

Private Equity Math

Introduction

Private Equity Firms (PE) are investment funds that deploy their cash to acquire companies. Limited partners (i.e. institutional investors) contribute into the funds and the general partners (i.e. the private equity firm) manage the investments. Private equity is a rapidly growing area of finance. From 2006 to 2022, Private Equity fundraising has increased from \$480 billion per year to \$1,203 billion (Averstad et al, 2023). In total roughly \$13.2 trillion in assets has been invested into private equity since 2006 based on data from Averstad et al. (2023). How PE caught my attention was their investment into insurance (my field) and healthcare. In healthcare, private equity invested \$356 million in 1990. However, investment in this space ballooned to over \$67.5 billion in 2019 (Gandhi, Song, & Upadrashta, 2020). Private Equity firms commonly acquire firms using leveraged buyouts. In a leverage buyout, the private equity takes out debt to pay the purchase price. These leveraged buyouts increase risk but can augment financial returns substantially because interest costs are often relatively low.

In this paper, I focus on how private equity firms can make substantial returns. While leveraged buyouts increase average returns, private equity has additional options at their disposal to increase returns. After acquisition, private equity firms may sell the assets of the acquired company and pocket the proceeds. In addition, private equity may implement significant cost cutting measures which potentially compromises quality. Further, PE may undergo anti-competitive mergers and acquisitions which may raise prices or compromise quality further. Further, PE firms charge fees from the acquired company using a 20%-2% structure. 2% of assets are distributed to the PE firm and PE firms take 20% of the profits (but not losses) (Matthews & Roxas, 2022). Lastly, PE owners appear to be taxed favorably thanks to carried interest and low capital gains taxation rates in the United States. While it may be great for the financials of private equity firms, these transactions are not without consequences. I will explore these consequences further in the Controversies section. The remainder of this paper will be structured as follows. I will first discuss the mathematics of a leveraged buyout. I will then focus on management levers that PE firms often pull to improve financial performance. I will briefly cover private equity taxation and delineate the carried interest loophole. The last section will cite private equity controversies.

Leveraged Buyouts

In mergers and acquisitions the acquisition price is typically calculated as sum of the discounted future cash flows at a certain discount rate¹. I have developed a detailed example of a hypothetical acquisition in which a PE firm will realize the cash flows below from the target company after the acquisition. In my example, I set the discount rate to 10%. Thus, from the table below, summing column 3, the valuation is approximately \$433. Using this price, the

¹ Future cash flows are discounted to consider time-value of money. For instance, take the example where you expect to realize \$105 in a year after completing a transaction and no cash flows thereafter. If you discount this cash flow at 5%, then you would be willing to pay \$100 today to realize an expected return of 5%.

internal rate of return (“IRR”) is 10%. The internal rate of return represents the yield from this investment. In this case the IRR is the same as the discount rate and this is not a coincidence.

Table 1: Valuation Example - No Debt			
Index	[1]	[2]	[3] = [1] * [2]
Time	Cash Flows	Discount Factor @ 10%	Discounted Cash Flows
0			
1	100.00	0.91	90.91
2	90.00	0.83	74.38
3	81.00	0.75	60.86
4	72.90	0.68	49.79
5	65.61	0.62	40.74
6	59.05	0.56	33.33
7	53.14	0.51	27.27
8	47.83	0.47	22.31
9	43.05	0.42	18.26
10	38.74	0.39	14.94

Now let’s bring in the debt to show how debt juices up returns. Let’s assume that the PE firm will borrow 50%² of purchase price and pay an annual interest cost of 5%. In addition, it is assumed the principal will be repaid in equal installments over 10 years (i.e. 10% of original principal is paid back each year for 10 years). Below table 2, summarizes the results after adding debt. The borrowing reduces the initial outlay of cash needed to fund the purchase price by half. This is slightly offset by interest and principal payments on the backend. After leverage, the IRR increases substantially to 16% which is summarized in table 3. As another caveat, interest expenses are generally tax deductible which could improve IRRs further.

² PE firms typically finance around 70% of leveraged buyout transactions with debt (Matthews & Roxas, 2022, Brown, et al, 2021).

Table 2: Valuation Example - With 50% Debt					
Index	[4] = [3]	[5] = 50% * Valuation runoff over 10 Years	[6] = [5] * 5%	[7] = Δ[5] + [6]	[8] = [7] + [4]
Time	No Debt Cash Flows	Debt Principal Balance	Debt Interest @ 5%	Debt Payments	With Debt Cash Flows
0	-432.78	216.39		216.39	-216.39
1	100.00	194.75	10.82	-32.46	67.54
2	90.00	173.11	9.74	-31.38	58.62
3	81.00	151.47	8.66	-30.29	50.71
4	72.90	129.84	7.57	-29.21	43.69
5	65.61	108.20	6.49	-28.13	37.48
6	59.05	86.56	5.41	-27.05	32.00
7	53.14	64.92	4.33	-25.97	27.18
8	47.83	43.28	3.25	-24.89	22.94
9	43.05	21.64	2.16	-23.80	19.24
10	38.74	0.00	1.08	-22.72	16.02

Table 3: Valuation Summary			
	Price	Debt	IRR
No Debt Financing	432.78	0.00	10.0%
With 50% Debt Financing	432.78	216.39	15.7%

Management Levers

In addition to using debt to increase returns, PE firms divert funds away from the acquired company and transfer them to the PE firm's investors. Two examples would be the 2% management fee and the 20% fee on profits (Matthews & Roxas, 2022). By taking away funds away from the acquired company, the acquired firm will be unable to make necessary long-term investments and will have less cash on hand to service debt. This may work great in the short-term for private equity. However, a business model cannot rely on rent seeking indefinitely without creating real value. We will later see in the Controversies section some examples where acquired companies went bankrupt.

Further, PE firms will often sell the acquired company's hard assets and distribute the proceeds to investors (Matthews & Roxas, 2022). This ultimately leads to the acquired company being forced pay rent on its previously owned facilities. This arrangement is called a sales leaseback. Another strategy to line the profits of private equity investors is dividend recapitalization where the acquired companies will issue debt and use the proceeds to pay PE investors (Matthews & Roxas, 2022). Higher debt in turn, will eat into a company's free cash flow.

In addition, private equity firms may attempt to improve returns by cutting expenses or raising revenues. PE firms typically make cuts to jobs that they deem are unneeded. For example, in PE acquired nursing home, the private equity firms will typically increase registered nurses ("RN") but cut other staffs and in aggregate staffing costs went down (Offodile II, et al, 2021). In

addition, PE may rely on price increases to improve profitability. This could be driven by the fact that consolidation leads to less competition and less competition could lead to higher prices. For example, hospital mergers have become more prevalent after 2010 which improved hospitals' negotiating power for insurance company reimbursements (Brown, et al, 2021). However, in turn this leads to higher premiums charged which is passed down to businesses and consumers. Another management lever is performance incentives. After taking control of management, PE develops manager pay incentives strongly linked to company performance (Gupta, et al, 2021) and underperformers are replaced.

Taxation

Private Equity firms are taxed as pass through entities. This means that taxable obligations are passed entirely to the firms' investors and is not taxed at the company level like corporations (Daugherty, 2022). As I have discussed above, private equity firms charge a 2% management fee and 20% of the profits. The 20% fee on profits is considered "carried interest" by the tax code and are taxed at favorable capital gain tax rates (Daugherty, 2022). This is known as the carried interest loophole. The 2% fee is typically taxed as ordinary income. In addition, private equity investors and partners generally avoid FICA taxes for Social Security and Medicare (Daugherty, 2022). Thus, in summary Private Equity avoids paying a corporate tax, switches from ordinary income marginal tax rates (as high as 37%) to capital gains tax rates (typically 15-20%) and avoids payroll taxes (15.3% on first \$160,300 of payrolls) (US Office of the Chief Actuary).

Controversies

Private equity deals result in significant debt being taken out by both the private equity firms and the acquired company. This increases leverage which will increase risk and eat into cash flow. As such, it is not uncommon for the acquired company to go bankrupt. For instance, the nursing home chain acquired by Carlyle, HCR ManorCare was not able to make its interest payments or lease payments and went to bankruptcy court in 2018 (Gupta, et al, 2021). Additionally, Hahnemann in Philadelphia went bankrupt in 2018 (Appelbaum & Batt, 2020). Hahnemann mainly served low-income populations and was acquired by the private equity firm, Paladin Healthcare (Appelbaum & Batt, 2020). It was subsequently sold to real estate developers and converted into luxury apartments after bankruptcy (Appelbaum & Batt, 2020).

In addition, after the acquisition, acquired firms may reduce quality. It has been found that private equity acquired nursing homes had worse mortality rates than non-PE acquired nursing homes. In a study by Gupta et al (2021) they found mortality rates (measured during the nursing home stay and 90 days after discharge) for private equity acquired nursing homes were 10% higher than non-private equity nursing homes. It should be noted that this study compared private equity nursing homes to for-profit nursing homes and it is possible that the study was comparing against already poor mortality rates³. In addition, Gupta et al, (2021) found that mobility decreased, billing amount per patient increased and patients were more likely to start anti-psychotic drugs (Gupta et al, 2021) against the non-private equity acquired control.

³ This is because for profit nursing home are often blamed as a driver for poor patient outcomes in nursing homes (Gupta et al, 2021).

Further PE acquisitions have led to consolidation in the healthcare sector. As I have alluded to earlier, consolidation reduces competition which can raise prices. One such example is the air ambulance sub-sector where 2 private equity firms control 64% of the industry as of 2017 (Scheffler, Alexander & Godwin, 2021). In line with this consolidation, air ambulance prices increased by 60% in 5 years (Scheffler, Alexander & Godwin, 2021). Keep in mind that air ambulances are for life-saving, emergency services and therefore are price inelastic. This means consumers are less sensitive to prices because life is essentially priceless. Further, private equity firms have been found to be more likely to invest in firms operating in low competition markets (Scheffler, Alexander & Godwin, 2021). In addition, low competition markets may also lead to compromises in quality. In the US, hospitals and nursing homes compete on quality rather than price (Gandhi, Song, & Upadrashta, 2020). If there are not many other competing firms than there is little incentive to improve quality.

One additional potential reason why quality could deteriorate is due to cost cutting measures implemented after the PE acquisitions. For instance, PE firms that acquire nursing homes often cut their non-registered-nursing staff and may cut other administrative costs (Offodile II, et al, 2021). In addition, after acquiring hospitals private equity firms may cut less profitable services to improve the company's financials (Appelbaum & Batt, 2020). While this may benefit the private equity firms' bottom line, it comes at the cost of patients. Common services that get cut include obstetrics and gynecology (Appelbaum & Batt, 2020).

Private equity firms benefitted from low interest rates after the financial crisis, favorable tax treatment and loose anti-trust scrutiny. Many private equity firms avoid anti-trust scrutiny as many deals go unreported because they do not meet the required reporting threshold of \$92 million in deal value (Wollmann, 2020). However, the value provided by private equity companies is questionable. Proponents claim that PE firms lead to economies of scale through consolidation and application of PE firms' expertise. However, PE firms also cut jobs, reduce quality and can even lead to bankruptcy of the acquired firms at the cost of consumers. It should be noted that private equity does not lead to deterioration in quality in all industries (Gandhi, Song, & Upadrashta, 2020). However, I think we should take issue with private equity firms' fees and how they use the assets of the acquired company. After acquisition, PE firms sell the acquired company's assets to pay itself. These funds could have been invested but private equity is short-term oriented. PE has capitalized on lower interest rates and used the leverage buyouts to its advantage. In turn, there has been consolidation which seems to lead to less competition at the cost of consumers. The US has a monopoly problem and private equity is a driver.

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