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The private equity J-Curve: cash flow considerations from primary and secondary points of view

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Introduction

Investors should expect a greater return from private equity than from public equity investments due to illiquidity and a long-term commitment. In contrast to public equity, private equity investments initially have negative returns and accumulated negative net cash flows for a relatively long time period, which investors have to bear in mind when setting up a new programme or approving new investments. Due to the characteristics of the return and cash flow profile, this pattern is called the J-Curve, which illustrates the tendency of private equity funds to deliver negative returns and cash flows in the early years and investment gains and positive cash flows later in the investment fund's life as the portfolio companies mature and are gradually exited.[1] Portfolios of funds have a similar J-Curve pattern, but usually the J-Curve effect is more pronounced in the sense that it takes longer to report a positive internal rate of return (IRR) as capital calls of funds are drawn over a longer period of time.[2]

The shape of the J-Curve

The depth and length of a J-Curve depends on several factors. First, the J-Curve is influenced by the level of fees early on in the fund's life. Since management fees are based on the entire committed capital while this capital is only gradually invested over the first few years and distributions are usually miniscule, management fees and organisational expenses have a significant effect on the shape of the J-Curve. Second, a fund usually consists of different types of transactions: some very successful transactions, those that meet expectations and those that underperform. The latter can usually be identified fairly quickly and are hence written down or off early on in the fund's life. For the companies meeting or exceeding expectations, it takes a longer time to implement the changes creating value and finally realise the positive outcome. Third, the J-Curve effect is also more pronounced where private equity managers are more conservative, thus writing down assets early on or carrying the value of their investments close to cost until they are forced to write up the value of their assets close to or at the time of the realisation. While these differences in valuation between managers are gradually disappearing with the acceptance of mark-to-

market valuations, there is still some leeway for the private equity manager. Fourth, the most important factor for the shape of the J-Curve is the timing of the investments and divestments. The more quickly fund managers invest capital, the steeper the J-Curve. The longer it takes to generate distributions, the longer (and usually deeper) the trough of the J-Curve.

However, there are instruments that mitigate the relatively late distributions in an investment programme. First of all, investors can try to manage fees effectively. However, this might be challenging as terms in today's private equity landscape are (at least to some extent) standardised and have similar patterns. Second, they can acquire lower-returning investments such as mezzanine that promise current income. Third, they can effectively structure their investment programme to incorporate early returns by shifting some of the later gains to the earlier returns. Finally, secondaries are a powerful tool to reduce the J-Curve effect, especially if they are acquired at a discount to net asset value.

All of these measures can be modelled in a cash flow model to try to predict the cash flow pattern (and the length and depth of the J-Curve) of a private equity investment programme. This chapter will first briefly describe different models to forecast private equity cash flows and then display the characteristics of the J-Curve, and its mitigation, by comparing primary and secondary investments in one of these models.[3]

Different models for forecasting private equity cash flows

Modelling private equity cash flows and net asset values (NAV) is challenging, mainly for two reasons: the scarcity of publicly available data and the illiquidity of the asset class. These two limiting factors, however, are precisely the main reasons why private equity as an asset class outperforms public asset classes.[4]

The following points examine what a J-Curve model should describe, and what factors influence the model.

1. *Timing of cash flows* – how long is the investment period, when do distributions start and what does net cash flow look like?
2. *Timing of performance* – how and to what extent do managers write up or write down NAVs?
3. *Market performance* – how is the overall private equity market developing and what influence does this have on a portfolio of private equity funds?

Various models are used for predicting private equity cash flows and NAV development. This chapter briefly discusses the different modeling techniques and then goes into more detail about one specific method, the so-called conditional historical simulation.

Overview of modeling techniques

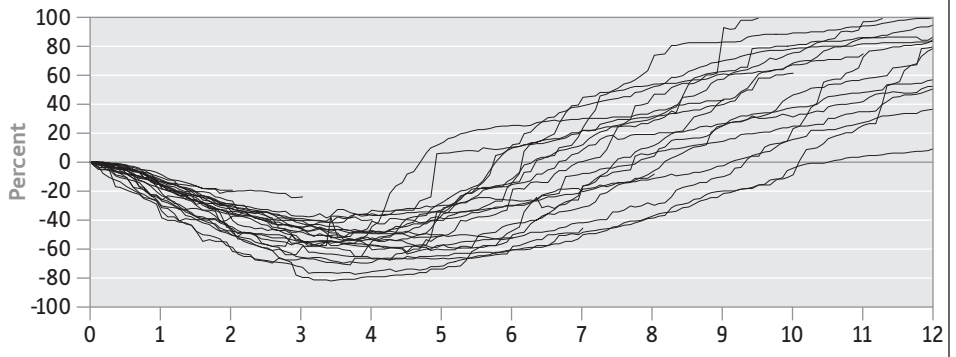
Public benchmarks (any public index) and private benchmarks (e.g. provided by Thomson Venture Economics or Cambridge Associates) describe overall market performance. They can be used to predict overall market performance in the future. However, neither public benchmarks nor private benchmarks provide information about the timing of cash flows and about performance.

Shape functions can predict cash flows and the timing of a fund's performance. Take downs, distributions, and NAV are described by smooth functions (e.g. Weibull distributions) that are usually derived as averages from historical data.

Shape functions provide a model that is simple to understand because it shows the future cash flows as single smooth lines. However, it has several limitations: a) because of the short historical sample of private equity data of about 25 years, predictions for the future are solely based on historic averages and b) the simple use of Shape functions will not provide variations around the average patterns, nor will it account for private equity market performance.

Based on historical cash flow and NAV data of individual funds, historical simulations can be performed. A Monte Carlo simulation based on historic data predicts cash flows of a given portfolio. For every run in the simulation, the historic fund data is combined in a random way respecting certain boundary conditions, such as fund geography and fund type. For example, for a portfolio consisting of five US buyout funds and two European venture funds the stochastic model would randomly select five US buyout funds and two European venture funds from the underlying fund database, and then add the corresponding cash flows and NAV data points. As a result, every run of the simulation produces a cash flow curve and a forecast for the

Figure 2.1: **Cumulative net cash flows (distributions minus take downs) per vintage year as a percentage of commitments – all US private equity**



Source: VentureExpert.

NAV. The results of the simulation runs can then be statistically evaluated. The advantage of such an approach is the detailed prediction of cash flows and of the timing of the performance. Apart from average cases, a stochastic model also predicts possible variations in the cash flows and the NAVs and their likelihood. Figure 2.1 shows the historic variability of J-Curves over different vintage years as an example. However, the model implies that the historical data accurately describes future private equity market performance. This is a rather bold statement in light of the fact that private equity data is only available for the last 20–30 years.

Various aspects of the models described above can be combined in order to obtain a model, the conditional historical simulation, which unites most of the advantages of the individual models.

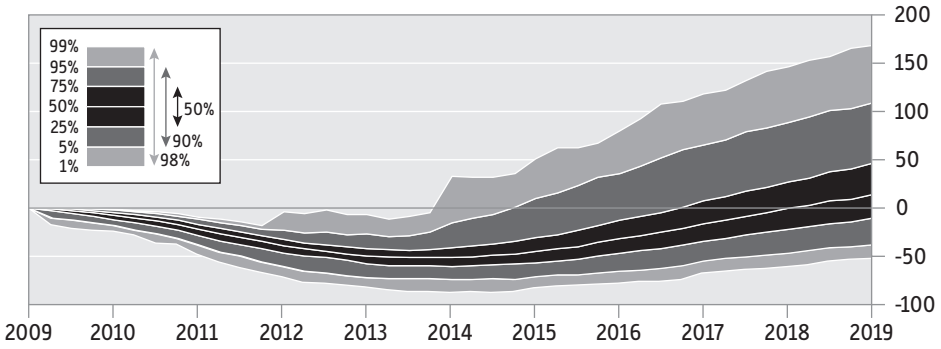
The basis of the conditional historical simulation is the historical simulation described above, which is expanded with a stochastic simulation of a public market index (e.g. use a GARCH process for the S&P 500 index). For every run in the simulation, the stochastic path of the index is used to scale the distributions of the private equity portfolio,[5] and to adjust the NAVs of the underlying funds. This additional factor eliminates the bias inherent in the underlying historic data. The stochastic index needs additional input parameters that can be adapted to the current market situation and the economic outlook.

Empirical results for J-Curve simulation for primary funds

Capital Dynamics has developed a sophisticated cash flow and net asset value forecast simulator that can provide detailed results for our analysis. The cash flow simulator is based on the above mentioned conditional historical simulation; each run in the Monte Carlo simulation reflects a random private equity portfolio and a random economic market cycle. Rather than just showing the median case (white line in black area of Figure 2.2), the model provides different percentiles of the empirical distribution, like the 25th and 75th percentile (white line between black and dark grey area), the fifth and 95th percentile (white line between dark grey and light grey area) and the first and 99th percentile case (white boundary to shaded area).[6]

The first empirical result of the simulation (Portfolio A), consisting of primary funds only, needs about 5.5 years to reach the highest NAV which is approximately 80 percent of the committed capital in the median case. For the calculation a commitment of $100 million is assumed to a diversified portfolio of private equity funds invested over two vintage years. In order to fund the portfolio the investor requires capital of $55 million in the median case (i.e. 55 percent of the committed capital). This is shown in Figure 2.2. The chart shows the median line which is the white line in the black area. In addition, the investor could also derive the long-term net cash requirement for more positive cases and more negative cases. As can be seen from the chart, only about 50 percent of the committed capital is required if the private

Figure 2.2: **Development of cash flow J-Curve of a primary fund (investments into private equity funds split over 3 years)**



Source: Capital Dynamics results of conditional historical simulation based on Venture Economics data and characteristics of portfolio A.

equity market environment and the private equity portfolio behave similarly to the top quartile case. This number increases to about 60 percent for the down case (25th percentile case).

In addition, the chart can be used to estimate when the J-Curve will reach its deepest point, that is, when the distributions are larger than the capital calls in one period (quarter). This is the case for the median scenario in the year 2014. When the white line crosses the x-axis the paid-in capital is fully returned to the investor. For the median case an investor could expect a positive net cash flow in year 2018, for the top quartile case it is expected to be mid-2016 and for the down case it is expected for 2020.

These charts are a powerful tool for investors to derive their net cash requirement as well as the timing of the cash flows for various scenarios, which is particularly useful in difficult market conditions. In addition, a conditional historical simulation can not only be used to predict cash flows for primary funds but also for secondary funds. This next section focuses on the analysis of the J-Curve by comparing primary and secondary investments and how their cash flow profiles affect the shape of the J-Curve.

Optimise liquidity management through secondary investments

Investors in primary private equity funds usually commit to provide a certain amount of capital as and when requested by the fund's manager. The manager then calls this capital and makes private equity investments on behalf of the fund over a period of three to five years. The net asset value of the fund increases gradually and in line with the first investments before valuation adjustments are made by the manager. The investments are usually realised after a four-to-seven-year holding period and proceeds are distributed to the fund's investors.

In contrast to primary commitments, a secondary investor acquires an existing interest in a private equity investment from the original investor who is looking for an exit prior to the fund's termination. These secondary interests may either be partially drawn down or completely funded. The secondary investor acquires the interest at a negotiated price and usually assumes any outstanding commitments of the seller. Due to these characteristics, secondary investors acquire existing private equity investments with immediate net asset values. In addition, distributions can be expected earlier than with primary investments and consequently secondaries enhance cash flows for the investors and lower the cash flow requirements for the investors as will be shown later.

Investing in secondary transactions can add value to both established investors with existing portfolios and new investors not only from a performance perspective, but also with regards to the above mentioned cash flow profile. Often established portfolios are concentrated in terms of vintage years, geographies or fund types. Sufficient portfolio diversification is a key element to reduce risk and can even increase the expected median return of the portfolio due to the right skewed distributions of private equity returns and multiples.[7] Secondaries are able to lower the concentration on various levels and increase diversification. New investors who would like to enter the asset class initially face the problem of very low diversification. A portfolio of well selected secondaries over various vintage years, geographies or investment styles addresses this problem and helps investors to reduce their risk through a higher degree of diversification. The increased availabilities and quality of funds in the secondary market allow for active management of a new or established private equity portfolio.

Shorter J-Curve with secondary investments

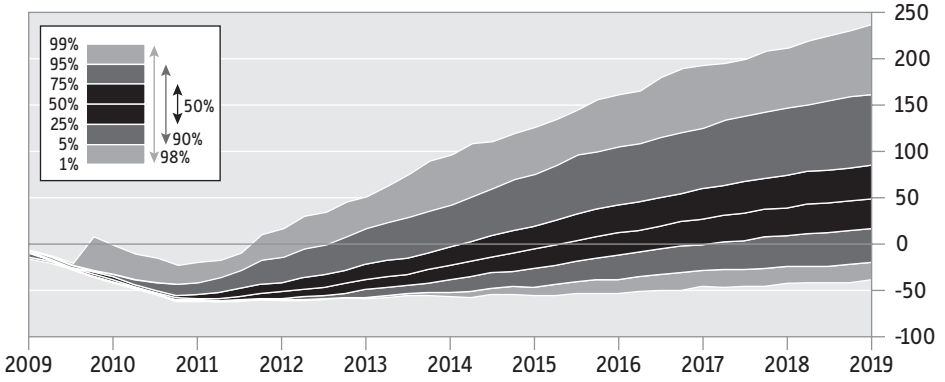
The following section analyses the effect of secondaries on the net asset value and the net cash flow of the total portfolio of an investor in more detail. In addition to the primary Portfolio A described above, two additional cases are examined, notably Portfolio B and Portfolio C.

- Portfolio B is a secondary portfolio which is 50 percent invested – 50 percent NAV and 50 percent open commitments. The average age of the funds in the secondary portfolio is three years.
- Portfolio C is a secondary portfolio which is 70 percent invested – 70 percent NAV and 30 percent open commitments. The average age of the funds in the secondary portfolio is 4.5 years.

For the modeling of the secondary fund, it is assumed that individual secondaries are acquired over two years at a price of 100 percent net asset value, which is a conservative approach. A reduction of the purchase price would enhance the net cash flow position of the investor and would shorten the time to break-even.

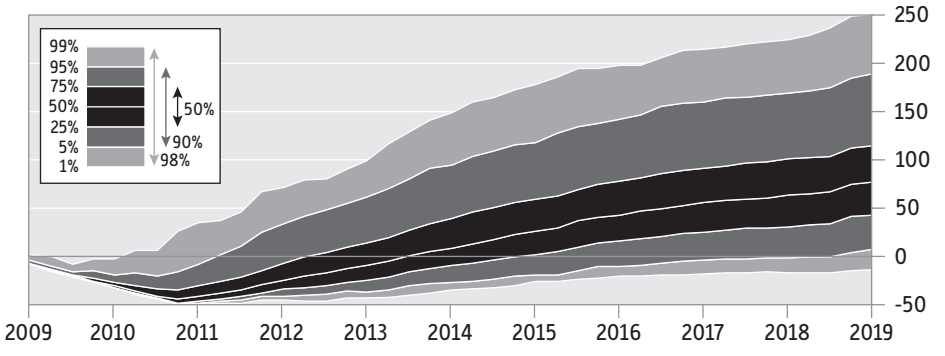
Portfolio B is based on a commitment into a globally diversified secondary fund which includes various private equity funds with different strategies and geographies with an average age of three years. At the time of purchase the net asset value of the funds is equal to the amount of open commitments (50 percent each). As expected, the portfolio shows that reaching the target net asset value is accelerated. A NAV of 80 percent of committed capital is already reached after 3.5 years. The net cash flow curve shows that investors need the same amount of cash ($55 million) to fund their total portfolio but capital will be drawn quicker which results in a shorter J-Curve. In addition, the break-even of the cash flow curve can be reached earlier. While it takes about eight years for the primary portfolio, the cumulative cash flow J-Curve is positive after 5.75 years in the median case as shown in Figure 2.3.

Figure 2.3: **Development of cash flow J-Curve of a secondary fund**



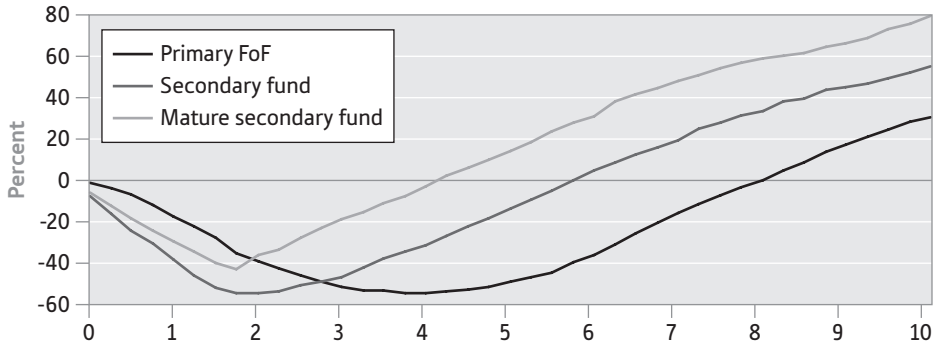
Source: Capital Dynamics results of conditional historical simulation based on Venture Economics data and characteristics of portfolio B.

Figure 2.4: **Development of cash flow J-Curve of a secondary fund with mature private equity funds**



Source: Capital Dynamics results of conditional historical simulation based on Venture Economics data and characteristics of portfolio C.

Figure 2.5: **Comparison of median cumulative net cash flow curves of primary fund of funds, secondary and mature secondary fund**



Source: Capital Dynamics results of conditional historical simulation based on Venture Economics data and characteristics of portfolios A, B and C; median curves of simulations only.

Portfolio C assumes that an investor acquires a secondary portfolio that is more mature than Portfolio B. This is reflected in a higher NAV to open commitments ratio which is 70 percent to 30 percent. In this portfolio the target net asset value is reached even faster, while the funding is expected to be lower than in Portfolio A and Portfolio B. As pointed out in Figure 2.4, the investor only needs about $44 million of capital in the median case despite the higher net asset value and price of the secondary portfolio. Moreover, the total portfolio would be net cash flow positive after four years. This shows that the maturity of the secondary has a large influence on the break-even point and deepness of the J-Curve.

Based on the above, the authors conclude that the maturity of secondaries affects the cash flows and net asset value of the investors' total portfolio. Distributions of secondaries can be expected earlier, and therefore they can fund capital calls of primary funds which lower the net cash flow requirements for the investor as depicted in Figure 2.5.

Conclusion

This chapter has presented the J-Curve in private equity investments and described the factors influencing the shape of the J-Curve. After introducing several models for predicting J-Curves, a sophisticated model (conditional historical simulation) was applied to different private equity portfolios. The model is able to predict private equity cash flows and NAVs, and it also provides probabilities associated with the variations of the median scenarios.

In addition, the chapter described the use of secondary funds in active portfolio management and also applied the model to secondary funds. This analysis shows that secondaries have positive effects on private equity portfolios by mitigating the

cash flow J-Curve. Furthermore, careful modelling allows appropriate integration of secondaries into existing portfolios. However, while cash flow predictions and portfolio allocation questions can be addressed quantitatively the qualitative aspects of the underlying assets are very important as well and have to be addressed by sophisticated investors with the required market expertise to ensure that capital is invested in quality portfolios.

In summary, the use of a sophisticated cash flow and NAV model is an important tool for the risk management of private equity investments, especially in times of market turbulence in which these models can be used to assess different levels of cash requirement and the shapes of J-Curves. □

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[1] For a broad description of the private equity model Gompers and Lerner (2004) and for the cash-flow and return characteristics Ljungqvist and Richardson (2003).

[2] In the following the authors focus their analysis on private equity portfolios for the sake of consistency with the analyses that will follow later (secondary and primary fund of funds).

[3] Diller and Wulff (2008) for a discussion of this comparison and section four of this chapter.

[4] Kaplan and Schoar (2005) for results for the US market and Kaserer and Diller (2004) for a performance analysis on European funds.

[5] Rouvinez (2003) for the description of the PME+ approach that is used for the scaling of the private equity cash flows.

[6] Weidig and Mathonet (2004) show that the degree of diversification has an influence on the span of the distribution.

[7] Diller and Herger (2008) show in an article in *Private Equity International* that diversification over number of vintage years is more efficient than over number of funds. A portfolio that is diversified over three vintage years has only half of the risk of a portfolio that has been built in one single year; keeping the number of funds per vintage year constant at five.

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