve distribution apportions the total item cost over a period based upon the % weighting specified.

Weighting at 50% distributes the cost item in even amounts across the specified period. Weighting of greater than 50% produces a “front weighted” distribution where the spend rate falls as the project progresses, whereas weighting of less than 50% produces an “end loaded” distribution with the spend rate increasing during the project.



The formula for the weighted curve is as follows:

$$\text{Base Value} = \frac{\text{Weighting} \times \text{Total Cost}}{\text{Number of Periods}} \times 0.02$$

$$\text{Increment} = \left[\frac{100 - (\text{Weighting} \times 2)}{\text{Number of Periods} - 1} \right] \times \left[\frac{\text{Total Cost}}{\text{Number of Periods}} \times 0.02 \right]$$

Starting with:

$$\text{Period} = 0$$

Then loop through each period with the following equations:

$$\text{Period Value} = \text{Base Value} + \text{Period} \times \text{Increment}$$

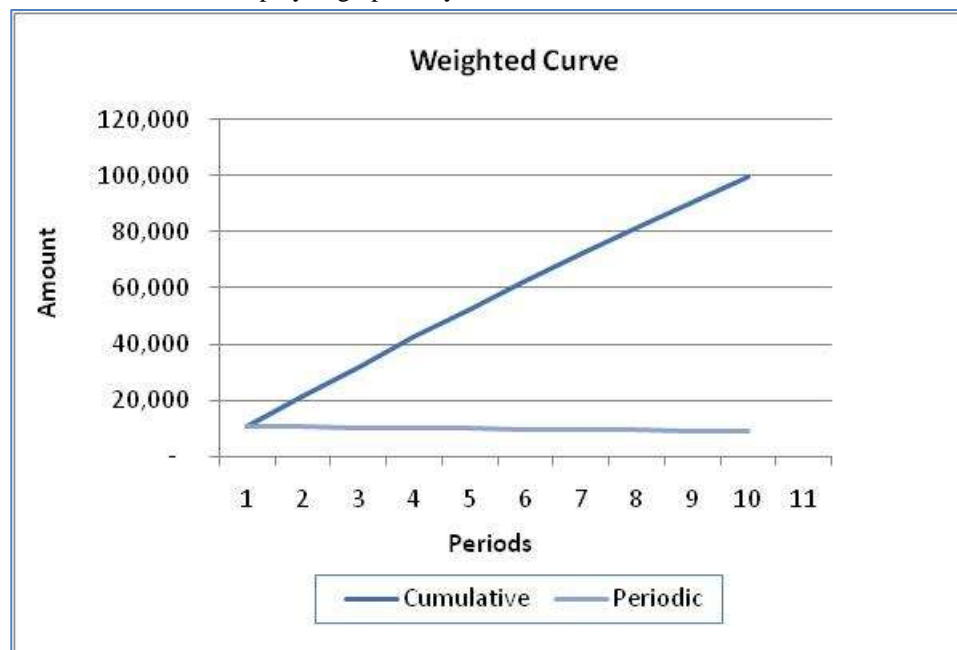
$$\text{Period} = \text{Period} + 1$$

Example

This can be illustrated by the following example, assuming a total cost of £100,000 to be distributed over 10 periods:

		Period	Period Amount	Cumulative
Total Cost	100,000	1	11,000	11,000
Number of Periods	10	2	10,778	21,778
Weighting %	55	3	10,556	32,333
		4	10,333	42,667
Base Amount	11,000	5	10,111	52,778
Period Increment	-222.22	6	9,889	62,667
		7	9,667	72,333
		8	9,444	81,778
		9	9,222	91,000
		10	9,000	100,000
Total Weighted Curve Amount				100,000

These values can be displayed graphically as follows:



Chapter 7

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