Ranking, Scenario, and Sensitivity[1]
In-Class Problem[2]

As a consultant assisting clients in selecting among a choice of private equity offerings, you're often tasked with the responsibility to select model forms, identify discount rates, and then rank projects by their outcomes. You and your client have gathered data on several projects, each with forecasts for revenue and net income growth and differing levels of risk, and you now want to consider which of the projects best fits your client's needs. Your client has $100,000,000 to invest and is prepared to add more than one offering to their portfolio. The client could easily earn 4% on these funds in a virtually risk free investment vehicle.

In an effort to make an informed decision on each of the target projects your client has asked that you provide a DCF/DG model valuation for each firm given. You'll be expected to comment on the advisability of providing these firms with the funding amounts they're each seeking.

The projects before you are as follows:

- **Dawn Treader Enterprises – A green energy start-up with limited resources and only two years of financial statements to review, but with innovative and highly accomplished ownership who've developed game-changing technology. The firm projects negative earnings for 3 years of $5,000,000 each, to be followed by earnings growth of 35% for the 5 years following starting at $3.5 million based on a set of government contracts recently entered into. Growth projections beyond that period are expected at 8% annually. You're projecting a risk adjusted discount rate of 20% for a potential investment in this firm. The firm is seeking funding based on a $25,000,000 valuation. Market returns for firms similarly structured firms are 9% and you've calculated a beta factor for the firm of 1.4.**

- **You Can't Get Enough, Inc. - This firm develops quality food product franchises and has recently had great success capitalizing on the nation's long-overdue focus on BBQ, grits, and Dr. Pepper. The firm has designed innovative training, support and technology sufficient to launch a series of franchise opportunities and has committed to consistent growth of 10% earnings growth for the following 10 years and industry projected growth rates of 6% beyond that point in time. The firm's most recent financial statements reflect net income of $1,800,000. It has 15 years of financial statements representing consistent profits and has developed a reputation for fiscal prudence and limited risk taking. While its ownership has expanded over the years to include several closely held investor relationships, the firm remains under capitalized to support franchisee acquisition for its BJSG Ribs line and two new franchise lines under development: Funky Fusion and Bistro Bites. You're projecting a risk adjusted discount rate of 12% for a potential investment in this firm. The firm is seeking funding based on a $15,000,000 valuation. Market returns for firms similarly structured firms are 7% and you've calculated a beta factor for the firm of 1.2.**

[1] This problem and solution set is intended to present an abbreviated discussion of the included finance concepts and is not intended to be a full or complete representation of them or the underlying foundations from which they are built.

[2] This problem set was developed by Richard Haskell, PhD (rhaskell@westminstercollege.edu), Gore School of Business, Westminster College, Salt Lake City, Utah (2015).

- **BTW Boutiques – Capitalizing on trends in repurposing quality women's apparel, BTW has 8 boutiques in highly attractive domestic locations producing consistent profits growth of more than 15% for each of the last 5 years, with the most recent year profit reported at $5,000,000. The firm designed an online buying platform allowing them to purchase surplus product from households at low prices in an effort to keep up with consumer demands in their boutique locations. Due to the strength of this source of product supply the firm has laid extensive plans to employ the same technology in online distribution under the BTW brand. You're projecting a risk adjusted discount rate of 18% for a potential investment in this firm. The firm projects profit growth of 20% annually for the foreseeable future and is seeking funding based on a $90,000,000 valuation. Market returns for firms similarly structured firms equals 11% and you've calculated a beta factor for the firm of 1.3.**

1. **Provide a DCF/DG model valuation including IRR, NPV and Payback values for the forecasted explicit period for Dawn Treader Enterprises.**

Dawn Treader Enterprises

r	0.2
$g_{4\text{-}8}$	0.35
g_{9+}	0.08

0	(25,000,000.00)	(25,000,000.00)	(25,000,000.00)
1	(5,000,000.00)	(4,166,666.67)	(29,166,666.67)
2	(5,000,000.00)	(3,472,222.22)	(32,638,888.89)
3	(5,000,000.00)	(2,893,518.52)	(35,532,407.41)
4	3,500,000.00	1,687,885.80	(33,844,521.60)
5	4,725,000.00	1,898,871.53	(31,945,650.08)
6	6,378,750.00	2,136,230.47	(29,809,419.61)
7	8,611,312.50	2,403,259.28	(27,406,160.33)
8	11,625,271.88	2,703,666.69	(24,702,493.64)

IRR, NPV and PAYBACK include CF_0 and are calculated for explicit forecast period only

All PV_{DCF}, CV_{DG}, PV_{CV} values do not include CF_0 and are calculated for explicit and continuing value periods

IRR	-2.34%
NPV	($24,702,493.64)
PAYBACK	NA
PV_{DCF}	$297,506.36
CV_{DG}	$104,627,447
PV_{CV}	$24,333,000
PV_{DCF} + PV_{CV}	$24,630,506.5

2. What types of problems do you see arising from the values you've calculated and what might you recommend be done to resolve the problem(s)?

The NPV using the explicit period is negative, but the value using all available data is positive. This is a relatively short forecast period on which to derive a value for a firm with multi-year government contracts and results in a short term valuation problem and an insufficient period for the acquisition to result in a positive return for the client. The cash flow during the explicit period only results in a present value of $297,506.36 and this is inclusive of the increased cash flow projections as the result of the client's investment. An assessment of the long term value of the investment is likewise less than the $25,000,000 asking price. So even in the long run the client stands little chance of receiving a positive return on investment. It's unlikely for this investment to be recommended unless the client is prepared to reduce their required rate of return (currently 20% - decrease not recommended) or the target firm is prepared to decrease the asking price (recommended).

Were the target firm to accept an offer based on a $20,000,000 valuation along with a commitment to fund the $5,000,000 operating deficit for the projected three-year term, and be able to evidence a likely extension of government or private sector contracts through and additional five year period, but at a less aggressive growth rate of 10%, the valuations would change dramatically and would be more likely to receive a positive recommendation to the client.

Dawn Treader Enterprises

r	0.2
$\mathbf{g_{4\text{-}8}}$	0.35
$\mathbf{g_{9\text{-}13}}$	0.1
$\mathbf{g_{14+}}$	0.08

0	(20,000,000.00)	(20,000,000.00)	(20,000,000.00)
1	(5,000,000.00)	(4,166,666.67)	(24,166,666.67)
2	(5,000,000.00)	(3,472,222.22)	(27,638,888.89)
3	(5,000,000.00)	(2,893,518.52)	(30,532,407.41)
4	3,500,000.00	1,687,885.80	(28,844,521.60)
5	4,725,000.00	1,898,871.53	(26,945,650.08)
6	6,378,750.00	2,136,230.47	(24,809,419.61)
7	8,611,312.50	2,403,259.28	(22,406,160.33)
8	11,625,271.88	2,703,666.69	(19,702,493.64)
9	12,787,799.06	2,478,361.13	(17,224,132.51)
10	14,066,578.97	2,271,831.04	(14,952,301.48)
11	15,473,236.87	2,082,511.78	(12,869,789.70)
12	17,020,560.55	1,908,969.13	(10,960,820.56)
13	18,722,616.61	1,749,888.37	(9,210,932.19)

IRR, NPV and PAYBACK include CF_0 and are calculated for explicit forecast period only	**IRR**	14.72%
	NPV	(9,210,932.19)
	PAYBACK	NA
All PV_{DCF}, CV_{DG}, PV_{CV} values do not include CF_0 and are calculated for explicit and continuing value periods	**PV_{DCF}**	$10,789,067.81
	CV_{DG}	$168,503,549
	PV_{CV}	$15,748,995
	PV_{DCF} + PV_{CV}	$26,538,063.2

3. Provide a DCF/DG model valuation without consideration of the target firm's funding request, and IRR, NPV and Payback values for the forecasted explicit period for You Can't Get Enough, Inc..

You Can't Get Enough, Inc.

r	0.12
$g_{1\text{-}10}$	0.1
g_{10+}	0.06

0	(15,000,000.00)	(15,000,000.00)	(15,000,000.00)
1	1,980,000.00	1,767,857.14	(13,232,142.86)
2	2,178,000.00	1,736,288.27	(11,495,854.59)
3	2,395,800.00	1,705,283.12	(9,790,571.47)
4	2,635,380.00	1,674,831.63	(8,115,739.84)
5	2,898,918.00	1,644,923.93	(6,470,815.91)
6	3,188,809.80	1,615,550.28	(4,855,265.63)
7	3,507,690.78	1,586,701.17	(3,268,564.46)
8	3,858,459.86	1,558,367.22	(1,710,197.24)
9	4,244,305.84	1,530,539.24	(179,658.00)
10	4,668,736.43	1,503,208.18	1,323,550.18

IRR, NPV and PAYBACK include CF_0 and are calculated for explicit forecast period only	**IRR**	13.81%
	NPV	$1,323,550.18
	PAYBACK	10
All PV_{DCF}, CV_{DG}, PV_{CV} values do not include CF_0 and are calculated for explicit and continuing value periods	**PV_{DCF}**	$16,323,550.18
	CV_{DG}	$82,481,010.2
	PV_{CV}	$26,556,677.8
	PV_{DCF} + PV_{CV}	$42,880,228.0

4. What types of problems do you see arising from the values you've calculated and what might you recommend be done to resolve the problem(s)?

In this case, we see a positive NPV for the explicit period as a result of the IRR > r (13.81% > 12%); so this investment appears to yield value to the investor. The payback point falls in the 10^{th} year. The PV_{DCF} w/o β_0 value of $16,323,550.18 and $PV_{DCF} + PV_{CV}$ value of $44,383,436.20 similarly reflect potential value creation for the client as both are in excess of the $15,000,000 ask from the target firm.

However, owing to the high level of business failure in both the food services industry franchise structure may present a sufficiently high level of risk to warrant a discount rate well in excess of the 12% employed in the models. Were the discount rate to rise to 15% the explicit period's NPV would fall to -$788,885.32, the Payback point would extend beyond the forecast period, and the various DCF values would decline similarly as shown below.

You Can't Get Enough, Inc.

r	0.15	
$g_{1\text{-}10}$	0.1	
g_{10+}	0.06	

0	(15,000,000.00)	(15,000,000.00)	(15,000,000.00)
1	1,980,000.00	1,721,739.13	(13,278,260.87)
2	2,178,000.00	1,646,880.91	(11,631,379.96)
3	2,395,800.00	1,575,277.39	(10,056,102.57)
4	2,635,380.00	1,506,787.07	(8,549,315.50)
5	2,898,918.00	1,441,274.59	(7,108,040.92)
6	3,188,809.80	1,378,610.47	(5,729,430.44)
7	3,507,690.78	1,318,670.89	(4,410,759.55)
8	3,858,459.86	1,261,337.37	(3,149,422.18)
9	4,244,305.84	1,206,496.62	(1,942,925.57)
10	4,668,736.43	1,154,040.24	(788,885.32)

IRR, NPV and PAYBACK include CF_0 and are calculated for explicit forecast period only

All PV_{DCF}, CV_{DG}, PV_{CV} values do not include CF_0 and are calculated for explicit and continuing value periods

IRR	13.81%
NPV	($788,885.32)
PAYBACK	NA
PV_{DCF}	$14,211,114.68
CV_{DG}	$59,656,076.6
PV_{CV}	$14,746,069.8
$PV_{DCF} + PV_{CV}$	$28,957,184.4

5. Provide a DCF/DG model valuation without consideration of the target firm's funding request, and IRR, NPV and Payback values for the forecasted explicit period for BTW Boutiques.

	BTW Boutiques
r	0.18
g_{1+}	0.2
g_{10+}	0.2

CV_{DG}

($300,000,000.00)

PV_{CV} – Ask

($390,000,000.00)

These valuations are based on a pure dividend growth model formation for a continuing value as of time 0.

6. What types of problems do you see arising from the values you've calculated and what might you recommend be done to resolve the problem(s)?

There are a few immediately discernable problems with the valuations as calculated: 1) the continuing value for this firm is -$300,000,000 and when the asking price is included the negative value expands to -$390,000,000; 2) the CV_{DG} presents as -$300,000,000 as a result of an inadequacy of the model - when r<g the model results in a negative valuation, which may not be warranted; 3) without a finite analysis period there is no possible way of calculating IRR.

We can remedy one of these problems by forming an explicit period of sufficient duration as to replicate enough of the continuing value period to arrive at a value similar to the CV_{DG} – Asking price, and to allow for IRR, NPV and Payback calculations as follows:

	BTW Boutiques		
	r	0.18	
	g_{1+}	0.2	
	g_{10+}	0.2	
0	(90,000,000.00)	(90,000,000.00)	(90,000,000.00)
1	6,000,000.00	5,084,745.76	(84,915,254.24)
2	7,200,000.00	5,170,927.89	(79,744,326.34)
3	8,640,000.00	5,258,570.74	(74,485,755.60)
4	10,368,000.00	5,347,699.06	(69,138,056.55)
5	12,441,600.00	5,438,338.02	(63,699,718.52)
6	14,929,920.00	5,530,513.25	(58,169,205.28)
7	17,915,904.00	5,624,250.76	(52,544,954.52)
8	21,499,084.80	5,719,577.04	(46,825,377.48)
9	25,798,901.76	5,816,519.03	(41,008,858.45)
10	30,958,682.11	5,915,104.09	(35,093,754.36)
11	37,150,418.53	6,015,360.10	(29,078,394.26)
12	44,580,502.24	6,117,315.35	(22,961,078.91)
13	53,496,602.69	6,220,998.66	(16,740,080.25)
14	64,195,923.23	6,326,439.32	(10,413,640.93)
15	77,035,107.87	6,433,667.10	(3,979,973.82)
16	92,442,129.45	6,542,712.31	2,562,738.48

17	110,930,555.34	6,653,605.74	9,216,344.22
18	133,116,666.40	6,766,378.72	15,982,722.94
19	159,739,999.69	6,881,063.10	22,863,786.04
20	191,687,999.62	6,997,691.29	29,861,477.33

IRR, NPV and PAYBACK include CF_0 and are calculated for explicit forecast period only

All PV_{DCF}, CV_{DG}, PV_{CV} values do not include CF_0 and are calculated for explicit and continuing value periods

IRR	21.23%
NPV	29,861,477.33
PAYBACK	16
PV_{DCF}	$119,861,477.33
CV_{DG}	($11,501,279,977.3)
PV_{CV}	($419,861,477.33)
$PV_{DCF} + PV_{CV}$	($300,000,000.0)

Notice that this still results in a negative CV_{DG}, PV_{CV}, and total valuation. Were we to extend the forecast period further still we might be prepared to forego the CV_{DG} valuation, but the greater the length of the forecast period the less reliable the forecast values becomes. For example, if we extend the forecast period to 50 years the DCF model provides an NPV inclusive of the target firm's asking price of $90,000,000 of $395,157,466.55 and an IRR of 26.11%. The NPV is high because g > r in such a proportion to drive substantial long term value gains, but with limited credibility. Were to apply a continuation value based on these data, we'd find that it would also be large enough to overcome the positive PV_{DCF} and once again result in a negative valuation.

There are other model forms available that do not suffer from the particular inadequacy we're observing in the DG model. Models such as the Key Value Driver (KVD), Adjusted Present Value (APV) and Economic Profits models, each of which have robust continuing value functions, may result in positive long term values.

7. Rank each of these firms based on each of the measures you included in questions 1, 3, and 5.

Based solely on the initial valuation analyses the rankings are as follows:

Firm	IRR	Rank	NPV	Rank	PB	Rank	Total Valuation	Rank
Dawn Treader	-2.34	2	-$24,702,493.64	2	NA		24,630,506.5	2
You Can't Get Enough	13.81	1	1,323,550.18	1	10	1	44,383,436.2	1
BTW Boutiques	NA		NA		NA		-300,000,000.00	3

Based on the alternate valuation metrics illustrated the rankings are as follows:

Firm	IRR	Rank	NPV	Rank	PB	Rank	Total Valuation	Rank
Dawn Treader	20.6	2	789,067.81	2	13	1	26,538,063.20	3
You Can't Get Enough	13.81	3	-788,885.32	3	NA		28,957,184.40	2
BTW Boutiques	26.11	1	305,157,466.55	1	20	2	305,157,466.55	1

8. **In which firm will you recommend your client offer to make an investment, how much will you recommend your client offer, and why do you believe your client should participate in the recommended investment?** *Be sure to recommend an offer high enough to have a high likelihood of acceptance, but not so much as to motivate your client to overpay. Be specific in your stated reasons for making the recommended offer.*

All things considered I'd recommend the client invest in Dawn Treader Enterprises. Though it only ranks 1st in the Payback category based on the amended metrics it requires the least upfront commitment from the client and the strongest likelihood of success given its existing government contracts – which may be seen as a signal for likely future contracts. I'd recommend making an offer based on a $20,000,000 valuation, assure the firm the ability to fund the required $5,000,000 for each of the next three years through debt financing, available either through the bond market or the client based on market opportunities and costs at the time, and reduce long term growth expectations beyond the forecasted explicit periods from 8% to 4%. I'd present an argument to the target firm that the current ask of $25,000,000 is unreasonably high due to its valuation's reliance on the client's capital noting the unreasonable nature of asking the client to pay for a valuation the client's capital is expected to create. I'd present an argument to the client based on the improved IRR, NPV, PB and total valuation that follows:

Dawn Treader Enterprises

	r	0.2	
	g_{4-8}	0.35	
	g_{9-13}	0.1	
	g_{14+}	0.05	
0	(20,000,000.00)	(20,000,000.00)	(20,000,000.00)
1	(5,000,000.00)	(4,166,666.67)	(24,166,666.67)
2	(5,000,000.00)	(3,472,222.22)	(27,638,888.89)
3	(5,000,000.00)	(2,893,518.52)	(30,532,407.41)
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10	14,066,578.97	2,271,831.04	(14,952,301.48)
11	15,473,236.87	2,082,511.78	(12,869,789.70)
12	17,020,560.55	1,908,969.13	(10,960,820.56)
13	18,722,616.61	1,749,888.37	(9,210,932.19)

IRR, NPV and PAYBACK include CF_0 and are calculated for explicit forecast period only

All PV_{DCF}, CV_{DG}, PV_{CV} values do not include CF_0 and are calculated for explicit and continuing value periods

IRR	14.72%
PAYBACK	-$9,210,932.19
PV_{DCF}	$10,789,067.81
CV_{DG}	$121,697,008
PV_{CV}	$11,374,274
PV_{DCF} + PV_{CV}	$22,163,342.2