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Investigating the risks associated with investing in private equity funds

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Abstract

Private equity and its types are one of the new and developed methods of the current era. Various financial and economic systems have been able to improve economic indicators by using these financial institutions. Increasing economic growth, increasing employment, using the production capacities of companies and increasing exports are examples of the most important macroeconomic achievements of using private investment financing institutions. Private equity institutions, which include venture capital investment, growth capital investment, leveraged buyout investment, and investment in distressed companies, can help countries' economies get out of recession. Private equity funds are a popular investment vehicle that offers high return potential but also comes with high risk. The purpose of this review is to identify and analyze the risks associated with investing in private equity funds with a special focus on their management methods.

Keywords: Venture capital, leveraged buyout, risk management, financing

1- Introduction

Financing of start-up businesses and enterprises that have passed the initial stages and reached maturity, but need financing for their development and growth, is one of the most important and challenging financial fields. Without financial resources, manufacturing companies and economic enterprises will not be able to continue their activities. Also, many productive and profitable enterprises are involved in challenging ways of financing in different ways, and due to the lack of optimal allocation of resources, huge capitals enter unjustified projects and waste. Private equity with its types provides financing for a wide range of enterprises.

Private equity and modern venture capital since the 1940s was established and gradually their role in the development of companies and financial markets became more prominent. Since then, private equity has been able to help economic growth and development, increase entrepreneurship and employment, increase production, and improve the gross domestic product of countries by financing companies that are in different stages of their life cycle. The successful experience of private equity in different countries and the lack of investors and the growth of this important financial industry has caused more attention to be paid to this important financial institution.

Private equity has become more popular among investors who want to diversify their portfolio beyond stocks and bonds; Large institutional investors, such as insurance companies, endowment, and pension funds, invest mostly in the

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private equity industry. Most of these investments are made through private equity funds because direct investment requires a lot of expertise and experience [1]. Private equity investment funds can offer attractive realized returns to attract funds from various institutional and public investors; However, it is very important to be aware and pay attention to the types of risks when investing in private equity funds, because private equity can carry a wide range of risks that are different from other types of investments, including the public stock market. Understanding these risks is important for making informed investment decisions and effectively managing portfolio risk. The purpose of this study is to identify and examine the types of risks in the private equity industry.

Studies in the 1980s Like Florida & Kenney (1988) on the advantage of private investment in all kinds of innovations including finance, technology, management, etc. have been concentrated in America [2]. These studies show that venture capitalists are investors who actively create innovative companies in four sectors. such as financial institutions, technology markets, local and global, professional and commercial service markets, and professional labor markets. In their literature review of the article is state that, research in the 1990s is divided into two categories [3]. The first category of research is the analysis of how to perform operations and management strategies for the Asymmetric information or Lemon problem and other information related to the issue of financing technology-oriented companies. The second category is studies that have analyzed the effect of venture capital on the success rate of portfolio companies. The result of this type of research was that companies with the support of venture capital have performed better than other companies without the support of venture capital in the world.

2- Research Methodology

This study was conducted to investigate the risks associated with investing in private equity funds. The main objective was to identify, classify, and provide solutions to cover various risks that investors face in these types of funds. Criteria for Selecting Articles are explained below. The selection of articles was limited to those research studies that directly addressed the risks of investing in private equity funds. The publication year of the articles they were ranged from 1990 to 2022. Therefore, articles that focused on other topics related to private equity funds or were outside the specified time frame were excluded.2022; Therefore, those articles that dealt with other topics in the field of private equity funds or were out of the time domain were rejected.

Also, the Search Method is explained for the reader. To find relevant articles, reputable scientific databases were utilized, including Google Scholar, Scopus, and JSTOR. The search strategy involved a combination of keywords and search phrases. Phrases such as "private equity funds," "risk management in PE funds," and "venture capital and PE funds," along with keywords like "risk," "risk management," and "risk factors" were used. The searches were conducted in English and covered the period from 1990 to 2022. Limitations are defined in the next sentences. Due to limitations in the search and article selection process, it is possible that not all risks associated with investing in private equity funds were covered. This is because only those articles that explicitly mentioned the risks of investing in private equity funds in their titles or abstracts were selected.

3- Results and Findings

3-1 Introduction to the Results

Before presenting any specific results, it is necessary to provide a brief overview of the types of private equity funds and their areas of activity. Private equity funds are categorized based on the life cycle of the companies they invest in. Venture capital funds invest in the early stages of formation and initial growth of businesses. Growth funds invest in the growth and expansion phase of companies, while buyout funds invest in mature businesses. Lastly, distressed funds invest in struggling companies in the decline or turnaround phase of their life cycle.

To better understand the risks of investing in private equity funds, it is necessary to illustrate the importance and position of private equity investment in different regions of the world in recent years. As depicted in the figure, the trend of investment in the private equity industry has been on a growth trajectory in recent years, driven by its favorable

performance and investor interest. The investment volume in this industry has been particularly higher in North America, especially in the United States, and Europe compared to other regions of the world. Investment in Asia has gained more attention, especially after the global financial crisis of 2008. Furthermore, in 2022, investment in this industry has decreased compared to 2021 in all regions except North America.

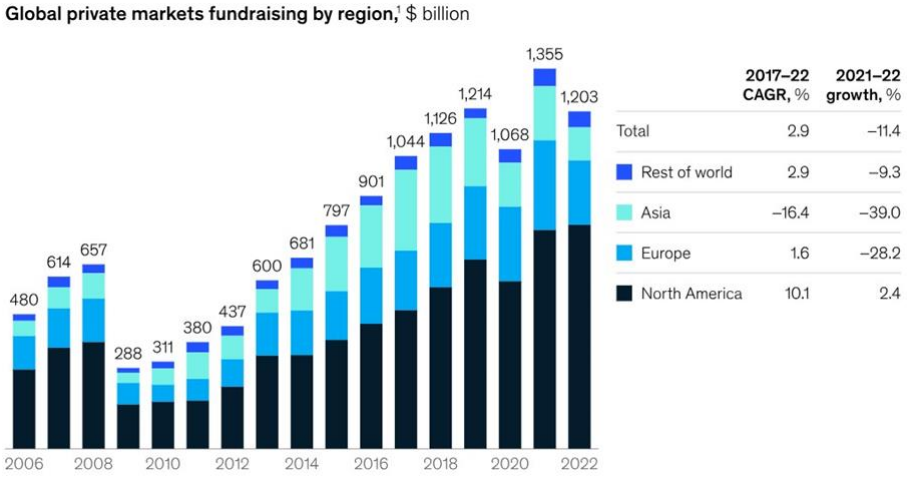

Fig 1. Global Private markets Fundraising by region

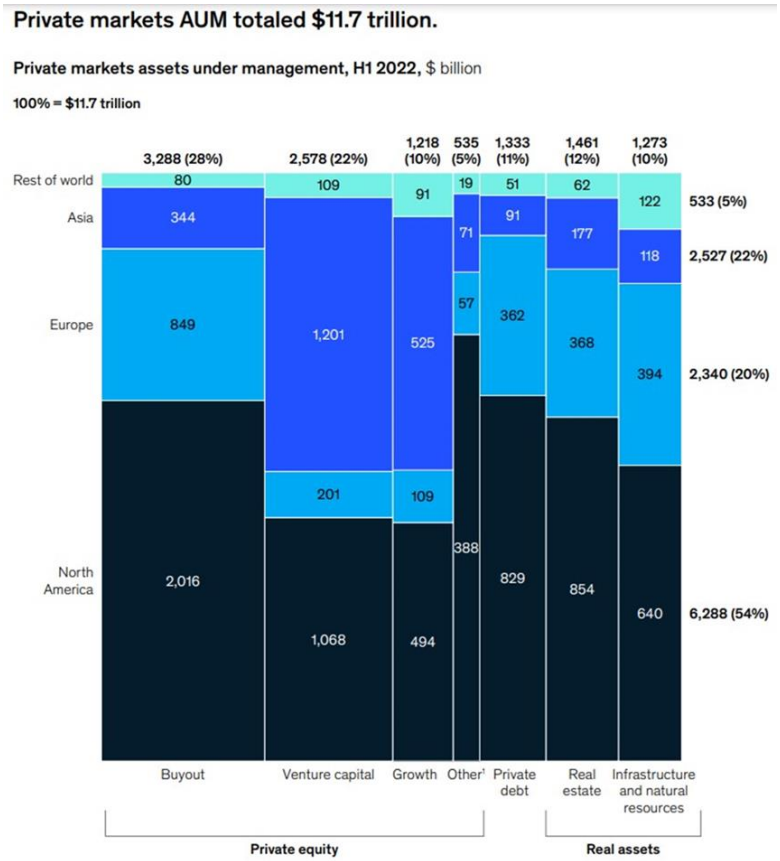

Fig 2. Private markets AUM

Figure 2 also shows the assets under management in different types of private investment funds in different regions of the world in the first half of 2022. As it can be inferred from Figure 2, the amount of investors favoring the two groups of property investment and venture investment globally was more than other types of investment in the first half of 2022.

3-2 Thematic analysis of the results

In the previous sections, we learned about private equity and different types of private equity funds. We also mentioned the growing trend of investment in this industry and the lack of investors. It can be said for sure that the risks and dangers in the private equity industry are not less, if not more than other types of investments, especially the public stock market. Therefore, it is important and necessary to know these risks and ways to deal with them before investing. The reviewed articles have classified the risks in these funds into four categories of risks related to fund operations, macro risks, liquidity risks, and special risks. Another group of articles has also presented methods to evaluate the risk-adjusted performance of different funds, which are also worth mentioning. In the following, we will discuss each of these cases in detail.

3-2-1 Risks related to fund operations

The operational risks of a fund include all the actions and decisions of a fund from the Fundraising phase to the withdrawal phase. These risks are unique in different funds. Therefore, both investors and private investment funds need to know and understand these types of risks and ways to deal with them.

3-2-1-1 Screening risks

Investigating the risks before investing in a private equity company by a private investment fund includes evaluating the potential risks associated with different investment opportunities and evaluating whether the potential return justifies the acceptance of such risks or not.

We will learn about these risks later.

principal-agent problem: This problem occurs when the manager hires representatives and assigns control and decision-making rights to him, but the principle of ownership of the assets and the responsibility for any loss lies with the manager. In the private equity industry, this can happen in such a way that, on the one hand, investors appear as managers and accept the private equity fund as a representative and entrust it with the responsibility of investing in private companies. On the other hand, the private equity fund, as a manager, entrusts the responsibility of its money to the investable company as a representative. The main problem in this type of risk is the conflict in priorities. Investors are looking for a low-risk investment with high returns in a shorter period. Managers of the privately held company are looking for easy and long-term financing. Creating alignment of interests between investors, funds, and investable companies

It is important to pay attention to before investing.

Risk of information asymmetry: It is a risk in which one party to the transaction has more information than the other party. In the private equity industry, the management of the privately held company usually has more information about the company's operations, financial position, and prospects than the private equity funds. Information asymmetry is the most important risk in the screening stage because it can be a valuation risk

Incorrect, it can lead to the loss of other profitable opportunities and challenges in the exit phase.

moral hazard risk: It is one of the common problems in the field of private investment and it indicates that when a party is immune to risk, it acts completely differently than when it is exposed to risk. Investors do not know how the entrepreneur or general partner uses the resources they have provided. For example, the general partner because of the loss from the investment

If he is not a partner, he may invest in high-risk companies to get higher returns and get more carried interest.

3-2-1-1 Risks related to the portfolio company

Private equity funds invest in a variety of companies and each company may face unique risks. Some of the key risks associated with companies that private equity funds have invested in include:

- Weak management performance
- Lack of product development

- Lack of alignment of management with the interests of venture capitalists
- The risk of technological progress

3-2-1-2 Investment portfolio risk

Portfolio risk is a critical consideration in private equity investments. Private equity funds usually invest in groups of companies to diversify their risk and potentially increase their returns. However, this diversification does not eliminate the risk potential of the portfolio.

Here are some key portfolio risks in private equity:

1) Concentration risk: In the public stock market, to reduce unsystematic risks, using a diversified portfolio can reduce this risk to a significant extent. But portfolio diversification in the private equity industry may not be easily possible, because diversification itself requires expertise in many fields, and acquiring this expertise requires a lot of time and money. Therefore, the risk of concentration in private equity funds means that the fund may have invested a significant part of its assets in a small number of companies from one or two different industries. This concentration can increase portfolio risk in case of poor performance of one or more companies.

2) Industry risk: Private equity firms may have portfolios that are concentrated in a particular industry Changes in the industry or stagnation in the industry can affect the performance of the portfolio and potentially reduce the return.

3) Geographic risk: Private equity firms may have portfolios that are concentrated in a specific geographic area. Economic or political changes in that region can affect portfolio performance and potentially harm returns.

In the following, we will review some published articles in this field and the solutions that are considered to deal with these risks.

Some authors for the first time presented three main mechanisms of screening risk control and management for venture investments [4], which are:

a) Use of financial contracts: These contracts, which are divided into two categories behavior-based contracts and result-based contracts, are a suitable method for screening risk management. Behavior-based contracts are used when the manager (investor or fund) can monitor and verify the behavior of his agent. On the other hand, outcome-based contracts are used when the agent's actions are not directly observable and monitored.

b) Use of investment syndicate: Investment syndicates are groups of investors who pool their capital for joint investment in a transaction. Regarding the private equity industry, the concept of syndicate refers to the partnership of two or more private investment funds. This partnership leads to increasing diversity in the portfolio, increasing expertise in different fields, increasing information, and, as a result, reducing the risk of information asymmetry.

C) Staging Financing: It is one of the effective ways to deal with screening risk. The main concept of this technique is the payment of financial resources by the private equity fund in a staggered manner and through different stages to the privately held company. Each part of the financial resources is paid to the privately held company only if the company has achieved specific and predetermined strengths. This will reduce investment risk and also be a tool to create incentives for privately held companies.

In some papers, it is suggested that venture capital funds should manage risk in the framework of the relationship between the principal and the agent in such a way that the interests of the manager and the representative are aligned [5]. They also emphasize the importance of communication and transparency in the relationship that regular communication, including A transparent financial and operational performance report, can help build trust and strengthen a positive working relationship between the investor and the investee. The author pointed out the principal-agent problems in the relationship between venture capitalists and entrepreneurs [6]. In the field of venture financing, this problem arises because venture capitalists and entrepreneurs have different goals and motivations.

Venture capitalists are primarily focused on maximizing the return on their investment while entrepreneurs are focused on building a successful and profitable business. According to him, stage financing can limit the costs caused by the unfavorable choice of investment and the resulting loss for venture investors. On the other hand, this slows down

investment development and makes the entrepreneur focus on paying money instead of lofty goals, which is one of its negative consequences. Heidi (2002) discusses the importance of portfolio diversification as a means of controlling risk and reducing unsystematic risk. Diversification includes maintaining investments at different stages of the life cycle and investing in different industries. Ljungqvist and Richardson (2003) do not consider the systematic and unsystematic risk of portfolio companies as the only factor affecting the return of private investment funds [7].

Factors such as the skill of managers of private equity funds, the quality of detailed and thorough investigation, and the ability to identify companies with high return potential can play a role in determining the success or failure of the fund. According to them, private equity funds are not well diversified, and on average close to 40 percent of their capital is invested in a single industry. Koryak and Smolarski (2008) in their research entitled "Perception of risk by venture capital and private equity firms: A European perspective."Investigate the operational risks of venture capital funds, especially in the screening stage [8]. The result of their research indicates that there is an implicit relationship between pre-contract screening (business measurement) and post-contract governance (control mechanism).

According to them, both behavior-based and outcome-based contract control mechanisms should be used; Because these mechanisms are designed to reduce different risks that venture capitalists face. Xu-bo Zhang & Chengbo Zhang (2009) introduced a comprehensive model that deals with the complex dynamics of the principal-agent problem, in which the challenges of an effective supervisory strategy are considered by considering the degree of risk aversion of the portfolio company on returns [9].

the differences in risk management approaches in risk-seeking private equity funds in different regions are examined by the authors. They identify two main approaches to portfolio risk management, including specialization (focusing on one or a few specific risk-seeking investments through an active approach) suitable for risk-seeking private equity funds and diversification (expanding investments in different industries) suitable for buyout funds. The author focuses on risk management strategies in high-risk investments in Germany [10]. Some other authors focused on some new aspect of financial problems and using technologies [11]. They emphasize the pivotal role of the expertise and experience of investment managers in reducing failure risks for venture capital companies, using empirical analysis and structural equation modeling.

Lerner (2022) examined the advantages and challenges of syndication in venture capital investments [12]. Among its advantages, he pointed out the increase in portfolio diversification, access to more expertise, participation in larger transactions, and reduction in transaction costs. However, the challenges of coordination, the conflict of interests of the two funds, and the reduction of control in the investable company were also significant points in his opinion.

3-2-2 Liquidity risk

Liquidity risk is very important in private equity funds. Units of private equity funds are usually illiquid, meaning that investors cannot easily buy or sell their shares. Private equity funds are usually long-term and due to the secondary market The less developed these funds are, the liquidity of the units of these funds is low. Also, as mentioned in the previous sections, private equity funds do not receive all capital at once from limited partners and attract the necessary capital through various capital calls. This case also challenges the investors' liquidity because they are committed to providing the fund's capital and must keep this liquidity ready over time and may lose the opportunity to invest in parallel markets. In the following, we will examine some articles related to the issue of liquidity problems in private equity funds.

It is investigated the relationship between liquidity risk and the performance of private equity funds in their research [13]. According to the results of their work, liquidity risk can affect the performance of private equity funds in different ways, the most important factor of which is the increase in investors' expectations of returns to compensate for low liquidity. They also suggested that private equity funds take the following steps to manage liquidity risk and improve performance: adopting a targeted investment strategy, diversification, proper exit planning, and effective communication with investors.

The author divides the liquidity risk in the private equity industry into two categories: market risk and financing risk [14]. Market liquidity risk refers to the ease of buying and selling an asset without affecting its price. Financing risk, also

known as cash flow risk, refers to the ability of a trader or investor to fulfill financial commitments and pay additional capital if needed. Nadauld et al. (2019) investigated and collected evidence from the secondary market of private equity [15].

According to the results of their study, investors who sell their private equity fund units in the secondary market have to give an average of 14 The discount percentage is from the fair value of their assets. On the other hand, buyers of fund units in the secondary market obtained an average return of 5% higher than other investors. They also consider the liquidity risk under the life of the fund, the size of the fund, the activity history of the fund, and the type of invested industry. The author provides insight into the factors that affect the discounts of selling shares in the secondary market and the importance of considering liquidity risk [16]. These factors include total risk, marketability, and cash flows of portfolio companies. They also point out that liquidity risk may be different depending on the type of investor and investment characteristics. For example, institutional investors may be less sensitive to liquidity and market capabilities than other people.

Maurin et al. (2022) investigated the concept of liquidity in private investment funds and proposed a theory for how liquidity affects the value of investments in private investment funds. They believed that investors demand a liquidity risk premium to compensate for the illiquidity of private equity funds. Also, the amount of this premium varies over time depending on market conditions and investor sentiments. For example, in periods of economic uncertainty, investors demand higher insurance premiums to compensate for the liquidity risk.

While studies like Harris et al (2014) have documented strong performance for buyout and venture capital funds, the inherent illiquidity of private equity investments presents a significant challenge for investors [17]. Their research, based on a large dataset of 1,400 U.S. PE funds, highlights the importance of using reliable data sources and underscores the potential for data bias in performance assessments. Furthermore, while they found outperformance compared to public markets, the difficulty of accessing and exiting PE investments, coupled with the complexity of evaluating fund performance, creates substantial liquidity risk. This risk is amplified by the fact that PE investments typically have longer lock-up periods and limited secondary market trading opportunities.

3-2-3 - macro risks

Macro risk refers to risks that are beyond the control of private equity funds and Macroeconomic factors such as changes in interest rates, inflation, exchange rates, geopolitical Events, and global economic conditions are related. These risks can significantly affect the performance of private equity funds. Below are some of the key macro risks for private equity funds:

1) Economic recession: A recession leads to a decrease in demand for goods and services, which can affect the performance of companies in which private equity funds have invested. This will devalue the portfolio and potentially hurt returns.

2) Foreign exchange rate risk: If private equity funds invest in companies in different countries, they will have severe problems with exchange rate fluctuations.

3) Interest rate risk: Changes in interest rates can affect the performance of companies in which private equity funds have invested. Higher interest rates can lead to an increase in borrowing costs, which is considered a big problem for leveraged buyout funds.

In a survey of 630 Different private equity funds in continental Europe, respondents rated 28 They received a percentage [18]. In their questionnaire, funds were asked how to manage different risks, and they received different answers. 33 percent of these funds cover their macro risks with insurance, 12 percent with future contracts, 28 percent with forward contracts 9 Percent with standardized derivatives, and 18 percent were hedged with custom derivatives. The authors in their research entitled COVID-19 and Private Equity [18]. Examine the impact of the pandemic on the private equity industry and how private equity firms are responding to the challenges presented by the pandemic. They also state that the impact of financial crises such as the 2008 financial crisis and the coronavirus epidemic in 2020 Private equity has been more intense on the industry than the public stock market. Therefore, private equity funds must take the possibility of financial crises seriously.

Robinson and Sensoy (2013) highlight the cyclical nature of private equity returns, finding that funds raised during periods of market exuberance ("hot markets") often underperform in absolute terms [19]. However, this underperformance is less pronounced when compared to the S&P 500. Their research also underscores the pro-cyclicality of PE cash flows, with venture capital funds exhibiting a stronger correlation with market cycles than buyout funds. This suggests that investors should be cautious about timing their PE investments and consider the potential impact of market conditions on fund performance

3-2-4 Specific risks

These risks are mainly known as governance, social, and environmental (ESG) risks They are different in different countries and regions, and today they have attracted the attention of researchers and different funds. Also, some research on how to use the ESG approach investigated to create more value with less risk [20]. Environmental laws in the European continent have been changing rapidly in recent years and have created the requirement for private investment funds to invest in renewable energy and zero-carbon projects.

The authors compared the risk management of Indian investment funds with French and German funds in their research [21]. Differences in legal systems in different countries lead to differences in risk management systems. Risk management practices in France and Germany are more advanced than in India. The result of their study was that the difference in risk management methods between the funds of different countries is influenced by factors such as the regulatory environment, the legal and governance system, and the culture of that country's society. Therefore, efficient risk management in private equity requires understanding the specific contexts in each country.

3-2-5 Performance evaluation using risk adjustment

Evaluating the performance of private equity funds is inherently a complicated method due to cash flow irregularities and unknown profit distributions. In addition, private equity funds may publish their earned returns to attract more investors, while it should be determined what level of risk this return has been obtained by accepting. It is pointed out in the research that measuring and adjusting returns using risk in private equity funds is very important because private equity funds are usually not liquid and are exposed to higher levels of risk than traditional investments [22]. It is proposed that a framework for how to effectively measure and regulate risk in private equity investments is based on the concept of "beta". This framework suggests that investors can use beta as a measure of risk in private equity funds, similar to how beta is used in public equity investments.

The authors of the articles address the challenge of accurately assessing private equity fund performance by proposing a new risk and return methodology using the general moment method (GMM) [23]. This approach, which avoids assumptions about probability distributions and relies on actual cash flow data, offers a more robust and flexible way to evaluate PE fund performance. Their work highlights the importance of utilizing sophisticated statistical techniques to navigate the complexities of PE data and provides a valuable tool for investors seeking to better understand the risk-return profile of these investments.

Phalippou & Gottschalk (2009) state the purpose of their research is to investigate and evaluate the performance of private equity funds both in net form (taking into account fund costs) and in gross form (without considering fund costs) [24]. According to their results, to attract more investors, funds only publish gross returns. If the fund costs are affected, the yield for the funds is 6 on average The percentage decreases. Also, in the discussion of risk adjustment according to the high leverage of the Leveraged buyout funds and the risky nature of venture capital investments do not consider the assumption of beta equal to one reasonable. Adjusting the risk of the yield of leveraged and risky acquisition funds, respectively, 0.75 and 0.77 The percentage decreased.

Also, the accuracy of the reported net asset value (NAV) is an important factor in evaluating the performance of private equity funds. Several studies have investigated the potential of NAV manipulation., especially in fundraising periods. It is found that widespread evidence of NAV manipulation, suggests that GPs may understate future distributions and smooth NAVs to present a more favorable performance picture [25]. They also observed spikes in valuations around fundraising

times, potentially indicating strategic manipulation to attract investors. The Article corroborated these findings, demonstrating that poorly performing GPs who fail to raise new funds are more likely to manipulate NAVs [26].

However, they also argued that LPs are becoming increasingly sophisticated in detecting such attempts, as the ultimate realized performance of these funds often falls short of the inflated figures presented during fundraising. Barber & Yasuda (2013) further confirmed this trend, showing that GPs' fundraising success is directly linked to their current fund's reported performance. Smaller and younger GPs, who have greater incentives to attract capital, are more likely to inflate NAVs around fundraising periods. The author added another layer to this issue, suggesting that GPs with strong interim performance may increase the risk of their subsequent investments, potentially driven by a desire to maintain the appearance of strong returns [27].

Gregory et al. (2017) by extracting 1074 data venture funds and 997 Leveraged buyout funds between 1969 Until 2016 Investigate how private equity firms may manipulate NAV reports. They find that general partners with a better track record tend to report conservative NAVs for long-term reputational preservation, while poorer-performing general partners may overreport NAVs for short-term survival. They suggest that investors give priority to the return of capital to investors (periodic profit distribution) over periodic reports.

4- Conclusion and suggestion research

In this research, we examined the risks associated with investing in private equity funds. Private equity funds are investment vehicles that collect capital from institutional and high-net-worth investors to invest in private companies. These funds are famous for their high returns, but they also have a high risk due to the illiquid nature of investments and the possibility of significant losses. Risks related to fund operations are one of the most important risks related to these types of funds, which include screening risk, risk related to the investable company, and total portfolio risk. Also, to reduce these risks, various methods such as diversification of investment, portfolio management, use of syndicate, stage financing, and use of strict supervision on private equity funds were suggested.

Liquidity risk is also a significant issue for private equity funds. As mentioned earlier, these funds are invested in illiquid assets, which means that it may be difficult to sell them quickly. This can be problematic if investors in the fund need to quickly cash out their investments, or if the fund needs to sell assets to meet its obligations. Macro risks and specific risks were also explained in detail. macro risks are considered in the category of unavoidable risks, but in the end, funds can control these risks to some extent by using financial instruments such as futures contracts and forward contracts, swaps, insurance, and other derivatives.

In the reviewed articles, operational risk and liquidity risk were more frequent than others. Subject classification of articles in Figure 3 It is visible. From the subject classification of the articles, it can be concluded that there are more studies in the field of unsystematic and avoidable risks than in other fields, and investment funds and investors can invest intelligently by studying and understanding them. In general, private equity investments can yield significant returns but are associated with a high level of risk. It is important for investors to carefully assess these risks and work with experienced fund managers who can help mitigate them through effective portfolio management and risk control strategies. Also, the funds should pay attention to these risks and take steps toward the interests of their investors.

In the context of a novel and innovative research work, a proposal can be to examine the impact of environmental, social, and governance (ESG) factors on private equity fund investments. This can include analyzing ESG practices Private equity funds, and the types of companies based on ESG criteria They invest in them and the performance of these investments over time. In addition, this study can investigate the role of ESG factors in the decision-making processes of fund managers and investors and the potential of ESG criteria to create a competitive advantage for private investment funds. One of the practical topics for future research is the development of an efficient model aimed at increasing secondary market liquidity for private equity fund transactions. Such a model should focus on identifying and reducing liquidity barriers, optimizing transaction processes, and innovative financial integration. The tools and technologies aim

to create a stronger and more dynamic secondary market that can better meet the needs of investors and improve overall market efficiency.

References

[1] Buchner, A. (2017). Risk management for private equity funds. Journal of Risk, 19(6).

[2] Florida, R. L., & Kenney, M. (1988). Venture capital-financed innovation and technological change in the USA. Research Policy, 17(3), 119-137.

[3] Bartzokas, A., & Mani, S. (Eds.). (2004). Financial systems, corporate investment in innovation, and venture capital. Edward Elgar Publishing.

[4] Gompers, P., & Lerner, J. (1996). The use of covenants: An empirical analysis of venture partnership agreements. The Journal of Law and Economics, 39(2), 463-498.

[5] Reid, G. C., G Terry, N., & Smith, J. A. (1997). Risk management in venture capital investor investee relations. The European Journal of Finance, 3(1), 27-47.

[6] Duffner, S (2003). Principal-agent problems in venture finance. Working Paper, 11/03. University of Basel

[7] Ljungqvist, A., & Richardson, M. (2003). The investment behavior of private equity fund managers.

[8] Koryak, O., & Smolarski, J. (2008). Perception of risk by venture capital and private equity firms: A European perspective. The Journal of Private Equity, 30-42.

[9] Zhang, X. B., & Zhang, C. (2009, July). Study on private equity investment risk avoiding based on principle-agent. In 2009 IITA International Conference on Services Science, Management and Engineering (pp. 388-391). IEEE.

[10] Proksch, D., Stranz, W., Pinkwart, A., & Schefczyk, M. (2016). Risk management in the venture capital industry: Managing risk in portfolio companies. The Journal of Entrepreneurial Finance (JEF), 18(2), 1-33.

[11] Nozari, H., Szmelter-Jarosz, A., & Ghahremani-Nahr, J. (2021). The ideas of sustainable and green marketing based on the internet of everything—the case of the dairy industry. *Future Internet*, *13*(10), 266.

[12] Lerner, J. (2022). The syndication of venture capital investments. In Venture Capital (pp. 207218). Routledge.

[13] Franzoni, F., Nowak, E., & Phalippou, L. (2012). Private equity performance and liquidity risk. The Journal of Finance, 67(6), 2341-2373.

[14] Brunnermeier, M. K., & Pedersen, L. H. (2009). Market liquidity and funding liquidity. The review of financial studies, 22(6), 2201-2238.

[15] Nadauld, T. D., Sensoy, B. A., Vorkink, K., & Weisbach, M. S. (2019). The liquidity cost of private equity investments: Evidence from secondary market transactions. Journal of Financial Economics, 132(3), 158-181.

[16] Chen, L. H., Dyl, E. A., Jiang, G. J., & Juneja, J. A. (2015). Risk, illiquidity, or marketability: What matters for the discounts on private equity placements? Journal of banking & finance, 57, 41-50.

[17] Harris, R. S., Jenkinson, T., & Kaplan, S. N. (2014). Private equity performance: What do we know? The Journal of Finance, 69(5), 1851-1882.

[18] Gompers, P. A., Kaplan, S. N., & Mukharlyamov, V. (2022). Private equity and COVID-19. Journal of Financial Intermediation, 51, 100968.

[19] Robinson, D. T., & Sensoy, B. A. (2013). Do private equity fund managers earn their fees? Compensation, ownership, and cash flow performance. The Review of Financial Studies, 26(11), 2760-2797.

[20] Indahl, R., & Jacobsen, H. G. (2019). Private equity 4.0: Using ESG to create more value with less risk. Journal of Applied Corporate Finance, 31(2), 34-41.

[21] Kut, C., & Smolarski, J. (2006). Risk management in private equity funds: a comparative study of Indian and Franco-German funds. Journal of Developmental Entrepreneurship, 11(01), 35-55.

[22] Korteweg, A. (2019). Risk adjustment in private equity returns. Annual Review of Financial Economics, 11, 131-152.

[23] Driessen, J., Lin, T. C., & Phalippou, L. (2012). A new method to estimate risk and return of nontraded assets from cash flows: The case of private equity funds. Journal of Financial and Quantitative Analysis, 47(3), 511-535.

[24] Phalippou, L., & Gottschalg, O. (2009). The performance of private equity funds. The Review of Financial Studies, 22(4), 1747-1776.

[25] Jenkinson, T., Sousa, M., & Stucke, R. (2013). How fair are the valuations of private equity funds? Available at SSRN 2229547.

[26] Brown, G. W., Gredil, O. R., & Kaplan, S. N. (2019). Do private equity funds manipulate reported returns? Journal of Financial Economics, 132(2), 267-297

[27] Crain, N. (2013). Career concerns and venture capital. WP University of Texas at Austin.