

Private Equity and IRR

JESSE REYES, J-CURVE ADVISORS, LLC

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Overview

- Why do we use IRR
- PE & IRR
- IRR Myths
- Problems with IRR
- What do we do

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Why do we use IRR

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- Timing matters
- Decision maker matters

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Timing Matters

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QUIZ TIME

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Date	Return			
12/31/17				
12/31/18	10%			
12/31/19	20%			
12/31/20	-30%			
12/31/21	50%			

WHAT IS THE AVG ANNUAL RETURN from 12/31/14 to 12/31/18?

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The math we learned in Kindergarten

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$$FV = PV(1 + r)^N$$
$$r = \left(\frac{FV}{PV}\right)^{(1/n)} - 1$$

FV=Future value, PV=Present Value, r rate of return, n=number of periods

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QUIZ TIME

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Date	Return			
12/31/17				
12/31/18	-30%			
12/31/19	50%			
12/31/20	20%			
12/31/21	10%			

WHAT IS THE AVG ANNUAL RETURN from 12/31/14 to 12/31/18?

8.5%

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QUIZ TIME

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Date	Index	Return		
12/31/17	1000			
12/31/18	1100	+10%		
12/31/19	1320	+20%		
12/31/20	924	-30%		
12/31/21b	1386	+50%		

WHAT IS THE ANNUAL RETURN From 12/31/14 to 12/31/18?

8.5%

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QUIZ TIME

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Date	Index	Return		
12/31/17	1000			
12/31/18	700	-30%		
12/31/19	1050	+50%		
12/31/20	1260	+20%		
12/31/21	1386	+10%		

WHAT IS THE ANNUAL RETURN From 12/31/14 to 12/31/18?

8.5%

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Typical Question

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- ▶ “Our/Some Fund Has a Return of 300 Percent”
- ▶ Is that good?
- ▶ Depends?

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Depends on What?

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- ▶ Over What Time period
 - ▶ Over Two Years -- great at 173% per year
 - ▶ Over Ten? --- hmmm!! At 11.61%
- ▶ Is it return on the investments the fund made or is it the return to the investors in the fund.
- ▶ Time Weighted/IRR/Realization/Horizon?

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Example 1

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- ▶ Invest \$1.5 million
- ▶ Worth \$5 million
- ▶ What is the return?

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What is the Return?

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- ▶ Invest \$1.5 million
- ▶ Worth \$5 million
- ▶ What is the return?
- ▶ $5/1.5=333\%$ Total Return
or percentage change of 233%
- ▶ Note – we haven't defined a time period

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Example 2

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- ▶ Invest \$1.5 million
- ▶ Worth \$5 million five years later
- ▶ What is the return?

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Example 2 What is the Return?

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- ▶ Invest \$1.5 million
- ▶ Worth \$5 million five years later
- ▶ What is the return?
- ▶ $5/1.5 = 333\%$ Total Return
- ▶ Lets annualize with formula
 $(\text{total return})^{(1/5)} - 1 = 27.2\%$
- ▶ This is the annual rate of return (compound annual growth rate, Geometric average return, Time weighted return, etc)

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Example 3?

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- ▶ Invest .5 in three years
 - ▶ .5 at the beginning of year 1 (i.e. end of year 0)
 - ▶ .5 at the beginning of year 2 (i.e. end of year 1)
 - ▶ .5 at the beginning of year 3 (i.e. end of year 2)
- ▶ Worth \$5 million at the end of year five

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Why The difference?

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- ▶ First two examples are just examining two points in time, i.e. .today and some point in the past.
- ▶ No transactions or cashflows occurred in the in between.
- ▶ The third example, complicated the calculations because we didn't invest the \$1.5 all at once.
- ▶ Notice that stock indices use the first approach-you only calculate returns at two points in time – assumes that you buy and hold.
- ▶ The third has shortened the average investment holding period so the time value of money says that the return is higher other things being equal.

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Why The difference?

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- ▶ Gets even more complicated if we measure returns for an investment where we also take money out over a period of time as well as put money in over a period of time.

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Why The difference?

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- ▶ Same with your savings account – if you put money in at one point and take it out at another point, you can calculate the return for that period of time which will be the APR, but if you put money in, take money out over a period time, the actual return over the life of your investment getting is not the APR but something different that depends on the average time you held the money. The APR assumes you put money in a lump and hold it

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Why The difference?

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- ▶ You have the same complications if you measure the return to an investment manager/mutual fund in public stocks --money goes in at different points in time, and is taken out at different points in time by the investor. – more on this later.
- ▶ Don't have this complication with a simple stock index – you are just measuring values at two points in time – no transactions in the middle, so you can use time weighted/total return calculations

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Example 3 What is the Return?

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- ▶ Invest .5 in three years
 - ▶ .5 at the beginning of year 1 (i.e. end of year 0)
 - ▶ .5 at the beginning of year 2 (i.e. end of year 1)
 - ▶ .5 at the beginning of year 3 (i.e. end of year 2)
- ▶ Worth \$5 million and the end of year 5
- ▶ What is the return?
 - ▶ $5/1.5 = 333\%$ Total Return
 - ▶ IRR = 34.2% annual IRR
 - ▶ Compare to return on example 2 of 27.2% annualized

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So what do we do?

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- ▶ So with investments either in private equity or any investment manager, if you have cashflows in and out of an investment simple percentage change/total return calculations can no longer be done to get the true Return on investment. So we turn to IRR, a form of ROI that takes the time value of money into account as it accounts for the timing of the transactions in the investment.

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Internal Rate of Return

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$$0 = \sum_{n=0}^N \frac{CF_n}{(1 + IRR)^n}$$

IRR=internal rate of return, n=period ,of cashflow, N=total periods, CF= cashflow

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Before the advent of software

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$$Dietze = \frac{EMV - BMV - CF}{BMV + 0.5CF}$$

$$ModifiedDietze = \frac{EMV - BMV - CF}{BMV + \sum_{i=1}^j (CF * W_i)}$$

BMV=Beginning Market Value, EMV=Ending Market Value, CF=interim cashflow, W=percent of time cashflow was in portfolio

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Private Equity & IRR

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- ▶ Three Inputs
 - ▶ Paid-in capital
 - ▶ Distributions adjusted by carried interest
 - ▶ Net asset value adjusted by management fee

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LP Cashflow Example

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Date	Paid In Capital	distribution	Annual Mgt Fee	Carried Interest	NAV	Cashflow
6/3/2013	10,000,000				10,000,000	(10,000,000)
12/31/2013		-	375,000		9,625,000	-
5/1/2014	10,000,000	-			19,625,000	(10,000,000)
12/31/2014		-	375,000		20,250,000	-
12/31/2015		-	375,000		20,175,000	-
9/10/2016	5,000,000	15,000,000		100,000	10,175,000	9,900,000
12/31/2016		-	375,000		11,000,000	-
11/22/2017		250,000		1,667	10,750,000	248,333
12/31/2017		-	375,000		11,825,000	-
12/31/2018		-	375,000		13,250,000	-
3/31/2019		12,500,000		83,333	15,750,000	12,416,667
12/31/2019		-	375,000		25,875,000	-
6/10/2020		1,600,000		10,667	35,275,000	1,589,333
12/31/2020		-	375,000		35,900,000	-
12/14/2021		-			38,400,000	-
12/31/2021		-	375,000		38,025,000	38,025,000
Total	25,000,000	29,350,000	3,375,000	195,667		
					IRR	19.7%
					DPI	1.17
					RVPI	1.52
					TVPI	2.69

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Decision maker matters

Choosing performance measures

- ▶ Question: How do we choose a performance measure
- ▶ Answer: Depends on the Decision you are trying to evaluate?

Decisions, Decisions

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A performance measure should reward/penalize the decisions made under the control of the decision maker.

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Naïve Manager Example

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- ▶ I have a choice to invest in either investment A or investment B in any amount
- ▶ A naïve manager would invest 50% in A and 50% in B
- ▶ Any decision that I make should be compared to the above decision and should be superior if I'm to be rewarded for my decision making.

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Who has control?

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- ▶ LP has control over which managers to pick
- ▶ LP has control over the amount / when to commit
- ▶ GP has control over timing capital calls, exits, distributions
- ▶ IRR rewards/penalizes timing
- ▶ TWR is timing agnostic
- ▶ So GP should be rewarded/penalized for their timing decisions

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IRR Myths

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Myths every good CFA/MBA knows about IRR

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- ▶ Myth #1: IRR can give you Indeterminate multiple solutions with cashflow sign changes
- ▶ Myth #2: IRR is flawed because of single re-investment rate assumption
- ▶ Myth #3: IRR is inferior to other techniques such as modified IRR.
- ▶ Myth #4: can't compare public/private returns

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IRR can give you multiple solutions

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- ▶ IRR is not a closed form formula – you have to “guess” at the answer
- ▶ As a polynomial, you find the “solution” when the first order condition (remember calculus derivatives?) give you a single root.
- ▶ However it is possible to have multiple roots when you have highly variable positive/negative cashflows
- ▶ Doesn't always happen as is often taught, but it can. i.e. sign change is a necessary but not sufficient conditions

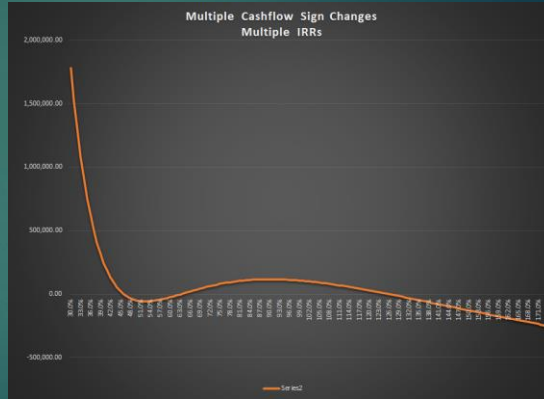
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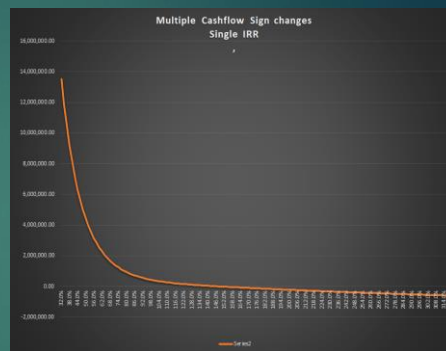
Multiple Cashflow Sign Changes, Multiple IRRs

Investment Date	Cashflow
1/31/2009	(1,000,000.00)
6/30/2011	11,200,000.00
6/30/2012	(1,448,148.23)
7/31/2012	(248,148.23)
8/31/2012	(398,148.23)
9/30/2012	(248,148.23)
10/31/2012	(248,148.23)
11/30/2012	(248,148.23)
12/31/2012	(248,148.23)
1/31/2013	(248,148.23)
2/28/2013	(248,148.23)
3/31/2013	(248,148.23)
4/30/2013	(248,148.23)
5/31/2013	(248,148.23)
6/30/2013	(3,048,148.23)
7/31/2013	(248,148.23)
8/31/2013	(248,148.23)
9/30/2013	(248,148.23)
10/31/2013	(248,148.23)
11/30/2013	(248,148.23)
12/31/2013	186,851.77
1/31/2014	(248,148.23)
2/28/2014	(248,148.23)
3/31/2014	(248,148.23)
4/30/2014	(248,148.23)



Multiple Cashflow Sign Changes, Single IRR

Investment Date	Cashflow 2
12/31/2012	(1,800,000.00)
12/31/2013	5,220,000.00
9/30/2015	(250,000.00)
11/30/2016	(9,750,000.00)
4/30/2017	1,458,000.00
2/28/2018	(10,753,977.00)
9/30/2018	(11,960,000.00)
9/30/2019	(22,071,884.00)
1/31/2020	(70,000,000.00)
6/30/2020	260,623,503.83



Single reinvestment rate assumption

- ▶ Supposedly only way to get an IRR in an investment is if you reinvest at the IRR
- ▶ Everyone says/repeats this but no one knows where it came from – most serious investment managers know it's not true.
- ▶ If that was true then same could be said for your bank account, your mutual fund etc
- ▶ I think it comes from some notion that IRR works on multiple cashflows while TWR is two points. They forget to remove/add cashflows
- ▶ We will look at Yale brouhaha as example of this distortion
- ▶ But no one has a mathematical reason why this should be so.
- ▶ In the end the IRR is a measure that balances cashflows

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Why not use modified IRR

- ▶ Again – a concept from project management
- ▶ One way around the multiple IRR problem or in some circles to “improve” the IRR is to use a modified IRR formula
- ▶ MIRR uses another return to model the NPV value as a reinvestment rate assumption– supposedly it's the “cost of capital” in a project management sense, but in a investment performance metric – the reinvestment rate will be just some guess with no real basis.
- ▶ So substituting one bad guess for another bad guess is not optimal and not recommended for private equity

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Comparing public / private equity

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- ▶ IRRs and TWR are incommensurable
 - ▶ Reinvestment rate assumption?
 - ▶ IRR – timing matters, TWR – timing doesn't
- ▶ Public Equity/Private equity have different valuation schema
 - ▶ Public equity has a contemporaneous price
 - ▶ Private equity is an appraisal asset with significantly lagged values
- ▶ So how does and investor compare public/private equity
- ▶ Enter the Public Market Equivalent

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Public Market Equivalents (PME)

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- ▶ Rather than calculate TWR for public equity, create a synthetic IRR for public equities
- ▶ First formulation independently developed by:
 - ▶ Coller / Reyes (investor/researcher) in 1993 (Public Market Equivalent or PME)
 - ▶ Long / Nickels (Alignment capital) in 1996 (called ICM "index comparison method")
 - ▶ Bannock/BVCA (industry association) in 1994 (called comparators)
- ▶ Idea is to invest the cashflows from private equity into an index and then create a synthetic cashflow from that investment and calculate an IRR which can be compared to the original IRR
- ▶ When it works, it works great, but does create some mathematical dominance stability issues under certain circumstances

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Basic PME (Long-Nickels)

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Index Comparison Method				Fund size(\$M):		800			
Cashflow Period	Call	Distrib	FV	Nominal Cashflow	Stock Index	PME FV	Synthetic Terminal NAV	PME Cashflow	
12/31/06	200	0	200	(200)	124.750	279	-	(200)	
12/31/07	0	0	200	-	130.988	-	-	-	
12/31/08	300	0	500	(300)	121.818	429	-	(300)	
12/31/09	0	0	550	-	109.637	-	-	-	
12/31/10	75	0	600	(75)	104.155	125	-	(75)	
12/31/11	0	500	300	500	119.778	(727)	-	500	
12/31/12	0	0	300	-	140.140	-	-	-	
12/31/13	0	0	300	-	142.943	-	-	-	
12/31/14	0	0	300	-	150.090	-	-	-	
12/31/15	0	0	300	300	174.105	-	106	106	
	575	500							
			Fund IRR -->	7.02%			PME	1.30%	
			Index TWRR-->	3.77%					
			DPI-->	0.87					
			RVPI-->	0.52					
			TVPI-->	1.39					
			PICC-->	0.72					
			PME -->	1.30%					
			PME+	2.89%					
			mPME	2.97%					
			Bison PME	2.50%					
			K&S PME	1.23					
			Direct Alpha	4.74%					

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Public Market Equivalent History

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- ▶ Original PME developed independently by Reyes/Coller Long/Nickels, Bannock/BVCA/EVCA (1992-1996)
- ▶ Long and Nickels created an Adjusted ICM to deal with negative NAV (1998)
- ▶ Roubinez and Kubr (investment managers) patented a PME method called PME+ which tries to remediate the stability issue (2003)
- ▶ Kaplan and Schoar (academic researchers) created another method which isn't a return but is a multiple (2005)
- ▶ Recently, Cambridge Associates created mPME to further address stability issues (2013)
- ▶ New "Direct Alpha" method developed by researchers at Landmark Partners tries to address some of the issues of the original PME while providing a direct comparison that doesn't need an intermediate step (2014)
- ▶ Global Endowment Foundation independently created same formula as Direct Alpha (2014)
- ▶ Bison has created a version of PME as well. (2015)

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So what's the problem with IRR?

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Press Field day with IRR Flaws

- ▶ How PE funds can overstate LP returns by up to 50 pct - PE Hub
- ▶ The Faulty Metric at the Center of Private Equity's Value Proposition (Inst. Investor)
- ▶ If IRR metrics had any sound basis, in fact, we would all be as rich as Croesus, (Ftimes)
- ▶ No, Yale's Venture Portfolio Didn't Double Every Year (Fortune)
- ▶ Fooled by IRRs (Yale, Schwarzman's Cases) (darcroom)
- ▶ Warren Buffett questions legitimacy of PE's use of IRR (Buyouts)
- ▶ FundersClub Returns Data: 41.2% Unrealized Net IRR in the first 18 months (blog)

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Most of this is “early returns” distorting record but there is also....

Common denominator of
Temporal Asymmetry

Temporal Asymmetry

- ▶ We may be doing this returns calculation all wrong
- ▶ Worked great when there was no dry powder
- ▶ As dry powder has increased, more money is not working than is working at some point
- ▶ So LP investment timeline is out of synch with GP investment
- ▶ I'm calling this Temporal Asymmetry and it may be at the root of a lot of problems we are beginning to see

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Three Examples of Temporal Asymmetry

- ▶ Dry powder
- ▶ Mgt Fee recognition
- ▶ Subscription Line agreements

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Dry powder

- ▶ Is the committed but not invested capital
- ▶ Trillions of dollars now sitting "idle"
- ▶ Mgt fee is calculated on committed capital
- ▶ This is a managed allocation but isn't included in performance calculation



LP vs GP Timeline and Dry Powder

LP Timeline



GP Timeline



Management fee recognition

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- ▶ Remember that one input to the PE calculation is the NAV
- ▶ The LP has already “paid” management fees in their paid-in capital
- ▶ So management fee is not an additional cashflow but an adjustment to NAV (like a checking account)
- ▶ So you defer recognition of management fee drag as you calculate performance at each cumulative year end.

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LP Cashflow Example

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Date	Paid In Capital	distribution	Annual Mgt Fee	Carried Interest	NAV	Cashflow
6/3/2013	10,000,000				10,000,000	(10,000,000)
12/31/2013		-	375,000		9,625,000	-
5/1/2014	10,000,000	-			19,625,000	(10,000,000)
12/31/2014		-	375,000		20,250,000	-
12/31/2015		-	375,000		20,175,000	-
9/10/2016	5,000,000	15,000,000		100,000	10,175,000	9,900,000
12/31/2016		-	375,000		11,000,000	-
11/22/2017		250,000		1,667	10,750,000	248,333
12/31/2017		-	375,000		11,825,000	-
12/31/2018		-	375,000		13,250,000	-
3/31/2019		12,500,000		83,333	15,750,000	12,416,667
12/31/2019		-	375,000		25,875,000	-
6/10/2020		1,600,000		10,667	35,275,000	1,589,333
12/31/2020		-	375,000		35,900,000	-
12/14/2021		-			38,400,000	-
12/31/2021		-	375,000		38,025,000	38,025,000
Total	25,000,000	29,350,000	3,375,000	195,667		
					IRR	19.7%
					DPI	1.17
					RVPI	1.52
					TVPI	2.69

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Pesky SLAs

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- ▶ Subscription Line Agreements
- ▶ Instead of drawing down capital, GP borrows from a lender at little to no interest
- ▶ GP makes investment with the loan
- ▶ At some point calls capital from LP and pay back loan
- ▶ Distribute proceeds from investments to LPs
- ▶ Bottom line: GP return is same (less small interest) but since LP's investment horizon has been shortened, return to LP is higher.
- ▶ Lot of disclosure requirements if SLAs are used, but better idea, compute returns from commitment date rather than investment date

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Subscription Line Agreements

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Effect of Subscription Line Agreements

Normative LP Return (no fee, no carry)					Normative GP return (no fee no carry)				
Year	Paid-in	Distr	Value	Cashflow	Year	Invest	Return	Value	Cashflow
2008				0	2008				0
2009	2500			-2500	2009	2500			-2500
2010				0	2010				0
2011	2500			-2500	2011	2500			-2500
2012				0	2012				0
2013	2500			-2500	2013	2500			-2500
2014				0	2014				0
2015				0	2015				0
2016		6000		6000	2016		6000		6000
2017				0	2017				0
2018			10000	10000	2018			10000	10000
			IRR	12.7%				IRR	12.7%
			DPI	0.80				DPI	0.80
			RVPI	1.33				RVPI	1.33
			TVPI	2.13				TVPI	2.13

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Subscription Line Agreements 55

Effect of Subscription Line Agreements

SLA LP Return (no fee, no carry 3% interest rate)					SLA GP return (no fee no carry 3% interest rate)				
Year	Paid-in	Distr	Value	Cashflow	Year	invest/pa	Return	Value	Cashflow
2008				0	2008				0
2009				0	2009	2500			-2500
2010				0	2010				0
2011				0	2011	2500			-2500
2012				0	2012				0
2013				0	2013	2500			-2500
2014	7500			-7500	2014	705			-705.003
2015				0	2015				0
2016		6000		6000	2016		6000		6000
2017				0	2017				0
2018			10000	10000	2018			10000	10000
			IRR	27.4%			IRR	11.5%	
			DPI	0.80			DPI	0.73	
			RVPI	1.33			RVPI	1.22	
			TVPI	2.13			TVPI	1.95	

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So what to do. 56

- ▶ One Idea– RoCC – Return on Committed Capital (Reyes PME)
- ▶ To make Public comparison, invest the entire commitment in a public index on day of commitment
- ▶ Or dollar cost average over a three to five year period
- ▶ Synchs up the timelines – and encompasses the uncommitted dry powder

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Invest One Tranche

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Date	Paid In Capital	distribution	Inc/Decr Value	Annual Mgt Fee	Carried Interest	NAV	NAV
6/3/2013	25,000,000	-	-	-	-	25,000,000	(25,000,000)
12/31/2013	-	-	-	375,000	-	24,625,000	-
5/1/2014	-	-	-	-	-	24,625,000	-
12/31/2014	-	-	1,000,000	375,000	-	25,250,000	-
12/31/2015	-	-	300,000	375,000	-	25,175,000	-
9/10/2016	-	15,000,000	-	-	100,000	10,075,000	15,000,000
12/31/2016	-	-	1,200,000	375,000	-	10,900,000	-
11/22/2017	-	250,000	-	-	1,667	10,648,333	250,000
12/31/2017	-	-	1,450,000	375,000	-	11,723,333	-
12/31/2018	-	-	1,800,000	375,000	-	13,148,333	-
3/31/2019	-	12,500,000	15,000,000	-	83,333	15,565,000	12,500,000
12/31/2019	-	-	10,500,000	375,000	-	25,690,000	-
6/10/2020	-	1,600,000	11,000,000	-	10,667	35,079,333	1,600,000
12/31/2020	-	-	1,000,000	375,000	-	35,704,333	-
12/14/2021	-	-	2,500,000	-	-	38,204,333	-
12/31/2021	-	-	-	375,000	-	37,829,333	37,829,333
						IRR	16.58%

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Invest One Tranche

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Date	Paid In Capital	distribution	Inc/Decr Value	Annual Mgt Fee	Carried Interest	NAV	Cashflow
6/3/2013	8,333,333	-	-	-	-	8,333,333	(8,333,333)
12/31/2013	-	-	-	375,000	-	7,958,333	-
5/1/2014	-	-	-	-	-	7,958,333	-
6/3/2014	8,333,333	-	-	-	-	16,291,667	(8,333,333)
12/31/2014	-	-	1,000,000	375,000	-	16,916,667	-
6/3/2015	8,333,333	-	-	-	-	25,250,000	(8,333,333)
12/31/2015	-	-	300,000	375,000	-	25,175,000	-
9/10/2016	-	15,000,000	-	-	100,000	10,075,000	15,000,000
12/31/2016	-	-	1,200,000	375,000	-	10,900,000	-
11/22/2017	-	250,000	-	-	1,667	10,648,333	250,000
12/31/2017	-	-	1,450,000	375,000	-	11,723,333	-
12/31/2018	-	-	1,800,000	375,000	-	13,148,333	-
3/31/2019	-	12,500,000	15,000,000	-	83,333	15,565,000	12,500,000
12/31/2019	-	-	10,500,000	375,000	-	25,690,000	-
6/10/2020	-	1,600,000	11,000,000	-	10,667	35,079,333	1,600,000
12/31/2020	-	-	1,000,000	375,000	-	35,704,333	-
12/14/2021	-	-	2,500,000	-	-	38,204,333	-
12/31/2021	-	-	-	375,000	-	37,829,333	37,829,333
						IRR	19.97%

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Including Committed Capital

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- ▶ Manager actual return 19.7%
- ▶ "Invest" lump sum 16.8%
- ▶ "Dollar cost average" 19.97%
- ▶ If we can get same metrics for industry, we have new benchmark. Reyes Benchmark ☺
- ▶ If we do the same with PME measures, we get new PME benchmark, Reyes PME ☺

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