The Pragmatics of Private Markets Investing

Karl Polen

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1 Introduction and Background

In this paper I share views I have developed about investing in private markets during thirty years of private sector experience followed by ten years in an institutional environment.[1]These views incorporate a framework for investment decision making and underwriting of strategies and firms. The process for assessing strategies and firms is unavoidably qualitative and subjective. However, I also present some analytical methods that I think are useful in support of the decision process.

I write this article partly in service to younger analysts who may be tasked with implementing these quantitative methods. My experience is that people find these calculations difficult at the outset and struggle to get their arms around them. I provide detailed examples, work through the formulas and calculations and, for those interested, code to automate the calculations. I always advise young people interested in investments to learn some coding and hope a few might be motivated by this article. If you learn to code in an advanced language like R or Python, it will open new avenues for your analytical work, will vastly improve your productivity and will protect the future of your career as forces of automation and artificial intelligence rapidly advance in our industry. Those not interested in the coding can simply skip the coding examples and won't miss anything.[2]

Institutional investors have adopted the use of private markets strategies in their portfolios at a rapidly increasing rate in recent decades. The markets themselves have grown commensurately to multi-trillion size. As the number of listed companies is actually declining, private markets have become difficult to ignore. This paper does not, however, attempt to justify the decision to invest in these markets or develop an approach to incorporating them in a strategic

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[1]I have worked for the Arizona State Retirement System for the last ten years, initially as Head of Private Markets Investing and as CIO for the last 4 years. While I work for ASRS as CIO, this work and the views it expresses are my own. The policies of ASRS are set in accordance with its governance policy and may be different from what is stated here. Any information about ASRS is drawn from public information readily available on its website.

[2]I code in the R programming language and use LaTeX for formatting results. For those interested, the code for this article is found at https://github.com/karlp-asrs/pragmatics. The github site contains some additional resources and instructions to help you get started.

asset allocation analytical framework. It starts, instead, from a standpoint that those decisions have already been made.

When I need to explain the underwriting process for private markets investing, I use the metaphor of a three legged stool. One leg each for strategy, organization and track record. By strategy, I refer to business strategy. What market are you addressing; what is your competitive advantage and how do you think you will add value? As a critical step in the process, we assess the health of the asset management organization. Do they have the organizational depth and skills to implement the target strategy? Have the created a culture that will allow them to continue to grow and improve over the life of the investment? We examine track record as confirmatory evidence on the first two questions. Track record alone is a weak indicator of likely future success. Finally, we consider the terms of an investment partnership as to the appropriateness of the costs associated with it and the reliability of the alignment of interest of the investor and investment manager. What follows is a more detailed discussion of these topics.

2   Strategy

As investors we learn we learn about strategy in the context of strategic asset allocation; i.e. the proportion of assets allocated to risks and associated premia related to equities, rates, credit, real estate and so forth. These decisions are the most important determinant of outcomes, at least after the fact. As important as this is, we are using the word "strategy" in a different way. We are referring to business strategy.

You can think of business strategy as an antonym to luck. It answers the question "how do we earn the profits we make." You earn them because somebody values what you do and you do it well. Strategy endures. Luck doesn't.

The history of private markets institutional investing goes back to the 1980s and 1990s. In those days, mere liquidity was a strategy. When the market suffered dislocations, for example in the RTC crisis of the early 90s, private capital seized on opportunities that were wildly mispriced. The RTC saw its mission as rapidly resolving failed S&Ls and they auctioned the assets individually and in pools to a market that simply was not structurally organized to absorb the volume of assets delivered.

The extraordinary returns earned from these times attracted additional capital and a private equity and private credit industry has organized itself globally with investment capacity measured in trillions of dollars. Private capital is now deeply embedded in the structure of capital markets and an effective competitor to public markets. It used to be that once a company reached a billion or so in enterprise value, its only option to raise capital for growth was in public markets. Following various crises of the last thirty years, regulation of public companies and the increasing presence of activist shareholders has increased the cost of going public and the reduced the attractiveness of it. In the meantime, the availability of private capital and the competitiveness of private markets

with multiple firms bidding on deals has made it feasible and efficient to finance firms to mid-cap and even large-cap range outside public markets. This is a self-reinforcing cycle leading to continued growth in private capital as investors seek access to these opportunities.

In this context, liquidity and savvyness about discerning value and opportunity are still needed but no longer sufficient. The sheer size of private markets ensures competitive bidding for pretty much anything that comes to market. In order to continue to earn excess returns, the best private capital firms have invested in their firms to create ever deeper expertise in the markets they address. They use this expertise to create strategic advantage to generate or gain access to deals and to formulate and execute business strategy for companies or properties owned. This trend also drove firms to specialize. For all but the very largest firms, there was a need to select which markets they want to address in order to build teams to accomplish their objectives.

Markets can broadly be categorized as "growth" or "value" markets. In growth markets, your goal is to accelerate the top line while optimizing operations to drive down unit costs enhancing profitability or creating a path to it. In value strategies, you rationalize operations in order to harvest cash flow. Practically any market offers opportunities to build businesses and make money. The question for the investor is whether the team you are evaluating is well prepared to tackle the issues presented by the strategy they are pursuing. Our view is that the skills required go well beyond financial deal-making skills. In private equity, operations teams are critical. If you are going to actually achieve "synergy" benefits when combining two firms, you need to support the management teams in successfully completing the necessary integration. Specialized industry expertise is often essential, whether it's marketing and logistics expertise for consumer brands or geologists and engineers who can evaluate "quality of rocks" in oil and gas ventures.

Real estate and credit are special cases. Real estate delivers value to consumers through design. Real estate design is the province of architects and urban designers who study consumer preference and grasp how to craft a strategy for building design responsive to location and environmental context that creates a strategic advantage in fulfilling its commercial purpose. Time and time again, we see well designed and operated buildings maintaining high occupancy and earning premium rents in markets and neighborhoods that otherwise would be regarded as highly competitive. Employment trends, the tastes of millenials and impacts of technology are rapidly changing what constitutes good design and risks of obsolescence in real estate are high. Value strategies of investing in older buildings at discount prices need to be evaluated carefully. Unlike other investment categories where scale is usually paramount, the beauty and challenge of real estate is the intensely local nature of markets creating the opportunity for competitive advantage and pricing power with a relatively small business.

Unlike equity strategies where value is created after the acquisition, credit strategies achieve their success mostly through their discipline and diligence in deciding whether or not to make a loan. Deep expertise in credit including industry coverage teams are essential to doing this well. Once the loan is made,

3

the die is largely cast. Nevertheless, active monitoring is extremely important. Rapid action in addressing a deteriorating credit can improve recovery rates.

The final test of strategy is consumer-centeredness. We started out by saying understanding strategy is similar to a firm grasp of the answer to how a firm earns its profits. If it's lucky or exploitive, it won't be sustainable. Firms have multiple consituencies and as firms mature, they evolve in how they embrace their responsibilities. For asset management firms, the first order customer is the asset owner which has entrusted them with a portion of their capital for management. The issues here are pretty straight-forward – the asset owner wants its money turned into more money together with some niceties like being kept informed on how things are going along the way, etc. More to come on this when we discuss terms in a later section.

To distinguish themselves, firms must serve a broader customer set. Private equity firms serve the management teams of the companies they own. A software industry investor adds value if it has an internal consulting team with expertise in software development and marketing. Such a firm becomes a preferred partner getting a last look in auctions or even having the chance to buy businesses "off market". A middle market credit firm adds value through its reputation for reliably closing and fair dealing when conditions evolve for better or worse. Such a firm can achieve premium pricing and hold firm on other terms and covenants.

Additionally, these relationships create access to deal flow. A firm must demonstrate an ability to actually deploy capital, timely, in the amount raised and consistent with the parameters of the promised strategy. I am not put off by a firm's aspiration to grow and, realistically, that is a goal for any firm of quality. However, an asset should be prepared to demonstrate that their is scalable within the bounds of their fund raising aspirations, without drift or deterioration in underwriting standards.

Every firm has a critical internal customer set in the people who work there. This is the topic of the next section.

3 Organization

Once you select strategies to pursue, you need to hire teams to implement them. Private markets investing concerns itself principally with this hiring decision. Though we analyze prior investments, it isn't the same as securities analysis. When Warren Buffet drinks a Coca Cola and reads their financial statements and decides he likes it, he then can buy the stock and Coca Cola is what he gets. You can analyze the prior track of a private equity firm all you want, but you don't get those deals. What you are evaluating is whether they have created a culture and process that adds value and assessing whether you think it is likely they will repeat that success.

You will start evaluating an organization simply by looking at the size and composition of the team. Is it big enough and does it contain the technical specialties necessary to implement the planned strategy. A relevant statistic is

firm assets under management divided by employee headcount. From that information, you can calculate an estimate of the recurring revenue per employee. For firms with lower AUM per employee, less than \$100 million, the business viability may not be sustainable with adequate personnel to support the strategy. For firms with high AUM per employee, one would ask whether the firm is investing enough in itself and whether there may be too much outsourcing. The purpose of base asset management fees should be to support an organization well-resourced to implement the investment strategy.

Firm culture is the other main topic for examination. Founder leadership style establishes and guides the culture. In building a firm founders make a series of increasingly selfless decisions. The first decision is to found the firm in the first place. The founders have a fire in their belly to pursue something reflecting their unique take on strategy and build something which is their own. This first "at bat" is critical – if you don't have enough early success to attract capital and talent, the firm never really gets off the ground. As the firm progresses, the founders are then faced with the task of transitioning from deal culture to firm culture. Leadership style at this point becomes critical.

One of the fun things about being an investor in private markets is the opportunity to meet many founders and observe how they manage this journey. The best managers deemphasize the personalities of the founders in order to build the culture of the firm. Leaders in this style see leadership as service and to a significant degree an antonym to authority. They build a culture reflecting a philosophy and discipline of business practice and then trust the culture. Decisions and responsibility are increasingly entrusted to the team as their skills and experience grow. The founders don't hold themselves out as final decision makers. Instead they monitor that appropriate discipline was observed in making the decision and that feedback loops are present to appropriately measure the outcome of the decision and learn from those outcomes. Teamwork is emphasized. Every individual understands her role and does not let down her colleagues with substandard, incomplete or tardy work. People learn to trust each other in the integrity and professionalism of their work. Leadership in this context serves the firm, the employees and the culture. The leaders accept financial rewards only after taking care of the team first. They are quick to credit the team for their work.

Compensation and employment terms are important. This is where the rubber hits the road. While it may be the case that employees will be loyal to firms that create a rich employment experience full of challenge, team comraderie and joy from shared experience of success, this only goes so and the firm will deteriorate if the riches created are not properly shared. Persons in authority who accept rewards for themselves without first taking care of their teams are creating an intrinsically toxic environment. As the firm evolves, if will develop formalized and for more senior personnel contractual arrangements for sharing profit. Careers are emphasized and career conversations about what this job means to each person occur regularly. The uniqueness of individuals is a source of strength for the culture. Succession planning and ownership of the asset management firm need to be addressed well in advance of need both to protect

investors and to complete the bond with the next generation of managers who will succeed the founders. The capital of an asset management firm is human capital and founders who do not properly share rewards and do not plan for succession are dissipating that capital.

Assessing these things is difficult for an investor, but important. Typical investment arrangements with these firms involve fund lives of ten to fifteen years. One sees firms that ossify or disintegrate in that time frame and contractual protections rarely provide adequate remedies. In my own case, I use a thought experiment to help myself with this decision – I have adult children and I ask myself if this firm is a place I would want them to work. Will they be continuously challenged with projects and duties of increasing complexity as their skills grow. Will they receive regular candid feedback and will they receive financial rewards commensurate with the value of their work. Will they advance in a career path suited to them providing opportunities for technical excellence or the chance lead a team or a business line. Will the culture, however demanding, avoid hazing rituals and allow them to grow as individuals with interests and relationships beyond work. If it's a good place to work where you'd be proud for your children to be associated with it, then it has a decent chance of surviving and thriving.

4 Track Record

Why do we look at track record? Luck and randomness are everywhere and just because a firm has done well, it is far from certain it will continue to do so. In public markets, there is some evidence that strategies that have recently done well will deteriorate. In private markets, the evidence for persistence of performance is, at best, equivocal.

We understand all that, but care about track record anyway. We care about it because it is the one unfudgeable and unspinnable piece of evidence we have that might help us assess whether the firm has created a quality culture and is pursuing a robust strategy. What follows is a somewhat detailed explanation for calculating performance metrics for private equity style investments (where investments are illiquid and market timing is determined by an investment manager with a sequence of capital calls and distributions which are nondiscretionary for the investor).

4.1 Traditional Methods of Performance Measurement

Comparing private equity performance to public markets presents technical challenges. The usual way to compare two investments is with time weighted returns. This works with liquid investments where the investor can choose which assets to own and in what weight. For example, you can use time weighted returns to properly compare the performance of large cap stocks with small cap stocks over whatever time frame is of interest to you.

Private equity doesn't work the same way. PE investments are typically in the form of limited partnership interests with subscription agreements pursuant to which the financial sponsor has the right to control the amount and timing of capital which is called in to the partnership. So, the amount of capital deployed varies over time and the investor has no control over the timing of calls or distributions for the investment. In this context, time weighted return calculations are not useful in understanding the performance of a private equity investment because the variability in the amount of capital deployed will typically be very large.

The traditional performance metrics for private equity are DPI, TVPI and IRR. DPI stands for distributions as a percent of invested and is calculated as the sum of distributions received divided by the sum of capital contributions made. TVPI is "total value as a percent of invested" and calculates the "total value" as the sum of distributions plus the value of the unrealized assets still owned by the partnership divided, again, by the sum of the capital calls. IRR is the internal rate of return, customarily expressed as an annual interest rate, calculated on the cash flows with the capital calls expressed as negative numbers and including the final cash flow as part of the time series for the calculation.

These traditional measures collectively give a good sense of the performance of a particular PE investment and allow you to compare private equity investments to each other. Data services tracking private equity use a combination of these metrics to rank performance in "quartiles". They customarily group funds to control for market context in "vintages" based on the year the partnership began investing. So, a 2006 vintage fund which invested across the global financial crisis and earned a 10% IRR might be a top quartile performer for that vintage, while the same IRR would be below average for, say, a 2009 vintage.

4.2   Public Market Equivalent methods

Controlling for market context by vintage is useful but still crude because there is a lot of variability of patterns of calling and returning capital from fund to fund. A number of authors proposed methods for this, but Steve Kaplan and Antoinette Schoar wrote an influential article exploring private equity performance [3] . In this article they formulated a method for calculating private equity performance as a "public market equivalent" which we will refer to as KSPME. KSPME is calculated as ratio of benefits to costs and a value greater than 1 indicates performance above the opportunity cost benchmark. The calculation is illustrated in the following formulas.

The required data are a time series of capital calls C_t, a time series distributions D_t, a final value at time n of V_n and a time series of dividend adjusted market indices M_t. You calculate a future value factor as the ratio of the market index at time n divided by the index at prior times t as follows:

$$FV_t = \frac{M_n}{M_t}$$

You then multiply (pair-wise for each of the values) the future value factor times calls and distributions

$$C_{FV} = C_t * FV_t$$

;

$$D_{FV} = D_t * FV_t$$

You now have what you need to calculate

$$KSPME = \frac{\Sigma D_{FV} + V_n}{\Sigma C_{FV}}$$

KSPME is a wealth measure reflecting how much extra money you have by investing in the private equity fund compared to an alternative public markets investment.

KSPME has some nice mathematical properties that allow it to be related to the capital asset pricing model. Gredil, Griffiths and Stucke have published an article that explores this relationship and proposes an additional metric, called "Direct Alpha", which is a measure expressed as an annual percent of outperformance of a private equity investment compared to a public market benchmark [2]. It is calculated as the IRR of a time series constructed by combining the future value adjusted calls (as negative numbers), distributions and the final value. So, it uses exactly the same data as KSPME but with different calculations to reduce the data to a single measurement.

$$Direct Alpha = \log\left(1 + IRR(-C_{FV}, D_{FV}, V_n)\right)$$

If you have an IRR of a private equity investment IRR_{PE} calculated as a discrete annual return, you can then calculate an IRR_M that you would have earned by investing in a market index with the same timing of investments and withdrawals as the calls and distributions of the private equity investment.

$$\log\left(1 + IRR_M\right) = \log\left(1 + IRR_{PE}\right) - Direct Alpha$$

KSPME and Direct Alpha supplement the traditional private equity performance measures with mathematically rigourous methods consistent with the CAPM framework. KSPME provides a measure of how much additional wealth is gained with a private equity measurement. Direct Alpha tells you the rate at which the additional wealth is accumulated.

4.3 Illustration of calculations of private equity performance measurements in R

For those interested, we provide here detatiled mechanics for calculating PME. The code and data are found on the earlier referenced Github site. We work from a hypothetical data set of private equity cash flows and valuations with dates for each entry. Although this is a limited data set covering only four investments, the exact same code will work on a large data set with thousands of entries for

hundreds of investments. That's the beauty of coding – the algorithm doesn't grow in size simply because the data set has.

First, we read in the data and show its initial form.

```
library(tseries)
library(zoo)
pedata=read.csv('pedata.csv')
pedata$date=as.Date(pedata$date,format='%m/%d/%Y')
unique(pedata$fund)

## [1] Fund 1 Fund 2 Fund 3 Fund 4
## Levels: Fund 1 Fund 2 Fund 3 Fund 4

head(pedata)

##     fund       date        value type
## 1 Fund 1 2008-11-14 -272.6157935    C
## 2 Fund 1 2008-12-10  -65.9728249    C
## 3 Fund 1 2008-12-19    0.1192945    C
## 4 Fund 1 2009-05-29   -0.2999770    C
## 5 Fund 1 2009-08-12   -8.5177131    C
## 6 Fund 1 2009-10-22   -7.6253831    C
```

We now calculate a combined cash flow and valuation for the portfolio and an additional investment labeled "Total".

```
pedata=split(pedata,pedata$type)
total.c=data.frame(fund="Total",
                aggregate(value~date,pedata$C,sum),type="C")

total.v=data.frame(fund="Total",
                aggregate(value~date,pedata$V,sum),type="V")
pedata=rbind(pedata$C,pedata$V,total.c,total.v)
tail(pedata)

##         fund       date        value type
## 2171 Total 2013-09-06    21.071523    C
## 2181 Total 2013-09-20    -3.840467    C
## 2191 Total 2013-09-24     1.657436    C
## 2201 Total 2013-09-26   -19.144470    C
## 2211 Total 2013-09-27    75.802883    C
## 1102 Total 2013-09-30  4015.458228    V
```

Next we download the Russell 2000 index from Yahoo finance. R can handle other data services, but we use Yahoo because it's available to anybody at no charge.

```
r2k=get.hist.quote('^RUT',min(pedata$date)-5,
                max(pedata$date)+5, quote='AdjClose',
                provider='yahoo',retclass='zoo',quiet=TRUE)
r2k=na.locf(merge(r2k,
                zoo(,seq(start(r2k),end(r2k),by='day')),all=TRUE))
```

We now `merge` the index data with the private equity data set so that each entry in the data set has its related market index value.

```
r2k=data.frame(date=time(r2k),index=as.numeric(r2k))
pedata=merge(pedata,r2k)
head(pedata)

##          date    fund       value type  index
## 1 2007-12-28 Fund 4 -136.82732    C 771.76
## 2 2007-12-28  Total -136.82732    C 771.76
## 3 2008-01-30  Total  -41.57570    C 695.49
## 4 2008-01-30 Fund 4  -41.57570    C 695.49
## 5 2008-02-26  Total  -10.90081    C 717.32
## 6 2008-02-26 Fund 4  -10.90081    C 717.32
```

We now `split` the data set in to a list of data frames, one for each fund and the total portfolio.

```
pelist=split(pedata,pedata$fund)
names(pelist)

## [1] "Fund 1" "Fund 2" "Fund 3" "Fund 4" "Total"
```

I've written a function called `pe.performance` which processes data in the format of each of the data frames in `pelist`. The code for all the functions used in this post are listed at the end of the post. Having done the hard work of preparing the data for analysis, we can now calculate the performance statistics with only two lines of code.

```
stats=lapply(pelist,pe.performance)
stats.df=data.frame(lapply(stats,unlist))
round(stats.df,3)

##              Fund.1 Fund.2 Fund.3 Fund.4 Total
## tvpi          1.113  2.401  1.801  1.266 1.567
## dpi           0.187  0.779  0.958  0.353 0.553
## irr           0.039  0.626  0.268  0.071 0.175
## kspme         0.681  1.883  1.334  0.846 1.083
## direct.alpha -0.130  0.351  0.120 -0.049 0.029
## ind.irr       0.182  0.145  0.125  0.125 0.142
```

Here is an example of a way to graphically present the results.

```
stats.df2=as.data.frame(t(as.matrix(stats.df)))
stats.df2=data.frame(name=colnames(stats.df),stats.df2)
library(ggplot2)
ggplot(stats.df2,aes(x=ind.irr,y=irr,label=name,colour=kspme))+
        geom_text()+
        xlab("Market Return")+
        ylab("Fund IRR")+
        geom_abline(intercept=0,slope=1)+
        ggtitle("Private Equity Performance")
```
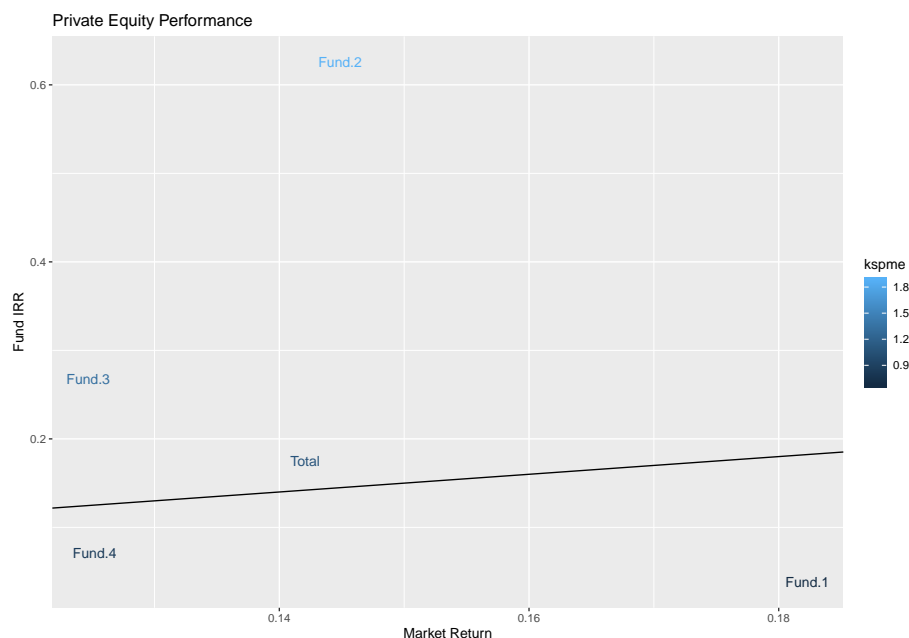

PME methods are not a magic bullet, but they are very useful. Prior to these methods, it was difficult to benchmark performance. PME methods provide a rigorous tool for assessing performance relative to market which is an essential starting point for assessing the quality of a firm and its strategies.

4.4 Consideration of skewness

One last topic on performance assessment deserves mention. As is well known, stock market returns are skewed with a few outliers contributing disproportionately to performance. Hank Bessembinder has shown that only 4% of stocks have contributed substantially all the outperformance of the stock market since the great depression.[1]We'd like to see a similar positive outlier type of skewness in our private markets investments. The data sets are too small in private

markets for any pretension of fancy statistics. I prefer something I call a "slugging percentage" which is simply the percentage of deals that have returned 3X or more of the initial investment. We then compare that to the percentage of deals that have lost money and if it's comfortably larger, we have evidence of the sort of skewness we are looking for. In the next section, we will analyze the effect of incentive compensation on the skewness of net returns and you will see that positively gross returns are needed to balance things out for the investor.

5 Understanding and Analyzing Cost

Private equity structures are complicated and difficult to analyze. We present here a quick and dirty analyzer of general partner compensation in real estate and private equity partnerships. It analyzes the outcomes across a range of performance scenarios in single period investment context. It is useful for analyzing the sharing of income between the GP and investors as income varies.

5.1 Background

Real estate and private equity investments are typically owned in a partnership which includes a general partner (the "sponsor") and limited partners ("investors"). The sponsor organizes the investment, recruits the investors and manages the assets. The general partner is typically compensated with an asset management fee and an incentive fee.

The asset management fee is usually stated as a percent per annum of assets under management. This can be either as a percent of "commited" capital or "invested" capital. In the former case, the fee is earned based on the amount the investors commit from the inception of the partnership without regard to when the capital is called. If the asset management fee is based on invested capital, then the fee is calculated only on capital which has been called.

The asset management fee is generally not contingent on performance, but on occasion investors can negotiate a deferral of a portion of an asset management fee until a minimum investment hurdle rate of return is achieved. There is a great deal of variation in these arrangements and a person tasked with analyzing a partnership will need to refer to the partnership documents.

In this post we only consider the case of asset management fees on invested capital, but we allow a portion of the fee to be deferred based on performance. In a later post, we will consider more complex structures in a multi-period project environment.

The incentive fee ("carry") is typically stated as a percent of profits. Profits are normally defined as the gross profits of the investments after returning partnership expenses including the asset management fee. Usually, a hurdle rate of return must be achieved before sharing begins. So, a typical deal might be stated as "20% carry over an 8% pref with a 50% catchup". This means that

the partnership has to earn at least 8% return before the sponsor earns any carry. Above an 8% return, the sponsor gets half the profit (i.e. the catchup is 50%) until the ratio of profit split is 20% to sponsor. Thereafter, the profits are split 80% to the investors and 20% to the sponsor. Incentive fees of 20% over an 8% hurdle are nearly universal in private equity. Although the catchup is negotiable, somewhere in the 50% to 100% range is typical.

Real estate deals have greater variation. Many real estate deals have multiple layers, but no catchup. So, a real estate deal might be stated as "20 over 8, 30 over 12 and 50 over 20". Stated this way, sponsor starts sharing 20% of profits once the investor earned an 8% return, switching to 30% of profits once the investor has earned a 12% return and 50% of profits once the investor has earned a 20% return. There is no catchup in this structure, but between the 8% and 12% hurdle sponsor carry starts to drag on return and the net return to the investor needs to be higher than 12% before the the next level of carry kicks in.

5.2 Private Equity Example

Let's revisit the typical private equity structure ("20 over 8 with a 50% catchup"). We will add a 2% asset management fee and consider the sharing of cash in the context of an investment with a hold period of exactly one year. We will now step through, in agonizing detail, each of the calculations for profit sharing.

5.2.1 Level 0 -- the investment

Invest $100 in an asset. In addition, the investor has to pay the asset management fee of $2. So, they have invested $102

5.2.2 level 1 -- return of capital

The first $102 goes to pay back the investor's capital -- \$102 cumulative cash, 2% gross return, 0% net return

5.2.3 level 2 -- pay pref

The next 8.16 dollars goes to cover the "pref" of 8%. $110.16 cumulative cash. 10.2% gross return, 8% net return

5.2.4 level 3 -- catchup

We now start splitting 50/50 until the sponsor has 20% of the distributed profit
Here we have a simple algebra problem
We are looking for a value of x where

$$\frac{.5x}{8.16 + x} = .2$$

Let's solve for x

$$x = 3.264 + .4x$$

$$.6x = 3.264$$

$$x = \frac{3.264}{.6} = 5.44$$

So, the next 5.44 dollars are distributed 50/50.

At this point, $115.6 has been distributed, of which $2.72 went to the sponsor as incentive fee. The gross return is 15.6% and the investor has received a net return of 12.9%.

5.2.5   level 4 -- parri passu

Remaining cash is distributed 80/20. Suppose the asset is sold for $130.

The limited partner receives $102 return of capital plus $22.4. The sponsor receives $5.6 incentive fee in addition to the $2 it received as an asset management fee.

The gross return on the investment is 30%. The net return to the investor is 22%.

At the github site we've provided a function called `waterfall` that automates these calculations. We illustrate its use for the private equity structure we have just stepped through.

```
peinv=100
pecap=102
dmat.pe=data.frame(am=0,pref=(.08*pecap),catchup=.5,carry=.2)
ans.pe=waterfall(dmat.pe,ret=seq(100,130,.1),invcost=peinv,capital=pecap)
```

Here is a plot that shows the share going to sponsor and investor.

```
plot(ans.pe$grossreturn,ans.pe$grossreturn,type='l',
        col='red',xlab='Gross Return',ylab='Return')

lines(ans.pe$grossreturn,ans.pe$netreturn,type='l',col='blue')
legend('topleft',legend=c('Gross Return','Net Return'),
        col=c('red','blue'),lwd=1)
```
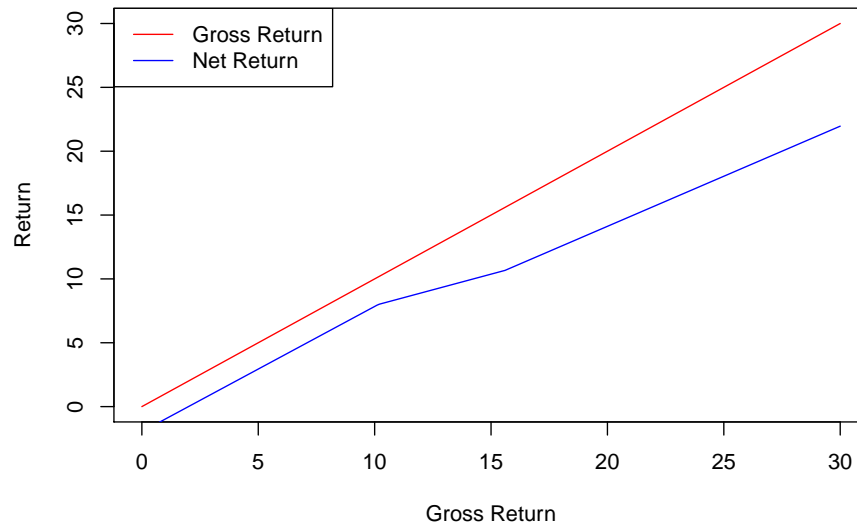
This plot shows the share of profit going to the GP on the margin.

```r
deltaprofit=diff(ans.pe$grossreturn)
deltagp=diff(ans.pe$grossreturn-ans.pe$netreturn)
gpcut=100*(deltagp/deltaprofit-.02)
plot(ans.pe$grossreturn[-1],gpcut,
     main=('Marginal Share of Return to Sponsor'),
     xlab='Gross Return', ylab='Percent',
     type='l',col='blue')
```

Marginal Share of Return to Sponsor
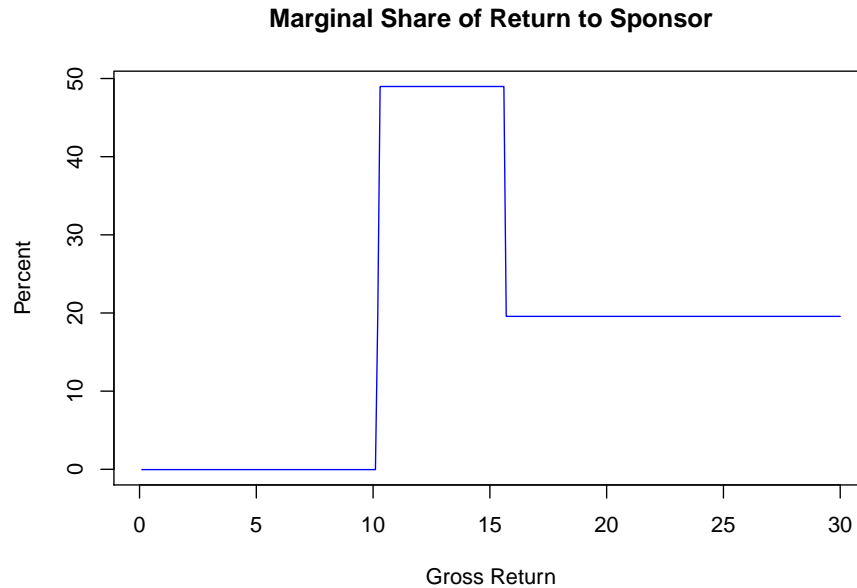
As you can see, the share to the GP increases to 50% during the catchup phase. It then drops to 20% for returns above the breakeven where the GP has 20% of the cumulative profits.

5.3 Real Estate Structure Example

Let's do the same for the real estate example where the incentive fee is "20 over 8, thirty over 12 and 50 over 20". In this case, we illustrate where there is a 2% asset management fee but half the fee is deferred until the investor has achieved an 8% return.

```
reinv=100
recap=101
dmat.re=data.frame(am=c(0,1,0),pref=c(.08,.12,.20)*recap,
        catchup=c(0,0,0),carry=c(.2,.3,.5))

ans.re=waterfall(dmat.re,ret=seq(100,130,.1),invcost=reinv,capital=recap)
```
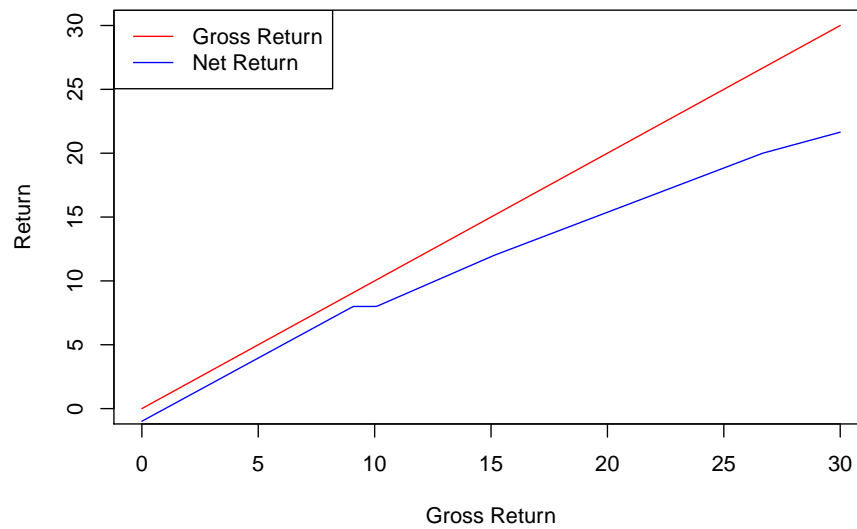
Here is a plot that shows the share going to sponsor and investor.

```
plot(ans.re$grossreturn,ans.re$grossreturn,type='l',col='red',xlab='Gross Return',ylab='Retu

lines(ans.re$grossreturn,ans.re$netreturn,type='l',col='blue')
legend('topleft',legend=c('Gross Return','Net Return'),
        col=c('red','blue'),lwd=1)
```
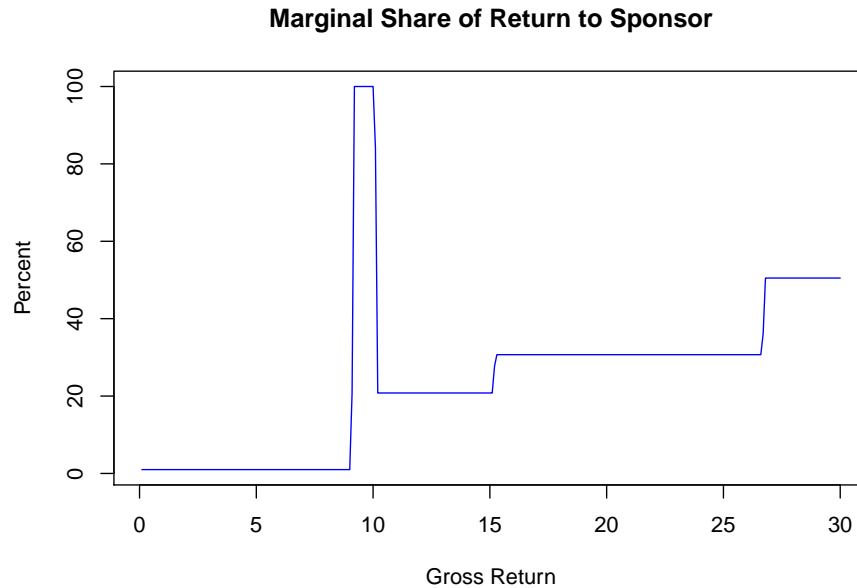
This plot shows the share of profit going to the GP on the margin.

```r
deltaprofit=diff(ans.re$grossreturn)
deltagp=diff(ans.re$grossreturn-ans.re$netreturn)
gpcut=100*deltagp/deltaprofit
plot(ans.re$grossreturn[-1],gpcut,
        main=('Marginal Share of Return to Sponsor'),
        xlab='Gross Return', ylab='Percent',
        type='l',col='blue')
```

Marginal Share of Return to Sponsor

As you can see, the GP share spikes when they recover their share of the deferred management fee, then follows the stairstep of 20%, 30% and 50% shares of profit above the hurdle rates delivered to the investor.

These calculations are tricky and a source of endless frustration for analysts entering the profession. For those willing to suffer learning a bit of coding, functions like the one provided can help.

5.4 Consideration of skewness

We will now use the waterfall function to analyze the skewness of net returns in a private equity structure a 1.5% management fee and incentive of 20% over an 8% preferred return with an 80% catchup.

```
dmat.df=data.frame(am=1.5,pref=8,catchup=.8,carry=.2)
ret=100+seq(-20,30,.1)
wat=waterfall(dmat.df,ret)
```

5.4.1 Calculating net returns given a probability distribution assumption for gross returns

Suppose we think gross returns are normally distributed, with a mean of 15% and standard deviation of 15%. How are the net returns distributed? The below code makes these calculations and presents a comparative density function.

```
mu=15
sd=15
ret.seq=seq(mu-3*sd,mu+3*sd,.1)
ret.den=dnorm(ret.seq,mu,sd)
ret.count=round(1000*ret.den)
ret2=100+rep(ret.seq,ret.count)
wat2=waterfall(dmat.df,ret2)
with(wat2,plot(density(netreturn),col='blue',
        main='Return Density',xlab='Gross Return'))
with(wat2,lines(density(grossreturn),col='red'))
legend('topleft',legend=c('Gross Return','Net Return'),
        col=c('red','blue'),lwd=1)
```

Return Density
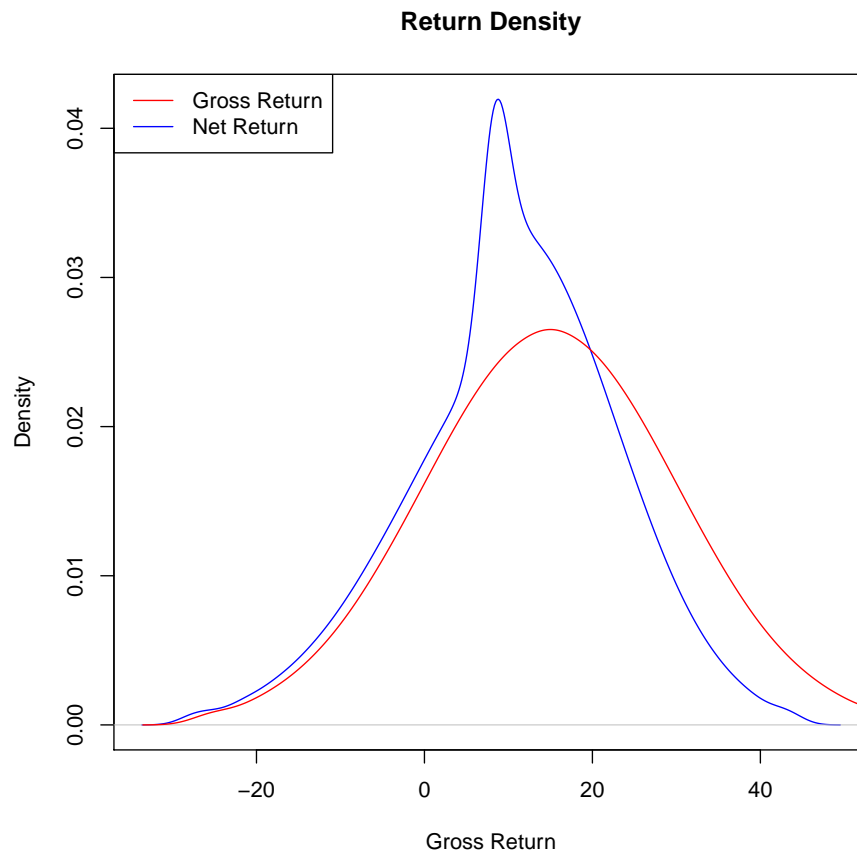
As you can see, the net returns are skewed to the low return side if you assume normally distributed gross returns. This is why we are looking for managers with a track record for positive skewness in their gross returns.

Next we show the distribution of fees with a vertical dotted line at the mean

fee.

```r
fee=wat2$grossreturn-wat2$netreturn
mean.fee=mean(fee)
plot(density(fee,from=min(fee)),col='purple',lwd=2,
        main='Fee Distribution', xlim=c(1,14))

abline(v=mean.fee,lty='dotted',col='purple')
```

Fee Distribution


N = 9969   Bandwidth = 0.382
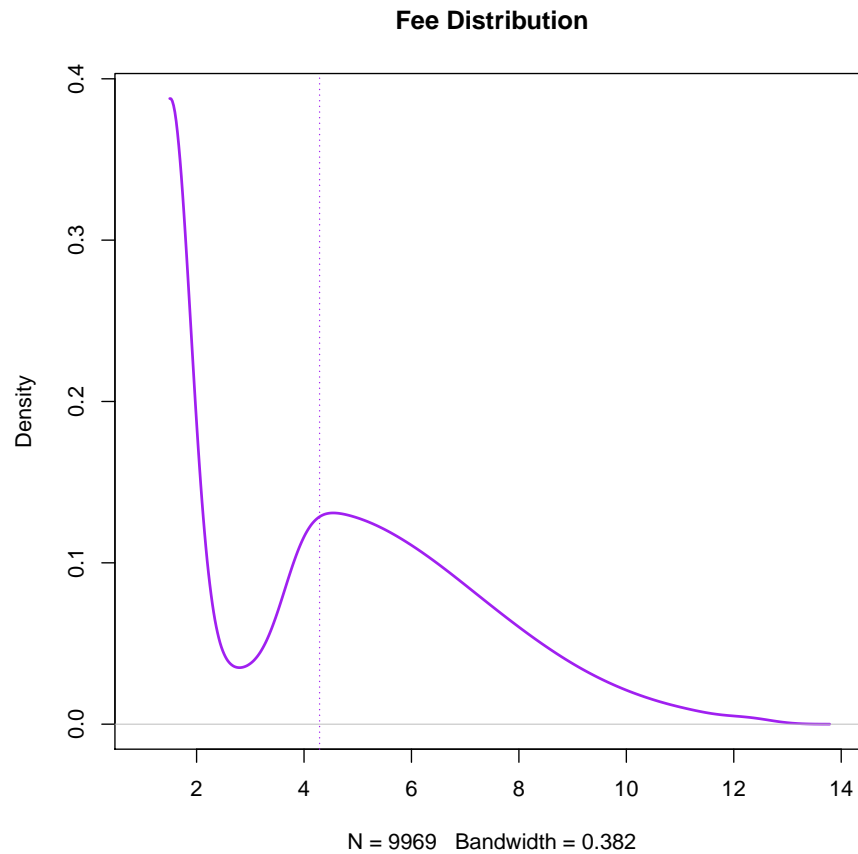
It you want an estimate of what your fees are likely to be, this is a way to calculate it.

5.5   Fee Effectiveness

As part of evaluating an investment program, you will inevitably be asked "did you receive value for the fees you paid?" I think the best way to look at this is by considering fees as a percent of excess profits.

Let's setup a PE investment with market standard terms of 1.5% asset management fee, 20% carry over an 8% hurdle with an 80% catchup. First we show a plot the fee as a function of gross return.

```
dmat.pe=data.frame(am=1.5,pref=8,catchup=.8,carry=.2)
ans.pe=waterfall(dmat.pe,ret=seq(100,130,.1))
df=data.frame(Gross_Return=ans.pe$grossreturn,
         Net_Return=ans.pe$netreturn)
df$Fee=df$Gross_Return-df$Net_Return
bench=6 #asuumed near term public market returns
df$Excess_Return=df$Gross_Return-bench
df$Excess_Return[df$Excess_Return<=0]=NA
df$Slice_to_GP=pmin(1,df$Fee/df$Excess_Return)
ggplot(df,aes(x=Gross_Return,y=Fee))+geom_line()
```
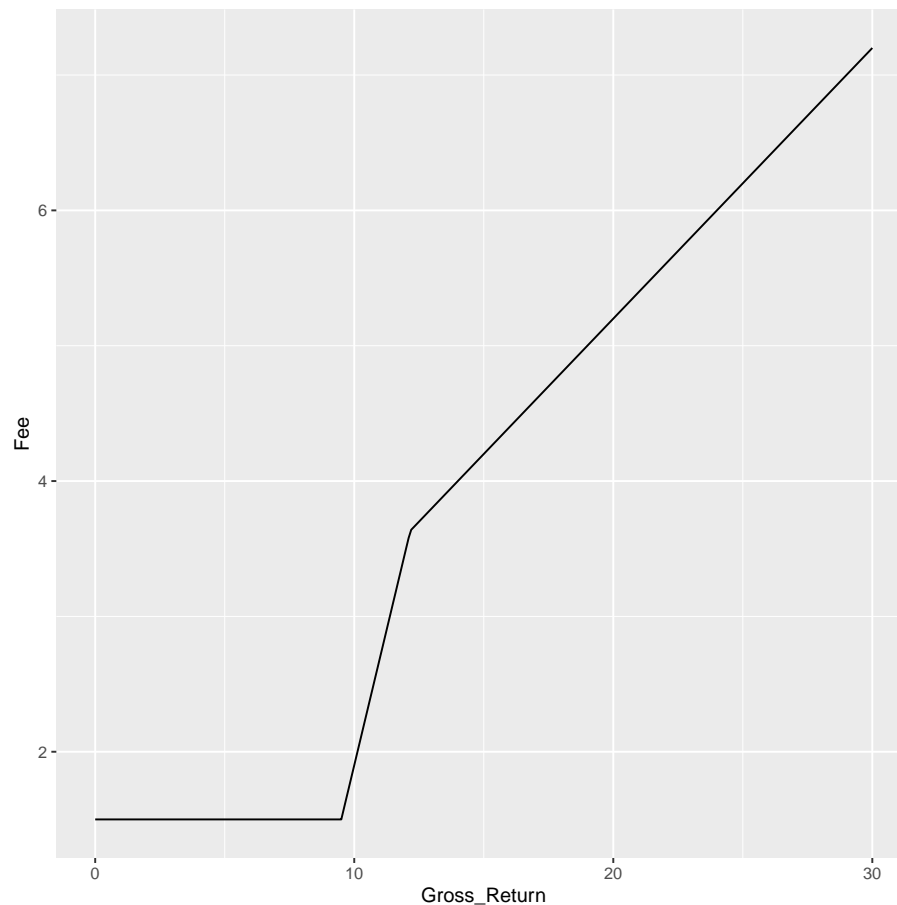

Now we show a plot of the fee as a percent of the excess return.

```
ggplot(df,aes(x=Gross_Return,y=Slice_to_GP)) + geom_line()
```
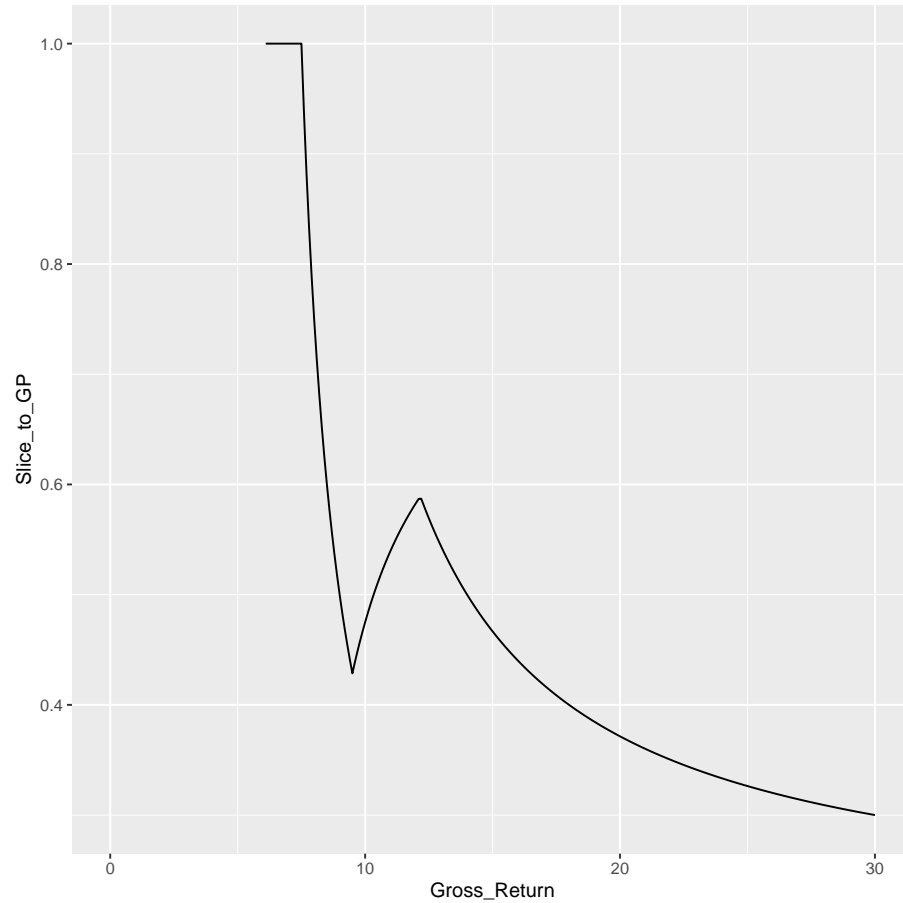

5.6   Negotiating terms to manage cost

The primary fee cost drivers in private equity type investment are the asset management and incentive fees. If you are trying to negotiate and reduce cost, here are some suggestions on where to direct your focus.

Pay close attention to the catch-up provisions. Assuming your incentive fee is 20 over 8 and a reasonably successful investment program, the catchup will add 1.6% per year to the investment cost; i.e. the 20% incentive rate times the 8% hurdle. While this would be considered market standard in many contexts, it may at times be negotiable. The catchup has the biggest impact in the return band of 9% to 12% gross returns, where the catchup is paid. If this is an interemediate return strategy (as much real estate and credit strategies will be) where the expected returns are within that band, you need to consider whether this is acceptable to you. Negotiated solutions might be elimination of the

catchup, possibly in consideration for a lower hurdle or the addition of higher incentive structures for exceptional performance as in the real estate structure described above.

Asset management fees are charged on either "committed" or "invested" capital. In the former case you pay a fee on the full amount of capital committed whether or not it has been called. Assuming investments are made ratably over the first three years of the partnership, this adds 1.5 times the annual fee rate over the life of the fund. Assuming an annual fee rate of 1.5% and weighted average duration of investments of eight years, the annual additional cost is a little less then 30bp per year. This is a fraction of the cost of the catchup, but still important. You need to keep in mind the whole picture. If your manager is smaller, they may need the early revenue to support a proper team for your strategy and you might better serve yourself by focusing on other areas for cost savings. But compromises may be available in the form of reduced fees on committed capital or performance based fees that link fees to achieved operational results.

Finally, you should pay careful attention to what services are funded by the asset management fees and what services are charged as additional fund expenses to the partnership or charged to the deals. Read the manager's "ADV" forms filed with the SEC. There is a lot of useful disclosure here.

5.7   When Alignment of Interest Fails

By sharing profits with an asset manager, you achieve alignment of interest with them. At least while things are going well. The system falls apart with underperforming investments. With underperforming investments there is no incentive for the manager to wrap up the partnership. In fact, the manager is better off avoiding asset sales to continue the asset management fees and for the option value on the incentive fee in case the asset recovers. The investor may well prefer to wrap things up and recover their capital from an underperforming investor in order to move on to the next thing.

The situation is exacerbated when incentive fees are paid on a deal by deal basis. In that case if the manager has sold profitable deals early in the partnership and collected incentive fees for them they may owe the partnership money for a "clawback" on liquidation of the partnership to the extent fees initially advanced for early deals are higher than ultimately earned. This provides a powerful additional incentive to delay final liquidation.

For an investor in a program constructed of traditional closed end fund partnership interests there is little defense against these problems other than a well diversified portfolio with multiple managers, strategies and vintages. In that structure any problems will be mitigated and you can gradually weed out any managers who handle tough situations more to their own advantage.

However, if you are a larger investor you may be able to structure investments as large "separate accounts" on custom terms. In those structures, you may be able to negotiate provisions in favor of the investor for discretionary termination of investment periods, custom mandatory investment criteria and ability to

direct liquidation of all or part of the assets. This approach is much more management intensive and requires specialized expertise to implement, but can add significant value in reduced cost and reliably aligned interests.

5.8 Information rights

An area of ongoing frustration for me has been the quality and timeliness of information delivered to the investors. While some sponsors do an excellent job, there are more who fall short. With advances in technology, accounting systems have rapidly moved toward real time dashboard type environments. Private equity shouldn't be any different. Investors should have access to real financial statements for each of the portfolio investments, prepared in accordance with GAAP consistently applied and delivered promptly. Additionally, there should be management discussion including a set of key performance indicators relevant to the deal and compared to initial underwriting expectations. With this information, an investor could know if an investment is going well.

What is actually delivered to investors is far too often partial information, not consistently presented from quarter to quarter and heavily spun by the firm's marketing department. Investors shouldn't put up with this, but for some reason they do and I have found it difficult to get traction with commingled fund managers on this topic. It's puzzling to me that asset managers do not find it relevant to strive for excellence in this area in order to add value to their investors. In a separate account arrangement, this can be addressed and the manager will not incur any additional cost because of it. If the manager is competent enough to earn your investment, they already have this information and just need to share it with you.

6 The Upshot

When I started to write this paper, I thought it was going to be about the quantitative methods. I've written code which I believe could be a minor, but useful addition to the field. It quickly dawned on me that this would create the wrong impression, as though implementing these quantitative tricks would lead to a successful investment program.

The most important determinant of investment success are strategy selection and investment manager hiring decisions. My view is that private markets investing is business investing. Business strategy analysis boils down to deciding which markets do you want to address and what approach will you implement in an effort to add value. Growth and value strategies can both be productive. It may be easier to generate excess profits in growing markets because they are more forgiving – market growth can be bail you out even with operational missteps. Value strategies when well implemented have the advantage of high margins and operating cash flow in run off situations but are less forgiving in implementation. My experience suggests strategies with differentiated products and potential for pricing power are more likely to produce excess returns.

Manager hiring decisions are key to successfully implementing the strategy you have selected. You need to assess the fit of the organization to the strategy – the organization needs depth and expertise in the industries, products and managerial disciplines needed by the strategy. The organization needs to be healthy with a strong and motivated team. The PME methods discussed here provide a rigorous way to assess whether a manager has in fact added value. But that measurement is only useful in support of your assessment that an organization is well suited to implement a strategy you have chosen to pursue. If you flip the order and conclude something like "the PME was good, the strategy and the firm must be good", you are (in my opinion) making a mistake.

Negotiation of terms matters. I think the best way to think about cost is as a percent of excess return and we have presented methods for analyzing and understanding cost. Minimization of cost is not the goal. Indeed, if you are successful in selecting strategies and management teams your absolute cost will be higher because you will pay more in incentive fees. You need to negotiate fees keeping in mind the big picture – you want to encourage and support your partners to build and maintain high quality teams and the fees paid need to be consistent with that. The mix and timing of fees paid needs to be logical for the firm you have chosen as your partner. But when the dust settles, you want the fees to bear a reasonable relationship to excess returns earned. As the investor you are taking essentially all of the risk and need to retain a fair share of the reward.

How has this worked at for ASRS? I've consciously said very little about my employer. But I've worked at ASRS for ten years mostly as Head of Private Markets Investing and the last four years as CIO. We have built a private markets program consisting of real estate, private equity and credit that now amounts to about 40% of our fund and is targeted to be about 50% of the fund in coming years. Over that ten year period, the private markets program have exceeded their benchmarks with annual excess returns for the ten year period of 1.7% for private equity, 2.7% for real estate and 5.1% for credit. In the most recent year ended June 30, 2019, the excess returns were 7.5% for private equity, 3.7% for real estate and 2.3% for credit[3]. These excess returns have added over $2 billion of value to the ASRS trust fund and contributed to the overall performance of ASRS which has placed it consistently among the top quartile of public pension plans. [4]

I'd like to close with some thoughts about research and potential reform. In the research area, the quantitative research and introduction of techniques (notably PME) is useful. But more organizational oriented research wwould help. It seems like finance oriented papers need to be data and statistics oriented and organizational factors aren't well suited to that type of analysis. But I'm arguing organizational stuff is what matters. Are there are characteristics of

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[3]The benchmarks are ODCE for real estate, Russell 2000 for private equity and the LSTA leveraged loan index + 250bp for credit.

[4]Detailed information about ASRS investment performance is found in reports to the board investment committee and posted on the ASRS website at azasrs.gov/content/board-and-committee-meetings

firms (such as growth, sharing of carry, management of careers) that can be associated with higher likelihood of success? Are their characteristics of investors (such as industry experience, analytical methods and compensation approaches) that influence outcomes? On the industry side, the near universality of "20 over 8" as an incentive structure should be questioned. Fund sponsors rightly point out that the 8% hurdle may not be appropriate in a 2% treasury world. Incentive compensation linked to excess return relative to market indices may be an improvement and use of PME methods in measuring excess performance appropriate. Reform is needed to improve alignment on underperforming funds. The languishing of out-of-the-money funds is common and creates the appearance they are being milked for fees. Investors need remedies and structures to address this. Finally, progress in the quality and timeliness of information delivered to investors would be a great boon to them.

Thank you for reading this article! I hope you found it useful.

References

[1] Hendrik Bessembinder. Do global stocks outperform us treasury bills. *available at SSRN*, 2019.

[2] Oleg Gredil, Barry E Griffiths, and Rudiger Stucke. Benchmarking private equity: The direct alpha method. *Available at SSRN*, 2014.

[3] Steven N. Kaplan and Antoinette Schoar. Private equity performance: Returns, persistance and capital flows. *The Journal of Finance*, 60(4), August 2005.