

Matching Cash Flows and Discount Rates in Discounted Cash Flow Appraisals

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Introduction

There are many conceptual and practical problems inherent in valuing a closely held business using discounted cash flow (DCF). One of the most critical and basic decisions an appraiser has to make is to define the appropriate calculation of cash flow and match it with the appropriate discount rate. If this selection is not made properly, the entire appraisal is invalid, even if every other decision is made correctly. This article describes four choices the appraiser may use as the definition of cash flow, the appropriate discount rate that matches each definition, and the values that result from these choices.

Direct and Indirect Cash Flow Calculation

Appraisers can calculate cash flow using the two general formats that are found in the Generally Accepted Accounting Practices (GAAP) cash flow statement commonly constructed by Certified Public Accountants (CPA's). The two methods are direct and indirect and it is vital for the appraiser to understand the specific cash flow elements contained in these.

The method illustrated in Exhibit 1 is consistent with the direct method in which cash inflows and cash outflows are directly calculated. The primary source of cash inflow for most businesses is, of course, cash sales and collections. From this point, most of the remaining activities of the business cause cash outflows, such as operating expenses, replacement and growth in assets, and financing outflows associated with debt, payment of preferred and common stock dividends, and repurchase of stock.

However, several activities add to the cash flow stream. These include asset liquidations, additional borrowing, and issuing preferred and common stock.

Exhibit 1

Calculating Cash Flow (Direct Method)

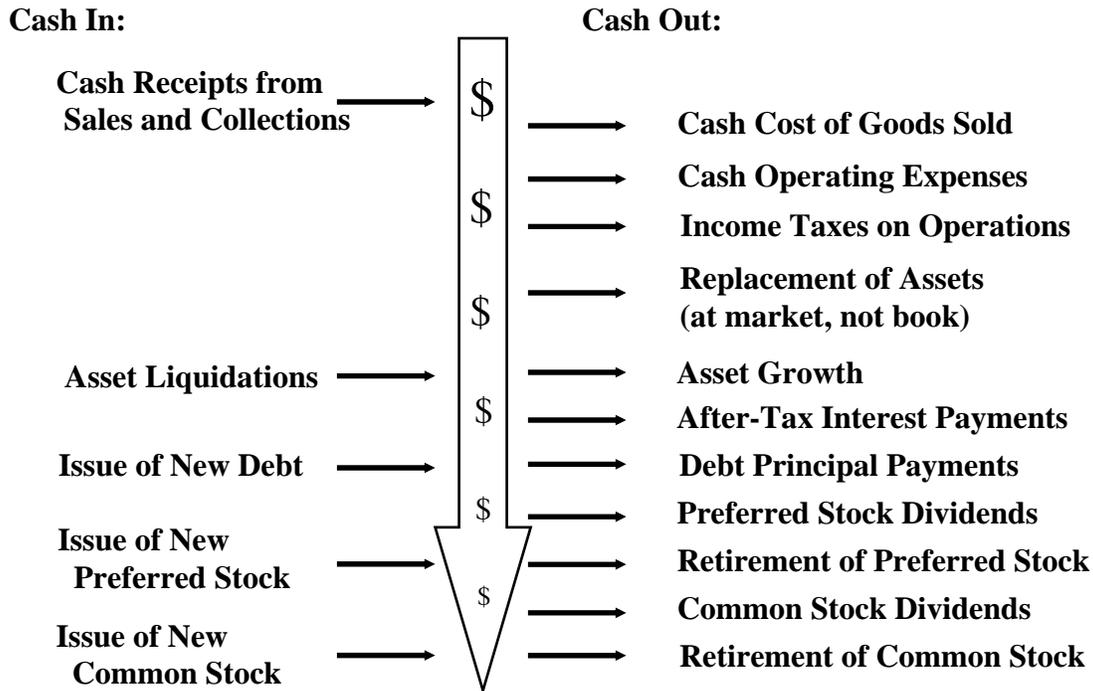
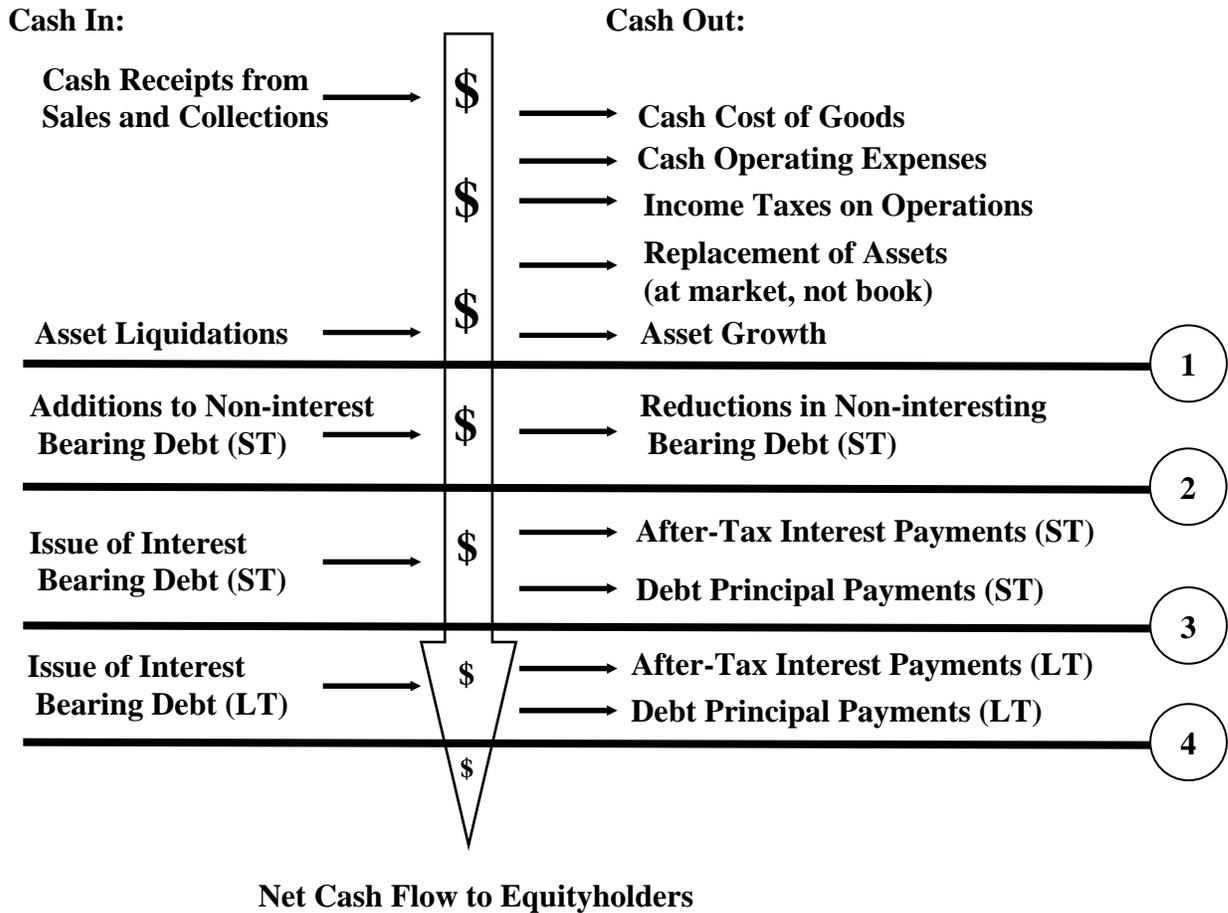


Exhibit 2 illustrates the cash flow stream recast to result in cash flow available to common equityholders. This exhibit also contains four markers that designate various levels of cash flow that can be used to calculate value under the four different definitions described below. In the interest of simplicity and space, preferred stock cash flows are eliminated from Exhibit 2 and the remainder of this discussion. Investment earnings would be included either in cash receipts or netted from interest costs.

The various elements of cash flow are relevant to the specific interest the appraiser is asked to appraise. For example, if the interest being appraised is the common equity interest of the company, the appraiser projects cash flow available to equityholders. This cash flow is designated as level 4 on Exhibit 2. Alternatively, the value being appraised may be the total earning capacity of the assets of the subject business. This value is commonly called “enterprise value” and, in this case, the appraiser must estimate the cash flow expected to be generated by all of the assets of the business prior to any cash flow related to financing sources. This cash flow is designated as level 1 on Exhibit 2. In other situations, the appropriate cash flow may be somewhere in between such as levels 2 and 3 on Exhibit 2.

Exhibit 2
Calculating Cash Flow
(Direct Method)



Cash flow can also be calculated by the indirect method as shown in Exhibit 3. This method results in exactly the same cash flow calculation as the direct method shown in Exhibits 1 and 2. It is also the method that is commonly used by appraisers in that most DCF appraisals project accrual basis income statements and balance sheets. These statements then can be easily utilized to forecast cash flow using the indirect method by adjusting projected accrual basis net income.

Exhibit 3

Calculating Cash Flow (Indirect Method)

Net Income
+ Depreciation and Other Non-cash Charges
+/-Changes in Current Assets
+/-Changes in Current Liabilities
Net Cash Flow from Operations
- Non-current Asset Replacement (at market, not book)
- Non-current Asset Growth
+Non-current Asset Liquidations
+Issue of New Long Term Debt
- Principal Payments on Long Term Debt
Net Cash Flow to Equityholders

The indirect method can also be recast as shown in Exhibit 4 to calculate cash flow at various points to allow matching with discount rates depending on the value being calculated. In the appraisal process, the appraiser would use either the direct or indirect formats illustrated in Exhibits 1-4 to forecast cash flow for each year of a future projection period. The discount rate would be used to reduce projected cash flow to present value.

Exhibit 4

Calculating Cash Flow (Indirect Method)

Net Income
+Income Taxes
+Interest
+Depreciation and Other Non-cash Charges
- Taxes on Operations
+/-Change in Current Assets
- Non-current Asset Replacement (at market, not book)

- Non-current Asset Growth	
<u>+Non-current Asset Liquidations</u>	1
<u>+/-Changes in Non-interest Bearing Short Term Debt</u>	2
- After-tax Interest on Short Term Debt	
<u>+/-Changes in Interest Bearing Short Term Debt</u>	3
- After-tax Interest on Long Term Debt	
+Issue of New Long Term Debt	
<u>- Principal Payments on Long Term Debt</u>	4
<u>Net Cash Flow to Equityholders</u>	

The Appropriate Discount Rate

Of course, the discount rate used to calculate the present value of this cash flow should conceptually match the cash flow. In a DCF appraisal, the discount rate accounts for financing not taken into account in the cash flow projections and includes all financing sources on the balance sheet below the point at which the cash flow calculation stops.

Exhibits 5 and 6 contain a simple set of facts that can be used to calculate discount rates for the four levels of cash flow shown in Exhibits 2 and 4 and described below.

Exhibit 5

Cost of Capital Example

Cost of Debt:

Interest Bearing Short Term Debt

$$\text{Pre-tax cost} = 0.10$$

$$\text{Tax Rate} = 0.40$$

$$\text{After-tax cost of short term debt} = 0.10 \times (1 - 0.40) = 0.06$$

Long Term Debt:

$$\text{Pre-tax cost} = 0.12$$

$$\text{After-tax cost of long term debt} = 0.12 \times (1 - 0.40) = 0.072$$

$$\text{Cost of Equity:} \quad 0.14$$

Exhibit 6

Capital Structure Example

ASSETS	\$300,000		Including	Including	Excluding
			All Short	Interest	Short Equity
=			<u>Term Debt</u>	<u>Bearing Short</u>	<u>Term Debt</u>
				<u>Term Debt</u>	<u>Only</u>
DEBT					
	Non-interest Bearing				
	Short Term Debt	\$60,000	0.20		
+	Interest Bearing				
	Short Term Debt	\$60,000	0.20	0.25	
	Long Term Debt	\$90,000	0.30	0.375	0.50
OWNERS EQUITY					
	Equity	<u>\$90,000</u>	<u>0.30</u>	<u>0.375</u>	<u>0.50</u>
				<u>1.00</u>	<u>1.00</u>
TOTAL	<u>\$300,000</u>	<u>1.00</u>	<u>1.00</u>	<u>1.00</u>	<u>1.00</u>

This hypothetical company has short term debt, long term debt and common equity in its capital structure. If the cash flow calculation is consistent with level 1 in Exhibits 2 and 4, it includes cash flows from operations and changes in assets with no provision for debt or equity flows. The discount rate, or weighted average cost of capital (WACC), that applies to any cash flow should include the remaining financing sources not included in the cash flow stream. In this case, the discount rate should comprise all sources of financing including short and long term debt, both interest bearing and non-interest bearing, and common equity.

The value resulting from discounting this level of cash flow is the total enterprise value of the business and would be used, for example, if a buyer were purchasing assets only with the seller retaining all debt. The debt retained by the seller would include both interest bearing debt, such as long and short term notes, and other obligations as well as non-interest bearing debt, such as accounts payable and other accrued expenses.

Exhibit 7 shows the calculation of the cost of capital appropriate for discounting level 1 cash flow. As shown, the capital structure for this level includes all financing sources weighted in proportion to their value. In this example, the appropriate cost of capital would be 7.6%. As noted above, the resulting value is commonly called enterprise value.

Exhibit 7

Cost of Capital Including All Sources of Financing

If cash flows are projected for operations and changes in assets only with no debt or equity flows, the cost of capital should include the cost of all financing sources:

ASSETS	=	<u>Weight</u>	X	<u>Cost</u>	=	<u>WACC</u>
DEBT						
Non-interest Bearing Short Term Debt		0.20	X	0.00	=	0.00
+ Interest Bearing Short Term Debt	}	0.20	X	0.06	=	0.012
Long Term Debt		0.30	X	0.072	=	0.022
OWNERS' EQUITY Equity		<u>0.30</u>	X	<u>0.14</u>	=	<u>0.042</u>
Total		<u>1.00</u>				<u>0.076</u>

If a buyer is going to purchase all assets and assume non-interest bearing debt, another calculation of value is required. For this situation, the cash flow would be calculated including changes in non-interest bearing debt and the discount rate would be adjusted accordingly. In this case, the appropriate cash flow is level 2 in Exhibits 2 and 4. The matching discount rate is 9.5% as shown in Exhibit 8.

If a buyer is going to purchase all assets and assume all short term debt, the appropriate cash flow is designated as level 3 in Exhibits 2 and 4. The matching discount rate would be calculated using long term debt and equity. In this example, the discount rate is 10.6% as shown in Exhibit 9.

Exhibit 8

Cost of Capital Excluding Non-Interest Bearing Short Term Debt

If cash flows are projected including changes in non-interest bearing short term debt, the cost of capital should exclude the cost of non-interest bearing short term debt:

ASSETS	=	<u>Weight</u>	X	<u>Cost</u>	=	<u>WACC</u>
DEBT						
Interest Bearing Short Term Debt	}	Weighted Average	0.25	X	0.06	= 0.015
+ Long Term Debt		Includes All Sources Except Non-Interest Bearing ST Debt	0.375	X	0.072	= 0.027
OWNERS' EQUITY			<u>0.375</u>	X	<u>0.14</u>	=
Equity						
Total		<u>1.00</u>				<u>0.095</u>

Exhibit 9

Cost of Capital Excluding All Short Term Debt

If cash flows are projected deducting interest on and including changes in all short term debt, the cost of capital should exclude the cost of all short term debt:

ASSETS	=	<u>Weight</u>	X	<u>Cost</u>	=	<u>WACC</u>
DEBT						
+ Long Term Debt	}	Weighted Average	0.50	X	0.072	= 0.036
OWNERS' EQUITY		Includes Long Term Debt and Equity	<u>0.50</u>	X	<u>0.14</u>	=
Equity						
Total		<u>1.00</u>				<u>0.106</u>

If a buyer is going to purchase equity and thus assume all debt, the appropriate cash flow is cash flow available to equityholders and is designated as level 4 in Exhibits 2 and 4. The matching discount rate would be the cost of equity only, which in this example is 14% as shown in Exhibit 10. A summary of the cash flow levels, matching discount rates, and resulting values is shown in Exhibit 11.

Exhibit 10

Cost of Capital Excluding All Debt (Cost of Equity)

If cash flows are projected deducting interest on and including changes in all short and long term debt, the cost of capital should exclude the cost of all debt and include the cost of equity only:

ASSETS			<u>Weight</u>	X	<u>Cost</u>	=	<u>WACC</u>
=							
DEBT							
+			+				
OWNERS' EQUITY	}	Weighted Average					
Equity		Includes Equity Only	<u>1.00</u>	X	<u>0.14</u>	=	<u>0.14</u>
		Total	<u>1.00</u>				<u>0.14</u>

The values identified in this discussion can also be used to check the consistency of the valuation approach used by the appraiser. For example, assume that the appraiser's assignment is to estimate the value of the equity of the subject business. The value can be estimated by calculating the level 4 cash flow described above and discounting the cash flow at the cost of equity. As a check, the appraiser can also calculate the enterprise value described above and subtract the current market value of all of the subject business's debt. The debt can be valued by discounting the future payments (both interest and principal) at the current market return on similar debt.

If the assumptions used for all calculations are consistent, the equity values calculated by both methods should be identical. As a practical matter, it is almost impossible to make the assumptions exactly consistent and the resulting equity values should be approximately equal.

Exhibit 12 contains a summary of the various values described in this article and their components. If level 1 cash flow is used to calculate enterprise value, equity value can be calculated by subtracting the market value of all the debt owed by the company from enterprise value. Alternatively, if level 4 cash flow is used to calculate the value of the company's equity, enterprise value can be calculated by adding the market value of the company's debt to the equity value. If enterprise value and equity value are calculated independently as described above, they should be consistent with the enterprise and equity values calculated per Exhibit 12. If not, there is an inconsistency in the

assumptions the appraiser has used in calculating the two values and highlights an area for further analysis and reconciliation.

Summary

Matching cash flow with the conceptually appropriate discount rate is critical in discounted cash flow appraisals. Cash flow can be calculated at a number of different points in its journey through the company and the discount rate should include financing sources not included in the cash flow calculation at that point. Proper matching does not insure that mistakes will be avoided elsewhere in the appraisal process, but a mismatch of the cash flow and discount rate does insure that resulting value will be invalid.

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Exhibit 11

Summary of Cash Flow Levels, Discount Rates, and Values

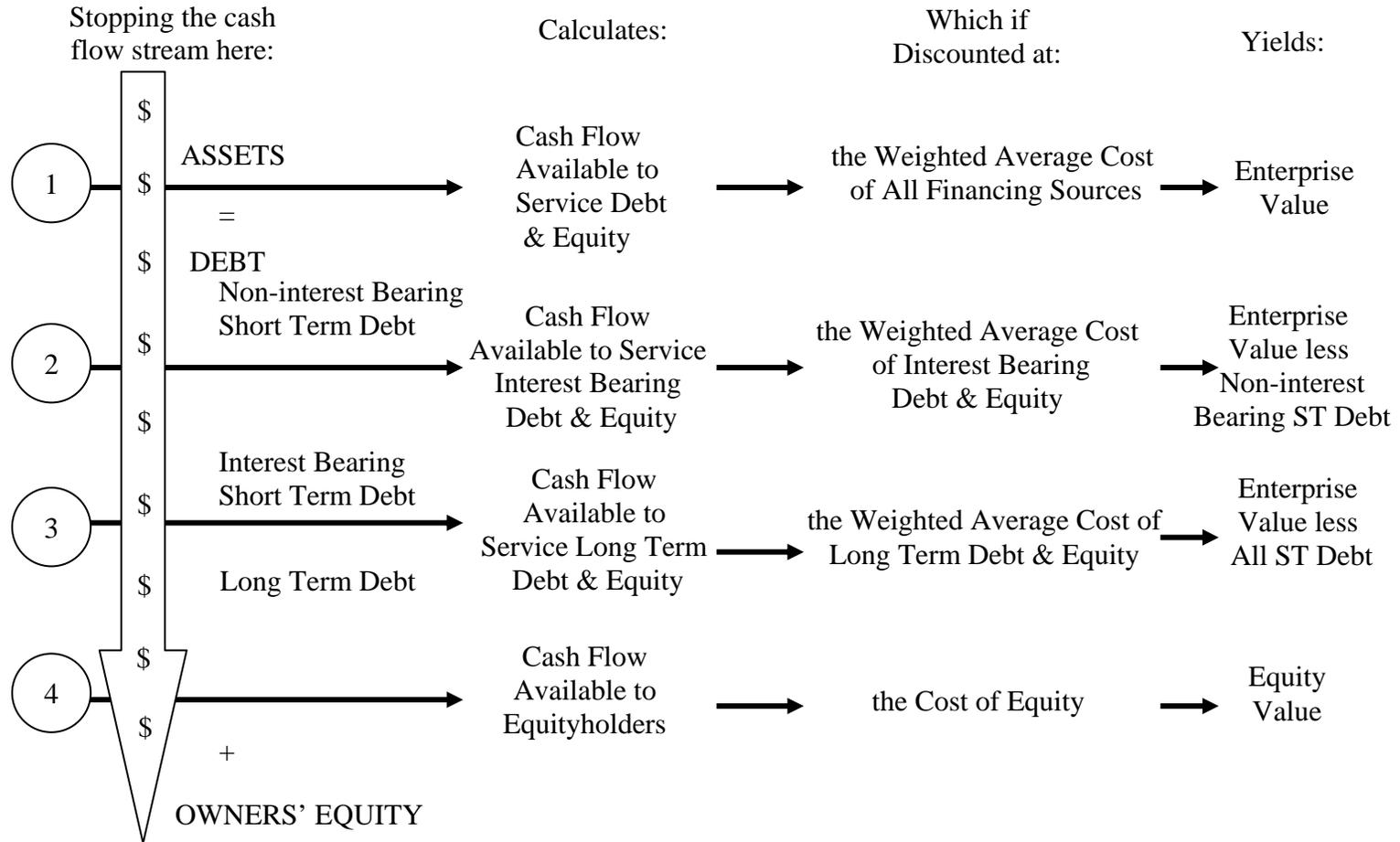
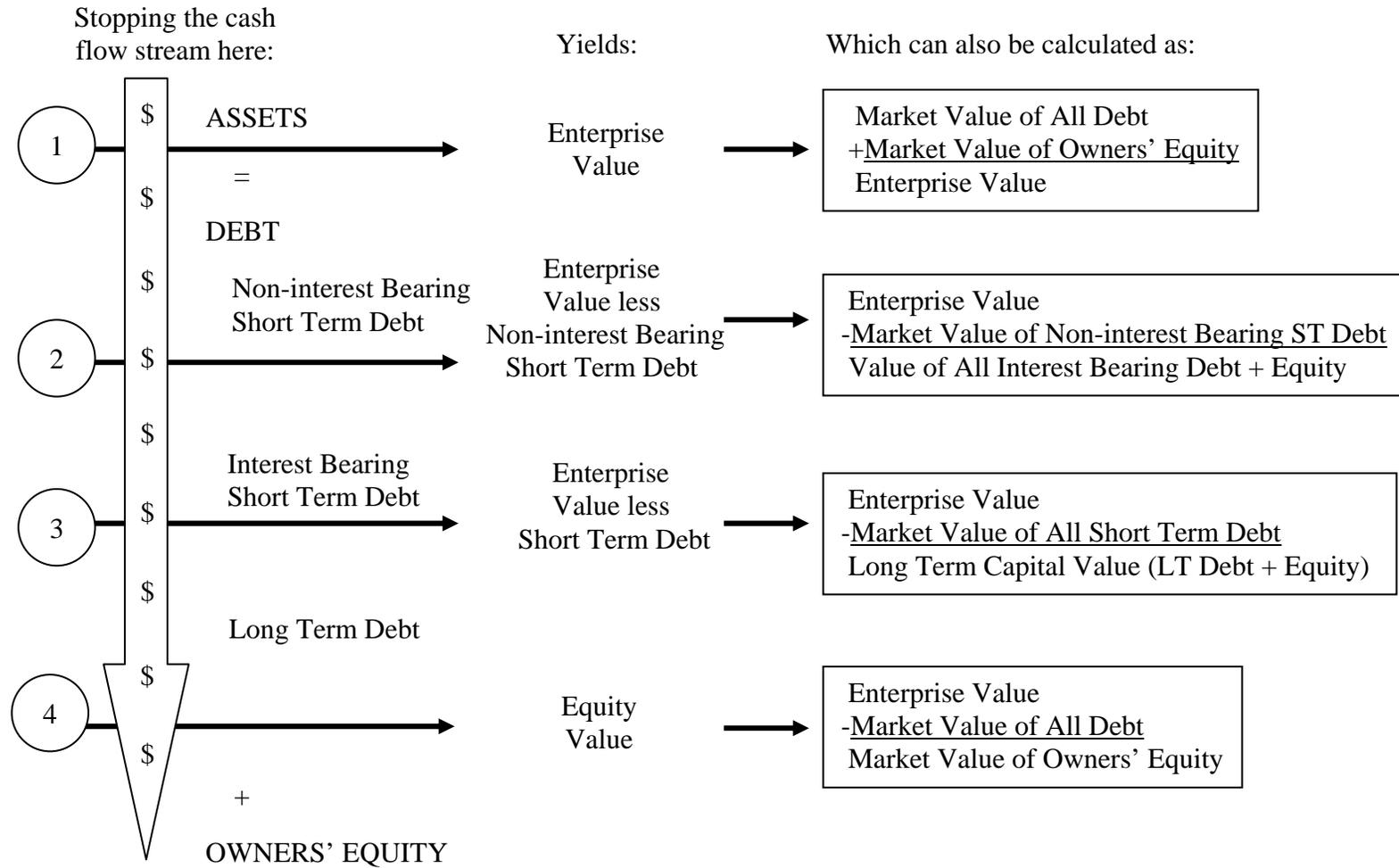


Exhibit 12

Calculation of Values



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